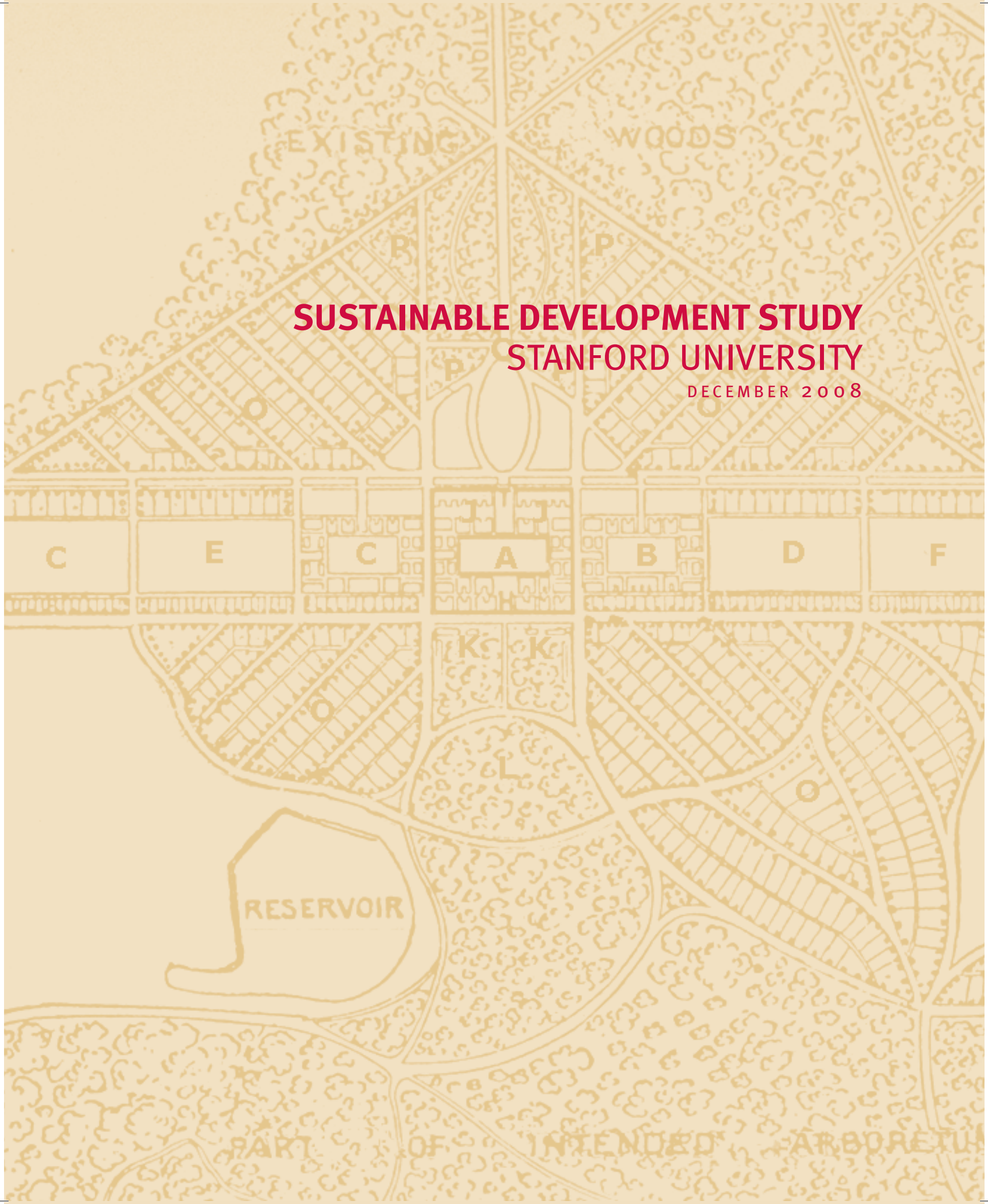

SUSTAINABLE DEVELOPMENT STUDY

STANFORD UNIVERSITY

DECEMBER 2008

County of Santa Clara

Department of Planning and Development
Development Services Office

County Government Center, East Wing
70 West Hedding Street, 7th Floor
San Jose, California 95110
(408) 299-5700 FAX (408) 279-8537

November 3, 2008

The Stanford General Use Permit (GUP) and the Stanford Community Plan (SCP), adopted in 2000, require that Stanford complete and submit a Sustainable Development Study (SDS) covering all of its unincorporated lands prior to the County accepting applications for the second half of academic development allowed under the GUP. The SCP required Stanford to cooperate with the County in preparation of this document, and to address specific items and issues identified in the SCP. Once deemed adequate by the County Planning Office, the SDS is required to be presented to the Stanford Community Resource Group, then forwarded to the Planning Commission for a recommendation, and finally, reviewed and approved by the Board of Supervisors.

The Stanford Community Plan states that the SDS is to be a planning study, that demonstrates how future development could be accommodated on the University campus and to ensure that growth under the 2000 GUP and future growth patterns are consistent with quality planning practices and the County's planning objectives. The SCP makes it clear, however, that the County's approval of the SDS, shall in no way be construed as the County's agreement to or approval of the amount, type or location of development described in the study. The study does not modify the 2000 GUP or the conditions of approval.

In preparing the SDS, Stanford regularly consulted with the County, and has included in the document consideration of all specific items and issues required. The SDS should prove to be a valuable tool in informing future development of the academic campus, preventing sprawl into the hillsides and in resource protection.

On October 31, 2008, the Planning Office deemed the SDS document adequate. Tentative dates for public review and consideration of the SDS are as follows:

Community Resource Group	11/13/08 7:00 PM	Palo Alto Art Center	1313 Newell Road, Palo Alto
Planning Commission	11/20/08 7:00 PM	Palo Alto Art Center	1313 Newell Road, Palo Alto
Board of Supervisors	12/09/08 2:00 PM	Board Chambers, County Government Center	70 W. Hedding Street, San Jose

To confirm meeting dates, times and locations, contact Marina Rush, Project Planner at (408) 299-5784 or access the County Planning Office website: http://www.sccgov.org/portal/site/planning.

Jody Hall-Esser

Mrs. Jody Hall-Esser, Director
Department of Planning and Development
County of Santa Clara

JHE:mh

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* Photo credit: L.A.Cicero/Stanford News Service

** Image from: The Nineteenth Century in Print: Periodicals Garden and forest. / Volume 1, Issue 43.

*** Photo credit: Tom Fox/SWA Group

SUSTAINABLE DEVELOPMENT STUDY

CHAPTER 1: EXECUTIVE SUMMARY

Chapter 1: Executive Summary

Executive Summary

The County of Santa Clara adopted the Stanford Community Plan and approved the General Use Permit for Stanford University in 2000. Under this permit, the University may develop up to 2,035,000 additional square feet of academic facilities and 3,018 units of housing. The combined housing and academic growth is expected to reach approximately 3.5 million square feet. The General Use Permit also includes a number of requirements, one of which is the preparation and approval of a Sustainable Development Study.

The Sustainable Development Study (Study) must be approved by the County Board of Supervisors before the University applies for the second million of the approximately 2 million additional square feet of academic buildings approved in the General Use Permit. The timing of this requirement is designed to ensure that development under the permit and future growth patterns are consistent with the policies and conditions of the Community Plan and General Use Permit.

This Study is not a development proposal. It is a planning exercise required by the Stanford Community Plan that sets the stage for ongoing dialogue that will continue to shape campus growth as development proceeds under the General Use Permit and as additional development is considered in the future. Actual development proposals will continue to be evaluated for their environmental and policy impacts by the County of Santa Clara. For a schedule of public hearings regarding the Sustainable Development Study see http://www.sccplanning.org/portal/site/planning.

The Stanford Community Plan identifies three general components that the Study must include:

- Describe long-term growth potential for Stanford lands, demonstrate how future development will be sited to prevent sprawl into the hillsides, and provide long-term assurance of compact urban development
- Provide for long-term protection of natural and scenic resources, with a view beyond the 25-year timeframe of the Academic Growth Boundary
- Identify areas of potential future development in the Foothills

COMPACT URBAN DEVELOPMENT INSIDE THE ACADEMIC GROWTH BOUNDARY

The Stanford Community Plan establishes an Academic Growth Boundary, which divides the University's lands in unincorporated Santa Clara County into two areas: Central Campus and Foothills (figure 1.1). The Community Plan recognizes that the Academic Growth Boundary is not a permanent planning boundary, but should be in place for a long enough period to promote increased growth within the Central Campus rather than unnecessary development of land in the Foothills. The specific requirement is that the Academic Growth Boundary will remain in place for a minimum of 25 years and until the University reaches 17,300,000 square feet of academic, support, and student housing facilities.

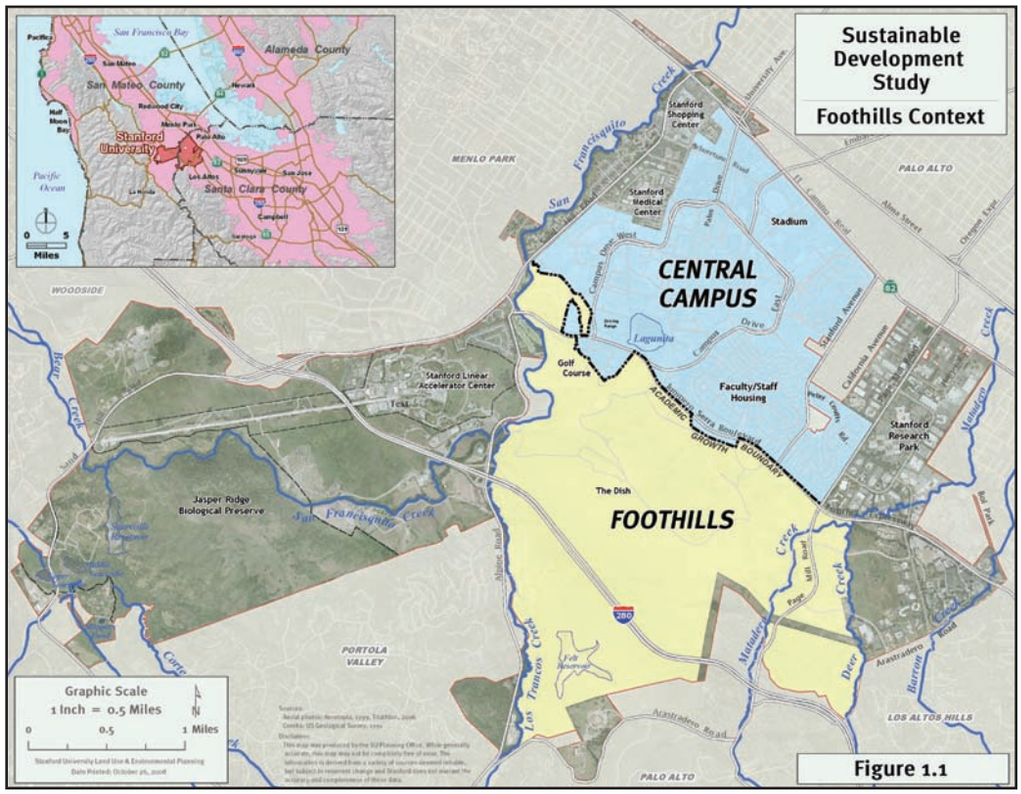


Figure 1.1 Stanford University Lands (see fold-out map)

The Stanford Community Plan states that the Study is to address resource protection with a view beyond the 25-year timeframe of the Academic Growth Boundary. Thus, the Study extends beyond 2025. But the Study recognizes that it is difficult to predict all of the demographic, educational, social, and community needs that might influence growth patterns at Stanford in the far distant future. In addition to potential changes in the ways that universities fulfill their educational missions, approaches to increasing density and societal views on how much density might be appropriate in an area change over time. For example, the University's introduction of multi-level basements and underground parking structures are a new direction in campus planning that might not have been acceptable or feasible in the past.

Accordingly, studies of this type require a planning horizon. Stanford proposed and County staff agreed to use a planning horizon of 2035 for the Sustainable Development Study. This timeframe is consistent with generally accepted periods for long-range plans. It also represents a significant extension beyond the projected completion of development under the General Use Permit in 2018, and the date for reviewing the Academic Growth Boundary in 2025. Further, this planning horizon recognizes that uncertainty increases as the horizon becomes more distant. While it might be possible to project growth rates over 50 years, 100 years, or longer, the assumptions about the likelihood of a particular growth rate and how that growth might be accommodated, grow more speculative over time. At some point, the analysis would no longer be credible and would not provide meaningful information. The 2035 planning horizon strikes a balance between the desires to provide a long-term planning framework and to produce a study that is useful.

The Sustainable Development Study assesses the potential to site future development on the Central Campus during the planning horizon. The Study presents campus planning principles to promote compact urban development, ensure efficient and environmentally responsible circulation networks, and preserve the historic quality of the campus. Under the 2000 General Use Permit, Stanford's approach has been to increase overall density through infill and redevelopment, while applying a range of densities appropriate to different areas of the campus (figure 1.2). These same principles will be employed throughout the second half of buildout under the General Use Permit.

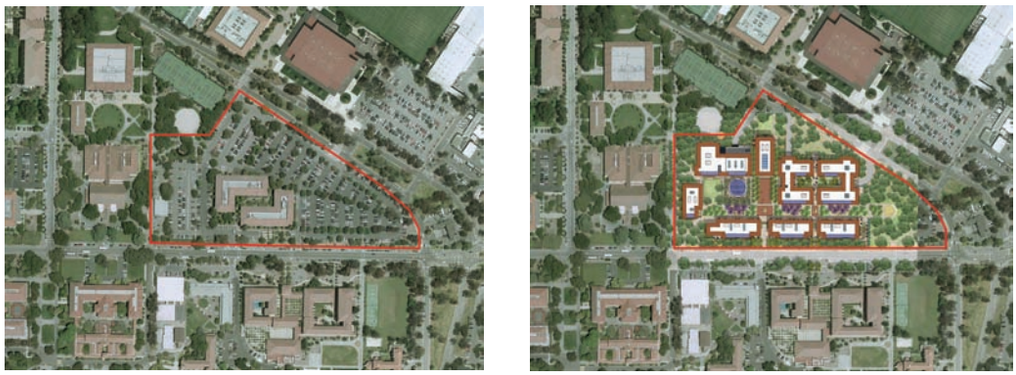


Figure 1.2 Redevelopment at higher density to promote compact development and improve landscape character: the Graduate School of Business project (currently under construction).

The Study uses these campus planning principles and a range of growth rates to model three scenarios for future development between the completion of the current General Use Permit in about 2018 and the planning horizon of 2035. The three scenarios present conceptual diagrams showing a mix of academic and housing facilities. The growth rates modeled range from 2 million square feet (115,000 sf/year) in the Minimal Growth scenario to 5 million square feet (300,000 sf/year) in the Aggressive Growth scenario. In between, the Study models a Moderate Growth Scenario of 3.5 million square feet. This scenario represents about 200,000 additional square feet per year from 2018 to 2035, and mirrors the actual growth rate at Stanford both from 1960 to 2000, and during the first half of development under the General Use Permit (figure 1.3).

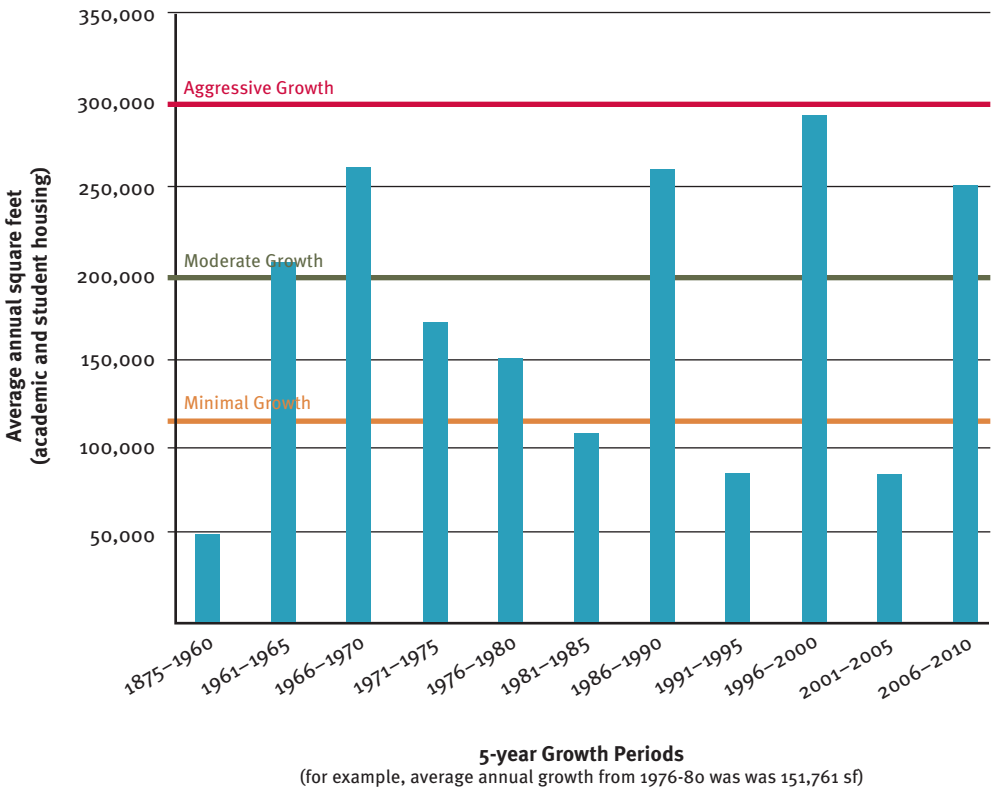


Figure 1.3 Stanford University's growth pattern over time (academic and student housing facilities)

The scenarios provide a mechanism for assessing whether campus development through the planning horizon can be accomplished without creating pressure to move the Academic Growth Boundary. The Study demonstrates that continued implementation of Stanford's campus planning principles to redevelop and renovate the campus at the densities that have been realized under the current General Use Permit would provide long-term potential development capacity. Even the largest of the hypothetical growth scenarios can be accommodated within the current Academic Growth Boundary (figure 1.4).

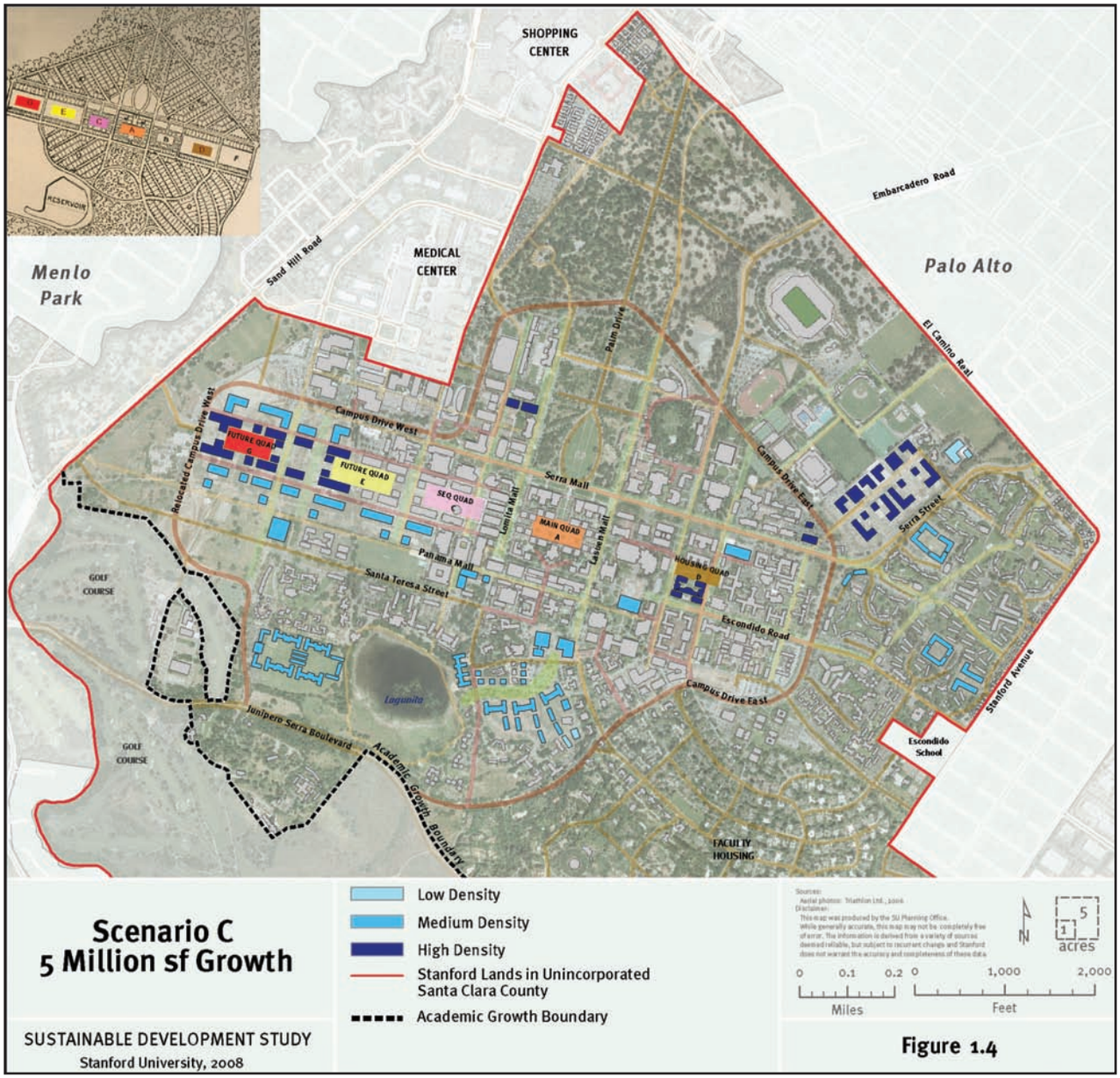


Figure 1.4 Scenario C Development Map: 5 million sf Growth

RESOURCE PROTECTION IN THE FOOTHILLS

The Study also presents planning principles for the Foothills area, designed to ensure that natural and scenic resources are protected over the long term. The Foothills include a variety of landscape types: grasslands, oak woodlands, and riparian corridors. The Foothills also host a mix of existing uses: radiotelescope "dishes," the campus radio station, a solar observatory building, outdoor recreation features, and facilities used by agricultural tenants. The General Use Permit allows 15,000 square feet of new facilities in the Foothills. While the University has no plans to build additional facilities in the Foothills, the requirements for the Sustainable Development Study include identifying developable areas outside the Academic Growth Boundary.

The Study accomplishes this by identifying protected areas and applying a land sensitivity analysis to the remaining lands to identify natural and scenic resources and physical features (Figure 1.5).

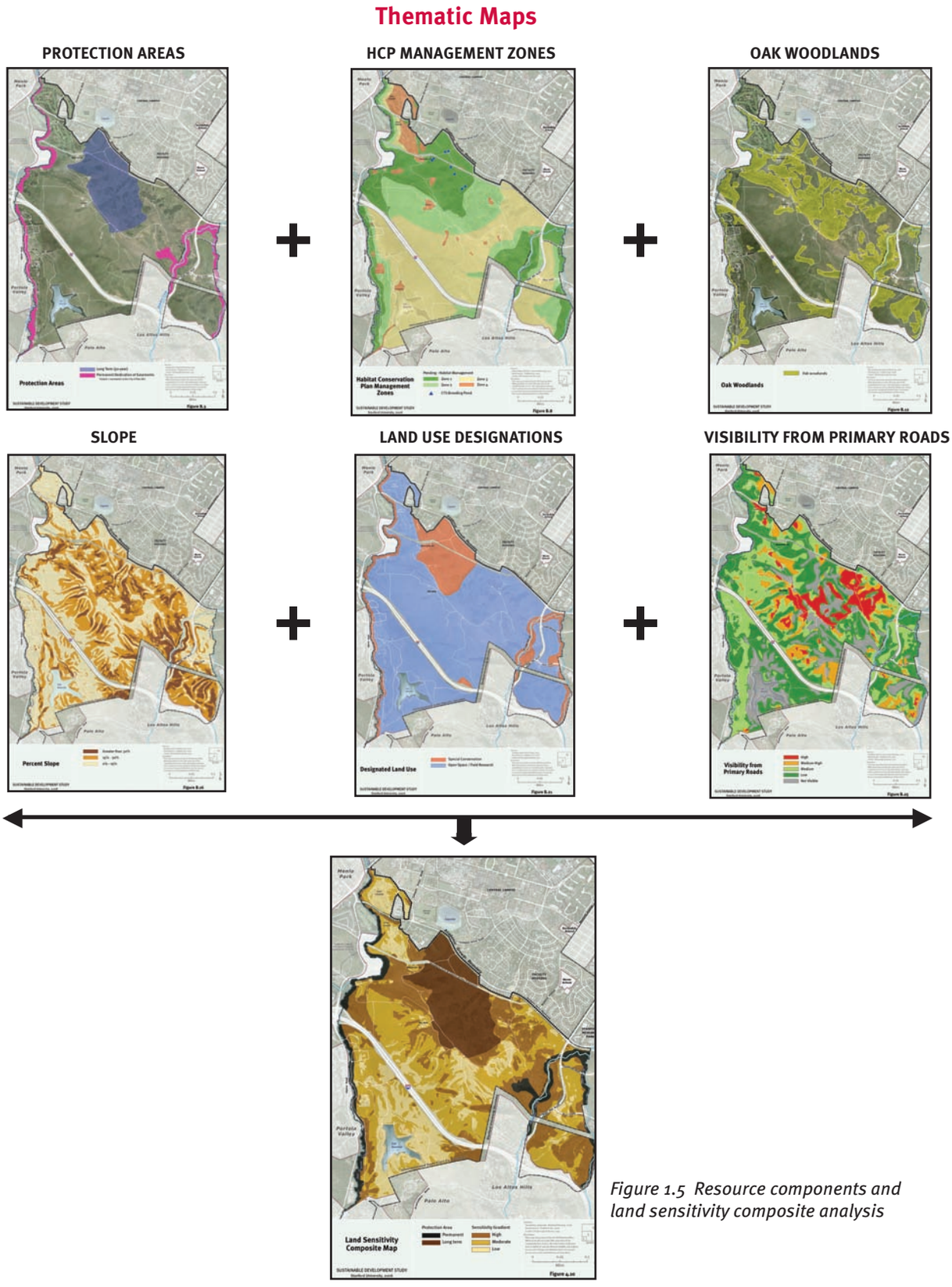


Figure 1.5 Resource components and land sensitivity composite analysis

The result of this analysis can be used in order to inform broader, planning level decisions about the use of Foothills lands (Figure 1.6). The information produced by this analysis will be used by Stanford when factoring resource conservation into its decision-making processes.

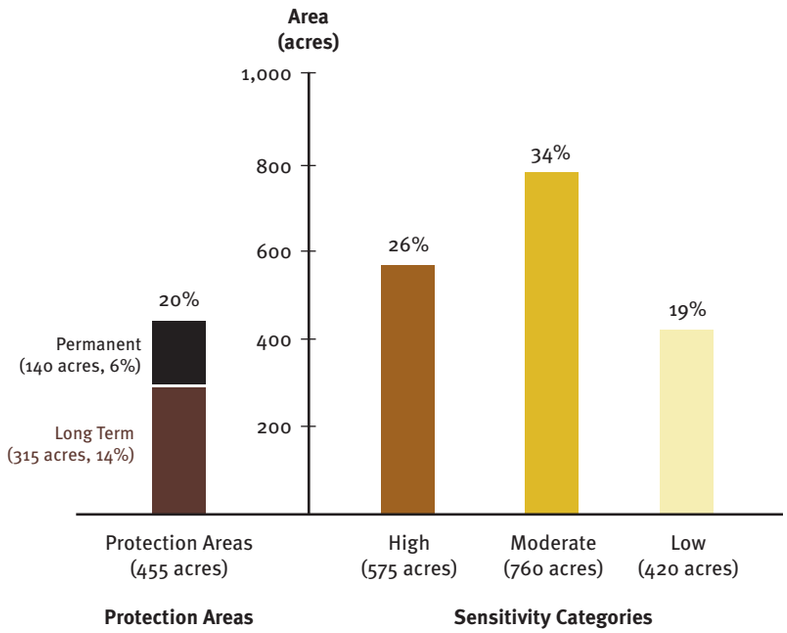


Figure 1.6 Protection Areas and land sensitivity summary chart

ENVIRONMENTAL SUSTAINABILITY PROGRAMS

The Stanford Community Plan's policies for the Sustainable Development Study are primarily focused on land use. In addition to describing Stanford's principles for promoting sustainable land use patterns inside and outside the Academic Growth Boundary, the Study discusses the University's broader environmental sustainability programs that extend beyond the Stanford Community Plan requirements. Building on the University's strong record on energy and water conservation, recycling, and support for alternative transportation, major new initiatives have been launched in these areas.

The University plays a critical leadership role in research and education concerning solutions to the global environmental crisis, and the credibility of these efforts depends in part on the success of its efforts to manage its own operations sustainably. The University has Sustainability Working Teams developing new guidelines for institutional practices in five focus areas:

- **Energy and Atmosphere:** evaluates measures for energy conservation, energy efficiency, clean energy supply and development, and implementation of campus greenhouse gas reduction targets
- **Green Building:** evaluates guidelines and standards for sustainability in new building construction, renovation, new building operation and maintenance, and building demolition and materials recovery
- **Water**: explores and evaluates measures to conserve water and advance sustainable water use on campus
- **Waste Minimization:** explores and evaluates measures to enhance sustainability through waste management, reuse, and recycling practices
- **Transportation:** explores and evaluates measures to reduce the environmental impact of University-owned, private, and commercial vehicles, as well as University-related travel by members of the campus community

The Study addresses the requirements of the Stanford Community Plan and General Use Permit to provide an analysis of the long-term future growth potential for Stanford lands and assurance of compact development that avoids sprawl into hillsides and protects natural resources. It represents Stanford's enduring commitment to sustaining educational excellence, responsible resource conservation, and balanced managed growth in a rapidly changing world (figure 1.7, 1.8).

Figure 1.7 Sustainability Fair in White Plaza

Figure 1.8 Community volunteers assist in habitat restoration efforts in the Foothills

SUSTAINABLE DEVELOPMENT STUDY

CHAPTER 2: INTRODUCTION

Chapter 2: Introduction

The Sustainable Development Study (Study) is a requirement of the General Use Permit, approved in 2000 by the County of Santa Clara Board of Supervisors (2000 GUP), and is described in the Stanford Community Plan. The Study identifies planning principles that reflect the character of two regions within Stanford lands: the Central Campus and the Foothills, which are separated by an Academic Growth Boundary (Figure 2.1). The Study presents campus planning principles and conceptual development scenarios to analyze a range of potential growth rates that could be accommodated on Stanford's Central Campus. The Study also presents foothills planning principles and a sensitivity assessment to recognize and protect the sensitive resources located in the Stanford Foothills.

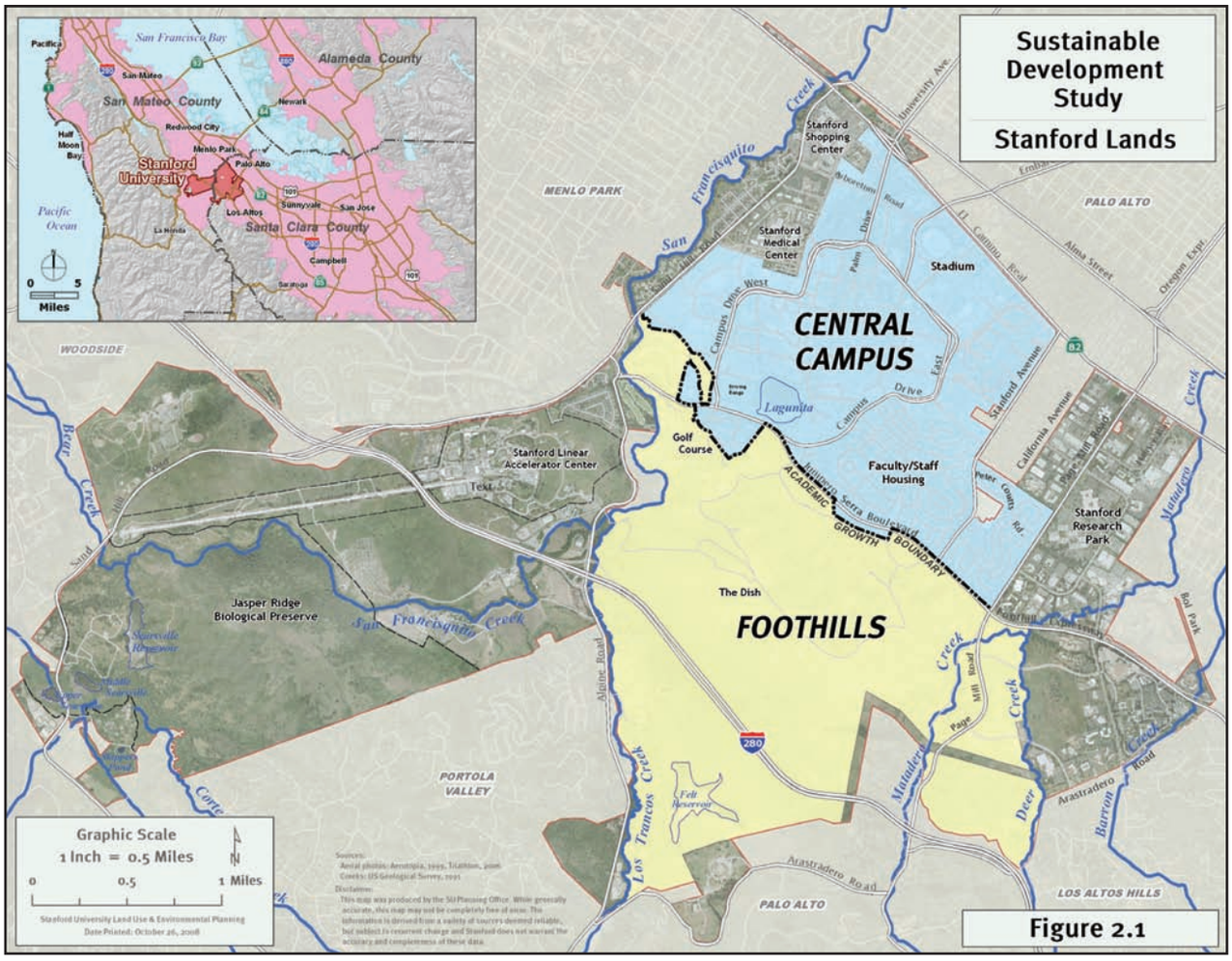


Figure 2.1 Stanford University Lands (see fold-out map)

When the Stanford Community Plan was adopted and the 2000 GUP was approved, sustainability had an urban planning focus: the development of compact, pedestrian, and transit-friendly communities, and the avoidance of sprawl into undeveloped areas. Since that time, the concept of sustainability has broadened to address a wider range of environmental issues. Therefore, the Study contains a chapter on the University's environmental sustainability programs to inform the community on these broader efforts. The basic goal of the Sustainable Development Study is to ensure that the University's growth and development proceed in a manner that is consistent with policies developed by the County of Santa Clara in the Stanford Community Plan.

Guiding Principles

Based on a basic goal of managing growth to protect quality of life, the Santa Clara County General Plan seeks to combine idealism and pragmatism in crafting policies for the future development of the County.[1] The Community Plan for Stanford University, adopted by the County of Santa Clara in 2000, applied the County of Santa Clara's policies for the future of the region, while also recognizing the University's mission. Guiding principles of the Sustainable Development Study are a synthesis of adopted County of Santa Clara principles and Stanford's own planning principles. These guiding principles include:

- Educational Excellence
- Managed, Balanced Growth
- Responsible Resource Conservation
- Managing for Uncertainty by Maintaining Flexibility

EDUCATIONAL EXCELLENCE

The Santa Clara County General Plan links economic and social well-being to educational excellence. More than 350 K-12 schools operate in the County of Santa Clara as well as 31 colleges and universities offering higher degrees.[2] The County of Santa Clara's vision for educational excellence for this extensive network of institutions includes:

> "An educational system capable of:
> a. Enabling individuals to develop their abilities, skills, and knowledge to full potential;
> b. Enhancing each individual's sense of personal fulfillment and creativity;
> c. Enhancing the region's economic competitiveness through the development of a capable, skilled work force." [3]

Stanford University was founded by Leland and Jane Stanford in 1885 "to qualify its students for personal success and direct usefulness in life " and " to promote the public

1 Santa Clara County General Plan 1995-2010,.Book A, page A-11.
2 State of California Post-Secondary Education Commission. Viewed at http://www.cpec.ca.gov/CollegeGuide/AdvCollegeSearch.asp, July 24, 2008.
3 Santa Clara County General Plan 1995-2010. Book A, page A-9.
4 Stanford University, The Founding Grant with Amendments, Legislation and Court Decrees. Published by Stanford University, 1987. Page 4

welfare by exercising an influence in favor of humanity and civilization."[4] More than 16,000 Stanford alumni live and work in the South Bay Area[5], demonstrating a direct link between the University's educational mission and the highly skilled labor market of Silicon Valley.

A key guiding principle of the Sustainable Development Study is management of Stanford University lands in support of educational excellence. Leland and Jane Stanford's Founding Grant included the site for the campus, along with surrounding lands intended to serve as reserves for future academic use and to produce income to support the University. Stanford's development has closely followed the intent of its founders, and the original plan for the campus continues to shape its evolution. The strength of the vision of the University's founders will be evident in Chapter 3, where the original plan provides a foundation for considering possible growth scenarios for the University. Stanford University is widely recognized as a center of educational excellence and for its role in the continued social and economic well-being of the County and the region. The County of Santa Clara and Stanford University have a long and successful history of cooperative planning to sustain the University's excellence.

Figure 2.2 Roundtable discussions on global security and climate change

Figure 2.3 Students in the outdoor classroom

MANAGED, BALANCED GROWTH

The Santa Clara County General Plan states that growth is both necessary and desirable to maintain the County's social and economic vitality. However, this growth must be carefully managed to ensure balance among land uses, critical resources, and the quality of life for County residents. Regional agencies predict continuing population growth of approximately 2 million new residents in the San Francisco Bay Area during the Sustainable Development Study period (2009-2035).[6] A discussion of how a planning horizon was selected for the Sustainable Development Study is presented later in this chapter.

Predicting Stanford's population growth is difficult because the demographics of a university are very different than that of the general population. However, Stanford has a long history of managed, balanced growth. The University maintains an extensive private road, pathway, and shuttle network, and provides housing and recreational

5 Stanford Alumni Association WebDirectory. Viewed at https://pgnet21.stanford.edu/WebDirectory/search, July 24, 2008.
6 www.abag.ca.gov/planning/currentfcst/summary1.html. Viewed July 24, 2008.

facilities for students, faculty, and staff. Growth in campus housing has kept pace with increases in campus academic facilities. Overall, the mix of land uses on Stanford's lands in unincorporated Santa Clara County reflects a balance among academic, housing, and support uses.

Figure 2.4 Women's Ultimate Frisbee team

Students in a classroom

The University's land use pattern at a more detailed level reflects more than a century of evolution from a rural, agricultural setting ("the Farm") to one that is compact and urban, favoring higher-density development strategically sited to preserve open space and to promote efficiency in transportation and infrastructure. Stanford began its transition to higher-density facilities in the 1990s, with a focus on the redevelopment of outdated, low-density facilities and the restoration of the quadrangles and axes of the original campus plan. A density analysis in Chapter 3 applies a well-defined set of campus planning principles to demonstrate how managed, balanced growth can continue during the study period and beyond. These principles incorporate sustainable urban planning and architectural concepts; see Chapter 5 for further discussion of the University's overall environmental sustainability program.

RESPONSIBLE RESOURCE CONSERVATION

The County of Santa Clara has a long record of leadership in efforts to control urban sprawl and to protect important natural resources. The County of Santa Clara's Community Plan for Stanford University reflects these values through the adoption of an Academic Growth Boundary (AGB) and new designations for Open Space and Field Research (OS/FR) and Special Conservation Areas (SCA). Along with implementation of the University's campus planning principles (described in Chapter 3), these planning tools promote compact development in the Central Campus while protecting sensitive areas in the Foothills.

In addition, the County of Santa Clara and Stanford are each completing Habitat Conservation Plans (HCP) to protect sensitive plants and animals and to promote habitat restoration efforts; the County's HCP covers portions of southern Santa Clara County and Stanford's covers all of its lands in Santa Clara County. Land use and resource conservation values and concerns are shared widely in the local community. These values are reflected in the planning principles for the Central Campus (Chapter 3) and the Foothills (Chapter 4).

Stanford University has launched a series of initiatives that promote environmental stewardship. Examples include the Woods Institute for the Environment, which hosts academic programs in renewable energy, land use and conservation, oceans and estuaries, and fresh water, and training programs for future environmental leaders. The Precourt Institute for Energy Efficiency was founded at Stanford in 2006 to develop and promote environmentally sensitive technologies. The Sustainable Stanford program brings this focus of resource conservation and environmental protection to managing the daily operations of the campus, including green building and landscape efforts, water and energy conservation, solid waste minimization, and transportation management programs. The Sustainable Development Study reiterates Stanford's commitment to resource stewardship and sustainable approaches to the future operation of the campus consistent with its mission and the core values it shares with the local community.

Figure 2.5 Sustainability Fair in White Plaza

Figure 2.6 Community volunteers assist habitat restoration efforts in the Foothills

MANAGING FOR UNCERTAINTY BY MAINTAINING FLEXIBILITY

At the time of this study, local housing prices are falling for the first time in two decades; climate patterns are shifting, with concomitant economic impacts; and gasoline prices, while dropping, continue to be high. How do we predict the dimensions of the regional jobs-housing balance in the future? What will parking lots look like in 20 or 30 years? Will they be needed at all? How will new technologies change the way classrooms and laboratories are used?

Looking back at major events of the past 25 years, there have been many surprising changes that neither Stanford nor the County might have predicted. In 1985, there was only one cellular phone on campus, and the Internet was a small network of computer scientists sharing program code. Ronald Reagan was beginning his second term, Nelson Mandela was still in prison in South Africa, and a world-wide oil glut forced gas prices down to $1.20 a gallon. In 1989, the Loma Prieta earthquake caused more than $120 million in damage to the Stanford campus and resulted in a major shift in financial resources to structural repairs and retrofitting the campus' older buildings. Looking forward to the future, Stanford and County of Santa Clara planners, and all members of the greater community can expect to be surprised repeatedly as politics, economics, natural forces, and technological changes continue to affect local quality of life.

Figure 2.7 Musicians in Sweden and at Stanford competition play together over the Internet

Figure 2.8 Winner of 2005 driverless car

Three facets of uncertainty affect the University's facilities planning. First, the unpredictability of the University's finances in terms of income sources (e.g., grants, investments, tuition, rents) and in operating expenses, both of which are closely tied to national and global economic trends, as well as to policy decisions in Washington, Sacramento, Menlo Park, Palo Alto, and San Jose. Second, the cutting edge of innovation in advanced research moves at a pace and in directions that are difficult to foresee. And third, the emergence of new technologies and expanding fields of knowledge may change the very nature of universities and the way they grow.

In 1958, Stanford had approximately 20 faculty members to cover all the various subfields of biology, most housed in a single Department of Biological Sciences. Due to the stunning growth of knowledge in the biological sciences over the past 50 years, the University now has more than 190 biologists in 10 separate departments devoted to these fields: Biology, Biochemistry, Bioengineering, Chemical and Systems Biology, Developmental Biology, Genetics, Microbiology and Immunology, Molecular and Cellular Physiology, Neurobiology, and Structural Biology. This does not count the many non-clinical scientists housed in the clinical departments of the Medical School, which have also had to expand substantially to maintain coverage of their fields. Similarly, the University now has more than 220 faculty members working on issues related to the environment, climate change and sustainability; in 1958, the University had none. Expansion of this sort is an absolute necessity if the University is to continue to provide the level and quality of research and teaching expected of a leading university.

In even broader terms, the future of higher education over the long term is difficult to predict due to rapidly changing technologies and the erosion of government financing in the educational sector. Some organizations are predicting a massive shift of students into online educational programs and away from traditional 4-year colleges, both public and private. Another variable is government funding for basic research in science and medicine, which has declined nationally and as a percentage of Stanford's operating budget. Federal grants make up 28 percent of the University's annual operating

budget (down from 36 percent 4 years ago), and more than 45 percent of Stanford undergraduates receive federal grants, loans, or work-study income. These technological and financial trends in higher education will shape the University's priorities, but it is extremely difficult to predict the outcome.

Managing for uncertainty adds both caution and excitement to the planning enterprise and creates the context and need for flexibility. Maintaining flexibility, within the framework of managed, balanced growth, is an essential underlying assumption of the Sustainable Development Study. The retention of large land areas for unknown but potentially crucial future uses has guided the historical development of the campus and will continue to shape its plans for the future.

Stanford's land reserves allow the University the flexibility to respond strategically to new directions in teaching and research. In Chapter 3, three different growth scenarios are studied and demonstrate that the University can implement its campus planning principles to site new facilities on its Central Campus within the existing AGB. In Chapter 4, the potential to site special-use facilities in the areas outside the AGB is studied. In both chapters, the specific academic initiatives that would create the need for these facilities are unknown; however, the analyses demonstrate the capacity of the lands to accept additional development.

Together with managing for uncertainty, maintaining flexibility argues against rigid categories, boundaries, or goals. One of the University's greatest strengths is the permanence of its land assets; it can make adjustments in land uses to adapt to changing circumstances. In response to uncertain future conditions, Stanford might, for example, find that demand for on-campus housing declines with the rise of telecommuting and distance learning. On the other hand, demand for on-campus housing might actually increase as regional and even local transportation networks reach capacity. The Stanford Community Plan and 2000 GUP offer considerable flexibility for Stanford to determine its academic facilities and housing program needs. As the County and the University look ahead to the future, flexibility will continue to be the key to maintaining balance among land uses, conserving critical resources, and leaving room for future decision-makers to embrace exciting new opportunities.

Purpose and Requirements

In Stanford University's Draft Community Plan and General Use Permit application (dated November 15, 1999), Stanford promoted compact urban development patterns and proposed the creation of a restrictive academic growth boundary that would be similar to urban growth boundaries (UGBs) used by cities to prevent sprawl. During the public review process, this idea was accepted, and the approved Community Plan includes an Academic Growth Boundary (AGB) located approximately along Junipero Serra Boulevard, separating the Central Campus from the Foothills.

Just as the Santa Clara County General Plan includes mechanisms for review of cities' UGBs, the Stanford Community Plan recognizes that the AGB is not a permanent planning boundary. Rather, the Community Plan states that the AGB should be in place for a long enough period to promote increased growth within the Central Campus rather than unnecessary development of land in the Foothills. The specific requirement in the Stanford Community Plan is that the AGB will remain in place for a minimum of 25 years and until the University reaches 17,300,000 square feet of academic, support, and student housing facilities within the AGB.[7] The AGB can be modified earlier than 2025 by a 4/5ths vote of the County of Santa Clara Board of Supervisors.

The County recognized that in order to accommodate development in the Central Campus as allowed under the 2000 GUP, it would be necessary for Stanford to develop the campus at a higher density. The Sustainable Development Study required by the 2000 GUP Condition E.5 is a mechanism to review the location and manner for future development and is required to be completed prior to proceeding with the second half of allowable development. The intent of this requirement addresses concerns that development at a low density might consume land within the AGB too quickly, resulting in pressure to place academic development into the Foothills. (See Figure 2.9, for full text of the Stanford Community Plan's description of the purpose of the Sustainable Development Study.) The need for and timing of the Sustainable Development Study is reflected in the Stanford Community Plan:

> "This study will be required to be completed during the time that the 2000 General Use Permit is in effect to ensure that both growth under the 2000 General Use Permit and future growth patterns are consistent with the recommendations of the study regarding the appropriate location and manner of development." [8]

7 Stanford Community Plan (SCP). Chapter 1 Growth and Development, page 13.
8 SCP.Chapter 1 Growth and Development, Strategy #2, page 17.

Other stated purposes of the Sustainable Development Study, found in the Stanford Community Plan, similarly promote avoidance of sprawl and protection of sensitive lands:

> "The Sustainable Development Study shall accomplish the following:
>
> - Demonstrate how future development will be sited to prevent sprawl into the hillsides, contain development in clustered areas, and provide long-term assurance of compact urban development
> - Provide for protection and/or avoidance of sensitive plant and animal species and their habitats, creeks and riparian areas, drainage areas, watersheds, scenic view sheds, and geologic features such as steep or unstable slopes, and faults."[9]

In addition, the Sustainable Development Study fulfills "the County's desire to understand the University's long-term development plans so that such development may accomplish the University's academic mission in a manner consistent with quality planning practices and the County's planning objectives. The Community Plan represents a commitment to quality stewardship of a unique regional asset."[10]

9 SCP. Chapter 1 Growth and Development Strategy# 2, GD 12, pages 18–19.
10 SCP, Chapter 1 Growth and Development, Strategy #2, page 17.

Stanford Community Plan
Strategy # 2: Engage in Co-operative Planning and Implementation

The policies associated with this strategy articulate and reinforce the decision making and co-operative arrangements among Stanford, the City of Palo Alto and the County of Santa Clara which have been in place for several decades. These policies clearly articulate a departure from General Plan policies for other urban unincorporated areas of the county; however, because the County's intentions regarding annexation, use regulation, and service provision differ from other urban areas it is appropriate that specialized policies and consultation procedures apply to Stanford.

The 1985 Land Use Policy agreement stipulates that Stanford will provide all municipal services to unincorporated portions of Stanford lands, including contractual arrangements for services as needed. The Community Plan and new General Use Permit create a need to ensure that service use by Stanford residents and Stanford's provision or contracting of services are consistent with one another.

The policies also reflect the County's desire to understand the University's long-term development plans so that such development may accomplish the University's academic mission in a manner consistent with quality planning practices and the County's planning objectives. The Community Plan represents a commitment to quality stewardship of a unique regional asset.

To provide for consideration of these issues, Stanford will be required prepare, at its own expense and in cooperation with the County Planning Office, a Sustainable Development Study covering all of its unincorporated lands in Santa Clara County. This study will be required to be completed during the time that the 2000 General Use Permit is in effect to ensure that both growth under the 2000 General Use Permit and future growth patterns are consistent with the recommendations of the study regarding the appropriate location and manner of development.

The Sustainable Development Study shall be based upon and meet planning principles and criteria established by the Board of Supervisors in the Community Plan and 2000 General Use Permit, as supplemented by the County Planning Office. These principles and criteria will include, but not be limited to, recognition, protection and avoidance of important natural resources including sensitive plant and animal species and their habitats, creeks and riparian areas, drainage areas, watersheds, scenic viewsheds, and geologic features such as steep or unstable slopes, and faults. The Sustainable Development Study shall identify the maximum planned buildout potential for all of Stanford's unincorporated Santa Clara County land,demonstrate how development will be sited to prevent sprawl into the hillsides, contain development in clustered areas, and provide long-term assurance of compact urban development. In the interest of maintaining hillside views, developable areas should generally be limited to those with an elevation lower than 200 feet. Coupled with new zoning that promotes clustering of development, the Sustainable Development Study will address issues of resource protection with a view beyond the 25-year time frame of the AGB.

The County may, at Stanford's expense, choose to conduct a parallel study to the Sustainable Development Study prepared by Stanford, or may choose to do additional work to supplement Stanford's study. The Sustainable Development Study will be submitted to the Board of Supervisors for approval.

Figure 2.9 Stanford Community Plan, Strategy #2

Sustainable Development Study Planning Horizon

The Stanford Community Plan states that the study is to address resource protection with a view beyond the 25-year timeframe of the AGB.[11] Long-term planning studies, by their nature, recognize the inevitability of change and the need for flexibility to adapt to future opportunities, priorities, and conditions. As discussed earlier in this chapter, predicting all of the demographic, educational, social, and community needs that might influence growth patterns at Stanford in the distant future is not possible.

Methods for increasing density, as well as societal views on how much density might be appropriate on a site, change over time. For example, a few decades ago the University might not have thought it feasible to accommodate academic programs in basements two levels below ground, as has occurred in the new Science and Engineering Quad, or to construct parking under recreational fields, as is the case at the Munger Graduate Student Residences.

Accordingly, studies of this type require a planning horizon. Stanford University proposed, and the County of Santa Clara planning staff agreed to, a planning horizon of 2035 for this Sustainable Development Study. This timeframe is consistent with the 25-year planning period used in many general plans, master plans, and long-range development plans prepared for counties, municipalities, and campuses. In addition, this timeframe enables the Study to consider both the second increment of academic growth under the 2000 GUP, as well as growth beyond completion of the 2000 GUP square footage. Moreover, this horizon extends 10 years beyond the date that the Stanford Community Plan sets for revisiting the AGB.

This planning horizon also recognizes that uncertainty increases as the horizon becomes more distant. While it might be possible to project growth rates over 50 years, 100 years, or longer, the assumptions about the likelihood of a particular growth rate and how that growth might be accommodated, grow more speculative over time. At some point, the analysis would no longer be credible and would not provide meaningful information. The 2035 planning horizon strikes a balance between the desires to provide a long-term planning framework and to produce a study that is useful.

11 *SCP, Chapter 1 Growth & Development Strategy #2, page 17.*

Components of the Sustainable Development Study

The Stanford Community Plan identifies the required components of the Sustainable Development Study. Further guidance from the Stanford Community Plan defines the Study's geographic scope to include all Stanford land in unincorporated Santa Clara County.

The components of the Study reflect three broad concepts discussed in the Stanford Community Plan:

- Definition of long-term growth potential for Stanford lands and demonstration of how future development can be sited to prevent sprawl into the hillsides and provide long-term assurance of compact development
- Protection of natural and scenic resources
- Identification of areas of potential future development in the Foothills

These components are addressed in Chapters 3 and 4 of the Sustainable Development Study. Additional sustainability strategies and programs are discussed in Chapter 5. The content of these chapters is further described below.

Chapter 3 presents a planning analysis of how and where future Central Campus development, both during the second half of 2000 GUP development and through the planning horizon for this Study, could be accommodated consistent with the County's adopted plans, policies, and principles, and Stanford's campus planning principles. The Sustainable Development Study presents the campus planning principles Stanford has used to site academic and housing facilities under the 2000 GUP. The Study uses these campus planning principles to identify potential locations for the second million square feet of academic facilities, as well as housing facilities, during completion of the 2000 GUP.

Chapter 3 uses these same campus planning principles to create three conceptual development scenarios that could accommodate a range of growth projections for 2035. The Study recognizes that Stanford has yet to identify programs to complete the development approved under the current GUP, much less development beyond that already authorized. As a result, the Study explores the potential to site campus development based on growth projections that are not tied to specific building needs or academic programs.

Chapter 4 of the Sustainable Development Study addresses natural resource protection in the Foothills and provides an inventory of potential constraints to development. The University has no plans or proposals to build new academic facilities in the Foothills, although limited development is allowed under the GUP.

The 2000 GUP states "[a] cumulative maximum of 15,000 square feet of building area may be located in the Foothills district in a manner consistent with the General Plan and zoning. This amount may not be increased, and shall be accompanied by an identified corresponding equivalent decrease in building area in the other development districts. No individual building or facility may exceed 5,000 square feet in size."[12] The Sustainable

12 GUP 2000, Conditions of Approval, E-2-b, page 7.

Development Study establishes an approach for evaluating Foothills areas that could be considered for potential development in the future and provides detailed information about the methods being used to recognize, protect, and avoid sensitive resources.

Chapter 5 represents the efforts that extend beyond the Stanford Community Plan's requirements but help inform the concept of protection of important natural resources. The phrase "sustainable development" as used in the Stanford Community Plan and 2000 GUP primarily encompasses land use planning principles promoting compact growth and protection of natural resources. These principles remain at the core of Stanford's campus planning efforts. However, since the Stanford Community Plan and 2000 GUP were adopted, the term "sustainability" has taken on additional meanings. Chapter 5 articulates the University's current efforts and long-term planning for environmental sustainability through reduced energy consumption, greenhouse gas emissions, water use, and solid waste generation, both in its existing campus facilities and in its new buildings. This chapter describes Stanford's internal guidelines for new buildings and major renovations, which set aggressive targets for minimizing energy and water use. It also describes Stanford's programs to reduce vehicle trips by encouraging the use of mass transit, carpooling, and pedestrian and bicycle modes of travel. Stanford also is increasing the use of lower or zero emission engines in shuttles and automobiles.

Taken together, the Sustainable Development Study:

- Articulates campus planning principles for locating possible future growth on the Central Campus
- Indicates that maximum planned buildout of the Central Campus through 2035 could likely be accomplished within the existing AGB
- Identifies planning principles for locating possible future facilities in the Foothills
- Recognizes sensitive resource areas
- Provides an internal planning tool for incorporating resource information into identification of future development areas, site selection, and planning process in the Foothills
- Describes Stanford's ongoing efforts to manage its operations to promote sustainability principles

The Study does not, however, constitute a proposal for entitlements beyond those that the County already has approved and is not intended to duplicate the requirements of the California Environmental Quality Act (CEQA) by studying the environmental effects of future growth. The County of Santa Clara and Stanford University anticipate that any major proposal for future development beyond the square footage authorized by the 2000 GUP would be subject to review under CEQA. Such review necessarily would include analysis of environmental topics that pertain to sustainability, including water supply, energy use, traffic, air quality, and waste generation.

This Study is not an actual development proposal. It is a planning exercise required by the Stanford Community Plan that sets the stage for ongoing dialogue that will continue to shape campus growth as development proceeds under the 2000 GUP and as additional development is considered in the future. Actual development proposals will continue to be evaluated for their environmental and policy impacts by the County of Santa Clara staff, the Planning Commission, and the Board of Supervisors.

SUSTAINABLE DEVELOPMENT STUDY

CHAPTER 3: CENTRAL CAMPUS | INSIDE THE AGB

Chapter 3: Central Campus | Inside the AGB

Introduction

This chapter examines how development under the 2000 General Use Permit (GUP), as well as future development beyond the 2000 GUP, could be located on the Central Campus to carry out Stanford Community Plan policies encouraging compact development. Stanford Community Plan Policy GD-12 requires that the Sustainable Development Study:

> **"Demonstrate how future development will be sited to prevent sprawl into the hillsides, contain development in clustered areas, and provide long-term assurance of compact urban development."**

The University has added much of the 2000 GUP square footage and housing units by replacing less efficient and outmoded buildings with new buildings that intensify the use of the site through added density (e.g., increased height and use of basements and attic areas). The University also has added buildings on infill sites, including surface parking areas, and replaced parking lots with underground structures. The University has also reused and retrofitted numerous existing buildings to accommodate new programs without adding substantial square footage. Reuse, redevelopment, renovation, and infill are development strategies Stanford expects to continue to apply as the 2000 GUP development proceeds.

The University has not yet finalized plans to complete the amount of development allowed under the 2000 GUP, and it has no specific plans for development beyond the 2000 GUP; however, in order to evaluate how long-term future development might be designed to avoid sprawl and advance principles of compact development, Stanford proposed, and County staff agreed, that a 2035 planning horizon should be used for this Study. This timeframe enables the County to consider both the second increment of academic growth under the current GUP, as well as growth beyond the 25-year time period for revisiting the AGB, which was adopted in 2000.

This chapter presents a range of 2035 campus growth scenarios. The 2000 GUP allows Stanford to develop approximately 3.5 million additional square feet (2,035,000 square feet of academic buildings and approximately 1.5 million square feet for at least 2,420 and up to 3,018 housing units). The "additional" square footage used in this Study corresponds to the net change in square footage resulting from new construction after deducting the offsetting demolition of existing structures. The University estimates that it will complete the square footage allowed under the GUP in 2018. This Study considers the following scenarios for additional growth beyond the square footage allowed under the 2000 GUP, from 2018 to 2035:

- Minimal Growth Scenario A - 2 million additional square feet (academic and housing), which averages to about 115,000 additional square feet per year
- Moderate Growth Scenario B - 3.5 million additional square feet (academic and housing), which averages to about 200,000 additional square feet per year
- Aggressive Growth Scenario C - 5 million additional square feet (academic and housing), which averages to about 300,000 additional square feet per year

The minimal growth scenario reflects the amount of square footage that the University historically has built during slower growth periods of 10 to 15-years (Figure 3.1). The aggressive growth scenario is considered to be unlikely in that it reflects more growth than would likely occur by 2035, based upon historic 10 to 15-year growth rates. The moderate growth scenario is consistent with the average annual rate of growth that has occurred at the University since the 1960s and during the first half of development under the 2000 GUP, and that is expected to occur through buildout under the 2000 GUP.

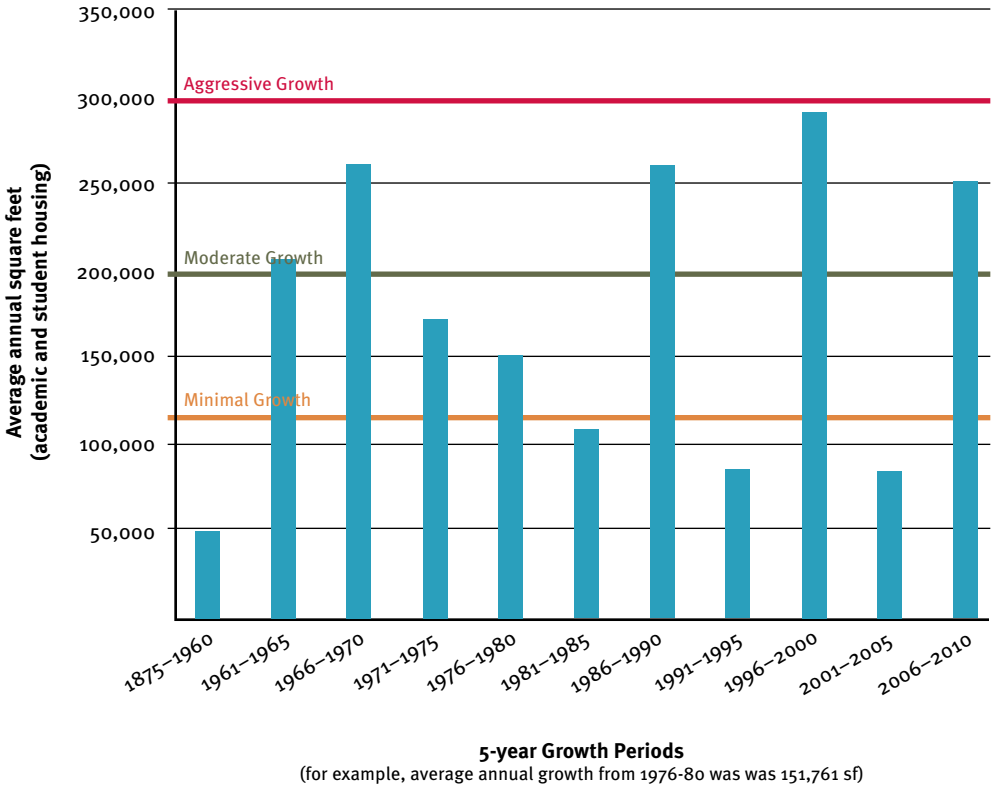


Figure 3.1 Stanford University Growth Scenarios

Background

Stanford University's primary goals are teaching, research, and the transfer of knowledge to the outside world. Stanford's lands and facilities serve to support its academic pursuits and a complementary residential community.

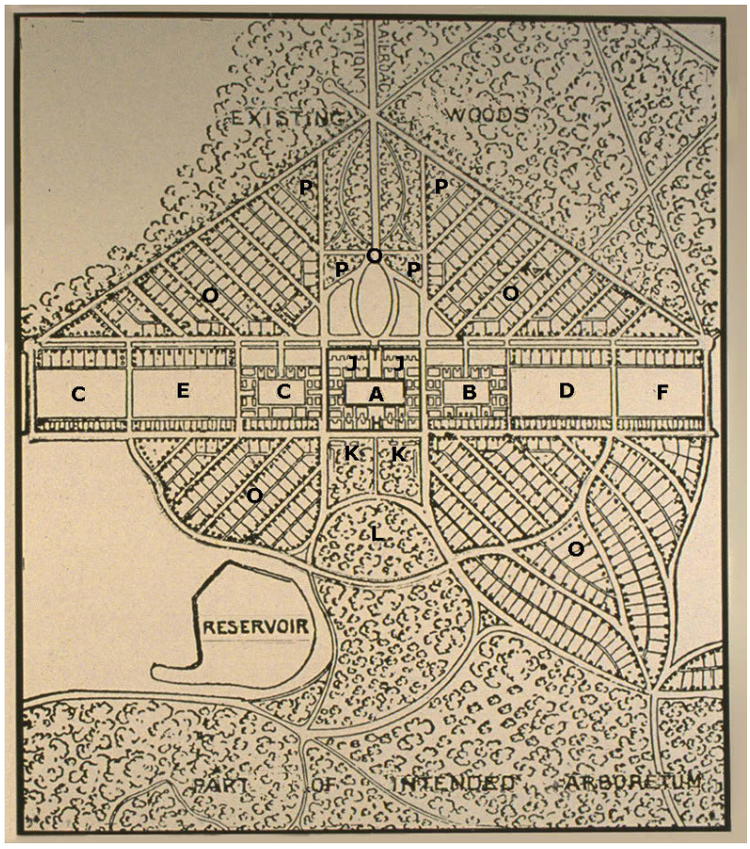
The Central Campus at Stanford University includes the Main Quad, which is the historic heart of the campus, the primary activities of the academic departments and programs, and residential, athletic, and support uses. Close physical proximity to diverse

academic programs has been a contributing factor to successful academic collaborations throughout the University's history. This physical connection to, and corresponding relationship among, academic programs is a vital criterion for site planning at Stanford.

HISTORY OF PLANNING AND DEVELOPMENT

The original plan for the Stanford campus was brought into existence by Leland and Jane Stanford and Frederick Law Olmsted. Attracted to the Beaux Arts style of architecture they had seen in Europe, the Stanfords insisted on a formal entry road (Palm Drive) ending at an imposing architectural presence (the Main Quadrangle and Memorial Church), while Olmsted argued for a more naturalistic arrangement of roads and buildings that ranged from the flatlands to the foothills. The collaboration created, at the end of the 19th century, what has become an iconic image for Stanford University: a powerful order of California Romanesque buildings of local materials arranged around courtyards and linked by covered arcades, all set in a strong naturalistic landscape.

The 1889 Olmsted Plan delineated future land uses and needs by the use of letters (A-R), rather than by name, function, or density (Figure 3.2). The organizing framework of the campus established a strong academic center arranged in quads (A, B, C, D, E, F, G), with adjacent neatly ordered patterns of residential zones (O) and other auxiliary and support uses (H, I, J, K, P, Q, and R). The center of the historic plan was juxtaposed with a parklike landscape setting of large areas of trees (L).



A. The Central Quadrangle
B & C. Sites for Adjoining Quadrangles
D,E,F,G. Reserve Sites for Additional Quadrangles
H. Site for University Church
I. Site for Memorial Arch
J. Sites for Libraries and Museums
K. Site for Industrial Department
L. Site for Botanic Garden
O. Four Areas for Detached Dwellings and Gardens
P. Four Sites for Secondary Schools
Q-R. Main Entry from Proposed Train Station

Figure 3.2 1889 Olmsted Plan

Many of the components of the Olmsted Plan were implemented during the development of the University in the 20th century; however, some components of the original planning strategy for growth were ignored. For example, the system of east-west quads was not fully realized, and some buildings were constructed that blocked the mall's critical axes (Figure 3.3). As will be described in more detail later in this chapter, the University has returned to the concepts in the Olmsted Plan in carrying out its current planning.

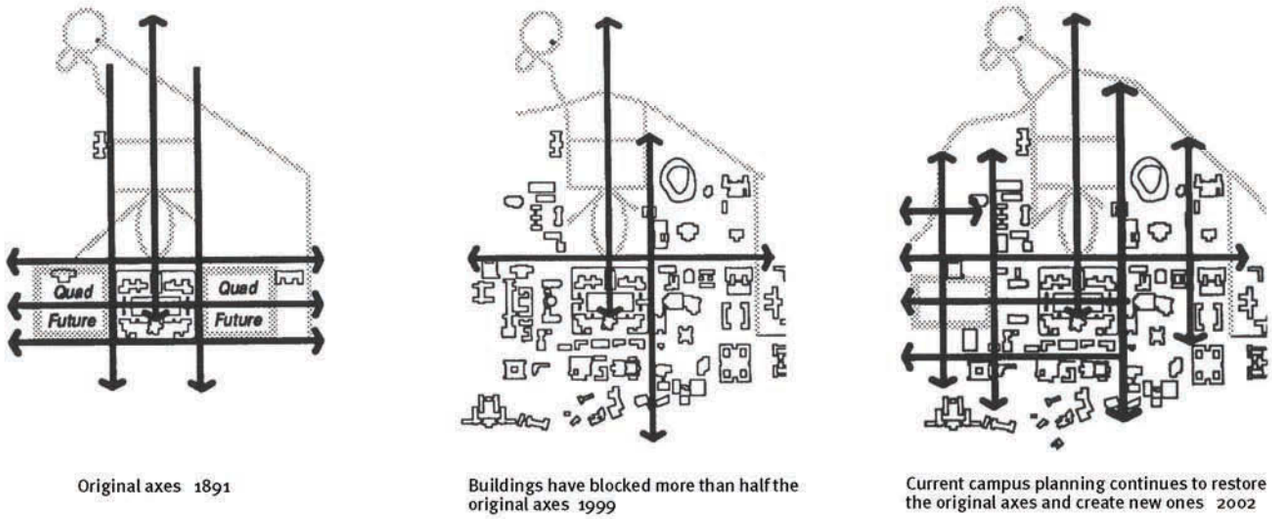


Figure 3.3 Development of the campus

During the 20th century, the University developed the campus to respond to changing physical and academic needs. The 1906 earthquake caused the University to rebuild its campus from the ground up: Recovery from the physical and financial devastation took nearly 20 years but remained true to the original campus plan.

On the heels of this reconstruction, the second burst of campus building occurred in the 1920s, following World War I. Campus construction during this post-WWI period was dominated by the Beaux Arts and Art Deco architecture of the prominent San Francisco firm of Bakewell and Brown. The University concentrated new academic buildings to the east of the Main Quad. The original plan, with its orderly arrangement of quadrangles, was reinterpreted due to taste and funding issues. During this period, automobiles arrived on campus, and development centered on roadways rather than the horse and carriage connections that Olmsted had envisioned (e.g., the University constructed the Campus Drive Loop Road and a grid pattern of streets and parking lots).

The militarization of the West Coast during World War II created a flood of military training programs and research funding for science and technology on campus. The high demand for new programs changed the orderly evolution and implementation of the original campus plan and the repetition of its signature Romanesque architectural style. Both during and after WWII, the atmosphere of urgent expansion led to the hasty construction of new buildings, loosely organized but not totally incompatible with the original plan. However, in contrast to the existing buildings made of durable materials such as sandstone and red tiles prevalent in the Main Quad these buildings of the 1940s and 1950s were built of

concrete blocks. Their architectural style was simpler than the earlier forms, and after a brief experiment with minimalist modern buildings, the campus settled on a blended style: utilitarian structures rendered in sandstone-colored concrete with tile roofs.

The buildings constructed during this period were set on a street grid, rather than in quads set around a gathering open space as in previous years. Most of the buildings were one and two-story structures: low-density development assumed to have a lifespan of 10 years. For example, the area constructed for researchers west of the Main Quad became a series of quick-to-build temporary labs and classrooms with few amenities, architectural features, or landscaped outdoor spaces.

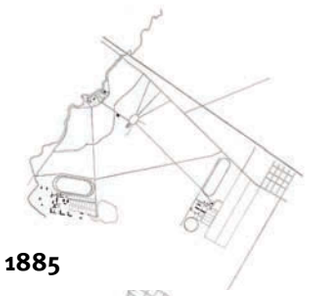
Building during the 1950s and 1960s virtually ignored the Olmsted Plan. The prevailing suburban development style resulted in construction of singular buildings surrounded by landscaped or paved space, rather than placing buildings in groups around courtyards or in other integrated development patterns. Some of these buildings even terminated the classic Olmsted axes. It was a period of unprecedented growth throughout the region, from San Francisco to San Jose, and University growth similarly was high during this period.

The environmental movement emerged as a major national development in land use planning in the 1970s and 1980s. For campus planning, this resulted in a new emphasis on bicycle and pedestrian movements across a circulation framework that had been earlier transformed to accommodate the private automobile. It also resulted in the creation of the Jasper Ridge Biological Preserve and the Campus Archaeology program; the historic renovation work on the Red Barn, Main Quad, and Hoover House; and the Foothills oak restoration program reflecting a new era of stewardship and conservation of the University's land and building resources. This was a period of moderately steady campus growth.

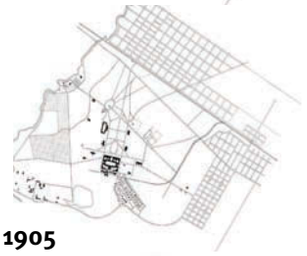
In 1990, Stanford architects and planners returned to the original Olmsted Plan for inspiration. The original plan was found to be remarkably appropriate to contemporary conditions and to economic and orderly (re)development. This resulted in Stanford's *Plan for the Second Century*, which set the direction for the eventual creation of the Science and Engineering Quad (SEQ), restoration of Palm Drive, and development of Serra Mall.

The *Plan for the Second Century* renewed a commitment to the founding key structural elements: the Main Quad, Palm Drive front entry, a loop road, quadrangles or clustered arrangements for academic and residential development, and supporting connectors (e.g., Lasuen, Lomita, and Serra malls), juxtaposed with large areas of open space. Facilities planning in the 1990s retained key structural elements of the Olmsted Plan and focused on three major initiatives:

- rehabilitation and seismic reinforcement of historic buildings following the second major earthquake to strike the campus in 1989 (including the Main Quad, Encina Hall, the Cantor Center for the Visual Arts, and the Bing Wing of Green Library)
- replacement of outmoded buildings with modern facilities
- expansion of student housing (such as Lyman Residences and Schwab Residential Center)

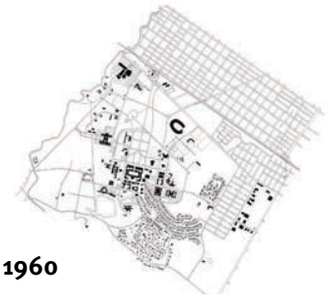


1885



1905

1935



1960

1995

2005

Campus Planning Principles

The 100-year-old Olmsted Plan and the University's plan for the second 100 years (Plan for the Second Century) have evolved into a broad set of campus planning principles that guide land use decisions for the central campus.

These campus planning principles include:

- Implement the Olmsted Plan
- Develop in a compact manner
- Provide appropriate density transitions from the core to the edges
- Preserve campus character, including natural, landscape, and circulation systems
- Allocate and use existing space responsibly
- Optimize site planning to take advantage of climatic conditions

The following sections describe how the campus planning principles have been applied and will continue to be applied to campus development under the 2000 GUP and beyond.

IMPLEMENT THE OLMSTED PLAN

As described in the overview of the campus planning history, the University has returned to the original concepts in the Olmsted Plan by developing a series of quads built along the primary east-west axis and associated connective elements (Figure 3.4).

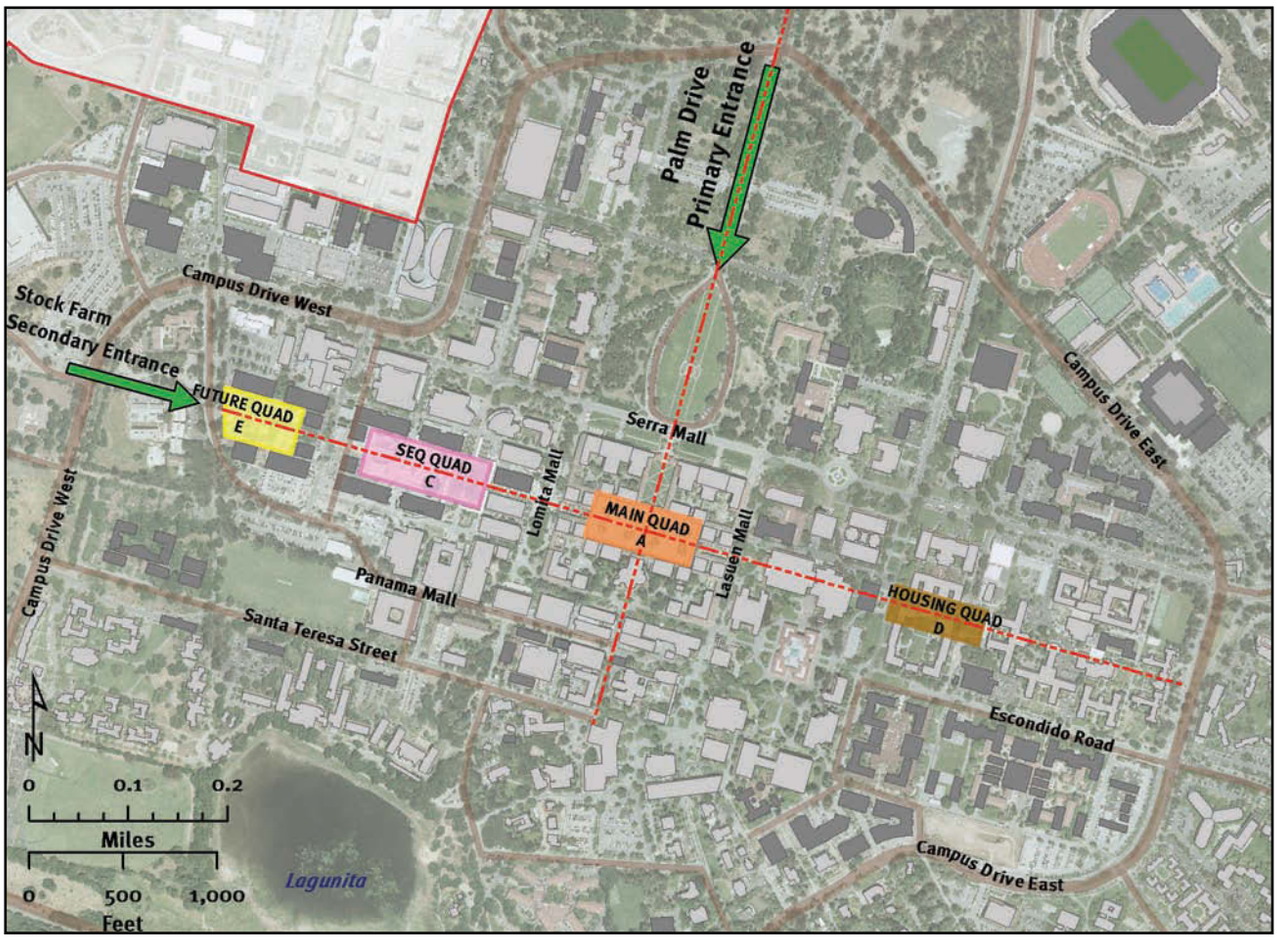


Figure 3.4 Campus Growth - Implementation of the Quad Plan

The Main Quad is a hub of multidisciplinary academic activity designed to support intellectual collaboration. Departments such as history, math, psychology, and geology are linked by covered arcades around quadrangle series of interior courtyards to foster interaction among scholars and synergy of ideas. The Science and Engineering Quad (SEQ), directly west of the Main Quad, was the second substantial quad to be constructed in accordance with the Olmsted Plan.

Under the 2000 GUP, Stanford has been completing construction of the SEQ, which is designed to be modern in style but still reflective of the Main Quad. The arcade system links multiple buildings and departments. Terraces above the arcades, intimate outdoor gathering spaces within the quad, and an exterior café seating area advance opportunities for collaboration (Figure 3.5).

Figure 3.5 Science and Engineering Quad (SEQ)

As buildout under the 2000 GUP continues, the University likely will continue this system of Quads to the west of the SEQ and the Main Quad by constructing a portion of a future Quad. This potential redevelopment project is expected to be of a high density similar to the SEQ, and to provide a variety of landscape features.

Another strategy underlying the Olmsted Plan is the clustering of academic programs by affinity to support academic collaboration. Completion of a set of buildings to cluster the Graduate School of Business (GSB) program currently is underway. Similarly, the Deans of the School of Medicine, School of Humanities and Sciences, and School of Engineering would like to achieve greater connection to stimulate opportunities for innovation across traditional disciplinary boundaries.

The next set of buildings the University is planning would further this clustering strategy by creating an Arts District. Presently, programs to support the arts (drama, music, visual arts, and dance) are in multiple locations. In the future, a new concert hall and arts building are expected to be constructed near existing arts venues, such as the Cantor Center and Memorial Auditorium, to bring the arts disciplines closer together and

to foster artistic collaborations. Echoing the Olmsted Plan, these efforts reinforce key linkages between these academic programs and venues (Figure 3.6).

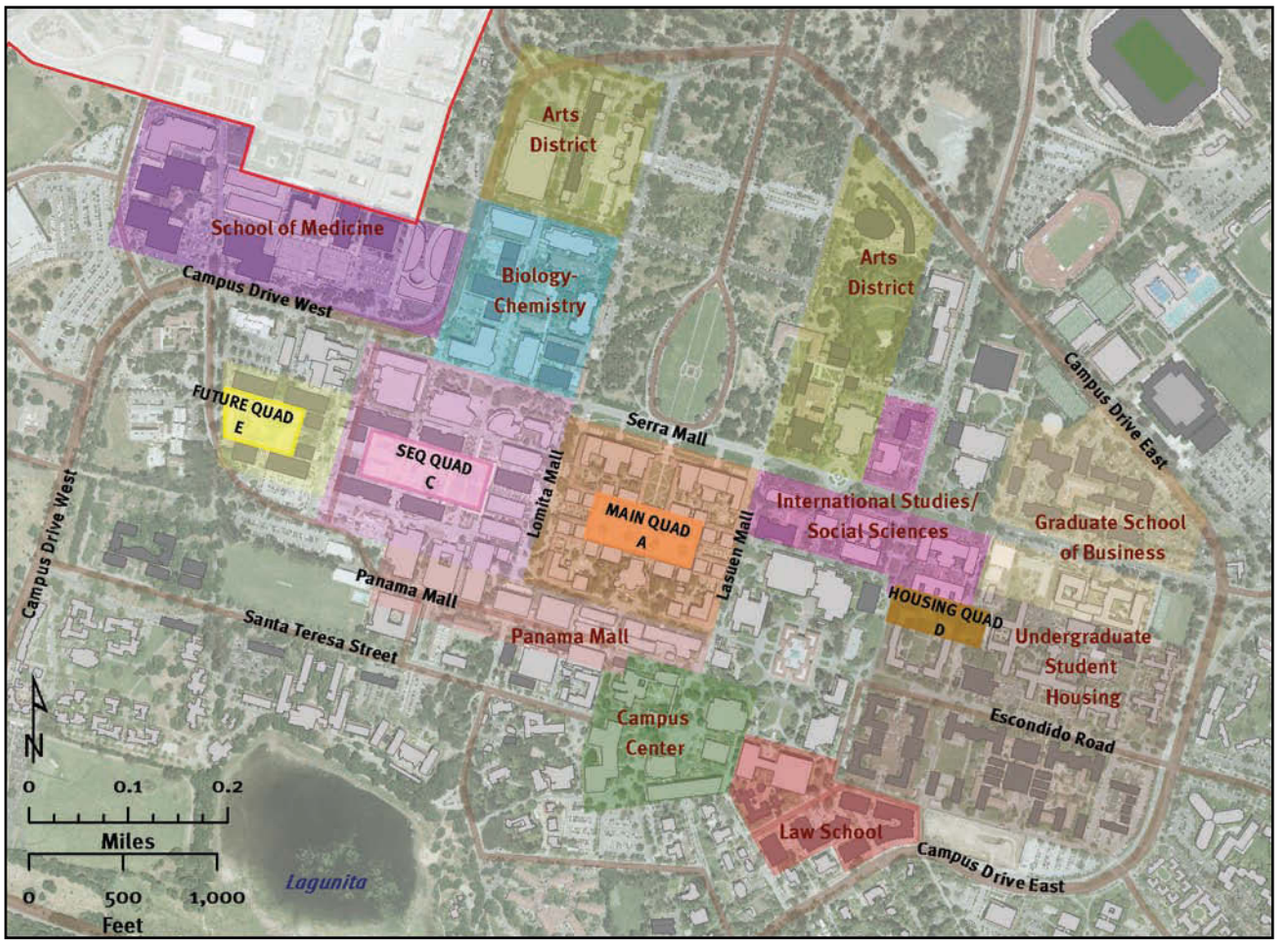


Figure 3.6 Campus Plan - Clustering of Academic Programs

DEVELOP IN A COMPACT MANNER

Compact development promotes efficient use of Stanford's land and cultivates opportunities for multidisciplinary research, education, and connections to residential life. To preserve the quality of the exterior spaces, a sense of place, and connections vital to campus culture, development strategies have included building below ground and balancing the scale of larger structures with substantial exterior spaces.

Much of the new square footage under the 2000 GUP has been added by redeveloping underutilized sites. The University is developing the SEQ (Figure 3.7) at a greater density than the buildings constructed in the 1950s on this same site. The four new buildings that make up the Quad, the Jerry Yang and Akiko Yamazaki Environment and Energy Building, Jen-Hsun Huang Science and Engineering Center, Nano Technology Center, and the Bioengineering/Chemical Engineering building, will total over 545,000 square feet. These buildings replace three structures that had totaled 149,000 square feet. The new buildings accomplish this increase in density through designs that include one or two stories below grade and three to four floors above grade (Figure 3.8).

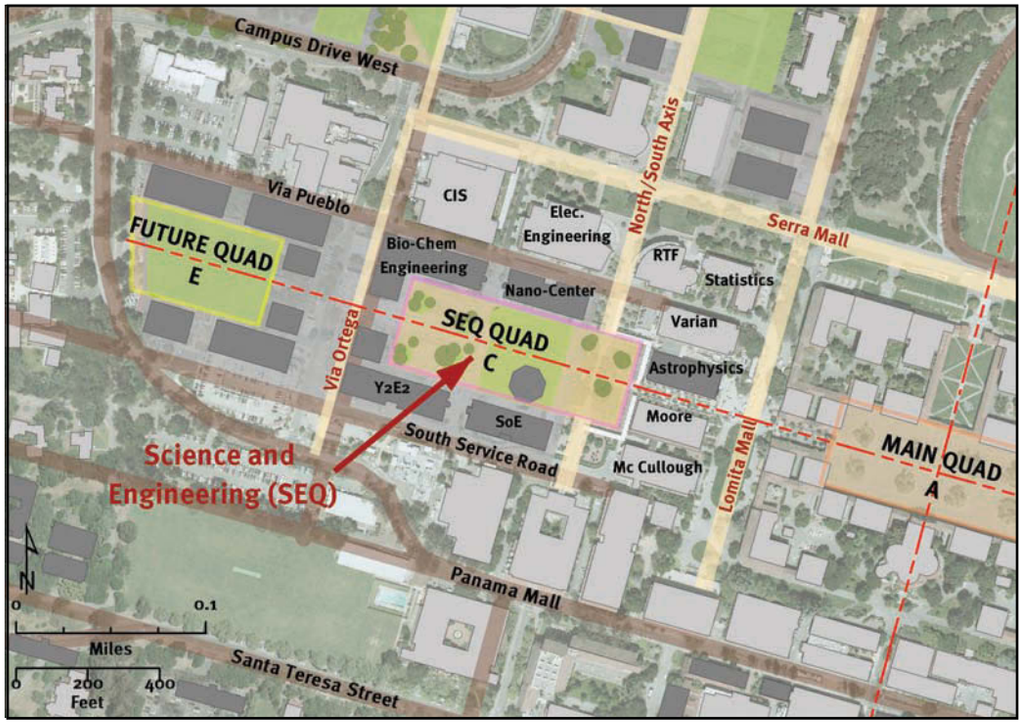


Figure 3.7 Compact Development Science and Engineering Quad

Figure 3.8 Compact Development (Before-After) Science and Engineering Quad

Similarly, the new Graduate School of Business (GSB) is designed to be approximately 360,000 square feet and replaces two office buildings that totaled 80,000 square feet (Figure 3.9). In lieu of the asphalt parking lots that surrounded the previous office building complex, the University focused on creating exterior spaces that support the GSB academic program and integrate it with the rest of the campus. The surface parking is being replaced with an underground parking structure, thereby providing a more compact and efficient use of the land (Figure 3.10).

Figure 3.9 Compact Development Graduate School of Business

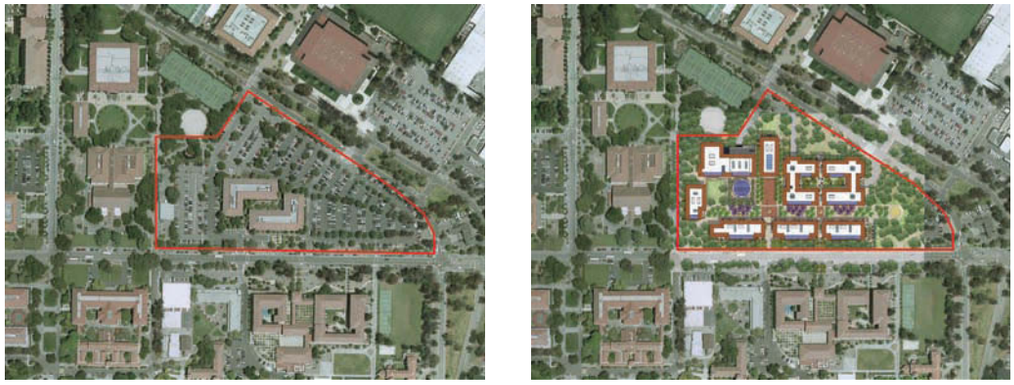


Figure 3.10 Compact Development (Before-After) Graduate School of Business

As the second half of the 2000 GUP is developed, the University anticipates that it will continue to redevelop sites to utilize its land in a more compact manner. Academic redevelopment and infill projects likely will include modernization of the Biology/ Chemistry area, new programs and buildings planned for the Arts District adjacent to the Oval, and an undergraduate computing center adjacent to Meyer Library.

In addition, the 2000 GUP includes substantial amounts of new campus housing, to further promote compact development. In keeping with Leland and Jane Stanford's vision for a residential University, in 2006 Stanford housed approximately 95 percent of its undergraduates and 60 percent of its graduate students on campus. As the University plans and constructs campus housing, it continues to create student communities that are strongly linked to academic core facilities. Much of the housing constructed under the 2000 GUP has been realized at a higher campus density than previous structures.

For example, the Munger Graduate Student Residences include 600 graduate beds in 469,000 square feet of building space, replacing an area of low-density structures along Campus Drive West and a surface parking lot.

Like the GSB, the Munger Graduate Student Residences include a centralized underground parking structure located under a recreational field to minimize the development footprint while providing an open, landscaped area and pedestrian pathways.

During buildout of the second million additional square feet of academic building space, Stanford will continue to provide housing at a pace commensurate with academic growth. The 2000 GUP requires Stanford to provide a total of 1,815 additional housing units by the time it reaches 1.5 million additional square feet of academic uses and a total of 2,420 additional housing units by the time it reaches the full 2,035,000 additional square feet of academic uses. The 2000 GUP authorizes the University to build up to 3,018 housing units.

PROVIDE APPROPRIATE DENSITY TRANSITIONS FROM THE CORE TO THE EDGES

Historically, Stanford has concentrated its higher-density academic facilities toward the center of the Central Campus. As shown in the SEQ and GSB figures, future development will continue to demonstrate higher density in this Central Campus core. Along the University's public edges, El Camino Real, Stanford Avenue and Sand Hill Road, land uses tend to be less dense.

Some development of the campus edges will occur under the 2000 GUP. The University anticipates that the most visually prominent area at the campus edge, the Arboretum, will remain unchanged. The Stanford Community Plan designates the Arboretum as campus open space, recognizing that the Arboretum is seen as "the initial defining landscape at the main entrance of the University and as an open space buffer from the urban environs of Palo Alto."[1] However, the Stanford Community Plan recognizes that increased density within the AGB may necessitate development on recreational fields and the loss of undeveloped areas at the borders of the campus, including at housing sites on previously undeveloped areas along Stanford Avenue, along El Camino Real, at El Camino and Quarry Road, and at Quarry Road and Arboretum Road.

The University has submitted plans for a collection of 39 houses along Stanford Avenue for University faculty. These two-story, single-family dwellings will serve as a transition between the residential housing scale of Escondido Village and the nearby College Terrace neighborhood, and will maintain a relatively low density of development along this edge of campus. On the corner of El Camino and Stanford Avenue, the University has proposed 22 additional housing units for rental to Stanford staff. These two-story structures will be a combination of single and duplex units, and will serve as another relatively low-density transition between El Camino Real and Escondido Village.

1 Stanford Community Plan, Chapter 5 - Open Space, page 83.

In addition to housing, two childcare centers will be constructed in Escondido Village along Olmsted Road adjacent to the staff rental housing. Nestled in a grove of oaks, these structures will be set back 100 feet from El Camino and will maintain a low density similar to the developed housing sites (Figure 3.11).

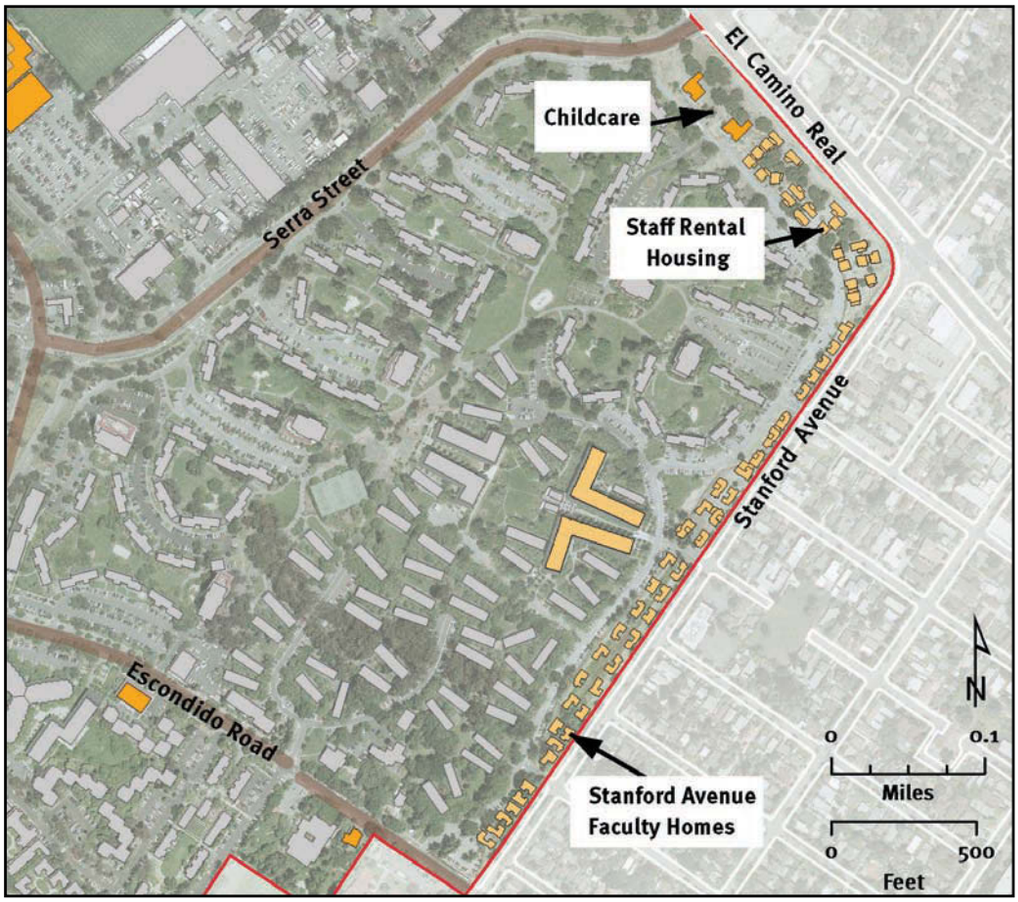


Figure 3.11 Density transition at campus edges

PRESERVE CAMPUS CHARACTER, INCLUDING NATURAL, LANDSCAPE, AND CIRCULATION SYSTEMS

When it opened, the University was located far from the urban centers of San Francisco and San Jose. The Stanfords placed the cornerstone of the original Quadrangle in the center of their Palo Alto stock farm. As the University has grown, the contrast of a sophisticated built environment adjacent to open fields of oak trees and tall seasonal grasses, set against a backdrop of foothills and the Coast Range, has remained central to the Stanford ambiance.

As the campus has developed, the topography and the clearly defined views and vistas achieved through an axial plan that fits the urban core within a natural setting has become an image closely associated with Stanford. The noted mid 20th- century cultural critic Lewis Mumford captured this contrast in 1947 by describing Stanford as “an urban scene in a rural setting.”

The University continues to develop open quads, restore and develop axial malls and connections, and site new buildings to capitalize on view corridors and vistas that provide both reference and inspiration. Under the 2000 GUP, preserving the architectural and landscape character of the campus has remained a central campus planning principle. Campus Center/White Plaza improvements, completed in 2008, create a sense of place that was the hallmark of the original campus plan. The design transformed a sea of asphalt and small grass islands into two distinct but interconnected settings for student interaction: a lush green park that joins the Old Union to the bookstore and an enhanced plaza to accommodate more active student programming (Figure 3.12).

Figure 3.12 Students in White Plaza

The restoration of Wilbur Field above Parking Garage 6 is another example of the University's innovative efforts to preserve campus character. Instead of building a 1,200-space parking garage above ground on the grass field, the University placed Parking Garage 6 below ground and restored the recreational field with natural turf above the structure. This park-like space is vital to recreation and social activities hosted by the adjacent student dormitories and serves as a transition zone between the core campus and single-family residential areas to the south.

As the University proceeds with the second half of development allowed under the 2000 GUP, focused efforts to preserve and improve the circulation and landscape infrastructure of the campus will continue. The master plan for the redevelopment of Panama Mall calls for consolidation of two existing service roads, bike paths, and pedestrian walks into a unified curbed walk along the south edge of the Mall. The north edge of the Mall will be redeveloped as a series of landscaped courts. The above-ground utilities serving major

engineering laboratories along the Mall will be screened with landscaping and integrated into Panama Mall courtyard elements.

There is also a plan to revitalize the historically established malls at the edges of the Oval to better link the core campus to redevelopment along Campus Drive. Lomita Mall will be improved from Serra Mall to Campus Drive, providing enhanced connections to the Cantor Center for the Arts and the proposed new Arts Building to its west. Lasuen Mall will be improved from Serra Mall to Campus Drive to create an Arts Path that will link Memorial Auditorium, new buildings for drama, music and dance, Frost Amphitheater, and the new concert hall.

Stanford also sites building and infrastructure to preserve and protect sensitive natural resources. Specific monitoring and conservation measures are required under the 2000 GUP within a designated California tiger salamander Management Zone. As explained in Chapter 4, Stanford has proposed a Habitat Conservation Plan to the federal agencies responsible for protection of species under the Endangered Species Act. If approved by the federal agencies and determined by the County to provide as much protection as the 2000 GUP conditions pertaining to California tiger salamander, the Habitat Conservation Plan will supersede these 2000 GUP conditions. The conservation program establishes a California tiger salamander management area for the Central Campus, with management and operation of Lagunita for the benefit of the species. Under the Habitat Conservation Plan, Lagunita would be protected from development for 50 years.

The 2000 GUP also includes conditions requiring special-status plant surveys, breeding raptor and migratory bird surveys, oak woodland replacement, replacement of protected trees, and wetlands mitigation. These conditions apply to all development on the Central Campus. In addition to project-specific measures, Stanford has on-going maintenance and improvement programs for landscape and infrastructure. Oak reforestation in the Foothills and Central Campus, improvement to drainage facilities to achieve environmental benefits, and improvements to campus pathways are examples of campus enhancements implemented through such programs.

ALLOCATE AND USE EXISTING SPACE RESPONSIBLY

In addition to adding square footage under the 2000 GUP, Stanford has also focused on improving the efficiency and use of existing buildings. In 2003, the University established parameters for schools and departments to use as planning tools, including space guidelines for sizes of offices and open work areas. The University conducts rigorous space utilization studies prior to constructing new buildings, to explore whether it can renovate existing structures to create space for new needs. One of the University's key goals is to recover 5 to 10 percent of the space in campus buildings. The Department of Capital Planning updated its space planning guidelines in 2006 and is conducting studies to ensure that Stanford adds new space only when necessary. Studies to date have found that departments applying the revised space planning guidelines could recover up to 10 percent of their space. To encourage more efficient use of buildings, Stanford requires selected schools to pay a charge for underutilized office space.

The use of these space planning guidelines is reducing the square footage of new academic buildings. For example, a space utilization analysis based on the University's internal space planning guidelines for the School of Engineering resulted in renovation of more than 250,000 square feet along Panama Mall in buildings such as Peterson Lab, Durand, and Mitchell. This study encouraged a more efficient space program and resulted in plan changes that reduced the total square footage proposed for the SEQ by more than 20 percent, avoiding the need for approximately 100,000 square feet of new construction. The most substantial building renovation projects completed under the 2000 GUP are highlighted in Figure 3.13.

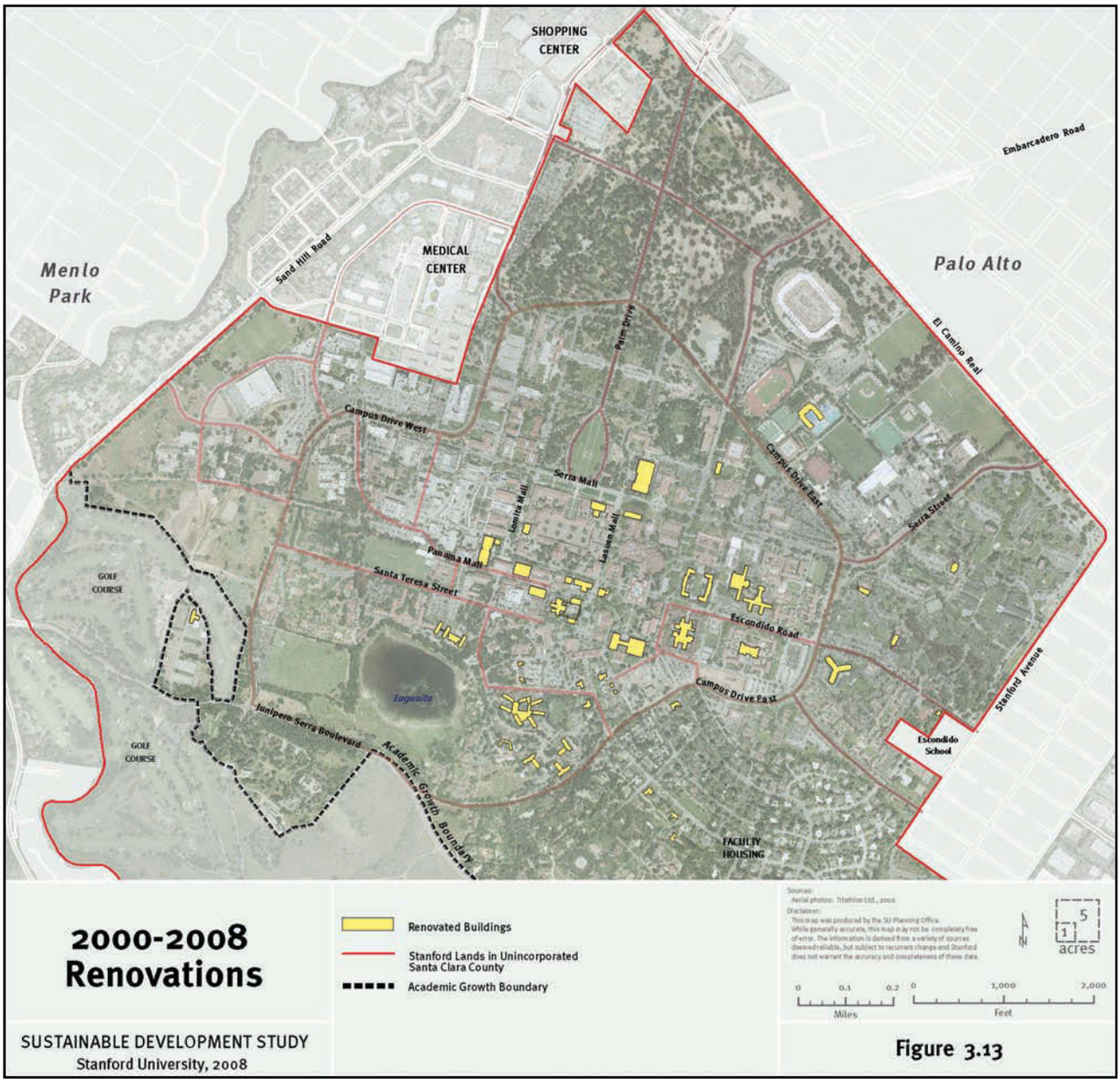


Figure 3.13 GUP 2000-2008 Renovations (see fold-out map)

As Stanford continues to complete construction under the 2000 GUP, it also will continue to implement its internal space planning guidelines to ensure that existing buildings are used efficiently, and it will continue to renovate existing buildings to accommodate changing University needs.

OPTIMIZE SITE PLANNING TO TAKE ADVANTAGE OF CLIMATIC CONDITIONS

The Olmsted Plan recognizes the relationship between buildings and external conditions. Buildings in the Main Quad were predominantly organized on an east-west orientation to take advantages of the north and south light and to leverage opportunities for natural ventilation. Arcades protected the campus population from wind and rain while enhancing circulation of air and letting in light.

Stanford's growth under the 2000 GUP has continued to build on these precepts. Building requirements and programs are carefully evaluated to ensure that the University uses exterior space for circulation and casual gathering. Structures and landscaping are carefully sited to incorporate principles of harvesting daylight and natural ventilation. For example, under the 2000 GUP, Stanford plans to build student housing in a new facility called "The Green Dorm", which would combine student housing program needs with ongoing research to optimize environmental performance (Figure 3.14).

Figure 3.14 Building orientation and site planning to optimize environmental performance

Similarly, Y2E2, the first "green" building completed in the SEQ, set a new benchmark for high-performance buildings. Key to the overall success of the SEQ were the planning and siting of four SEQ buildings along an east-west orientation and the architectural articulation of the facades that channels natural light and natural ventilation (Figure 3.15).

Figure 3.15 Y2E2 is sited to harvest natural daylight and ventilation

Stanford intends to continue its practices of carefully siting buildings, using arcades and other architectural features, and creating outdoor gathering spaces to take advantage of moderate climate conditions and to maximize use of natural light and air flow.

Planning and Development

UNDER THE 2000 GUP
ACADEMIC AND HOUSING PROJECTS, 2000 - 2009

Eight years into the 2000 GUP, the University has obtained permits for a total of approximately 800,000 additional square feet of academic buildings and 1,025 housing units that add approximately 600,000 additional square feet of campus development.[2] Within the next year, the University anticipates submitting applications that will bring the academic building total under the 2000 GUP to more than 1 million additional square feet compared to square footage in 2000.

Generally the development anticipated to be built under the 2000 GUP can be categorized as follows:

- Academic development (1,000,000 additional square feet)
- Housing development during same time period (1,210 units; approximately 700,000 additional square feet)

Upon completion of the first million additional square feet of academic development under the 2000 GUP, Stanford anticipates that it will have built the following major structures, some of which are still in the planning stage:

Research and classroom buildings:

- Carnegie Institution: Center for Global Ecology
- Dean of Research: Stanford Institute for Economic and Policy Research
- Graduate School of Business: Knight Management Center
- Hoover Institution on War, Revolution and Peace: Hoover Conference Center
- Inderdisciplinary Program: Jerry Yang and Akiko Yamazaki Environment and Energy Building (Y2E2, Part of SEQ)
- School of Education: Barnum Center for School and Community Partnerships
- School of Engineering: Automotive Innovation Facility
- School of Engineering: Bioengineering/Chemical Engineering Building (Part of SEQ)
- School of Engineering: Jen-Hsun Huang Center (Part of SEQ)
- School of Engineering: Nano Technology Center (Part of SEQ)
- School of Humanities and Sciences: Concert Hall
- School of Humanities and Sciences: Biology Building
- School of Humanities and Sciences: Arts Building
- School of Law: Law School Faculty Offices and Clinics
- School of Medicine: Li Ka Shing Center
- School of Medicine: Lorry I. Lokey Stem Cell Research Building

2 Additional square footage is the net result of demolishing old buildings and adding new buildings.

Housing

- Graduate housing: Escondido Village Studios 5 & 6
- Graduate housing: Munger Graduate Student Residences
- Undergraduate housing: Durand House Renovation
- Undergraduate housing: Crothers Hall/Crothers Memorial Dorm Renovations
- Undergraduate housing: Mirrielees Phase II
- Undergraduate housing: Roble Hall Renovation
- Employee housing: Olmsted Staff Housing
- Employee housing: Stanford Avenue Faculty Houses

Athletic/ Recreational facilities

- Arrillaga Recreation Center
- Ford Center Addition
- Practice Gym
- Stanford Campus Residents Association Sports Complex
- Stanford Red Barn and Stables Restoration
- Stanford Stadium

Community services and student activities

- Black Community Services Center Expansion
- Childcare Facilities
- Graduate Student Community Center
- Lorry I. Lokey Stanford Daily Building
- Old Union Restoration

ACADEMIC AND HOUSING PROJECTS, 2010-2018

- Academic development (1,035,000 additional square feet)
- Anticipated housing development during same time period (at least 1,210 units and up to 1,798 units; anticipated 750,000-1,000,000 additional square feet)

The second million square feet of academic development and corresponding housing units are not as well defined as the first million square feet because the University has not reached final decisions as to specific building projects to propose for County of Santa Clara Architectural and Site Approval (ASA) and building approval, and plans for these projects are not complete. To show how the second million square feet of academic development under the 2000 GUP might be completed, the University has created a preliminary map of future development by applying the planning principles described below and incorporating planning discussions that are underway but still at a conceptual stage (Figure 3.16).

With guiding campus planning principles in place and adaptable and evolving academic program needs, the University has the land capacity to:

- Implement an expansion to the west of the Science and Engineering Quad
- Execute the School of Medicine master plan with the addition of two more research buildings
- Realize plans for an Arts District
- Implement the expansion in the Biology/Chemistry area to the west of the Oval

Housing constructed during buildout of the second million square feet of academic development under the 2000 GUP will include additional student housing in the Central Campus, likely along Santa Teresa Street and Escondido Road, in Escondido Village, and on the designated Quarry Road sites near the Medical Center.

Figure 3.16 conceptually illustrates the general pattern of development under the 2000 GUP that is likely to occur by full buildout. As it completes development under the 2000 GUP, Stanford intends to continue implementing the campus planning principles that guided development of the first million square feet of academic uses.

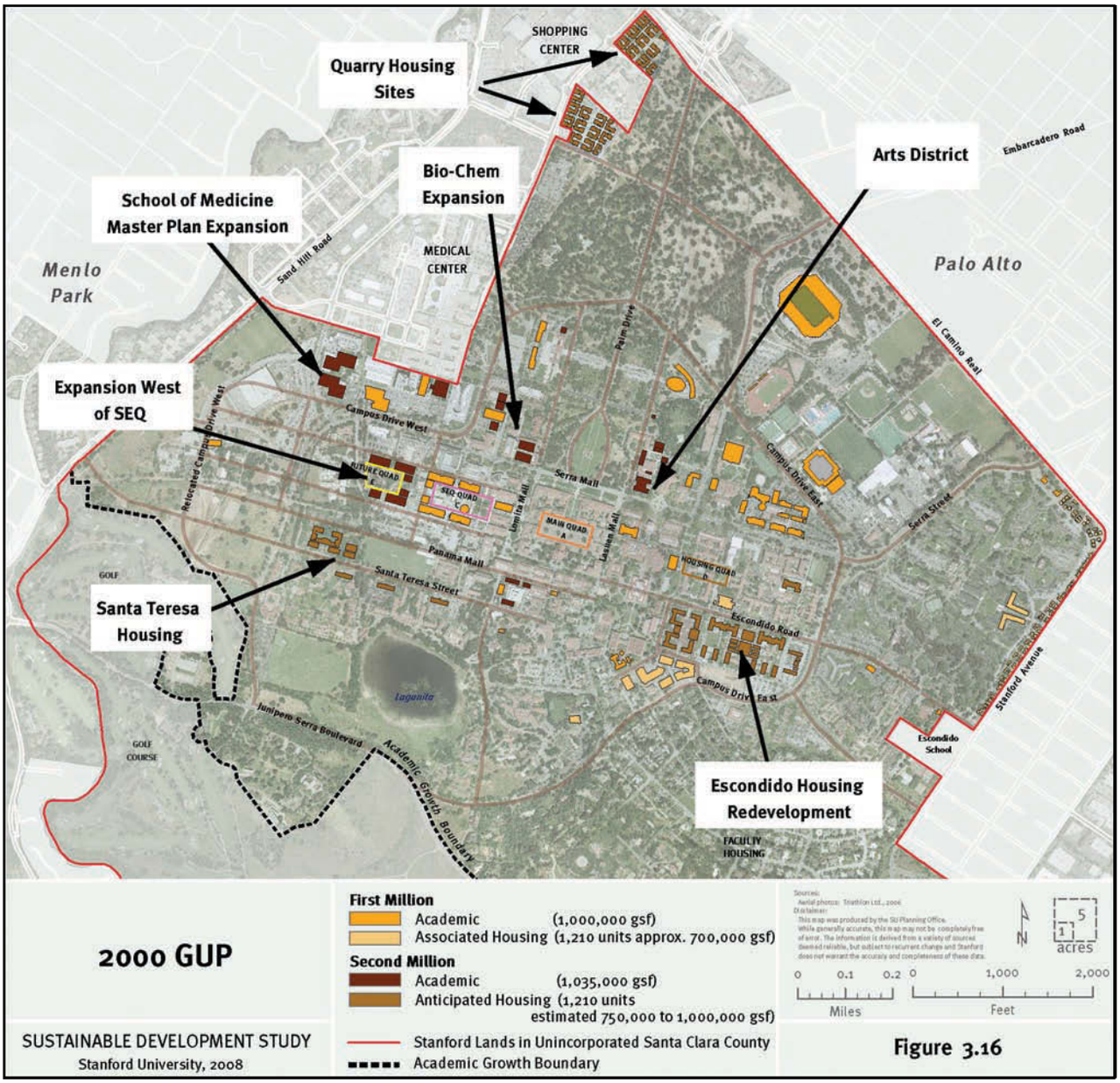


Figure 3.16 Campus Plan - Completed Projects 2000 GUP anticipated (see fold-out map)

Analysis

BEYOND THE 2000 GUP

Development under the 2000 GUP has been, and will continue to be, sited to avoid sprawl into the hillsides, contain development in clustered areas, and provide long-term assurance of compact urban development. Completion of the development allowed under the 2000 GUP will be designed to minimize later pressure for development of the Foothills.

This section looks beyond the buildout of the 2000 GUP to evaluate whether the same campus planning principles that are guiding development will also enable the University to accommodate campus growth over a longer planning period without creating a need to move the Academic Growth Boundary. To perform this evaluation of potential future growth from completion of the GUP development in 2018 through 2035, several steps were undertaken.

- First, as explained at the outset of this chapter and in Chapter 2, a planning period was established. The Stanford Community Plan calls for identification of "maximum planned buildout potential." It is not possible to calculate an absolute maximum buildout of a site without regard for a timeframe because construction methods and societal views on how much density might be appropriate on a site change over time. A few decades ago the University might not have thought it feasible to accommodate academic programs in basements two levels below ground, as is the case at the new SEQ buildings, or to construct parking under recreational fields, as has occurred at the Munger Graduate Student Residences. Thus, the Study requires a planning horizon. The year 2035 is the planning horizon for this study.
- Second, the University evaluated existing campus densities and then applied the campus planning principles described above to identify areas where densities could be increased.
- Third, Stanford estimated the amount of additional campus growth that might occur during the 2035 planning horizon. The University evaluated campus growth trends since the Stanfords developed their stock farm in 1875 through the anticipated completion of development under the 2000 GUP in 2018 to identify three possible growth projections from GUP buildout in 2018 to the planning horizon of 2035. These projections range from an additional 2 million to an additional 5 million square feet of academic facilities and housing. It is important to recognize that no proposals have been made for land use entitlements to accommodate any of these growth projections. They are theoretical projections based upon historic growth rates.
- Fourth, Stanford used the density assessment and the campus planning principles to create development scenarios for each of the growth projections. The methodology used to create these scenarios is described later in this section. By plotting possible development scenarios on a campus map, the University was able to determine whether future growth through 2035 could be accommodated without creating a need to move the AGB. The actual development that may be proposed through the planning horizon will depend upon academic program needs, which are not known at this time.

The scenarios in the study demonstrate that through the 2035 planning horizon the University can accommodate those ranges of development within the existing AGB by applying the campus planning principles, which will result in efficient space utilization, redevelopment of underutilized sites, renovation of existing buildings, and increased campus density through infill construction. These patterns of development have already led to extensive renewal and replacement of outmoded or inefficient buildings while minimizing pressure to expand into the Foothills.

STUDY ASSUMPTIONS

To formulate a study of potential growth over the amount allowed under the 2000 GUP, the University has employed the following assumptions:

- 2000 GUP development is completed by 2018
- Study planning horizon is 2035
- Density strategies rely on campus planning principles
- Development occurs within the existing AGB
- Future growth scenarios include a mix of new academic facilities and housing

To determine the amount of additional square footage that might be needed by 2035, it is necessary to estimate the date by which buildout under the 2000 GUP is likely to occur. The County adopted the 2000 GUP in November 2000. Development of the first 1 million additional square feet of academic facilities and 1,210 housing units (for a combined total of approximately 1.7 million additional square feet of campus development) is expected to be complete no sooner than the end of the year 2010.

The University anticipates that it might construct the second million additional square feet of academic facilities at a faster rate than the first million. Thus, for purposes of this analysis, the University assumes completion of square footage allowed under the 2000 GUP by 2018. This is a conservative estimate: Actual completion of the additional square footage may not occur until 2020 or later. Using 2018 as the assumed date for 2000 GUP buildout leaves 17 years of potential growth beyond the 2000 GUP. While the University cannot predict its development needs 25 years from now, it can evaluate strategies for growth that allow for a variety of possibilities. The study of how to accommodate potential growth is focused on the Central Campus within the AGB, and the scenarios assume a mix of academic facilities and housing.

DENSITY STRATEGIES

To begin to assess how future growth could be sited on the Central Campus in a compact manner, the University first conducted a study of existing campus densities and densities anticipated at the completion of the 2000 GUP. Over time, the metrics and characteristics that define campus density have changed. The original Olmsted Plan was a study in the layering of densities from very low-density farm and rural fields to the medium density of the faculty and staff housing, to the higher density campus core that was grounded by the Main Quad. As the University continues to transform and develop in a compact manner, that original high-density collection of buildings around the quad is now considered medium density. Today, campus densities generally fit within three categories:

- High Density
- Medium Density
- Low Density

The SEQ, GSB, Munger Graduate Student Residences, and the Biology/Chemistry area represent building complexes that define what Stanford considers High Density (Figure 3.17, 3.18, 3.19). In each of these areas, collections of three to four-story buildings incorporate below ground program areas (e.g., laboratories, offices, or parking structure), or dormer spaces in the mansard roof, as in the case of Munger Graduate Student Residences. These features increase intensity of site use without increasing height to an extent that the buildings detract from the overall scale that unifies the Stanford campus.

Figure 3.17 High Density Science and Engineering Quad

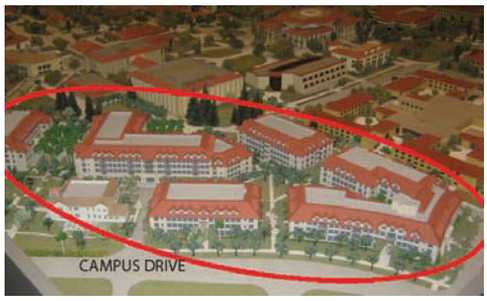


Figure 3.18 High Density Munger Graduate Student Residences

Figure 3.19 High Density Biology/Chemistry Area

The Main Quad, originally considered one of the densest zones of campus, is now representative of Medium Density. The Main Quad is an interconnected complex of sandstone buildings with red-tiled roofs suggestive of Mediterranean style. The simply massed Romanesque buildings are linked by deeply shadowed arcades and courtyards. The Main Quad is a mix of one, two and sometimes three-story structures with associated primary, secondary, and even tertiary courtyards and spaces that together work to diminish the overall scale of the space so it is not a massive block design (Figure 3.20).

Many of the undergraduate housing complexes also fall in the medium density category. The housing and associated connective elements often include passive and active recreation, and the buildings are of a size and scale associated with residential campus dormitories. Housing of this type typically is comprised of two, three, and four-story structures with narrow floor plates that allow natural light to penetrate dorm rooms in a double-loaded corridor. Freestanding dorms such as Toyon Hall and Branner Hall, as well as housing areas such as Manzanita Park and Governor's Corner, provide lawn areas that complement undergraduate residential life (Figure 3.21, Figure 3.22).

Figure 3.20 Medium Density Main Quad

Figure 3.21 Medium Density Manzanita Undergraduate Dorms

Figure 3.22 Medium Density Toyon Hall

Low Density areas tend to be at the perimeter of the Central Campus. The athletic fields and the Arboretum along El Camino Real, as well as the equestrian facilities and historic Red Barn on the west side of campus, are examples of low density areas. These areas are used for active/passive recreation and parking/circulation. Residential areas and associated programs, such as the Childcare Center at the corner of Serra Street and El Camino, also fall within this category (Figure 3.23 and Figure 3.24).

Figure 3.23 Low Density Athletics and Recreation Red Barn Equestrian Facilities

Figure 3.24 Low Density Childcare Center

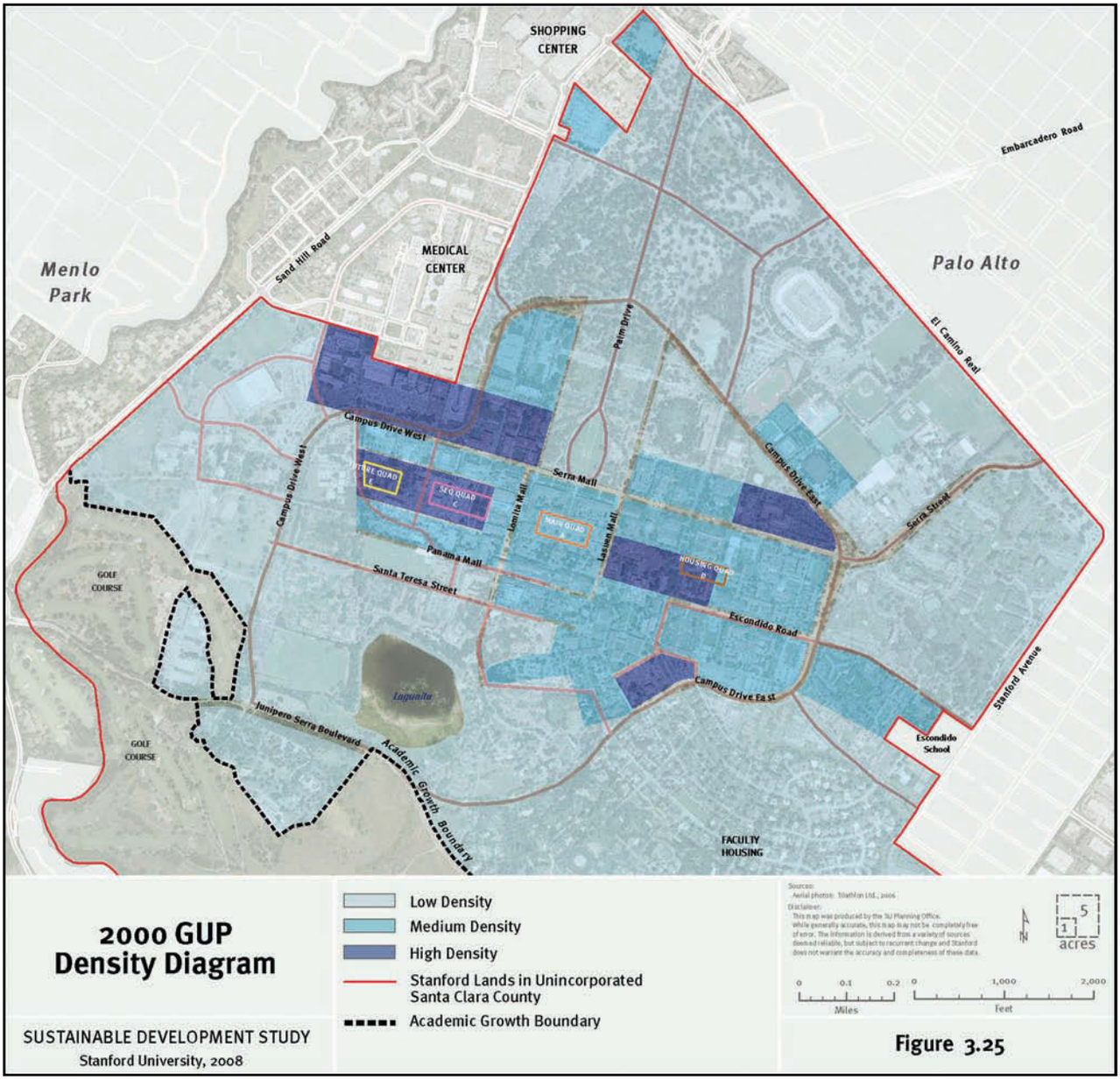


Figure 3.25 2000 GUP Density Diagram (see fold-out map)

Figure 3.25 shows patterns of densities anticipated at the completion of the additional square footage allowed under the 2000 GUP, anticipated to occur in 2018. This diagram illustrates how higher densities occur closer to the core of the campus and land uses transition to the lower densities at the northern and southern edges of campus.

Figure 3.26 illustrates one of many ways that this pattern of densities could evolve in the future beyond 2018 through application of the campus planning principles. The lowest densities could still be found at much of the perimeter of the Central Campus and the highest densities could continue to be at the core of campus, with the medium range densities occurring in the zones in between.

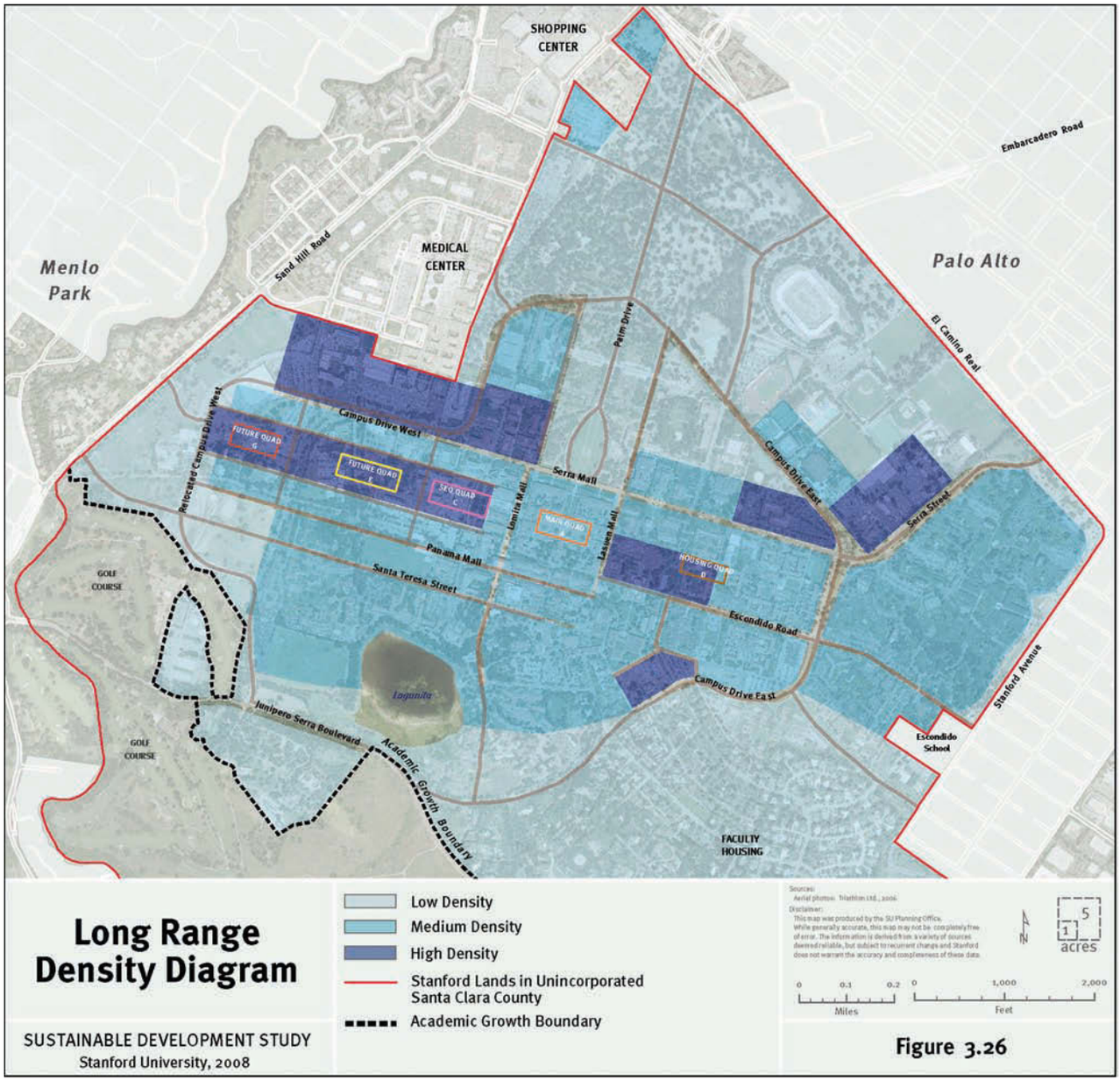


Figure 3.26 Long Range Density Diagram (see fold-out map)

This density assessment shows that there are medium-density areas that could be redeveloped to achieve a higher density such as at the western end of the system of central quads and the School of Medicine area, situated near the Stanford Hospital and Clinics, where higher density would be consistent with surrounding uses.

These density diagrams are a conceptual tool to enable the University to study the potential to grow in a compact manner while retaining its campus planning principles. Actual development patterns will vary from these diagrams as individual projects became refined and articulated in the future.

GROWTH PROJECTIONS

Stanford University cannot predict the exact path campus development might take by 2035. However, with a conceptual density pattern identified, the University can model possible scenarios for accommodating additional growth from completion of 2000 GUP development in 2018 through 2035. Further growth likely would include a mix of academic buildings and undergraduate/graduate housing, but exact ratios are unknown.
Three growth projections have been identified to present a range of possible development scenarios (Figure 3.27).

- Minimal Growth Scenario: 2 million additional square feet (academic and housing), which averages to about 115,000 additional square feet per year
- Moderate Growth Scenario: 3.5 million additional square feet (academic and housing), which averages to about 200,000 additional square feet per year
- Aggressive Growth Scenario: 5 million additional square feet (academic and housing), which averages to about 300,000 additional square feet per year

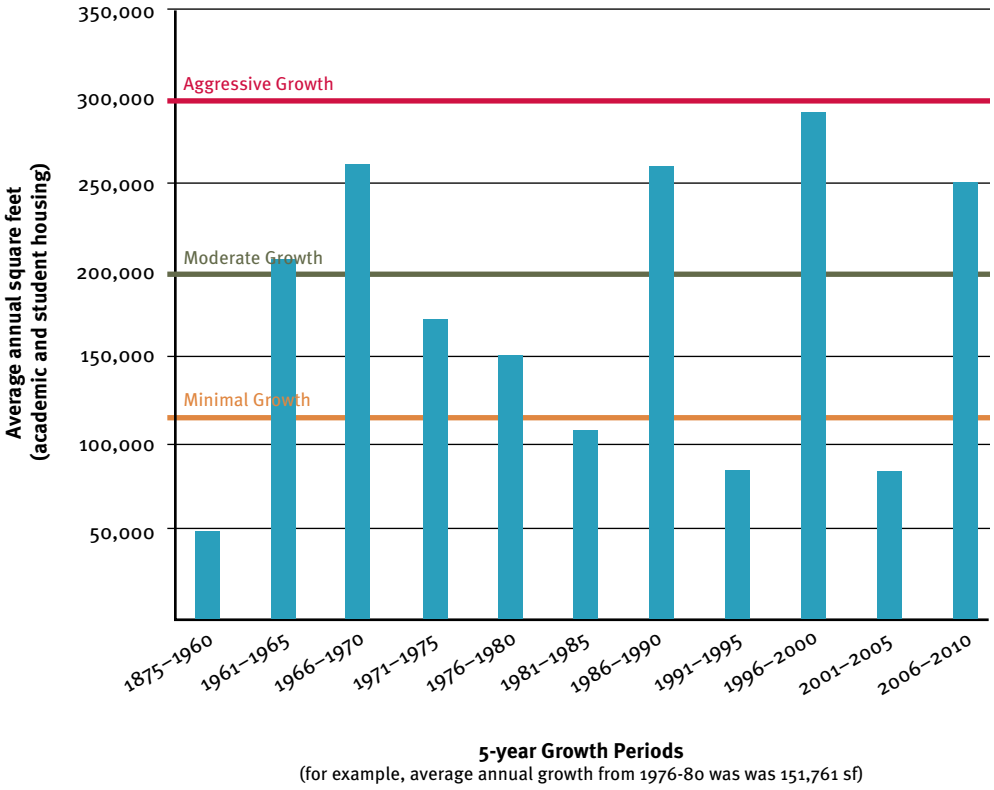


Figure 3.27 Stanford University Growth Scenarios

The Minimal Growth projection is consistent with the 5-year rate of campus growth between 1981 and 1985. Table 3.1 shows Stanford added 562,736 square feet during this time period or approximately 115,000 square feet per year. Multiplying the 17 years between the 2000 GUP buildout in 2018 and the end of the 2035 planning period by 115,000 additional square feet per year results in approximately 2 million additional square feet of development. The 1981-85 period was selected for this projection because it was at the lower end of the University's historic growth rates. This is a conservative projection because it exceeds the lowest rate of historic buildout.

TIME PERIOD	BUILDING AREA ADDED (gross square feet)	CUMULATIVE Building Area
1875-1960	4,363,375	4,363,375
1961-1965	1,069,406	5,432,781
1966-1970	1,353,405	6,786,186
1971-1975	890,496	7,676,682
1976-1980	758,805	8,435,487
1981-1985	562,736	8,998,223
1986-1990	1,348,841	10,347,064
1991-1995	439,840	10,786,904
1996-2000	1,507,326	12,294,230
2001-2005	435,038	12,729,268
2006-2010	1,299,235	14,028,503

Table 3.1 Building Area at Stanford 1875-2010 (Academic Facilities and Student Housing)

The Moderate Growth projection is consistent with the overall campus growth rate that took place at Stanford from 1960 to 2000. The Stanford Community Plan identifies the historic growth rate that has occurred at Stanford: "The growth rate since 1960 has represented an average annual addition of 198,200 square feet of academic uses, support facilities, and student housing. While the amount of growth on an annual or 5-year basis has fluctuated over the last 40 years, the rate of increase in cumulative building area has occurred at a relatively constant rate of approximately 200,000 additional square feet per year."[3]

The Moderate Growth projection also is consistent with the rate of growth that has occurred under the 2000 GUP to date, and is anticipated to continue through 2018. The 2000 GUP allows Stanford to construct 2,035,000 additional square feet of academic facilities and up to 3,018 housing units. Stanford estimates that the combined total square footage of new development under the 2000 GUP will be approximately 3.5 million square feet. Thus, over the course of the 2000 GUP, Stanford will add an average of about 200,000 additional square feet per year of academic facilities and housing units. Multiplying the 17 years between estimated GUP buildout in 2018 and the end of the 2035 planning period by 200,000 square feet per year yields a result of approximately 3.4 million additional square feet of development. The period between GUP buildout in 2018 and the end of the 2035 planning horizon is approximately the same period Stanford assumes it will need to complete build-out of the additional square footage allowed under the 2000 GUP. Therefore, a projection of 3.5 million additional square feet of growth is considered a reasonable Moderate Growth projection.

3 *Stanford Community Plan, page 10.*

The Aggressive Growth projection is substantially higher than Stanford's historic long-term growth rate and the growth rate anticipated under the GUP. This growth rate is consistent with the highest 5-year rate of campus growth -. Table 1.2 in the Stanford Community Plan shows that from 1996 to 2000 Stanford added 1,507,326 square feet of development, averaging approximately 300,000 additional square feet per year. Multiplying the 17 years between GUP buildout in 2018 and the end of the 2035 planning period by 300,000 additional square feet per year, results in approximately 5 million additional square feet of development.

Based upon the length of time it will take to complete the square footage allowed under the 2000 GUP and historic campus growth rates, the Aggressive Growth projection reflects more growth than actually is expected between 2018 and 2035. The Minimal Growth projection also is unlikely but is used to bracket the range of reasonably anticipated growth rates to ensure that the Study comprehensively considers potential scenarios.

As a caveat to this Study's growth projections analysis, current and likely future economic problems of regional, national, and worldwide influence suggest a diminishing rate of development for the future.

DEVELOPMENT SCENARIOS

Once the University estimated growth projections, it developed corresponding development scenarios. It started with the smallest of the projections, Minimal Growth, and created "Development Scenario A" by using the conceptual long-range density assessment and the campus planning principles to determine how 2 million additional square feet of development (a mix of academic and housing) could be sited on the Central Campus. To accomplish this, the University needed to make projections about the square footage of future buildings, as well as the amount of demolition that might be needed to make way for those buildings, by assuming that new buildings in a particular density area (e.g., an area shown as high density on the density assessment map) would have roughly the same footprints, heights, and square footages as existing buildings. For example, in plotting new buildings in the expansion of the quad system to the west of the SEQ (Quads E and G), the footprints and associated heights and square footages of the new buildings are assumed to be similar to buildings recently constructed in the SEQ.

In locations where redevelopment of existing buildings has been diagrammed, the actual square footages of the existing buildings were subtracted from the assumed square footages of the new buildings to arrive at the additional square footage at the redevelopment site.

Three conceptual development scenarios correspond to the three growth projections for the 2018 to 2035 plan period:

- Scenario A: Minimal Growth 2 million additional square feet (academic and housing)
- Scenario B: Moderate Growth 3.5 million additional square feet (academic and housing)
- Scenario C: Aggressive Growth 5 million additional square feet (academic and housing)

SCENARIO EXAMPLES

Each development scenario includes examples of the type of redevelopment and infill development that could accommodate the corresponding growth projection. The scenarios build onto one another; each starts with the same basic building blocks as the scenario before.

In some cases, the same example of a development type or location is carried over from one scenario to the next. In other cases, the amount of development under an example type is increased as the overall square footage increases. Additional examples are added reflect increasing growth rates. The following table summarizes the examples depicted under each scenario and the corresponding amount of additional development depicted for that example (Table 3.2).

The figures that illustrate the scenarios and associated examples provide color-coded building footprints that correspond to the density classifications previously depicted in the Long Range Density Diagram (Figure 3.26). Within each of these density classifications, individual building heights and square footages will vary.

EXAMPLE	TYPE OF DEVELOPMENT	SCENARIO A	SCENARIO B	SCENARIO C
A-1, B-1, C-1	Extension of Quad System	1,100,000	2,230,000	2,230,000
A-2, B-2, C-2	Golf Driving Range Development	480,000	480,000	480,000
A-3, B-3, C-3	Campus Green Redevelopment	215,000	350,000	405,000
B-4, C-4	Undergraduate Housing/Academic Infill	---	290,000	290,000
C-5	Bonair Siding Redevelopment	---	---	785,000
C-6	Escondido Village Redevelopment	---	---	410,000
	Remaining Square Footage for Renovations and Expansions of Existing Buildings/ Additional Infill Development	205,000	150,000	400,000
TOTAL	Additional Square Footage of Development	2,000,000	3,500,000	5,000,000

Table 3.2 Scenario Summary

ALL SCENARIOS: LANDSCAPE AND CIRCULATION SYSTEM

No facility expansion planning scenario can be explored without understanding how it might integrate with and strengthen the campus infrastructure, connective elements, and landscape. As the campus continues to grow under any of the development scenarios explored in this study, Campus Drive West could be reconfigured to provide a clear demarcation between the high-density areas at the core of campus and the lower-density areas at some of its boundaries. Structured parking garages, many of which may be constructed below ground with recreation (Figure 3.28) or building programs above, could be located along Campus Drive, which could continue to be the primary vehicular loop on campus. It is also possible that in the future shuttles, bike/pedestrian paths, and service routes would be allowed inside the loop with only very limited access for private vehicles.

Connective elements are the landscape areas, greenbelts, groves, malls, and outdoor places that unify the campus and provide amenities to campus life. The connective elements could be associated with all new quad complexes and with individual new buildings. These elements play a role in the perception of proportion and space, as high-density areas feel less intrusive with the design of appropriate outdoor spaces and articulated buildings.

Future development could continue the pattern of the north-south axis and malls established in the Olmsted Plan. These malls serve not only to clarify the organizational system within the campus but encourage movement and multidisciplinary collaboration among the various schools and departments within the University. These malls, in conjunction with other circulation routes that extend to the edges of campus, provide the means to manage transportation within the campus. Service routes could continue to be vital components of this circulation system. Via Pueblo and the South Service Road could serve as dedicated east-west service conduits and feed directly into Campus Drive.

The campus planning principles of developing in a compact manner, concentrating high density at the core campus, and preserving campus character are supported by the objectives to maintain connective elements. Each of the scenarios A, B, and C assumes the responsibility to strengthen campus infrastructure associated with growth and development, including connective elements, circulation systems, and utility infrastructure systems. It is assumed that similar improvements would be implemented for all scenarios.

Figure 3.28 Parking Garage 6, Wilbur Field

Development Scenario A, Minimal Growth Scenario (Figure 3.29) identifies future sites for 2 million additional square feet of development beyond the square footage constructed under the 2000 GUP, by 2035. The scenario is grounded in the campus planning principles and conceptual density pattern outlined earlier in this chapter:

This scenario explores a combination of new development, redevelopment, restoration, and infill strategies to address potential growth. Possible components illustrate a quantitative and qualitative approach to determine how the University could accommodate this level of growth.

Figure 3.29 Scenario A Development Map (see fold-out map)

Example A-1: Extension of the Quad System (Figure 3.30)

At the completion of the development allowed under the 2000 GUP, it is assumed that a portion of Quad E (Figure 3.2) to the west of the SEQ (Quad C) will be under construction. In this example of how future development could occur beyond completion of the 2000 GUP, the rest of Quad E could be completed and additional new buildings could be constructed to begin to define a new high-density Quad G. A set of medium-density new buildings could be developed to the south of this new quad and Quad E. These buildings would be generally two and three stories in height, with associated basements and floor plates similar to the buildings constructed in the SEQ. Whereas Campus Drive West will be reconfigured in scenarios B and C, it could remain in its current location in this scenario. In this example, 85,000 square feet of existing buildings could be demolished to allow for the construction of approximately 1,185,000 square feet of new space for a net increase of 1.1 million additional square feet.

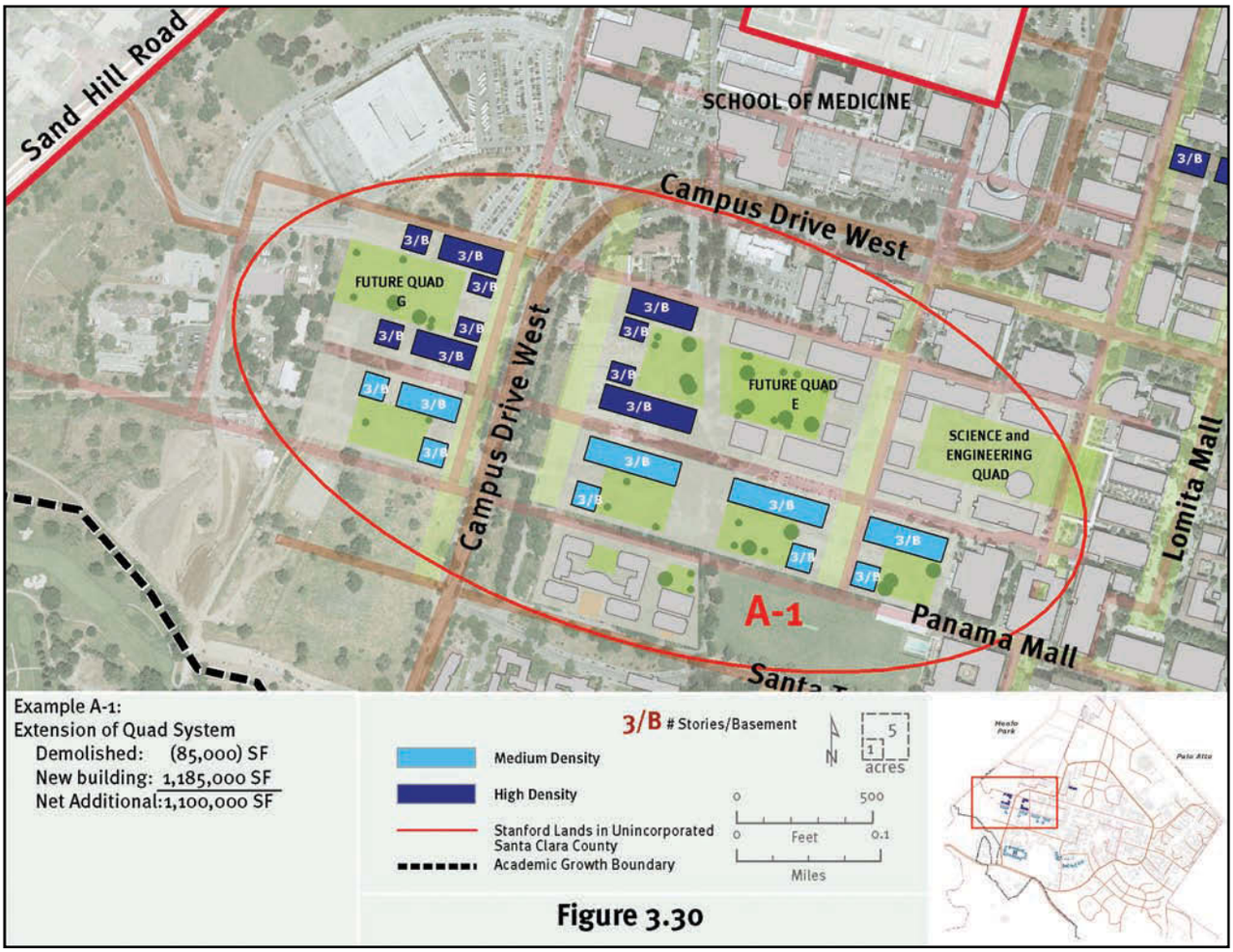


Figure 3.30 Example A- 1 Extension of Quad System

Example A-2: Golf Driving Range Development (Figure 3.31)

Currently used for low-density recreation, the golf course driving range could be redeveloped into a medium-density academic or housing precinct that fronts Lagunita. Based on the square footage of existing medium-density buildings on campus, a collection of two to three-story buildings on this site could yield approximately 480,000 square feet of new facilities, replacing 1,500 square feet of existing recreation facilities.

Example A-3: Campus Green (Figure 3.31)

The area south of White Plaza and the undergraduate Campus Center could be redeveloped to increase density while also reflecting the sinuous residential character that was originally designed in the Olmsted Plan to complement the more ordered nature of the quads. Currently this area is at the lower end of the medium-density scale, and it is anticipated that redevelopment could contribute to the sense of community by better connecting buildings and pathways. A campus green could support circulation and recreation, connecting the vibrant hub of student life in the Campus Center to potential recreational uses adjacent to Lagunita. The buildings in this area could be generally two to three stories in height.

This example suggests that if 138,000 square feet of existing space were demolished to re-develop these sites and construct 353,000 new square feet, medium-density facilities in this area of the campus could yield more than 215,000 additional square feet of development.

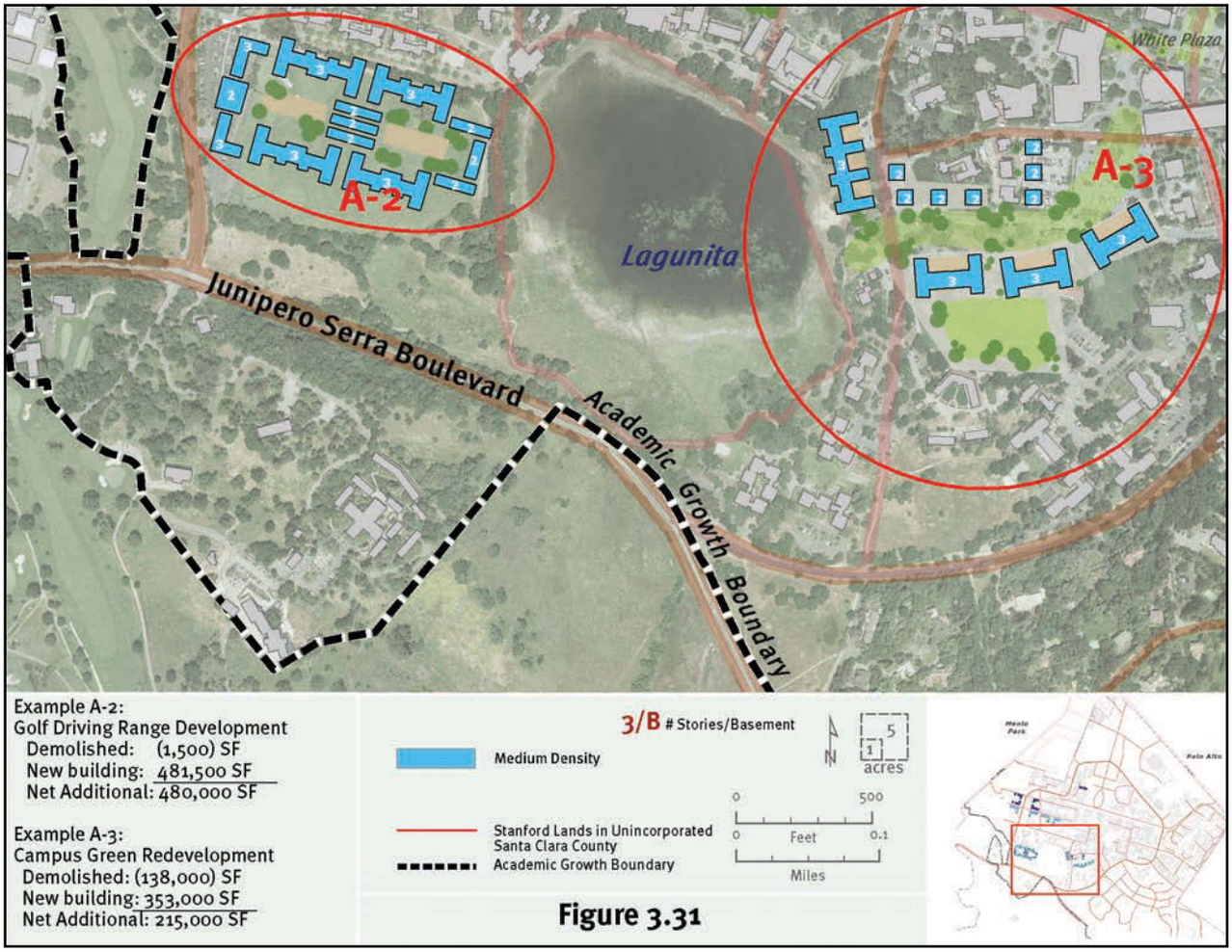


Figure 3.31 Example A-2Golf Driving Range and Example A-3 Campus Green Redevelopment

Additional Infill Development

The examples in Scenario A analyze opportunities to address minimal growth needs in various campus locations. It is anticipated that in addition to these redevelopment projects, there would also be renovations and expansions to existing buildings and additional infill development that could yield 205,000 additional square feet of building space for a total of 2 million additional square feet of development.

Development Scenario B, Moderate Growth (Figure 3.32), analyzes how the University might accommodate moderate growth projections and is based on the same campus planning principles and conceptual density pattern that drive Scenario A. Scenario B assumes a growth rate that would result in 3.5 million additional square feet beyond the completion of the development allowed under the 2000 GUP square footage through 2035 and expands on the development examples that were used in Scenario A. Different development patterns may emerge, which also would be consistent with the campus planning principles. The following examples highlight possible components that could support the moderate growth projection.

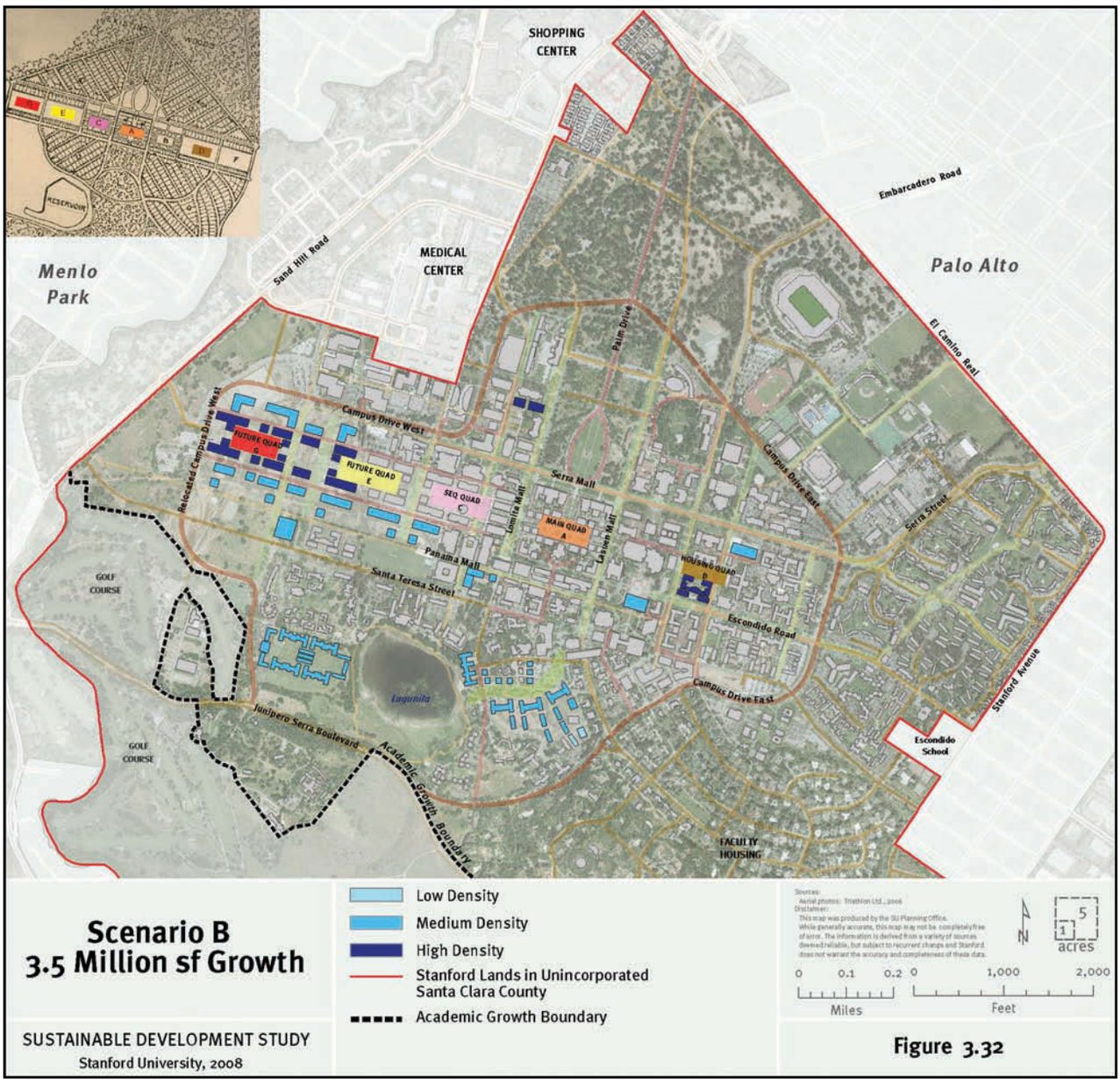


Figure 3.32 Scenario B Development Map (see fold-out map)

Example B-1: Extension of the Quad System (Figure 3.33)
A substantial portion of the growth in Scenario B could be accomplished by extending the quad system to the west of SEQ. Under this scenario, this could be accomplished by completing the remainder of Quad E and constructing an entire new Quad G.

Under Scenario B, a set of new buildings also could be developed to the south and north of this new high-density quad. Those buildings could be of a medium density and provide a transitional scale on Serra Street and Panama Mall. These new buildings are assumed to be a combination of two and three-story structures, and, like the buildings in the series of expanded quads, could be generally situated in an east-west orientation to maximize the harvesting of natural light and ventilation.

In this example, 132,000 square feet of existing buildings are assumed to be demolished, and those sites redeveloped to allow for the construction of more than 2,362,000 square feet of new space. This scenario could result in over 2,230,000 additional square feet of campus facilities.

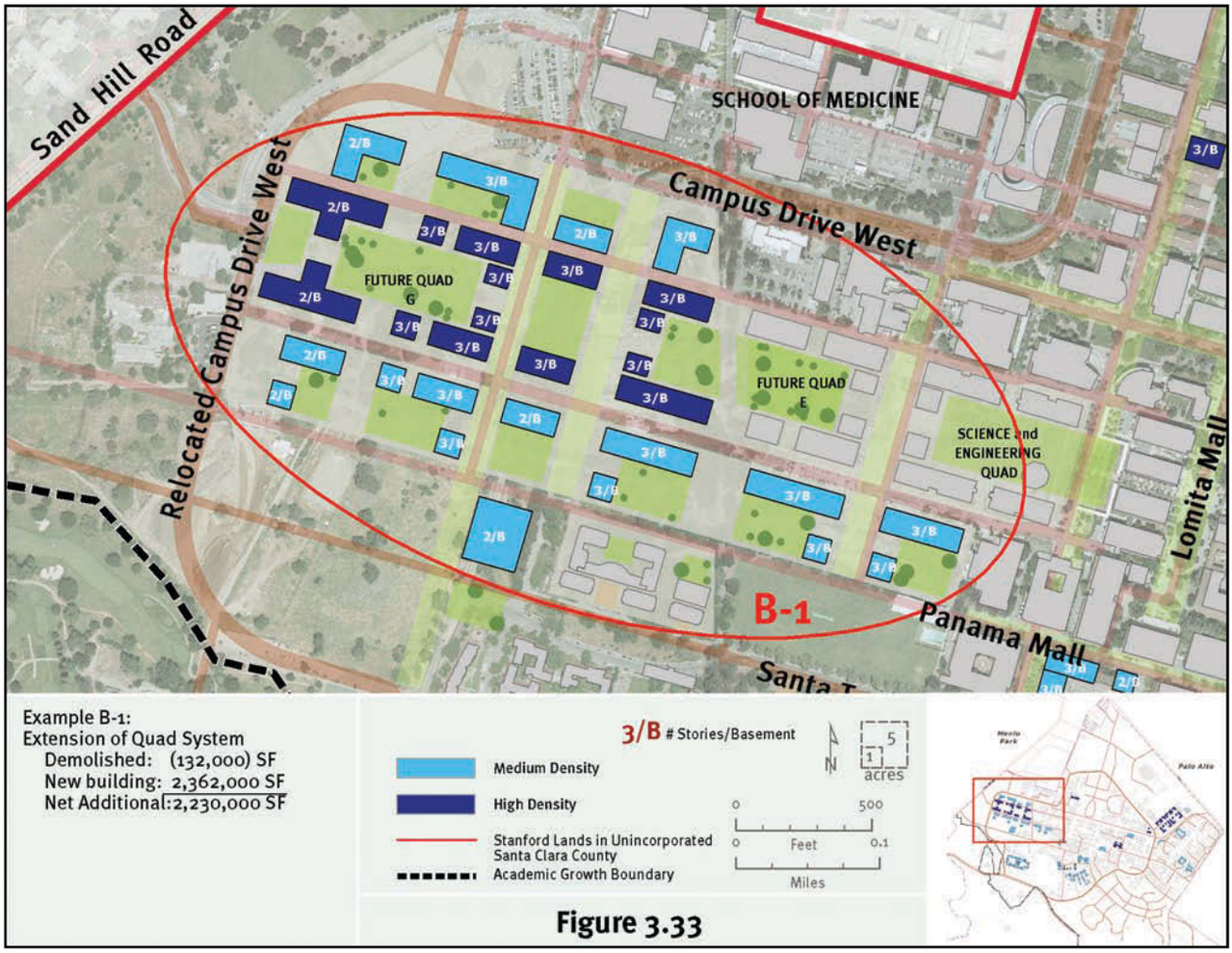


Figure 3.33 Example B-1 Extension of Quad System

Example B-2: Golf Driving Range Development (Figure 3.34)
As in Scenario A, the golf course driving range could be redeveloped into a medium-density academic or housing precinct that fronts Lagunita. A collection of two to three story buildings on this site could yield approximately 480,000 additional square feet of new facilities, replacing 1,500 square feet of existing recreation facilities.

Example B-3: Campus Green (Figure 3.34)
The area south of White Plaza and the undergraduate Campus Center could be redeveloped to increase density while reflecting the sinuous residential character that was originally designed in the Olmsted Plan to complement the more ordered nature of the quads. Under this Scenario, 138,000 square feet of existing space could be demolished to redevelop these sites with 488,000 new square feet of new medium-density facilities, resulting in about 350,000 additional square feet of development in this location.

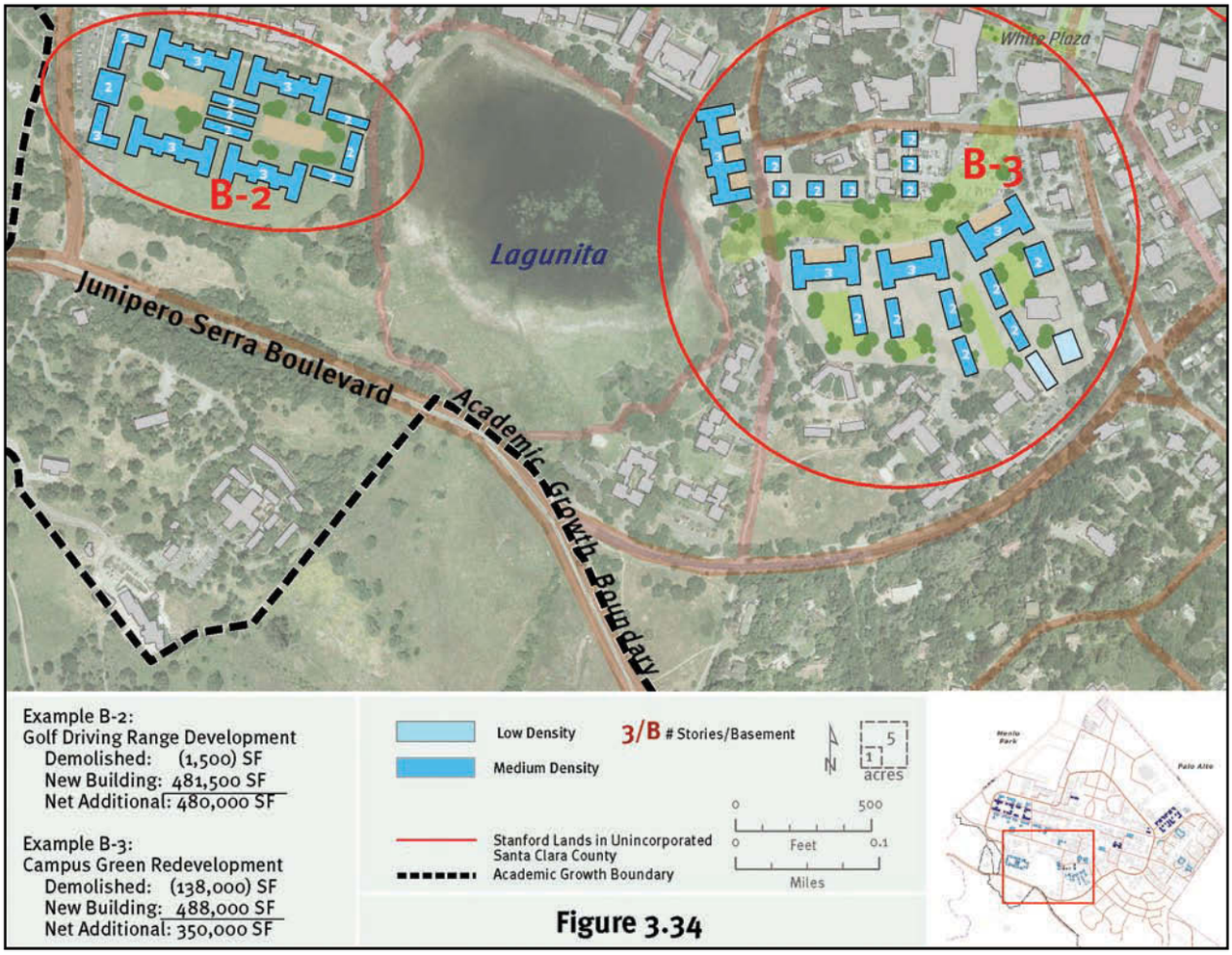


Figure 3.34 Example B-2 Golf Driving Range and Example B-3 Campus Green Redevelopment

Example B-4: Undergraduate Housing and Academic Infill (Figure 3.35)
This example illustrates the opportunity to construct new buildings on a variety of infill sites, including placing a high-density, three story housing complex south of the Encina Hall and Commons, which was originally constructed as the University's first men's dormitory and dining facility. This new complex could replace an existing low-rise dormitory and, at the same time, define a new quad in line with the linear series of quads found in the Olmsted Plan.

Another site, to the west of the existing Schwab Graduate Residences, could be used to replace one story service buildings with a medium-density academic or residential complex. A third site, located adjacent to the existing Law School and Green Library, also has the capacity accommodate a new building. This series of redevelopment projects could result in the demolition of 105,000 square feet of building space that could be replaced by 395,000 square feet of new construction, an increase of 290,000 additional square feet of development.

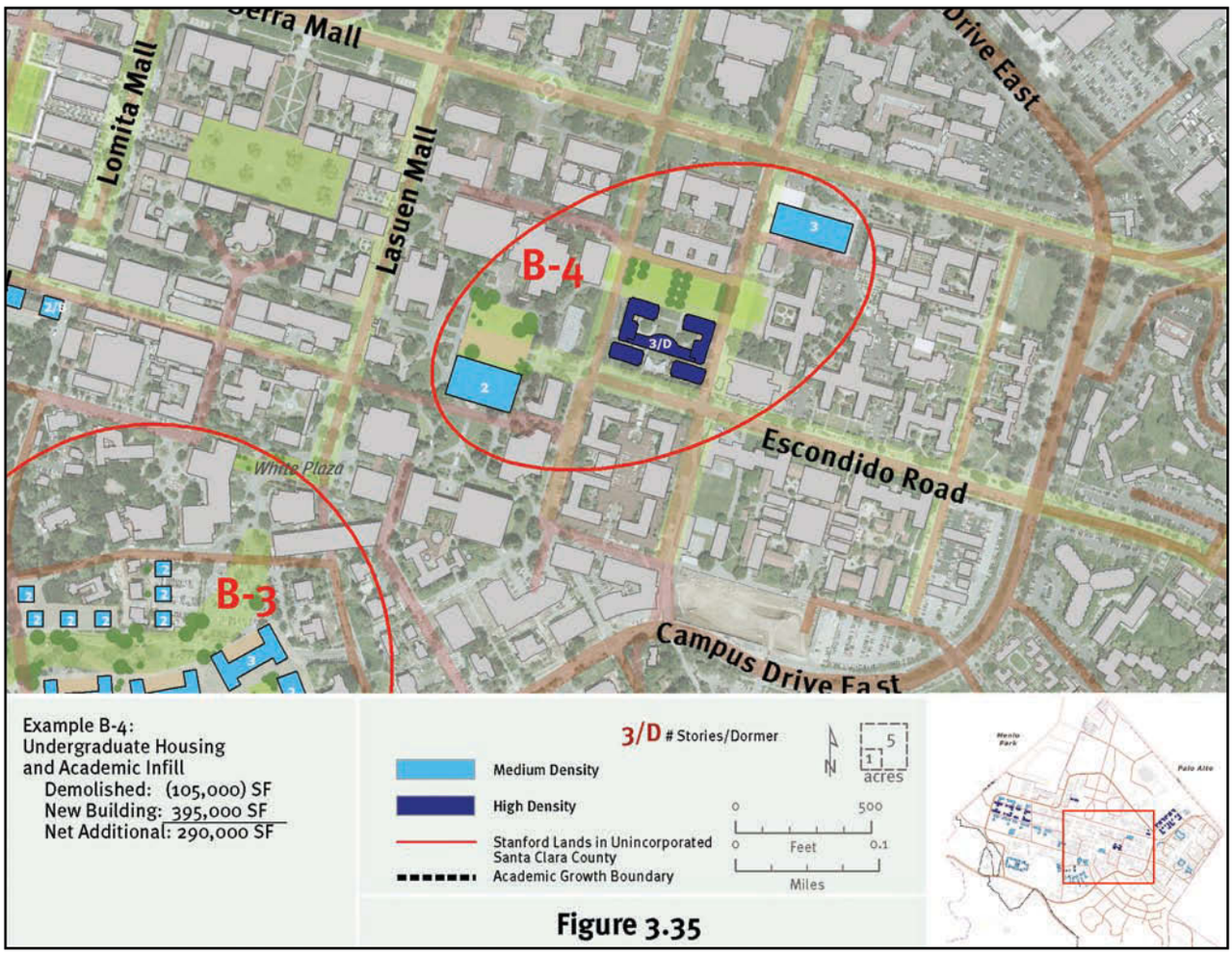


Figure 3.35 Example B-4 Undergraduate Housing/Academic Infill

Additional Infill Development
The examples in Scenario B analyze opportunities to address moderate growth rates in a variety of campus locations. It is anticipated that in addition to these redevelopment

areas, there also would be renovations and expansions to existing buildings and additional infill development that could provide approximately 150,000 additional square feet of development for a total of 3.5 million additional square feet of development.

Development Scenario C, Aggressive Growth (Figure 3.36), studies a development scenario designed to accommodate an aggressive growth rate through 2035. Grounded in the same campus planning principles and conceptual density pattern outlined in the other two scenarios, Scenario C evaluates the potential to construct 5 million additional square feet of academic and housing facilities between 2018 and 2035. The following examples illustrate the potential planning strategies to accommodate this growth rate.

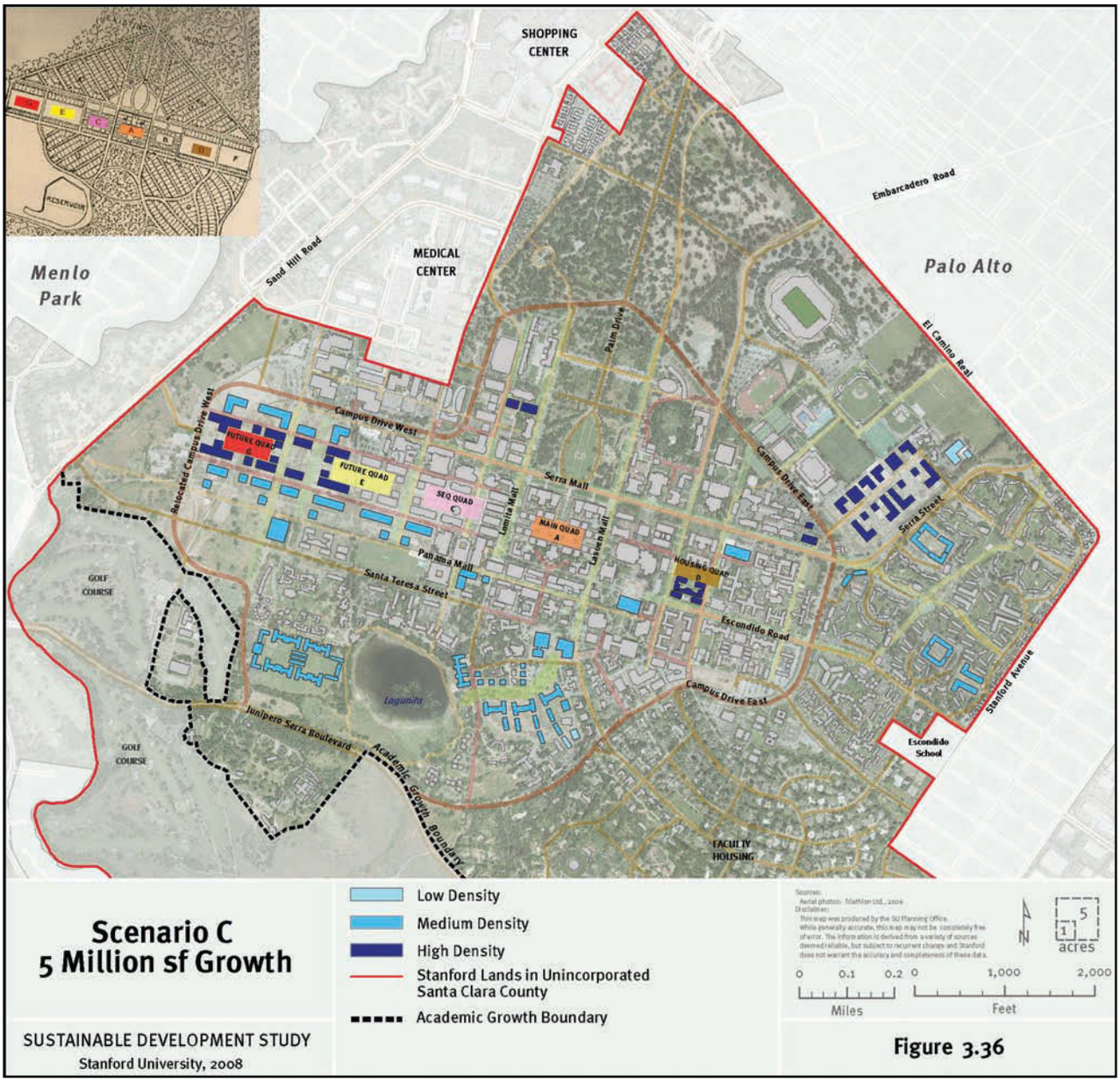


Figure 3.36 Scenario C Development Map (see fold-out map)

Example C-1: Extension of the Quad System (Figure 3.37)

The extension of the quad system in Scenario C could be similar to the expansion outlined in Scenario B in which 132,000 square feet of existing buildings could be demolished to allow for the construction of more than 2,362,000 square feet of new space. This could result in more than 2,230,000 additional square feet of campus facilities in these locations.

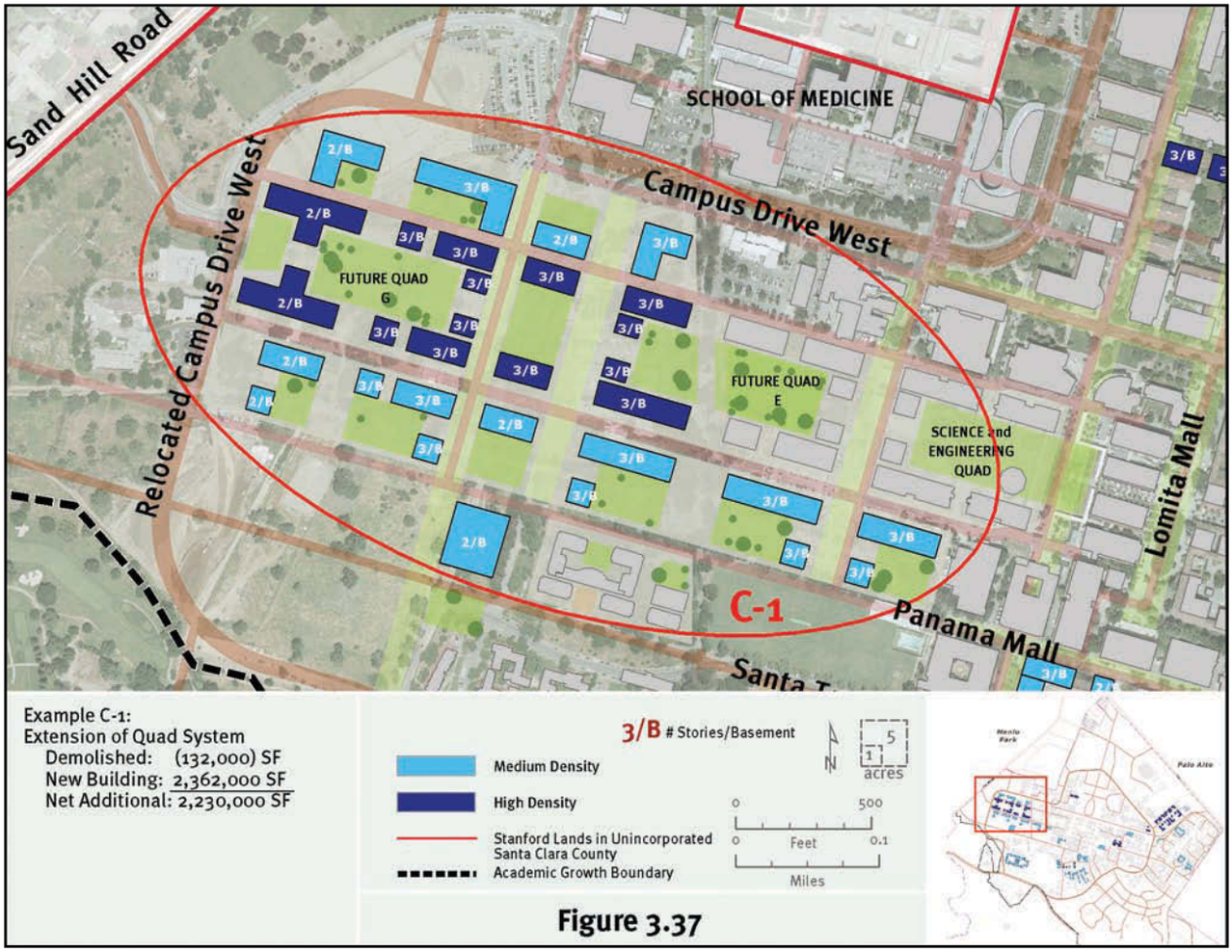


Figure 3.37 Example C-1 Extension of Quad System

Example C-2: Golf Driving Range Development (Figure 3.38)

The golf course driving range could be redeveloped with a collection of two to three story buildings on this site to yield approximately 481,500 square feet of new facilities, replacing 1,500 square feet of existing recreation facilities, for a total of 480,000 additional square feet of facilities.

Example C-3: Campus Green (Figure 3.38)

The area south of White Plaza and the undergraduate Campus Center could be redeveloped to increase density while also reflecting the sinuous residential character that was originally designed in the Olmsted Plan to complement the more ordered nature

of the quads. Scenario C shows that it would be possible to add more development in this area than was depicted under Scenarios A and B. Under this example, 310,000 square feet of existing space could be demolished to redevelop these sites and construct 715,000 new square feet of medium-density facilities, for a total of more than 405,000 additional square feet of development.

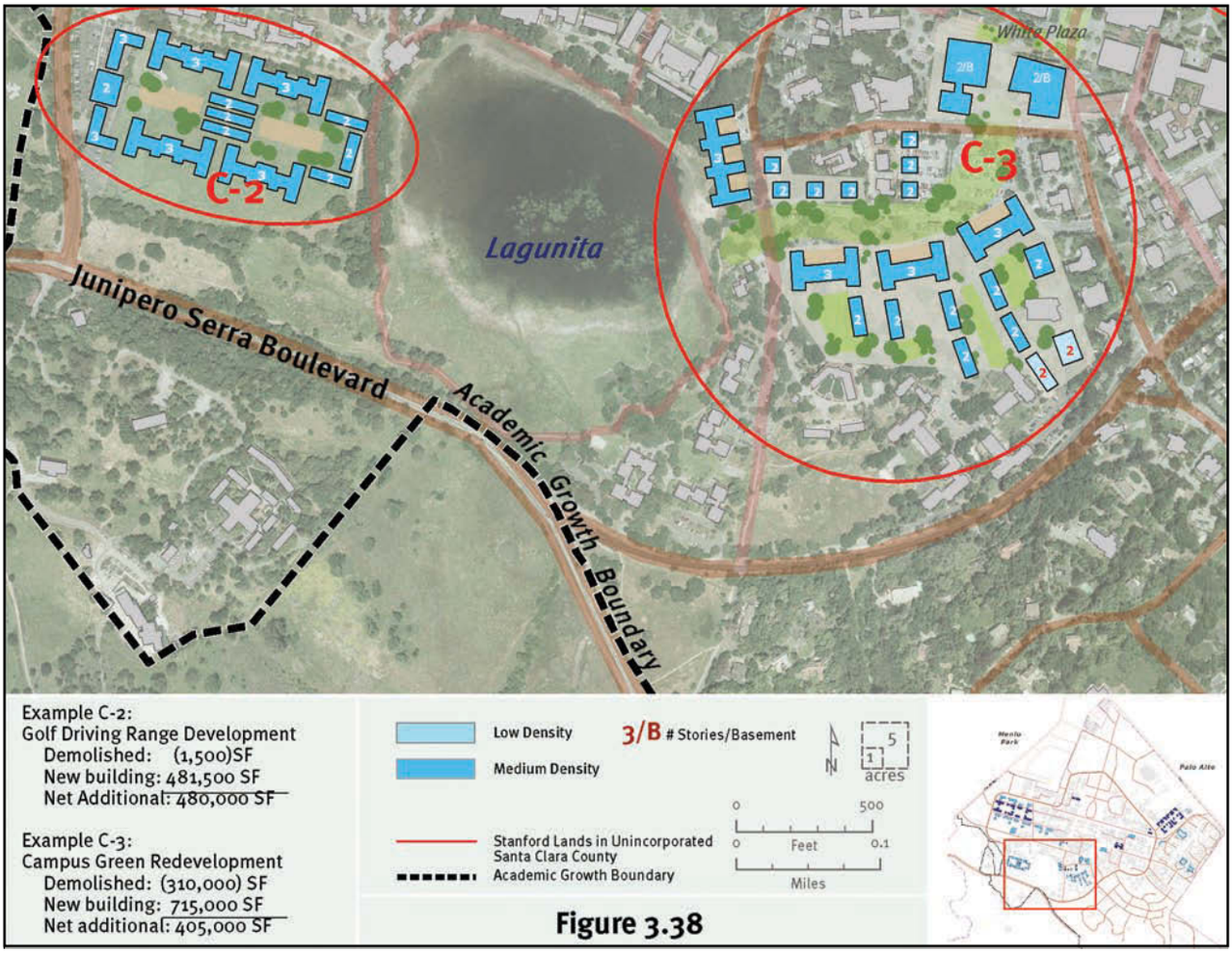


Figure 3.38 Example C-2 Golf Driving Range and and Example C-3 Campus Green Redevelopment

Example C-4: Undergraduate Housing and Academic Infill (Figure 3.39)
This example illustrates the opportunity to construct new buildings on a variety of infill sites. This series of redevelopment projects could result in the demolition of 105,000 square feet of building space that would be replaced by 395,000 square feet of new construction, for an increase of 290,000 additional square feet of development.

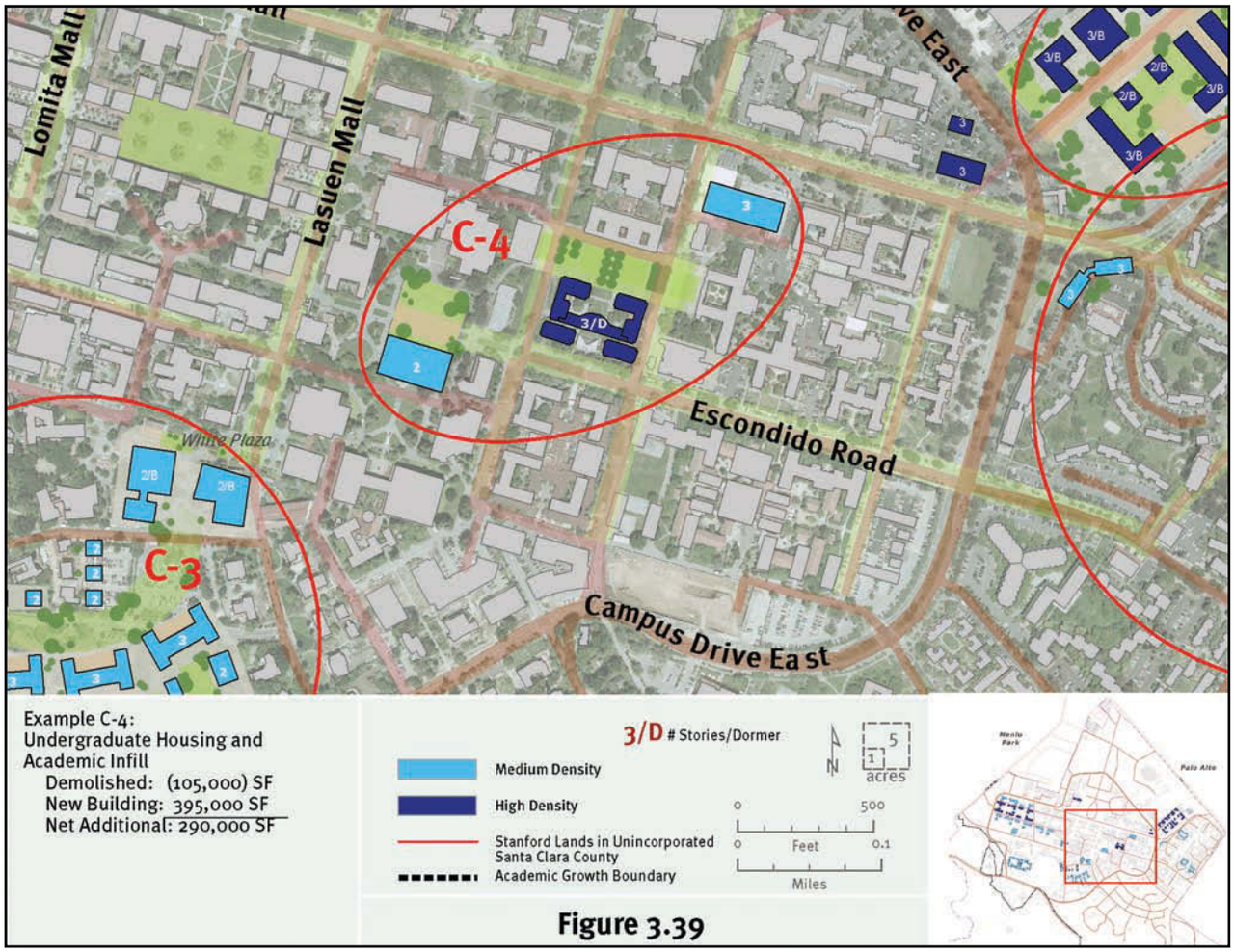


Figure 3.39 Example C-4 Undergraduate Housing and Academic Infill

Example C-5: Bonair Siding Redevelopment (Figure 3.40)
Bonair Siding, the area on the east side of campus that houses a majority of the facilities operations offices, storage, and equipment, could be redeveloped to support academic program growth or future housing needs. A collection of new three story buildings in this area, with associated basements, could generate a high-density area of 1,032,000 square feet of new building space, replacing more than 247,000 square feet of existing medium-density warehouse and office space for an increase of 785,000 additional square feet of development.

Example C-6: Escondido Village Redevelopment (Figure 3.40)
Escondido Village is currently a low-density housing community. Areas within the Village could be redeveloped in a more compact manner to accommodate future housing or even academic growth. In this example, 60,000 square feet of existing housing could be demolished and replaced with 470,000 square feet of new space, for a total of 410,000 additional square feet of development. With this potential expansion, the overall density for Escondido Village could be increased to medium density.

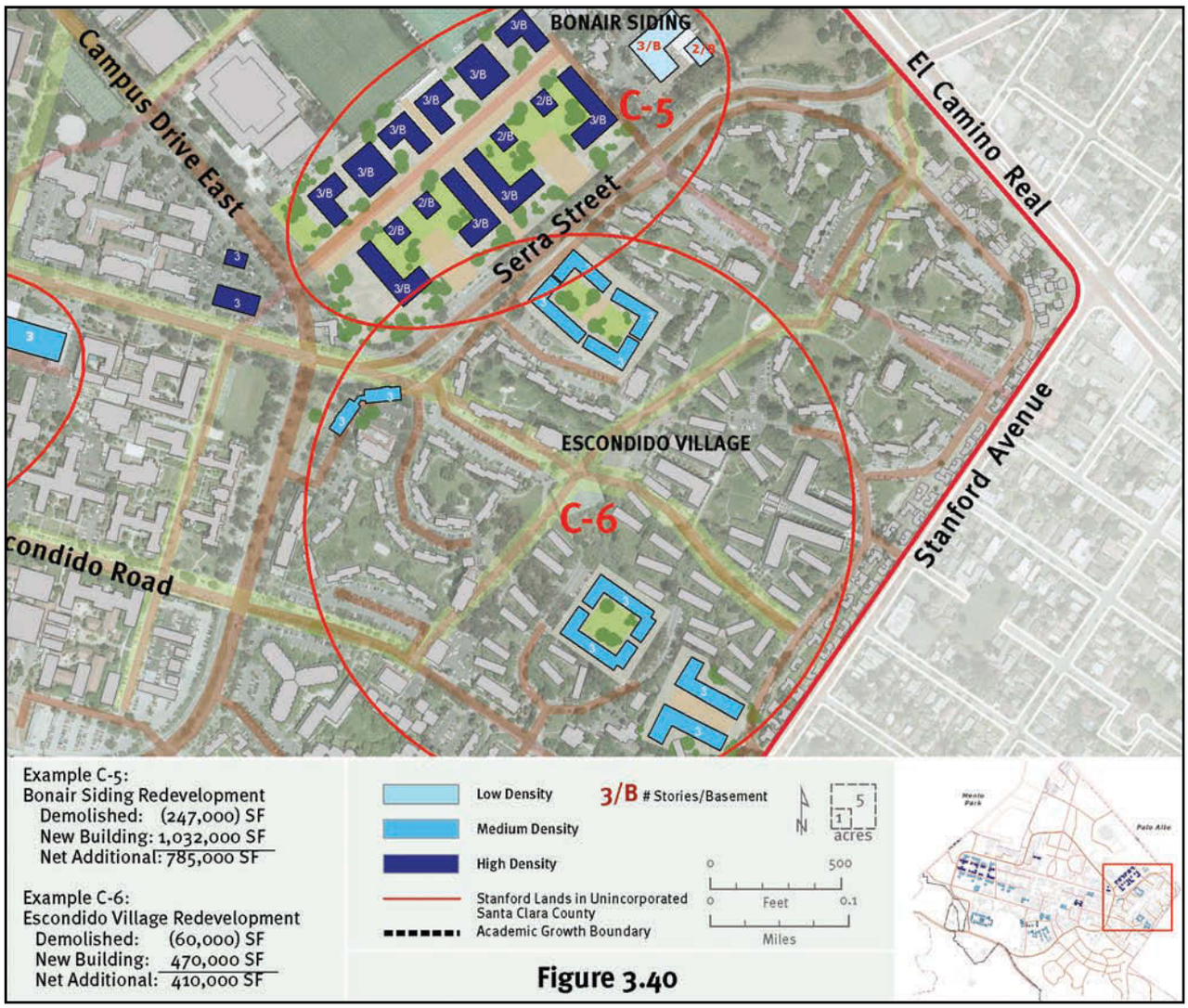


Figure 3.40 Example C-5 Bonair Siding and Example C-6 Escondido Village Redevelopment

Additional Infill Development

The examples in Scenario C analyze opportunities to address aggressive growth rates in a variety of campus locations. It is anticipated that in addition to these redevelopment areas, there also would be renovations and expansions to existing buildings and additional infill development that could provide approximately 400,000 additional square feet of development for a total of 5 million additional square feet of development.

Conclusion

These development scenarios demonstrate that maximum planned buildout through 2035 can be accommodated within the Central Campus inside the existing AGB through continued use of existing campus planning principles regarding the location and manner of development. Continuation of the current trends in campus development is likely to result in increased density without adversely affecting Stanford's academic learning environment and without creating undue pressure to expand campus development into the Foothills Development District.

The analysis also indicates that there may be opportunities to grow in a compact manner beyond the growth scenarios studied in this chapter. Redevelopment, renovations, and infill projects could continue to provide opportunities to increase densities and renew campus facility demands. For example, programs might be accommodated in space underneath recreation fields on the west side of campus or below future buildings. There also is the potential to increase density in the land along Sand Hill Road and still provide an appropriate transition to neighboring communities.

As Stanford University responds to the need for additional academic program space for research, education, and housing associated with campus life, it intends to maintain the quality environment and pride of place that has been the hallmark of its history and evolution.

This vision continues to be realized in part because of the University's continued implementation of campus planning principles:

- Implement the Olmsted Plan
- Develop in a compact manner
- Provide appropriate density transitions from the core to the edges
- Preserve campus character, including natural, landscape, and circulation systems
- Allocate and use existing space responsibly
- Optimize site planning to take advantage of climatic conditions

SUSTAINABLE DEVELOPMENT STUDY

CHAPTER 4: FOOTHILLS | OUTSIDE THE AGB

Chapter 4: Foothills | Outside the AGB

Introduction

The Stanford Community Plan requires the Sustainable Development Study (Study) to identify potential areas within the Foothills that could accommodate future development. The term "Foothills," as used in this Study, refers to the area designated as "Foothills Development District" in the 2000 General Use Permit (GUP). Development scenarios shown in Chapter 3 demonstrate, at a conceptual level, that Stanford University could accommodate maximum planned buildout through 2035 within campus lands located inside the Academic Growth Boundary (AGB). Actual University growth and program needs for the Foothills District beyond the 2000 GUP are not currently known. As discussed in Chapter 3, it appears that the AGB would not need to be moved through the Sustainable Development Study planning horizon based upon the range of development scenarios evaluated for the Central Campus.

This chapter describes and evaluates the Foothills land located outside the AGB. The Stanford Community Plan states:

> "With respect to the Foothills, the Sustainable Development Study shall identify all area(s) of potential future development. The potential development area(s) shall be consistent with the Community Plan strategies and policies, which include but are not limited to the strategies and policies relating to compact urban development, conservation of natural resources, open space protection, maintenance of scenic values, and avoidance of hazards." [1]

Although limited development is allowed under the 2000 GUP, the University has no current plans or proposals to build new academic facilities in the Foothills. This chapter establishes an approach for evaluating Foothills areas that could be considered for potential development in the future. It should be noted that all of these lands are currently designated Open Space and Field Research (OS/FR) or Special Conservation Areas (SCA) by the Stanford Community Plan, which already restricts allowable development. In the Background and Principles sections of this chapter, the Foothills lands will be placed in context through a brief discussion of the history, geopolitical background, regulations, policies, and planning principles employed to date by the County of Santa Clara and Stanford University. The chapter will also review existing development that has occurred under the 2000 GUP and generally describes the types of future activities that may occur based upon current knowledge about long-term University needs.

In order to identify the natural resources and sensitive features in the Foothills, this chapter analyzes the lands using Geographical Information Systems (GIS) to layer

1 Stanford Community Plan (SCP). Chapter 1 – Growth and Development, Implementation Recommendation SCP GD(i)4, Page 19

mapped resources and environmental and regulatory sensitivities. Infrastructure to support new facilities is not included as a factor in the sensitivity analysis and would need to be evaluated for specific projects and sites. This chapter describes how a sensitivity analysis can be used to synthesize relevant mapped information. If and when an academic need that requires a foothills setting is identified in the future, such a sensitivity analysis can be used in conjunction with the application of Foothills planning principles and assessment of program needs to identify potential development areas appropriate for the particular use. Additional site-specific analyses would also be conducted in conjunction with a proposed project to refine the sensitivity information available for a given location. A description of the Stanford University and County of Santa Clara processes is provided in the Analysis section of this chapter.

Background

GEOGRAPHICAL CONTEXT

The Stanford Foothills in unincorporated Santa Clara County cover approximately 2,400 acres[2] of rolling topography located south of the AGB and east of Alpine Road (Figure 4.1).

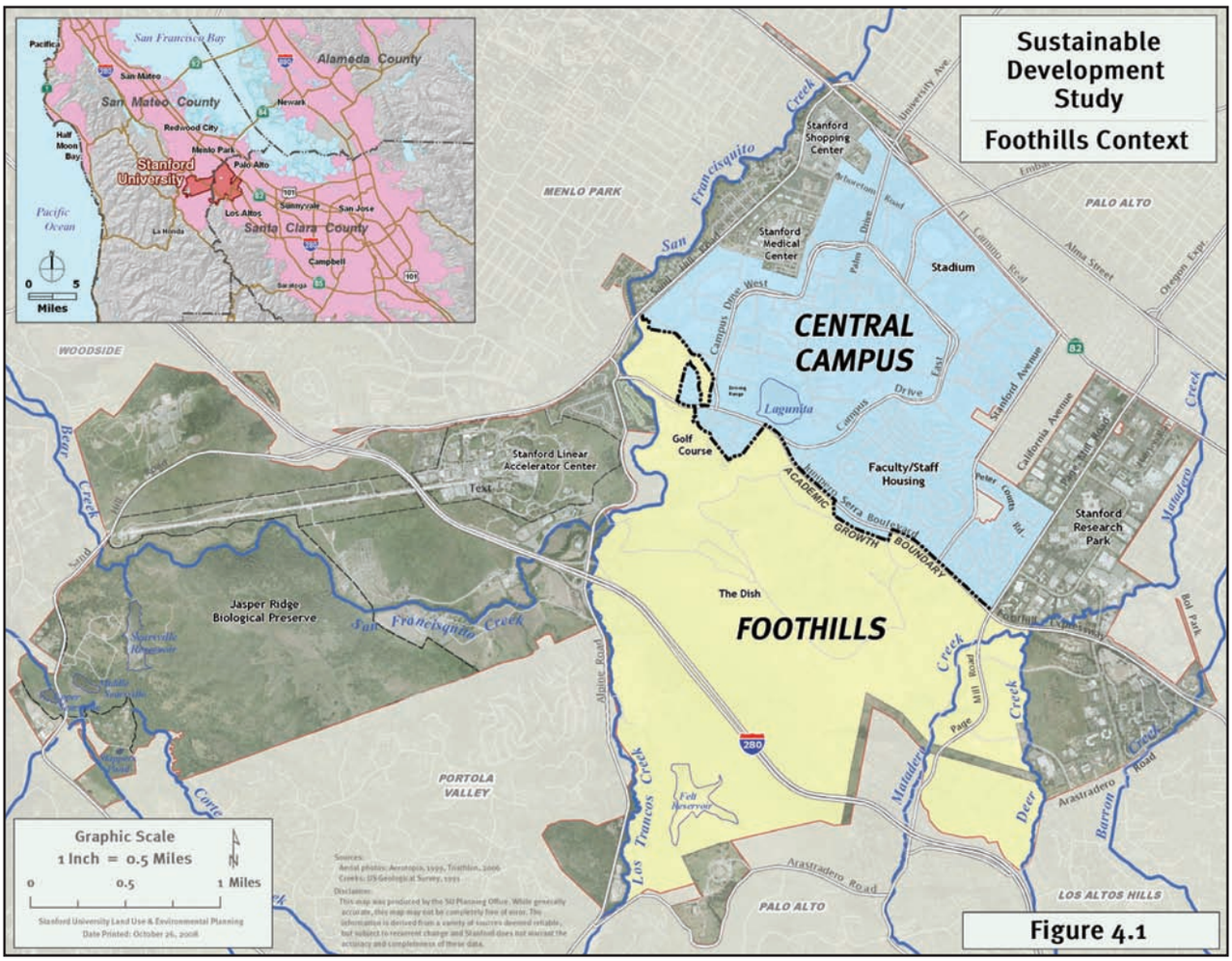


Figure 4.1 Location of Stanford Foothills in Santa Clara County (see fold-out map)

2 This amount includes all roads (I- 280, Page Mill Road, Junipero Serra Boulevard) on Stanford lands in the Foothills, which are not included in the subsequent analyses.

This land currently accommodates a wide range of land uses from academic to agriculture to recreation. Two major roads, I-280 and Page Mill Road, divide the land into three main areas: north of I-280 (1,475 acres), south of I-280 (530 acres), and east of Page Mill Road (250 acres). The lands also lie within two watersheds: Matadero/Deer and San Francisquito/Los Trancos creeks.

HISTORY

The history of these lands can be described starting with the Native Americans who occupied the area as the Spanish began to colonize through the advancing missions and rancheros. The native inhabitants, sometimes referred to as the Ohlone, maintained villages along the larger creeks and exploited the valley and foothills for food and other resources. The Spanish ranch introduced European-style agriculture, significantly altering the native plant communities and providing a structure for the redistribution of land as property. The western expansion of the United States, eventually peaking with the California Gold Rush, brought the opportunity for Leland Stanford to amass wealth and acquire a major farm in Palo Alto as respite from his more formal residences in San Francisco and Sacramento. The Stanfords used the land to raise racehorses and grow wine grapes, while other acreage was leased to tenants to grow commercial crops.

During the Palo Alto Stock Farm era, in the late 19th century, the Stanfords and their tenants used the Foothills grasslands for grazing stock. As was common practice, the farmers diverted and modified creeks and drainages to support agricultural uses, creating both seasonal and permanent lakes and reservoirs. Modest logging, quarrying, and mining enterprises, operated by tenants, took place during this period. While the existing character of the Foothills area is often perceived as "natural," in fact the land strongly reflects this history of human intervention.

Chapter 3 describes how the Stanfords created the Central Campus and how it evolved north of the AGB. The Foothills were not immediately needed for academic buildings or housing. The Founding Grant of the University recognized the value of the lands not immediately needed for the primary campus, and required that "the rents and issues there from" be used in support of the University. Thus, the renting of lands in the Foothills for agriculture, maintenance, and income commenced with the founding of the University.

Although agriculture continues to occupy the largest portion of these properties, a wide variety of other activities related to the University also take place in the Foothills. Cattle and equestrian uses juxtaposed with research radio antennas are emblematic of the broad range of such activities (Figure 4.2).

Figure 4.2 Foothills antenna use

FOOTHILLS REGULATION

Stanford's Foothills are held by the University for academic purposes. Stanford's first Use Permit was an open-ended, one-page document approved by the County of Santa Clara in 1962, which was before the California Environmental Quality Act (CEQA) and the practice of fully analyzing short and long-term environmental effects of development. Subsequently, in response to the need for more public participation and thoughtful consideration of Stanford's land use and development, two changes occurred: (1) the City of Palo Alto, the County of Santa Clara, and Stanford entered into a City Services (CS) Zone agreement that described governance and provision of municipal services for Stanford's Santa Clara County lands and (2) the County of Santa Clara determined a need for an updated use permit.

The University produced its 1980 Land Use Plan to anticipate and understand better how it might operate and develop over a given period of time. The 1980 Land Use Plan was given to all of the jurisdictions governing Stanford's lands and provided explanation about Stanford's intentions for the use of its land by reiterating the Founding Grant's directive that the lands were specifically for the purpose of supporting the University.

In 1985, the CS Zone agreement was updated as the 1985 Land Use Policy Agreement, commonly known as the Three-Party Agreement. The Land Use Policy Agreement continues to recognize that all of Stanford's lands are held in perpetual trust for educational purposes, and that those areas designated as "Academic Reserve and Open Space" may be used for agricultural and accessory purposes until they are needed for

academic use. Subsequently, the 1995 update of the Santa Clara County General Plan similarly included an "Academic Reserve" designation for the Stanford Foothills.

In contrast to the 1962 permit that simply allowed "the operation of a university," the 1989 General Use Permit for the University required description of the nature and intensity of the operation at much greater detail. When the County approved the 1989 General Use Permit for Stanford's lands, the Foothills were designated as a Special Condition Area where individual uses were evaluated and permitted separately because of environmental sensitivities.

In 1998, when Stanford began to approach the specified 1989 GUP development limit of 2,100,300 square feet including academic, academic support, and housing, it prepared an application for a new General Use Permit (2000 GUP) and Stanford Community Plan (SCP) that would establish land use policies specific to Stanford.

The adopted SCP recognizes the importance of the 1985 Land Use Policy Agreement and states that the County intends to maintain and enhance that agreement. The SCP Growth and Development chapter establishes an Academic Growth Boundary (AGB). The policies, strategies, and implementation recommendations for lands outside the AGB are geared toward protection of resources, avoiding hazards, and limiting academic activities to those that require a remote and natural setting for their basic functioning. The SCP states that the AGB "is not meant to be a permanent planning boundary, but it does need to remain in place for a long enough period of time to ensure that development will be directed toward the Central Campus over the long term."[3] The AGB will remain in the established location at least until 2025 according to the SCP.

Lands outside of the AGB are designated Open Space and Field Research (OS/FR) or Special Conservation Areas (SCA) in the SCP. Allowable uses within the OS/FR designation include: field study activities, utility infrastructure in keeping with the predominantly natural appearance of the foothill setting, grazing and other agricultural uses, recreation activities which are consistent with the protection of resources and with appropriate policies regarding Foothill access, and specialized facilities and installations that by their nature require a remote or natural setting.[4] These policies are reinforced by a 2000 GUP condition requiring OS/F zoning to implement the OS/FR designation. The County adopted OS/F zoning in 2003, which provides more specificity about the standards and uses of Foothills lands.

Allowable uses within the SCA designation are limited to conservation activities and habitat management. The SCP recommends an implementation measure to adopt Special Conservation zoning for the areas with this designation. The County will pursue zoning for the SCA designation once the United States Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration – National Marine Fisheries Service (NOAA Fisheries) approve a Habitat Conservation Plan for Stanford's lands. This process is further described in the section on Planning and Development Under the 2000 GUP.

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3 SCP. Chapter 1 – Growth and Development, page 13
4 SCP – Land Use (LU- 26), page 34

Foothills Planning Principles

The regulations adopted by the County of Santa Clara for the use of Stanford's Foothills lands, land use policies identified in the SCP, and the information the University has obtained from long-term management of its lands can all be synthesized into a set of planning principles for the Foothills. These principles are being, and will continue to be, implemented through the planning horizon for this Study (2035):

- Protect and enhance natural resources
- Avoid development in high sensitivity areas unless a specialized program use has unique siting requirements
- Maintain flexibility to accommodate current and future University needs

PROTECT AND ENHANCE NATURAL RESOURCES

For the University, its Foothills lands are an academic resource for uses that require a remote setting and the natural resources located on these lands and, furthermore, which can provide teaching and research opportunities in the natural sciences. Stanford places great value on these resources and actively protects and enhances them. The University constantly evaluates its operations in the Foothills in order to reduce any adverse effects to its natural resources. These efforts are described in the Conservation Activities section of this chapter.

AVOID DEVELOPMENT IN HIGH SENSITIVITY AREAS UNLESS A SPECIALIZED PROGRAM USE HAS UNIQUE SITING REQUIREMENTS

A second guiding principle for the University's use of its lands in the Foothills is to avoid development in high sensitivity areas unless a specialized program use has unique siting requirements. This principle is reinforced by the adopted SCP policy (SCP-LU 26) and OS/F zoning, which allow "specialized facilities and installations that by their nature require a remote or natural setting…" While it is not possible to predict all of the future uses that may be necessary to promote the purposes of the University, following the principle of avoiding highly sensitive areas unless programmatically required ensures that proper consideration will be given to all of the factors that come into play in occupying Foothills sites.

Historically, Stanford has utilized land sensitivity analyses as a component of its Foothills planning. In order to identify potential development sites, University planners review land characteristics and sensitivities, regulatory requirements, and programmatic needs. The identified potential sites then receive site-specific analyses to refine the sensitivity information prior to initiating Stanford and County of Santa Clara application processes. The Sensitivity Analysis and methodology are described later in this chapter.

MAINTAIN FLEXIBILITY TO ACCOMMODATE CURRENT AND FUTURE UNIVERSITY NEEDS

The historic patterns of land use show that the uses that have occurred in the Stanford Foothills have been varied and sometimes unpredictable. The remaining antennas and their support facilities are a small portion of the network that existed when radio telescopic research peaked in the 1960s. Since that time, other needs have emerged that

resulted in development of land in the Foothills, some of which has taken place outside of unincorporated County of Santa Clara. Such development includes Portola Valley (equestrian) Training Center, water storage reservoirs for the University and Menlo Park, biological field stations, and SLAC (formerly known as Stanford Linear Accelerator Center).

More recently, growing desires for recreational facilities from neighboring communities have led to proposals to locate trails, parks, and other recreational facilities in the Foothills lands.

Some of the land in the Stanford Foothills is leased for use as plant nurseries, grazing, and other agricultural uses. Stanford maintains a portfolio of property that it develops or leases to provide revenues to support its academic programs, including leases for commercial agricultural uses on lands held in reserve for future academic needs. In those cases, the University retains the right to reclaim such lands for academic use on short notice, since these lands are held to support its academic mission.

It is impossible to predict future University needs 100 years from now or even 25 years from now. For example, when the Stanfords laid out the campus in 1886, they could not have imagined that part of their stock farm would be used for antennas large enough to pick up signals from outer space. Now, universities are placing monitors in locations similar to Stanford's Foothills to assess the effects of climate change.

The retention of large land areas for unknown but potentially crucial future uses has guided the historical development of the Foothills and will continue to do so. Stanford's land reserves allow the University the flexibility to respond strategically to new directions in teaching and research. One of the University's greatest strengths is the permanence of its land assets.

Planning and Development

UNDER THE 2000 GUP

In the 2000 GUP, the County of Santa Clara created a Foothills Development District to encompass the lands outside of the AGB. At the time the County approved the 2000 GUP, less than 15,000 gross square feet (gsf) of existing development was located in the Foothills Development District. Under the 2000 GUP conditions, a maximum of 15,000 additional new square feet of building area may be located in the Foothills, and no individual building or facility may exceed 5,000 square feet. To date, Stanford has constructed a net increase of 4,732 gross square feet of structures in the Foothills consisting of the Brick Barn renovation located in the Stanford Equestrian Center and the Guard Shack located at Stanford Avenue and Junipero Serra Boulevard.

In addition to the relatively small amount of development constructed under the 2000 GUP, Stanford has undertaken many operational and conservation activities in the Foothills lands since just before 2000. These operational and conservation activities, which are in accordance with the principles described in the previous section, are described below.

OPERATIONAL ACTIVITIES

An example of balancing programmatic need and resource sensitivity occurred just prior to the adoption of the SCP and approval of the 2000 GUP. Stanford had identified a need to fortify its emergency water supply capabilities. Siting and designing a new reservoir involved analysis of the location of the water conveyance system, local access roads, topography, composition of the plant community and tree patterns, and local drainage and hydrology. Stanford developed a design that contoured excavated material to match existing topography, re-seeded the slopes with a seed mix developed by conservation biologists, enlisted Stanford's oak planting contractor to expand the oak woodlands, and added road extensions to allow better access for maintenance and operation of the new facility and other utility infrastructure. By matching the needs of its water system to the capabilities and sensitivities of the Foothills site, the University was able to construct needed infrastructure, improve water supply operations, reduce impacts of the new facility, and promote conservation objectives.

Just prior to adoption of the SCP and approval of the 2000 GUP, Stanford carried out a variety of activities to improve public access to the Foothills, while protecting sensitive creek corridors and woodland areas from damage caused by hikers and off-leash dogs (Figure 4.3). Stanford temporarily closed public access to the service roads in the "Dish" area, located between I-280, Junipero Serra Boulevard, Old Page Mill Road, and the Stanford Golf Course. The purpose of the closure was to resurface the service roads, remove and restore unauthorized trails, delineate the approved route for public recreational use, clarify and post rules, and fortify fencing to prevent future unauthorized recreational use. Stanford also improved a pedestrian path from the gate at Stanford Avenue/ Junipero Serra Boulevard (where the majority of public users enter) to a junction with the existing service road (Figure 4.4). To ensure compliance with regulations for recreational use, the Stanford Department of Public Safety began stationing community service officers at the Stanford Avenue gate.

Figure 4.3 Dish area restoration: before, 2000 (left), and after, 2008 (right)

The "Makin' Hay" outdoor art installation was approved under the 2000 GUP (Figure 4.5). The Stanford Cantor Center for Visual Arts outdoor sculpture program requested approval for the Foothills site because the piece was designed for a rural, pastoral setting. The County of Santa Clara found that the proposed use was a part of the academic program with specialized site requirements unique to the Foothills.

Figure 4.4 Dish route view, 2008

Figure 4.5 Art Makin' Hay 2002

In 2004, unused academic buildings and antennas were demolished at the retired Site 515 radio telemetry location. The University removed long-abandoned equipment and buildings, preparing the site for potential re-use, and restoring more natural landscape conditions to the site.

The University has regularly improved and maintained roadways, water pipelines, electrical transmission lines, and other infrastructure located in the Foothills. Since adoption of the 2000 GUP, utility changes have included replacement of utility lines and installation of photovoltaic panels on Reservoir II.

Stanford also has managed its leases to further its conservation efforts (Figure 4.6). Since 2000, the University has worked with existing tenants to relocate agricultural, nursery, and equestrian operations, including an equestrian trail, farther from sensitive resources near the creeks. An equestrian tenant replaced an existing facility with one farther from Los Trancos Creek, creating a location for future habitat conservation activities.

Figure 4.6 Leasehold - Boething Nursery

Such development and maintenance activities are responsive to the regulations, policies, and objectives for these lands set forth in the SCP/2000 GUP. For example, the OS/FR designation permits "recreational activities which are consistent with protection of environmental resources…" Controlling and containing recreational use helps protect sensitive habitat areas and stems the proliferation of unauthorized trails that could reduce the visual quality of the area. The University's commitment to increased protection of natural resources is further demonstrated by the conservation activities that have occurred under the 2000 GUP.

CONSERVATION ACTIVITIES

Following the Dish restoration program, the University hired a Conservation Program Biologist who conducted a number of restoration research projects geared toward improved management of the grasslands and restoration of the native plant community. Those projects provided the University with useful knowledge that has been applied to the restoration of minor disturbances in the Foothills and that will be used as it develops future conservation and restoration programs.

Under the 2000 GUP, the University has improved breeding habitat for California tiger salamanders with the aim of creating additional breeding habitat in the Foothills in order to reduce pressure on the breeding habitat in Lagunita in the Central Campus. In 1989, the University constructed experimental ponds in the Foothills to provide breeding habitat for California tiger salamanders. The 2000 GUP required additional ponds to further mitigate potential adverse effects to California tiger salamanders in the Foothills and the Central Campus. In 2003, the County of Santa Clara granted Architecture and Site Approval and issued grading permits to improve the original ponds and to construct six more. The University enlisted the services of a restoration biologist/hydrologist who specialized in wetlands restoration to design and oversee construction. These new and improved ponds have proven successful in modifying hydrological conditions to capture sufficient runoff for breeding habitat and exhibit biological indicators of success.

The University recently received approval for its Steelhead Habitat Enhancement Project to improve the existing Los Trancos Creek Fish Ladder to facilitate steelhead passage and to provide more efficient water diversion operations.

Furthering the principle of protecting and enhancing natural resources, the University is working with the USFWS and NOAA Fisheries to prepare a Habitat Conservation Plan (HCP) in support of incidental take permits. The Stanford HCP is designed to benefit federally protected species and the ecosystems upon which they depend. The primary biological goals of the plan are to increase the populations of these species and enhance their habitats on Stanford land.

The Stanford HCP provides an integrated habitat conservation program that will benefit all of Stanford lands, including the Foothills and Central Campus lands in the unincorporated portions of the County of Santa Clara. This conservation program will include the following components:

- Creation of Management Zones according to the habitat value of the land, ranging from Zone 1 (which supports one or more of the protected species) to Zone 4 (which does not support protected species)
- Minimization measures to reduce or avoid future impacts when possible
- Creation of permanent conservation easements along creeks, where land will be actively managed for the benefit of protected species and activities will be limited to those that support conservation purposes or maintenance of existing facilities. These easements will total approximately 140 acres in unincorporated Santa Clara County
- Creation of a 315-acre California Tiger Salamander Reserve in the lower Foothills, where development would be prohibited for the 50-year life of the HCP and where future conservation easements will be located if California tiger salamander habitat is developed
- Creation of a 95-acre California tiger salamander management area in the Central Campus, where land and operation of Lagunita will be actively managed for the benefit of California tiger salamander
- Monitoring, management, and enhancement (e.g., additional breeding ponds, removal of non-native species) of protected areas
- Tracking of effects to habitat so that mitigations (i.e., easements and enhancements) are always greater than the impacts of development

FUTURE TO 2035

The University has no current plans or proposals to build new academic facilities in the Foothills. Because future specialized needs for development cannot be known at this time, this Study does not assume that any particular amount of development beyond that authorized by the 2000 GUP would be pursued. This Study uses a planning horizon of 2035, and this section discusses the potential land use and development activities, including conservation activities, that might occur within that period in the Foothills. History has, however, indicated a need to remain flexible to respond to unanticipated needs. Any conjecture as to future development should be seen only as an example to illustrate how future initiatives might be assessed considering the regulatory and environmental constraints on these lands. As in the past, future activities in the Foothills will respond to the Foothills planning principles.

ACADEMIC USES

Given the current frequency of requests from academic departments for the use of the Foothills, the University expects that the need for sites to accommodate field activities will continue well beyond the life of the 2000 GUP. Stanford anticipates that engineering, science, humanities, and arts programs will continue to generate research and study opportunities that would be served by the special characteristics of the foothills. It is also possible that these or other programs could initiate a request for new facilities or other site improvements in the Foothills. Possible facilities could include field-station-type buildings to house labs and offices, new antennas or other distant sensing devices, plant growth facilities, studios, field equipment storage, and staging facilities.

Additionally, the University occasionally leases sites to affiliated academic institutions for their facilities which might include technical research facilities such as labs or antennas. Such affiliated institutions often directly support activities of Stanford researchers. For example, the Big Dish radio antenna is operated by SRI on a site licensed by Stanford, and this is used by the Stanford Gravity Probe "B" project to track and receive data from satellites.

SUPPORT USES

Future support uses could vary widely. Infrastructure such as reservoirs, roads, pipelines, and specialized facilities that require a remote setting might be needed to serve the campus or the region. Although the University has planned well and does not anticipate building additional reservoirs for its water needs, the City of Palo Alto has approached Stanford about siting reservoirs for emergency supply and recycled water storage. The University has provided both Palo Alto and Menlo Park with sites for similar uses in the past. Stanford also maintains a site for a wood recycling facility operated by its waste management contractor in the OS/F zone. With the trend toward greater diversion of waste from landfills, there could be a need to consider expansion of current recycling capabilities.

Agricultural uses are considered support activities, as they provide income as well as maintenance of the lands while the interim use occurs, thereby lessening the burden on the University's operating budget. If the current grazing and nursery tenants were replaced by other agricultural users, new facilities or site improvements could be necessary. The University has, in the past, received requests for land to establish orchards, organic farms, native plant nurseries, cattle raising, and vineyards.

It is not possible to determine the compatibility of any of the possible future uses with lands in the Foothills. However, the next section provides a sensitivity analysis approach that will be used by the University to verify suitable sites. Such analysis will help to avoid impacts to natural resources; however, site-specific analyses would also be utilized if individual projects were pursued.

Analysis

Planning for academic facilities in the Foothills involves a more complex site selection process than is typically required for the Central Campus. The Sensitivity Analysis initially will be used by the University to determine whether a development project that requires a specialized setting should be proposed in the Foothills, and if so, where the development project could be sited to avoid or minimize effects on sensitive resources.

The Sensitivity Analysis is one step in an internal Stanford University review and approval process (Figure 4.7). Before planners begin to evaluate sites, academic officers (president, provost, and deans) must approve any initiative as essential to the academic mission and functioning of the University. Capital projects above an identified threshold or requiring a significant change in land use must be approved by the Board of Trustees. After a potential site or sites are identified through the Sensitivity Analysis, other

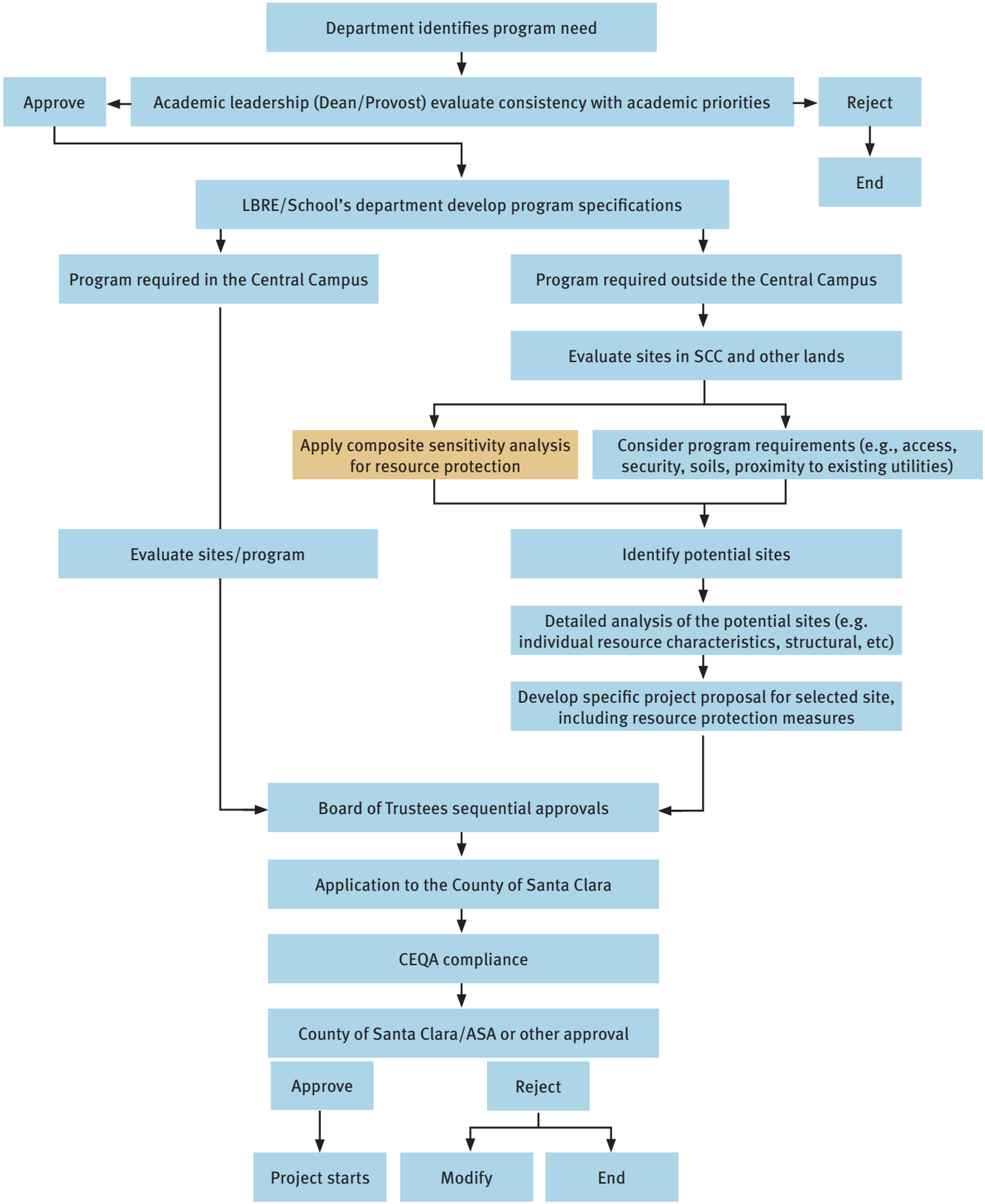


Figure 4.7 Planning process for academic facilities

operational and programmatic factors are evaluated. Factors evaluated would include but not be limited to infrastructure needs and availability, traffic, and access, proximity and affinity to other programs and facilities.

The University would then submit the proposal to the County of Santa Clara for its review, as is the case for all development under the 2000 GUP. For any projects proposed in the Foothills District, the County of Santa Clara would determine whether the proposed use was consistent with the 2000 GUP and the applicable zoning. The County of Santa Clara also would undertake the visual analysis specified in the OS/F zoning and determine whether the environmental impacts of the project had been addressed in the 2000 GUP EIR. This determination would take into account project-specific visual analyses, as well as the specific characteristics of the proposed development project and its setting. The County of Santa Clara would have the information in the Sensitivity Analysis to assist in its review, but it would also conduct further site-specific investigation to the extent it determines such investigation is needed.

Generally, the County of Santa Clara review would be conducted through the Architectural and Site Approval Committee process. If an initiative were to require an amendment to the 2000 GUP or a change in County Land Use regulation or policy, it would require a recommendation by the County of Santa Clara Planning Commission and approval by the Board of Supervisors.

PURPOSE OF THE ANALYSIS

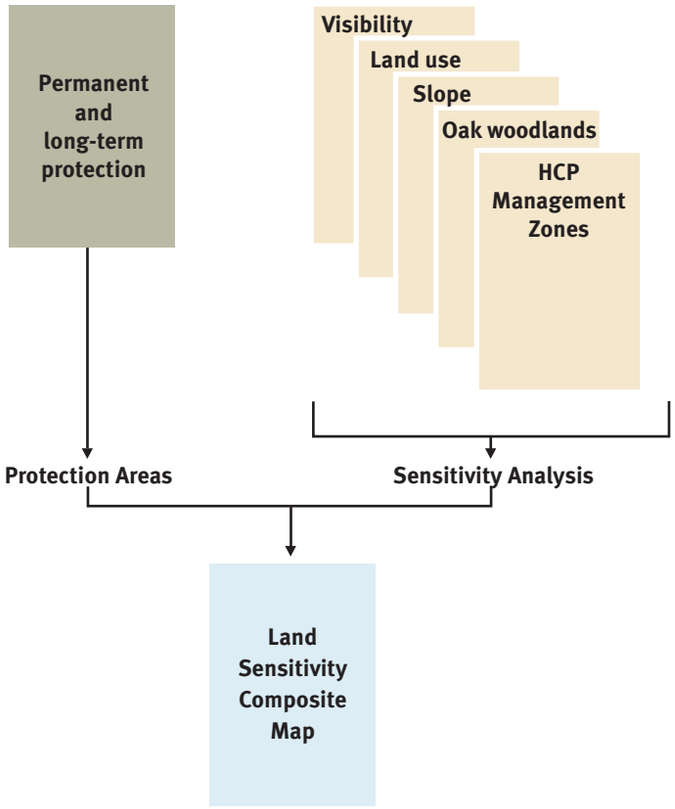
The University prepared a Sensitivity Analysis to evaluate proposed uses in the Foothills based upon environmental and regulatory characteristics (see Appendix B). If and when an academic need is identified in the future, a sensitivity analysis can be used in conjunction with the application of Foothills planning principles and an assessment of program needs to identify potential development areas appropriate for the particular use. It is through the use of the Sensitivity Analysis as well as project-specific environmental review that the University provides "protection and/or avoidance of sensitive plant and animal species and their habitats, creeks and riparian areas, drainage areas, watersheds, scenic viewsheds, and geologic features such as steep or unstable slopes, and faults," as specified in the Stanford Community Plan; however, a modeling exercise can never supplant project and site-specific analyses.

METHODOLOGY

The Sensitivity Analysis determines land sensitivity for resource protection in the Foothills. First, Stanford University identified the most important habitat areas that are considered "Protection Areas". These areas will have either permanent protection (mostly located in streams and riparian areas) or long-term (50-year) protection. These Protection Areas cover approximately 20 percent of the Foothills.

Then, in order to assess the sensitivity of the remaining lands, an overlay method to perform a multifaceted analysis of the Foothills' environmental sensitivity of the Foothills was prepared[5]. By using this method, different information can be layered and combined to identify overall sensitivity and suitability for different types of land uses. In the overlay method, environmental information and other information such as regulatory constraints are depicted on individual thematic maps (themes). For example, habitat zones, slope, and viewsheds would each be mapped to provide thematic maps. The University prepared six thematic maps; five of them (HCP management zones, Oak woodlands, Slope, Land Use, and Visibility) to overlay in its Sensitivity Analysis. The overlay Sensitivity Analysis and the Protection Areas were then compiled, creating a new composite map that reflects the values of all six constituent themes.

Appendix B includes a detailed description of the methodology used to prepare the Sensitivity Analysis. The following chart summarizes this methodology.



5 Ian L McHarg (Design with Nature, 1969) overlay approach assigns values to any environmental factors or themes. In these themes, a particular attribute (class) is assigned a numerical or nominal value that is a measure of the ability of that condition to accommodate a particular use.

The Sensitivity Analysis consists of the following steps:

Step 1: Select resource components
Step 2: Define classes and assign sensitivity values (sv)
Step 3: Perform overlay model
Step 4: Define sensitivity categories

These components include both environmental and regulatory information.

Step 1: Select resource components

The components identified for this analysis are: Protection Areas, HCP Management Zones, Oak woodlands, Slope, Land use designations, and Visibility from primary roads (Figure 4.8). Each of these components is defined briefly here and in greater detail in Appendix B.

Protection Areas. The University is working with USFWS and NOAA Fisheries to prepare a Habitat Conservation Plan (HCP). To prepare the HCP, the University studied the habitat characteristics of its lands and identified the most sensitive habitat areas. On lands in the unincorporated area of the County of Santa Clara these habitat areas will be designated in the HCP as:

- Conservation easements: 140 acres of stream and riparian habitat located in the San Francisquito/Los Trancos creeks and Matadero/Deer creeks to be dedicated permanently for conservation
- Conservation reserves: 315 acres of California tiger salamander habitat located in the lower Foothills to be protected for long term (50-year) conservation

The conservation easements and reserves are mapped as Protection Areas. Because the HCP would prohibit development of these lands during the Study period (2035), except for purposes of habitat enhancement, no further sensitivity analysis of these lands is performed and they are not given sensitivity rankings. Only those lands that do not have a regulatory prohibition on development are given sensitivity rankings in this analysis, including the components below. However, the Protection Areas are included in the final composite analysis and map.

HCP Management Zones. In areas outside the Protection Areas, the HCP identifies Management Zones that correspond to the relative habitat value for the covered species. The HCP habitat values range from Zone 1, which has a high habitat value, to Zone 4, which has a low habitat value.

Oak Woodlands. Oak woodlands are located throughout the Foothills. The HCP does not prioritize oak woodlands as habitat for covered species, thus the Protection Areas and HCP Management Zones do not reflect the sensitivity of these lands. Oak woodlands provide nesting and roosting habitat for a variety of wildlife species, as well as important visual benefits.

Slopes. Any development activities on lands with steep slopes need to address erosion and slope stability issues. As slopes increase, these requirements would also increase.

Thematic Maps

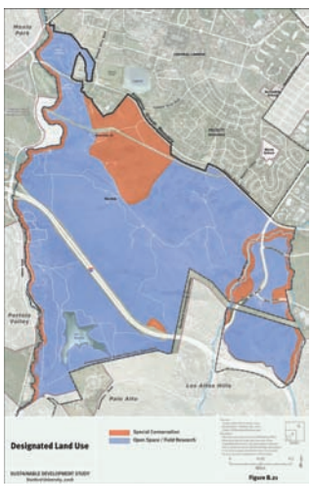
PROTECTION AREAS

HCP MANAGEMENT ZONES

OAK WOODLANDS

SLOPE

LAND USE DESIGNATIONS



VISIBILITY FROM PRIMARY ROADS

Figure 4.8 Resource components and land sensitivity composite analysis

Land Use Designations. The County of Santa Clara designates lands in the Foothills as Special Conservation Areas or Open Space and Field Research (OS/FR). Special Conservation Areas are subject to greater restrictions than OS/FR land.

Visibility From Primary Roads. Through its OS/F zoning, the County of Santa Clara has developed and applies a methodology for assessing the relative visibility of sites in the Foothills from defined primary roads.

Step 2: Define classes and assign sensitivity values (sv)

Each component is broken into several classes to allow relative ranking of sensitivity within the component. GIS mapping is used to assign a sensitivity value to each cell that represents a 5' x 5' area of land. For example, a thematic map depicting oak woodland would include cells with a higher value assigned to them in locations where woodland is present, and cells with a lower value where woodland is absent.

As another example, a thematic map depicting HCP Management Zones would include cells with a higher value assigned to them in areas that the HCP identifies as Zone 1 habitat, and cells with a lower value assigned to them in locations that the HCP identifies as Zone 2 habitat.

Step 3: Perform overlay model

The individual thematic maps for each component are then combined to create one map by adding together the sensitivity values assigned to each cell on the component maps to create a single sensitivity value for each 5' x 5' cell on the combined map.

This overlay method will purposely reinforce certain heightened sensitivities. For example, a cell that represents land that is located both within HCP Zone 1 habitat and within the Special Conservation Area land use designation would receive a higher combined score than a cell that represents land that is located both within HCP Zone 1 habitat and within the OS/FR land use designation. This difference in combined value reflects that, in addition to being sensitive species habitat, there would also be greater regulatory restrictions that would apply to a proposal to develop Special Conservation Areas land as compared to OS/FR land.

The final composite map of the six thematic maps shows the Protection Areas as distinct from the sensitivity categories. These areas were not given sensitivity rankings, as the HCP would result in a regulatory prohibition on development in these areas.

Step 4: Define sensitivity categories

For ease of analysis, the total scores for each cell are aggregated into three sensitivity categories (high, moderate, and low). This provides a relative ranking of the land areas. Should a more refined analysis be required, the underlying data can be easily accessed.

RESULTS

The distribution of the Protection Areas and land sensitivity categories are shown in Table 4.1 and Table 4.2, and Figure 4.9 and Figure 4.10.

TYPE	TIME	LOCATION	AREA (ACRES)	FOOTHILLS PERCENTAGE
Conservation easement	Permanent protection	Los Trancos/San Francisquito creeks; Matadero/Deer creeks	140	6%
Conservation reserve (50 years)	Long-term protection	California tiger salamander habitat	315	14%
		Total[6]	**455**	**20%**

Table 4.1 Protection Areas

CATEGORY	AREA (ACRES)	FOOTHILLS PERCENTAGE
High sensitivity	575	26%
Moderate sensitivity	760	34%
Low sensitivity	420	19%
Total[6]	**1,755**	**79%**

Table 4.2 Land sensitivity categories – Areas of Potential Development

LAND SENSITIVITY AREAS: PROTECTION AREAS

The most critical areas for the conservation of natural resources "Protection Areas" cover approximately 455 acres, about 20 percent of the Foothills. Under the HCP, development of these areas will be prohibited either permanently (6 percent) or for the 50-year life of the HCP (14 percent). Therefore, Protection Areas are not considered areas of potential future development under the Sustainable Development Study.

6 Of the 2,210 acres of land analyzed, Felt Lake, approximately 30 acres and Hetch Hetchy Aqueduct, approximately 10 acres are not included in the analysis.

LAND SENSITIVITY AREAS: AREAS OF POTENTIAL DEVELOPMENT

The remaining land, approximately 1,755 acres, is considered to be theoretically available for potential future development. The sensitivity rankings provide planners with information about resource issues and constraints of Foothills lands that will be considered if and when an academic need that requires a remote setting is identified during the planning horizon. The lands that fall into the various sensitivity categories are further described below.[7]

Approximately 26 percent of the land is ranked High sensitivity. The highly sensitive areas typically represent high values in at least two of the resources components such as HCP Management Zone 1 and presence of oak woodland. Examples of environmental factors combined in this category are:

High Sensitivity

HCP-Zone 1(8)	Oak w. (5)	Slope 0-15% (1)	SCA (7)	Visibility high (6)	**Total= 27**
HCP-Zone 1(8)	Oak w. (5)	Slope >30% (4)	OS/FR (1)	Visibility med-high (5)	**Total= 23**
HCP-Zone 1(8)	No oak (0)	Slope 0-15%(1)	SCA (7)	Visibility medium (3)	**Total= 19**

The Moderate sensitivity area covers approximately 34 percent of the land and it represents a varied combination of environmental conditions, frequently having one resource component with the highest rank. Examples of environmental factors combined in this category are:

Moderate Sensitivity

HCP-Zone 4 (1)	Oak w. (5)	Slope 15-30% (2)	OS/FR (1)	Visibility low (1)	**Total= 10**
HCP-Zone 2 (5)	No oak (0)	Slope 15-30% (2)	OS/FR (1)	Visibility medium (3)	**Total= 11**
HCP-Zone 3 (3)	No oak (0)	Slope 15-30% (2)	SCA (7)	Not Visible (0)	**Total= 12**

Approximately 19 percent of the Foothills land is ranked Low sensitivity. These areas have low values of habitat, usually HCP Zone 3 or 4, no oak woodlands and no steep slopes. Examples of environmental factors combined in this category are:

Low Sensitivity

HCP-Zone 4 (1)	No oak (0)	Slope 0-15% (1)	OS/FR (1)	Visibility low (1)	**Total= 4**
HCP-Zone 3 (3)	No oak (0)	Slope 0-15% (1)	OS/FR (1)	Not visible (0)	**Total= 5**
HCP-Zone 3 (3)	No oak (0)	Slope 0-15% (1)	OS/FR (1)	Visibility low (1)	**Total= 6**

7 A full description of the ranking is provided in Appendix B.

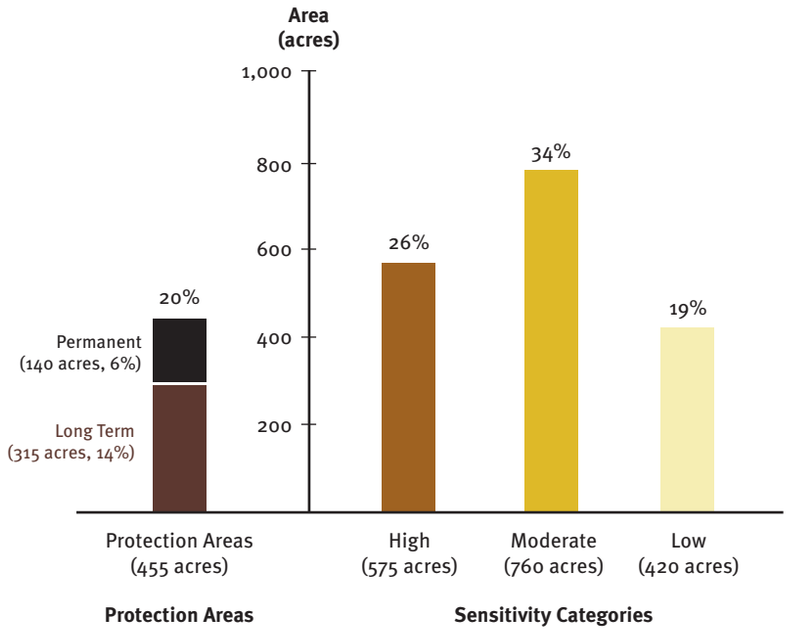


Figure 4.9 Protection Areas and Land Sensitivity Summary Chart

With the exception of the High-sensitivity areas located in the riparian corridors, the spatial distribution of these categories (Figure 4.10) shows the following regions of predominant land sensitivity:

High land sensitivity in the areas located:

- Between Junipero Serra Blvd. and the Dish's ridgeline[8]
- Between Junipero Serra Blvd. and Coyote Hill Road
- Between Deer Creek Road and I-280

Moderate land sensitivity in the areas located:

- Between the Dish area's ridgeline and I-280
- Between Coyote Hill Road and Deer Creek Road

Low land sensitivity in the areas located:

- South of I-280
- Between the Academic Growth Boundary and northwest of Hetch-Hetchy Aqueduct (current golf course area only)

The result of this analysis can be used in aggregated form as presented in Figure 4.10 to inform broader, planning level decisions about the use of Foothills lands. The information produced by this analysis may be used by Stanford when factoring resource conservation into decision-making processes.

8 With the exception of the golf course area.

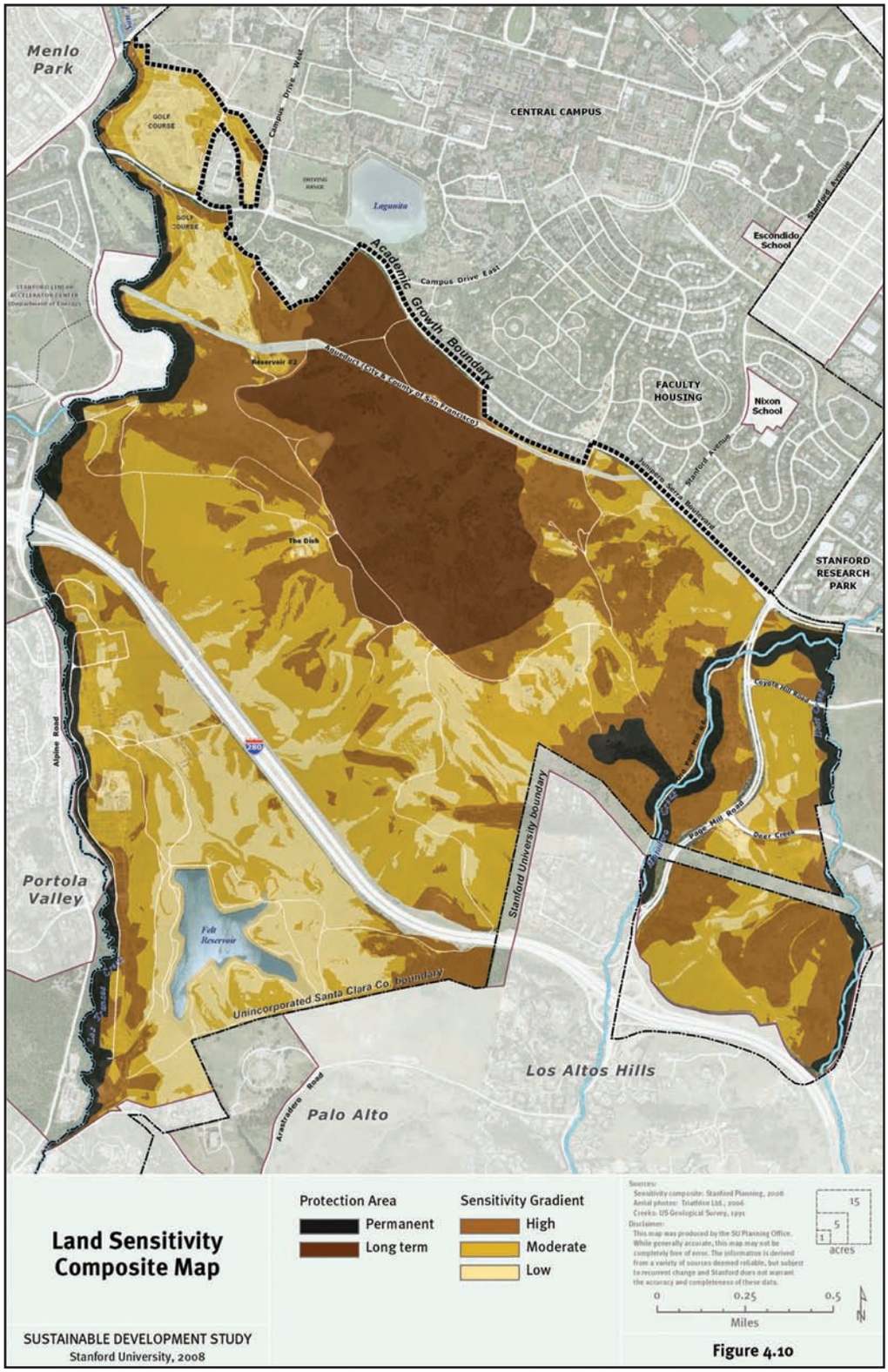


Figure 4.10 Land Sensitivity Composite Map (see fold-out map)

USE OF COMPONENT SENSITIVITY ANALYSES

Although the Sensitivity Analysis is a useful guide for recognizing resources to be avoided and for identifying areas available for development, it cannot be used exclusively to specifically define the location or capacity of the Foothills for future development. Other factors must be considered when determining whether a Foothills site is appropriate for development.

The types of specialized uses that could be considered for Foothills lands often have unique site or land requirements. For example, antennas often need ridgetop prominence or line-of-sight visibility to another facility. Specialized agriculture may require specific soils or slopes. An academic field station might require proximity to a particular resource for research. Adherence to the principle of matching facilities program needs with site capabilities dictates that analysis be performed on a case-by-case basis, specific to a particular proposal.

The Sensitivity Analysis for each component studied can be used to better understand each resource area and site capabilities of Foothills lands overall. The data imbedded in the files that produce the GIS maps are keyed to 5' x 5' cells and can be used to assist in more detailed, site-specific analysis. This finer level of detail could be used when siting an individual structure, such as a field research station or an antenna. These types of uses might need to be located in areas with high or moderate sensitivities, but the analysis can be used to identify specific sites to avoid potential environmental harm.

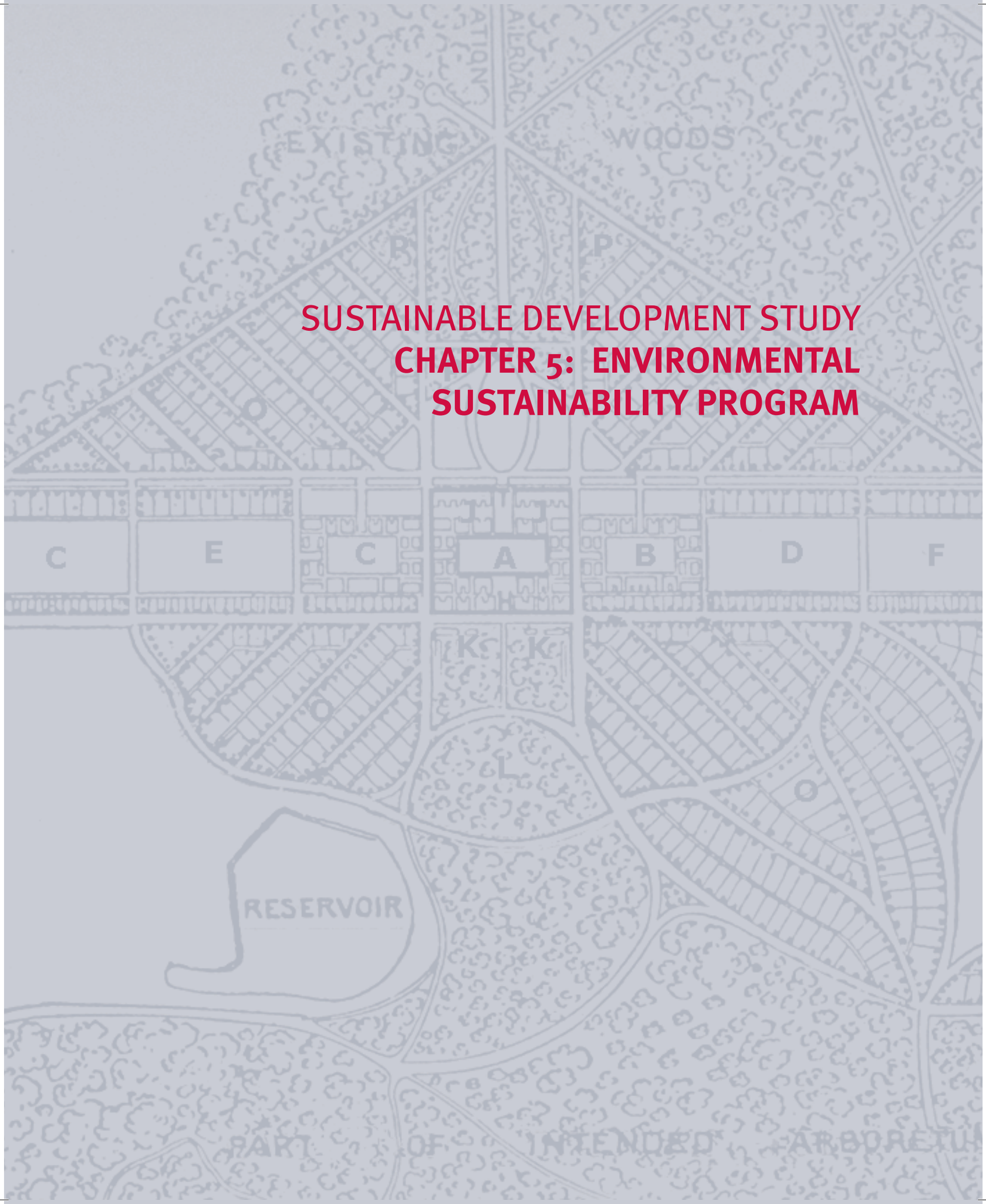
Conclusion

Although 15,000 square feet of development in the Foothills is allowed under the 2000 GUP, the University has no specific plans for facilities expansion or development in the Foothills. Agricultural uses will continue, and the University will continue to implement improvements in management practices to protect resources. Conservation activities will continue and increase when the HCP is approved by federal agencies. Reservoir uses, as well as utilities infrastructure, will also continue. Additionally, the University will continue to conduct research in the Foothills and to hold the lands as academic reserves.

The Sensitivity Analysis described in this chapter is a process that delineates protection areas, sensitive resources, and other factors constraining development in the area. This is a methodology that the University has and will continue to use in the future when assessing the location and manner of development of lands in the Foothills for uses that require a specialized setting. The ways in which this analysis could be used are further described in Appendix B, which includes a hypothetical case study.

Overall, the information produced by this analysis may be used by planners when factoring resource conservation into decision-making processes, along with the following Foothills planning principles:

- Protect and enhance natural resources
- Avoid development in high sensitivity areas unless a specialized program use has unique siting requirements
- Maintain flexibility to accommodate current and future University needs



SUSTAINABLE DEVELOPMENT STUDY
CHAPTER 5: ENVIRONMENTAL SUSTAINABILITY PROGRAM

Chapter 5. Environmental Sustainability Program

Introduction

The phrase "sustainable development" as used in the Stanford Community Plan and General Use Permit primarily encompasses land use planning principles promoting compact growth and protection of natural resources. The previous chapters of this Sustainable Development Study address these land use planning principles.

Over time, the term "sustainability" has evolved to encompass a wider array of environmental strategies. In addition to its research and educational interests in these areas, Stanford's sustainability efforts extend to University facilities and operations in six different city and county jurisdictions. Stanford recently received the highest grade award from Sustainability Endowments Institute for its campus sustainability programs. The University's sustainability programs are designed to encourage innovation and experimentation to determine measures best suited to the needs of the campus community and its physical environment. Sustainability is a rapidly evolving field with extraordinary challenges, and the University's programs will continue to change to take advantage of new insights and advancements. In addition, the University will comply with any new regulatory requirements that are adopted in the future.

This chapter presents a broader view of Stanford's sustainability principles, programs, and how they are - and will continue to be - carried forward into the University's planning, building, and operations. The University's environmental sustainability programs focus on major elements of resource conservation and environmental protection, including energy and climate change, transportation, water, and waste. Further, in addition to addressing sustainability in its existing facilities, the University recognizes that times of growth present opportunities to raise the overall sustainability of its campus by embedding high performance in its new buildings and major renovations. The University has therefore made "green" building a distinct focus in its sustainability programs.

Sustainability Defined

Sustainable development has its origins in the work of the World Commission on Environment and Development, established in 1983 by the United Nations General Assembly to formulate a global agenda for change. The Commission's charge was to propose long-term environmental strategies for achieving sustainable development by the year 2000 and beyond.

In the foreword to the Commission's 1987 report entitled Our Common Future, the Commission's Chairman Gro Harlem Brundtland wrote:

> **"The environment does not exist as a sphere separate from human actions, ambitions, and needs, and attempts to defend it in isolation from human concerns have given the very word 'environment' a connotation of naiveté in some political circles. The word 'development' has also been narrowed by some into a very limited focus, along the lines of 'what poor nations do to become richer'...But the environment is where we all live; and development is what we all do in attempting to improve our lot within that abode. The two are inseparable."**[1]

This approach to global issues spawned a new way of thinking about the environment and what it meant to be sustainable. For the first time, the health of the environment was linked to a robust economy and the state of society, or social equity. The University embraces this broad concept of sustainability and believes education plays a central role in making the vision of improvements in the environment, economy, and social equity a reality.

Stanford's basic mission to create and disseminate knowledge has wide-ranging effects on society. Although Stanford embraces a broad vision of sustainability that includes recognition of economy and social equity as forces equal to the environment in the sustainability equation, the discussion contained in this Study will focus on operational and educational programs targeted at improving campus environmental performance.

"Sustainability must become a core value in everything we do."

JOHN L. HENNESSY, PRESIDENT, STANFORD UNIVERSITY

1 Our Common Future, Chairman's Foreword, 1987. Viewed at http://www.un-documents.net/ocf-cf.htm.

Sustainability Exemplified
Commitment, Principles, and Processes

Stanford is a leader in developing solutions for the world's most compelling challenges, including improving environmental sustainability, one of the biggest issues facing our generation.

In 2006, Stanford University President John Hennessy announced The Stanford Challenge to bolster the University's research efforts on seeking solutions to the most pressing problems facing the nation and world. One of the four focal points identified for the Stanford Challenge is the Initiative on the Environment and Sustainability:

> "The 21st century is a critical time in our Earth's history. The quality and quantity of natural resources, oceans, forests, freshwater, are stressed by the increasing demands of human activity. At the same time, nearly a billion people do not have enough food to eat and more than a billion do not have access to clean water. The challenges of providing the resources we need without irrevocably compromising our precious life-support systems are formidable. Through Stanford's Initiative on the Environment and Sustainability, environmental researchers and scholars are taking up these challenges, helping to ensure that current and future generations can live well on our planet."[2]
>
> This initiative keeps Stanford at the forefront of cutting-edge research and innovative teaching on the environment and sustainability. Special emphasis on interdisciplinary research and education brings together scientific, engineering, economic, social, and political fields of study in the quest to solve the world's most complex problems and to prepare students for roles in leadership.

"Our goal is to have an environmentally sustainable world where human needs are met while protecting and restoring the life support systems of the planet, not only for people today, but for generations to come."

JEFFREY KOSEFF, DIRECTOR
WOODS INSTITUTE FOR THE ENVIRONMENT

"The most powerful thing we can do is educate ourselves about sustainability and the challenges the world faces. When we use that knowledge every day and pass it on to others, we'll help create an evergreen world for ourselves and future generations."

JOSEPH STAGNER, EXECUTIVE DIRECTOR
SUSTAINABILITY AND ENERGY MANAGEMENT

"This is an enormous undertaking, but if we are to learn how to live on this planet in an environmentally sustainable way, if we are to leave something to be proud of for our children's children, we must begin."

JOHN HENNESSY, PRESIDENT
STANFORD UNIVERSITY

2 http://thestanfordchallenge.stanford.edu/get/layout/tsc/Environment

INITIATIVE ON THE ENVIRONMENT AND SUSTAINABILITY

The University promotes interdisciplinary research and teaching involving all seven of Stanford's schools as well as centers, institutes, and programs across campus, in recognition of the fact that solutions to complex challenges demand collaboration across multiple fields.

The University has formed the interdisciplinary Woods Institute for the Environment to coordinate its various environmental academic initiatives. The Woods Institute harnesses the expertise and imagination of University scholars to develop practical solutions to the environmental challenges facing the planet from climate change to sustainable agriculture to conservation. It brings together prominent scholars and leaders from business, government, and the nonprofit sector through a series of programs called Uncommon Dialogues and Strategic Collaborations designed to produce pragmatic results that inform decision makers.

INSTITUTIONAL PRACTICE OF SUSTAINABILITY

Stanford also recognizes the opportunity for and the responsibility of the University to provide leadership in the institutional practice of environmental sustainability in campus operations. Operational sustainability complements the commitment to sustainability education and research by employing cutting-edge knowledge in campus operations, by providing a physical environment for tomorrow's leaders to explore and practice sustainability, and by completing the circle to inform researchers and educators about the real-world challenges of advancing sustainability in the design, construction, and operation of the built environment.

Sustainable Stanford, a University-wide program to steer, connect, support, and optimize sustainability efforts, was launched to implement the strong commitment to sustainability of staff, students, and faculty. The program is led by the Department of Sustainability and Energy Management (SEM), which oversees campus utilities, sustainability programs, and transportation services.

This chapter focuses on campus operations and the work of SEM.

SUSTAINABLE STANFORD PROGRAM

Principles

Stanford's principles for environmental sustainability are:

- Strive for innovation in sustainable technologies
- Implement proven best practices
- Achieve environmental returns commensurate with economic investment
- Balance sustainability investments among new and existing buildings, infrastructure, and operations
- Share knowledge widely

Campus Sustainability Leadership and Organization
Stanford's managment approach for advancing sustainability in campus operations comprise three levels of engagement:

- Department of Sustainability and Energy Management
- Sustainability Working Group
- Sustainability Working Teams

Department of Sustainability and Energy Management (SEM)
The University's Department of Sustainability and Energy Management (SEM) was created in November 2007 by a reorganization that brought the University's utilities and transportation departments under one administrative roof. SEM's 85 staff members provide long-range planning for campus utilities and transportation needs and carry out those plans through capital improvements to campus infrastructure; procurement of gas, electricity, water, and sewerage services from external entities; and operation of campus utility and transportation systems on a day-to-day basis.

SEM works with campus administrators, faculty, and students to develop strategic long-term initiatives for energy use, greenhouse gas emissions reduction, water use, waste reduction, green building, and transportation, as well as developing and administering an affiliated communications and community relations program.

Sustainability Working Group (SWG)
The Sustainability Working Group is a University-wide task force charged with the preparation of policy and program recommendations to improve continuously Stanford's leadership and practice of sustainability. Its members include faculty with expertise in environmental science and policy, students, and high-level administrators as well as representatives from operational and policy offices around the campus.

Sustainability Working Group members represent:

- Associated Students of Stanford University (ASSU)
- ASSU Graduate Student Council
- Athletic Department
- Budget and Auxiliaries Management
- Development Office
- Environmental Health and Safety
- Government and Community Relations
- Graduate School of Business
- Haas Center
- Land, Buildings, and Real Estate (including SEM)
- Legal Office
- Precourt Institute
- Procurement
- Public Affairs
- Residential and Dining Enterprises
- School of Earth Sciences
- School of Engineering
- School of Medicine
- Stanford Alumni Association
- Stanford Hospitals & Clinics
- Stanford Law School
- Stanford Linear Accelerator
- Woods Institute for the Environment

Sustainability Working Teams (SWT)

Working teams were formed in academic year 2007-08 to concentrate on the major elements of sustainability. The SWTs are composed of campus subject-matter experts, such as faculty and engineering staff with specialized knowledge; representatives of key Stanford campus groups, such as students; and managers with authority for action in operational areas. The purpose of these teams is to define and implement environmental sustainability through direct action.

The SWTs in campus operations include:[3]

- **Energy and Atmosphere Team** evaluates measures for energy conservation, energy efficiency, clean energy supply and development, and implementation of campus greenhouse gas reduction targets
- **Green Building Team** evaluates guidelines and standards for sustainability in new building construction, renovation, new building operation and maintenance, and building demolition and materials recovery
- **Water Team** explores and evaluates measures to conserve water and to advance sustainable water use on campus
- **Waste Minimization Team** explores and evaluates measures to enhance sustainability through waste management, reuse, and recycling practices
- **Transportation Team** explores and evaluates measures to reduce the environmental impact of University-owned, private, and commercial vehicles, as well as University-related travel by members of the campus community

The SWTs are charged with delivering the following in each of the sustainability elements:

- Specific principles for pursuing sustainability
- Updated strategies for achieving sustainability within the principles
- Inventory progress to date, set updated goals, develop action plans, establish metrics, and monitor progress

The current and ongoing work of the five SWTs listed above is summarized in the next section of this chapter. The University's sustainability program awards and accomplishments are listed in Appendix C.

3 Additionally, there are sustainability working teams in the areas of Sustainable Procurement, Food and Dining, Communications and Community Relations, Economy, Evaluation Reporting, and Green Funding for student projects.

SUSTAINABILITY PROGRAM AREAS

The University aims to improve resource conservation and environmental protection in its campus operations and has established specific sustainability programs to address energy and climate change, water, waste, and transportation. Further, in addition to addressing sustainability in its existing facilities, the University recognizes that times of growth present additional unique opportunities to raise the overall sustainability of its campus by embedding high performance in its new buildings and major building renovations. Thus, an additional "green building" program brings together each of the other programs in the design and construction of new buildings and major renovations.

Climate Plan: Energy and Atmosphere

Reducing humankind's carbon footprint is one of the most important challenges facing our nation and the planet. Reducing greenhouse gas emissions (GHG) is a formidable task as the University experiences continuing growth in research and education. Responding to this challenge will take an adept combination of efforts to minimize energy demand in new and existing buildings and to formulate long-term energy supply strategies that serve the global effort to reduce GHG emissions.

Principles

Achieving the universal and ultimate vision of climate stability could take decades and require technologies that may not yet exist; therefore, the University's development planning now and for the foreseeable future will remain focused on buildings and energy supply infrastructure to serve both current needs and to provide flexibility to accommodate new technologies and changes in climate science as they are developed.

Stanford's principles for energy and atmosphere are:

- Leadership in solutions for energy and GHG reduction
- Focus on effective and durable solutions and measures
- Utilize the most economically productive measures

Strategy and Action

MONITOR CLIMATE CONDITIONS AND MODELS: Monitor regional and global climate conditions and the development of global models for containing climate change to manageable levels.

Action to date: Over the past decade, University faculty members have participated in the Intergovernmental Panel on Climate Change (IPCC) to monitor and model the global environment.

MAINTAIN STANFORD GHG EMISSIONS INVENTORY: Estimate the University's GHG emissions annually.

Action to date: Stanford joined the California Climate Action Registry in 2007 and prepared an inventory of its GHG emissions for calendar years 2006 and 2007 for emissions sources required by the Registry:

- Indirect emissions from electricity use
- Indirect emissions from steam, heating, and cooling from Cardinal Cogeneration
- Direct emissions from mobile combustion
- Direct emissions from stationary combustion

The inventories have been verified by a third-party certifier and the published emissions quantities are publicly available. (See Appendix D for additional information about Stanford's GHG emissions inventories.)

ANALYZE, MODEL, AND EVALUATE CAMPUS BASE CASE ENERGY AND GHG EMISSIONS: Develop a long-range "base case" energy demand, supply, and cost model for the University campus that incorporates current building code requirements and the most cost-effective, currently available energy supply options. Use this model to determine what Stanford's GHG emissions would be in the future if the base case were followed.

Action to date: In 2008, Stanford prepared a long-range base case energy demand, supply, and cost model with a GHG emissions estimate. Using California Climate Action Registry's Protocol as a foundation, Campus Base Case was established internally by Stanford. There is no standard methodology for preparing a base case, but the Climate Action Registry protocol for calculating emissions is a valuable building block for this type of an analysis.

DEVELOP OPTIONS FOR GHG REDUCTION: Bring knowledgeable campus operations and academic staff together to identify alternatives for reducing GHG emissions within Stanford's energy management program, including demand reduction in new and existing buildings and changes to energy supply.

Action to date: In early 2008, Stanford assembled teams of faculty, students, and operations staff to identify options for demand-side and supply-side energy management improvements to reduce GHG emissions. Numerous options were considered and quantified by preparing an estimate of the quantity and type of energy demand reduction (gas, electricity, steam, chilled water) or the quantity of renewable energy supply each option could produce and then superimposing these on the base case energy models to determine the net cost per metric ton of GHG reduction from each. The options were then prioritized by lowest cost per ton of GHG reduction to create a toolbox for constructing a long-term-GHG reduction plan. (See Appendix D for additional information about the GHG emissions reduction planning.)

DEVELOP CLIMATE PLAN: Construct GHG reduction scenarios and develop a Climate Plan for implementing GHG reductions in University operations. Through this process, the University intends to provide cyclical feedback and refinement to achieve greater overall reductions over time and to address opportunities to include new innovations and technology.

Action to date: In early 2008, Stanford drafted several long-range plans for possible GHG reduction using the options developed. These plans included cost-benefit analyses based on:

- Assumptions regarding the cost, availability, and legitimacy of renewable energy credits and carbon offsets
- Environmental and economic viability of long-term, fossil-fuel-fired cogeneration
- Amount of GHG reduction needed from Stanford to support regional and global goals

The University appointed a GHG Reduction Task Force in summer 2008, and its charge is to reconsider developing a long-term GHG reduction plan. Work is currently underway, findings and recommendations to the University president are targeted for delivery in early 2009. (See Appendix D for additional information about the process the University is using to develop its GHG Reduction Plan.)

IMPLEMENT GHG REDUCTION PLAN: Implement a GHG reduction plan and monitor the University's consumption of non-renewable energy resources and emission of greenhouse gases to determine if expected progress is being achieved. Modify plans as needed to respond to new technology and environmental change.

Action to date: While the University has not yet finalized specific long-range plans for GHG reduction, it has implemented many initiatives toward GHG reduction, including:

- Demand Side Energy Management: Stanford has created a dedicated Demand Side Energy Management (DSM) unit within its facilities organization to monitor, report, and improve upon energy efficiency in its existing buildings.
- Major Capital Retrofits Program: The University has allocated significant resources for major capital improvements to the most energy-intensive buildings on campus in order to reduce energy demand. The first overhaul, the Stauffer Chemistry Building, was completed in June 2007 and resulted in a 35 percent drop in electricity use, a 43 percent cut in steam use, and 62 percent less chilled water use. It also reduced carbon dioxide equivalent emissions associated with the building by 762 metric tons per year, and cut energy costs by 46 percent in the first 12 months. The remaining retrofits are scheduled for completion by 2012. Together, the improvements are expected to yield substantial savings and reduce total energy use in these buildings by 28 percent.
- Energy Retrofit Program: A cumulative savings of more than 240 million kilowatt-hours of electricity, or about 15 months of the University's current use and avoidance of 72,000 metric tons of carbon dioxide equivalent emissions has been derived through conversions and technology upgrades through changes in T8 lamps and electronic ballasts, variable-speed drives for motors, LED exit signs, and spectrally selective window film. The expenditure of more than $10 million over 15 years has been invested to improve energy efficiency on campus.

- Building Heating Ventilation Air Conditioning (HVAC) Recommissioning Program: Stanford is systematically reviewing the HVAC systems of 90 of its largest buildings, then adjusting or repairing the systems to ensure they work as designed. Technicians who conduct the reviews also recommend ways to further improve energy performance through energy retrofit projects. At the current pace, recommissioning of all 90 buildings should be finished by the end of 2010.
- Energy Conservation Incentive Program: Introduced in spring 2004 to give schools and administrative units within the University a financial incentive to use less electricity, the program sets a budget based on past consumption and lets participants "cash in" unused kilowatt-hours; those that exceed their electricity budgets must pay the difference out of their own funds.
- Conservation Cup: Dorms and row houses compete to see which can cut energy and water use the most compared with the previous spring. The contest also rewards residences with the lowest energy and water use on a per-student basis.
- CFL Giveaway: Student Housing has teamed with Students for a Sustainable Stanford, the Sierra Club, and Resource Solutions Group to sponsor one of the nation's largest campus-based compact fluorescent lamp giveaway programs.
- Solar Demonstration Projects: The University is running several solar energy projects:

  The Leslie Shao-ming Sun Field Station at Jasper Ridge has 20-kilowatt (kW) solar photovoltaic, and solar thermal heating systems.

  Synergy House has a 10-kW photovoltaic system partly funded and installed by students and house alumni who worked with Student Housing on the project.

Figure 5.1 Photovoltaic installation on Stanford water reservoir

Stanford's Utilities Division installed a 30-kW photovoltaic system to offset the energy used for pumping water into storage reservoirs (Figure 5.1).

The new Jerry Yang and Akiko Yamazaki Environment and Energy Building showcases three types of photovoltaic systems totaling 12 kW. A planned fourth system will bring total production to 15 kW.

Student Housing operates a solar hot water heating system at Roth House and has partnered with the Civil and Environmental Engineering department to incorporate solar water heating technologies in the Governor's Corner residence.

A 40.8-kW photovoltaic system supplies electricity to Lou Henry Hoover House, the University president's residence. To preserve the historic structure and optimize solar gain, the system is installed on the roof of the adjacent San Juan Reservoir.

Next Steps

As explained in more detail in Appendix D, in addition to operational changes that would conserve energy, the University is considering whether or how to replace the use of its cogeneration facility in order to reduce reliance on fossil fuels for electricity demand. Even though the cogeneration facility is a relatively clean source of power, renewable sources of energy have the long-term potential to provide greater reductions in global emissions of greenhouse gases. Legal impediments to direct access to power generated by renewable technologies may need to be removed before the University can pursue these types of changes.

Once the Climate Plan is completed, the University will proceed with implementation of the reduction strategies. The Sustainability Energy Management Department will proceed on the initiatives and the Energy and Atmosphere team will continue to monitor and evaluate progress on the projects, recommend specific actions as needed beyond the climate plan, establish metrics to monitor progress, and adjust plans to meet new innovations in technology and program management.

Green Building

Stanford strives for high efficiency in construction of its new buildings and in major renovations of existing buildings. To provide a state-of-the-art center of learning and research, and to respond to pressing environmental concerns, the University designs and constructs high-performance buildings that use resources wisely and provide healthy, productive environments.

Principles

The University strives to construct, renovate and operate buildings to provide safe, productive work environments that reduce the use of energy, water, and other resources, and the generation of greenhouse gases, other pollutants, and waste. Principles used in building design and operations include:

- **Functionality and Form:** Design buildings that serve the University's academic mission and perform their intended functions well
- **Efficiency:** Employ innovative technologies to increase building energy and water efficiency and minimize pollution and waste
- **Reuse:** Reprogram and reuse existing buildings where possible to use space efficiently and avoid the need for new construction

Strategy and Action

MAINTAIN A BUILDING INVENTORY: Proceed with an inventory of buildings and their condition to improve campus facilities and space usage.

Action to date: The University has developed and maintains an inventory of its buildings, and their condition, their programmatic assignments, and detailed occupancy data to identify opportunities for improved efficiency and reuse.

GUIDELINES FOR SUSTAINABLE BUILDINGS

The internal building guidelines encourage experimentation with new technologies. The University recognizes that not all new buildings will individually achieve these targets. Lessons learned during design, construction, and operation of buildings shape new best practices for future buildings in campus planning and development efforts. For example, installing real time metering technology in each building will provide data to inform techniques to be used in the design of subsequent buildings. Metering data tracks energy demand on an individual building level over the course of a day and over the course of a year to help identify energy leaks, inform renovation decisions, and influence future design and construction towards maximizing energy efficiency. The University is in the process of developing

The University conducts rigorous space-utilization studies prior to determining need for a new building, in order to identify if the building can be renovated to create space for new needs. Through the Department of Capital Planning and Space Management, Space Planning Guidelines were updated and completed in 2006.

The objectives of the guidelines are to:

- Conduct studies to ensure that Stanford adds new space only when necessary
- Apply guidelines to recover up to 5 to 10 percent of on-campus space
- Encourage more efficient use of office space
- Require selected schools to pay a charge for underutilized office space

DEVELOP BUILDING CONSTRUCTION AND RENOVATION GUIDELINES: Implement internal guidelines for applying sustainable design principles in the construction and major renovation of campus buildings.

Action to date: In 2002, the University developed internal Guidelines for Sustainable Buildings to provide managers with guidelines to encourage consistent implementation of sustainable practices in the construction and major renovation of campus buildings.

- Building Performance Guidelines: In 2008, the University augmented these guidelines by establishing new guidelines that target energy efficiency in new buildings of 30 percent below California Title 24/ASHRAE 90.1 (2004) and water efficiency 25 percent below similar existing campus buildings. These energy efficiency guidelines are U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) Gold equivalent.
- Project Manager for Sustainability: The University has dedicated a position to assist project planners with implementation of its internal guidelines for new construction and to assess, report on, and improve the sustainability of new and existing buildings.
- Building Projects: The University's recent new building projects (see Sidebar) exceed the targets set in its internal guidelines. Currently, the University is working to determine how to best evaluate post-construction building performance in a standardized fashion.

Next Steps

The Green Building Team will develop means and methods to determine how the new and renovated buildings are evaluated and monitored in relation to the University's internal guidelines for sustainable buildings. The team will establish revised guidelines as more information is gathered and programs change to meet new ideas and approaches.

Green Buildings Highlights

THE JERRY YANG AND AKIKO YAMAZAKI ENVIRONMENT AND ENERGY BUILDING (Y2E2) (2008)

This 166,500-square-foot building uses 56 percent less energy (based on regulated energy comparison) than a traditional building of comparable size and 90 percent less potable water than one with traditional fixtures and systems.

Features include:

- **A high-performance envelope (roof, walls, windows, sunshades, and light shelves) that reduce heating and cooling loads**
- **Internal atria, windows and vents that provide natural ventilation and light**
- **Significant portions of the building use no supplemental cooling**
- **Extensive use of recycled materials and sustainable products, such as bamboo. Exposed concrete floors significantly reduce carpet use and saved literally tons of raw materials**

The *San Francisco Business Times* named Y2E2 the Best Green Building in the Bay Area in March 2008.

CARNEGIE GLOBAL ECOLOGY RESEARCH CENTER (2007)

The Carnegie Institution's Global Ecology Research Center is an extremely low-energy laboratory and office building that emits 72 percent less carbon and uses 33 percent less water than a comparable standard building. The Center features an evaporative downdraft cooling tower, an exterior made from salvaged wine-cask redwood, no-irrigation landscaping, dual-flush toilets, and low-flow sinks. The design also furthers academic work: a "night sky" radiant cooling system demonstrates the principles of radiant heat loss to deep space—principles under investigation by Center researchers.

The American Institute of Architects Committee on the Environment (AIA/COTE) named the Global Ecology Research Center one of its Top Ten Green Projects in 2007.

The Leslie Shao-ming Sun Field Station at the Jasper Ridge Biological Preserve provides a natural laboratory for researchers and educational experiences for students. Sustainability elements include:

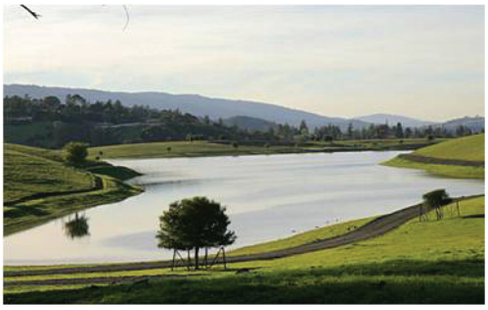
- **A 22 kW, grid-connected photovoltaic system**
- **A sophisticated energy monitoring system**
- **Water-free urinals, dual-flush toilets and tankless water heaters**
- **Salvaged materials used for siding, brick paving, casework, furniture and bathroom partitions**

AIA/COTE named Jasper Ridge one of its Top 10 Green Projects in 2005.

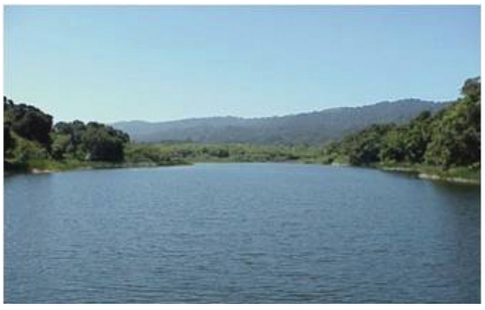
Jasper Ridge Field Station (2005)

Water

Stanford receives its potable water from the San Francisco Public Utilities Commission (SFPUC), which draws water from the Hetch Hetchy Reservoir in the Sierra Nevada and local watersheds to serve 27 Bay Area cities and agencies. Stanford's water conservation program is one of the most aggressive in the Bay Area, with full implementation expected to save more than 0.6 million gallons per day or 20 percent of the University's total allocation under its contract with SFPUC (3.033 million gallons per day annual average).



5.2 Felt Reservoir



5.3 Searsville Reservoir

Principles

The University's overall water use principle is to meet water needs in a sanitary manner with good water quality while also reducing the use of water and thereby preserving ecological systems and vital water resources on both a local and regional scale. More specifically, the University strives to maintain:

- **Reliability:** Assure reliable water supplies for sanitation, fire protection, human consumption, and other University needs, even through drought conditions.
- **Water Conservation:** Increase water conservation through waste minimization, efficiency improvements, and alternatives to water use for landscaping, cooling, and other large uses.
- **Regional Cooperation:** Preserve and protect water supplies through regional planning and cooperation.

Strategy and Action

MAINTAIN WATER INVENTORY: Maintain an inventory of water sources, rates of production, and uses.

Action to date: The University has developed and maintains a water inventory, as well as long-range models of water use and supply based on campus academic, business, and operations plans.

DEVELOP SUSTAINABLE WATER MANAGEMENT PLAN: Develop a Sustainable Water Management Plan and internal water use guidelines.

Action to date: The University has developed internal guidelines for water use in new buildings and water conservation in existing buildings. In compliance with the 2000

GUP, Stanford prepared and the County of Santa Clara approved a Water Conservation Reuse and Recycling Plan. Currently, the University is preparing a more comprehensive water management plan that considers all sources and uses of water for the campus over the longer term.

In January 2007, Stanford became the first university to join the California Urban Water Conservation Council. Membership gives the University the opportunity to work with experts on innovative technologies and processes, comment on new proposals or legislation, and share its experience in improving water efficiency.

The University has taken the following actions to implement its Water Conservation Reuse and Recycling Plan:

- maintained its average daily use within its water allocation from the SFPUC of 3.033 mgd. The University's average campus domestic water use for the 2006-07 year was 2.3 mgd
- installed water-saving devices throughout existing buildings on campus, including water misers, toilet retrofits, low-flow jet spray nozzles, and Maxicom controls
- implemented its updated Guidelines for Sustainable Buildings in recently constructed new buildings and is exploring systems to collect rainwater on campus for use in adjacent buildings

Next Steps

The SEM will complete its work in progress efforts towards a Sustainable Water Management Plan addressing long-term water supply, water conservation, waste water and storm water management. The Water Team will set specific goals, establish metrics to monitor progress, and continue to develop specific action plans as needed.

WATER CONSERVATION PROGRAM

Stanford completed 17 major water efficiency retrofit projects from 2001 through 2007, pushing down average daily domestic use from 2.7 million gallons a day (mgd) in 2000–01 to less than 2.3 mgd in 2006–07 despite campus growth. Projects included:

- **Retrofits in student housing cut water use by about 120 million gallons annually—a 37 percent reduction.**
- **Replacement of once-through cooling systems in laboratories with recirculating systems saved about 0.17 mgd.**
- **Installation of 58 water-saving devices on sterilizers reduced water use by about 0.08 mgd.**
- **Replacement of standard dishwashers with trough conveyers cut water use by about 142 gallons per hour—a 51 percent savings.**

RECYCLING AND REUSE

The University's Source Reduction and Recycling Program makes a significant impact. In 2007, Stanford recycled, reused, or composted:

- **5,855 tons of organic material**
- **829 tons of glass, metal, and plastic**
- **3,095 tons of paper**
- **236 tons of electronic waste**
- **3,171 tons of construction and demolition debris**

Waste Minimization

The California Solid Waste Management Act AB 939, requires 50 percent waste diversion by cities and counties in California. While this law does not directly apply to Stanford, the University's waste diversion programs exceed the target, having increased its landfill diversion rate from 30 percent in 1994 to 60 percent in 2007.

The University continues to improve collection activities, identifying new markets for waste materials and recyclables, and raising awareness so that "reduce, reuse, recycle, and compost" become habits.

Principles

Stanford's principles for sustainable waste management include:

- **Minimization:** Strive for a continual reduction in waste generation and maximum diversion
- **Sanitation:** Manage waste in a sanitary manner to protect public health and the environment
- **Reuse:** Divert, reuse, or recycle reusable materials. Maintain waste diversion rates at or above 60 percent
- **Rebuy:** Encourage the development of waste minimization and recycling technologies and markets by purchasing recycled products and materials when possible

Strategy and Action

MAINTAIN WASTE INVENTORY: Maintain an inventory of the University's waste generation sources and quantities.

Action to date: The University conducts a campus-wide annual inventory of its waste generation quantities and composition. It periodically conducts targeted waste characterization studies to develop detailed information on particular types of campus waste streams.

DEVELOP SUSTAINABLE WASTE MANAGEMENT GUIDELINES: Develop and maintain internal guidelines, marketing and outreach programs, and operational plans to advance sustainable waste management principles.

Action to date: The University has developed internal policies for the recovery and reuse of surplus property and guidelines for minimizing waste and recycling. Guidelines have been implemented through marketing and outreach efforts and through operational programs such as the installation of recycling bins throughout campus. Stanford monitors and reports its waste generation and recycling quantities quarterly to the County of Santa Clara.

The University's current waste reduction, recycling, and reuse programs include:

- Paper, cardboard, cans, glass, and plastics: Recyclables are gathered in more than 4,000 recycling bins across campus.
- Food: Food waste is composted at campus dining facilities cafes, student-managed housing, graduate housing, and special events and will soon expand to offices. Usable food is donated to community organizations through SPOON, the Stanford Project on Hunger.
- Landscaping: The University mulches brush and tree trimmings for use on campus, composts yard waste from residences and other buildings, and leaves mowing trimmings behind to replenish nutrients in lawn areas.
- Construction: Building materials, dirt, and other debris from construction and demolition are recycled or reused when possible.
- Electronic equipment: The University's surplus property operation collects and sells usable computers, and other electronic equipment. In 2007, there were 3,163 resale transactions, and more than 425,000 pounds of electronics were recycled.
- Small electronics: Small electronics are collected in more than 150 drop-off bins in academic buildings and residences. Cell phones and PDAs go to the "Donate a Phone, Save a Life" campaign, which benefits the National Coalition Against Domestic Violence.
- Batteries: The University's battery collection system employs a combination of drop-off bins, internal mailers, and regular hazardous waste pickups. Batteries are recycled off-site with recovery of metal and mercury.
- Property reuse: The ReUse Website facilitates sharing and reuse of equipment, furniture, and supplies among University departments. In 2007, campus users made more than 700 postings of unneeded items, most of which were successfully transferred to other departments.

Next Steps

The Waste Minimization SWT will set updated goals, develop action plans, and establish metrics to monitor progress.

TRANSPORTATION HIGHLIGHTS

Stanford holds peak-hour commute trips to the 2001 baseline (3,474 morning trips and 3,591 evening trips), which requires reducing the number of single-occupant vehicles and boosting alternative transportation use on an ongoing basis. For example:

- **From 2002-07, the proportion of employees driving alone to campus dropped from 72 percent to 52 percent.**
- **Marguerite shuttle bus ridership rose from 972,291 in 2004 to 1,325,489 in 2007—a 36 percent increase. Ridership during peak afternoon commute hours increased 60 percent, and the number of people getting on and off shuttles serving Caltrain commuter rail stations increased 24 percent.**
- **In 2007, 48 percent of University employees regularly used alternative transportation as their primary commute mode, compared with 25 percent within Santa Clara County. Of this 48 percent, 23 percent regularly used public transportation, compared with only 4 percent County-wide.**
- **Membership in the Commute Club, for commuters who commit to not driving alone on their commute, has risen 83 percent since 2001–02, while sales of long-term commuter parking permits have decreased 10 percent.**
- **Nearly one-third of Stanford's 1,021 fleet vehicles are electric, ten are hybrids, vehicles and the fleet includes one experimental solar vehicle.**

TRANSPORTATION

Stanford's transportation program allows people to travel to, from, and within the campus in an environmentally sustainable way. The University runs one of the most comprehensive Transportation Demand Management (TDM) programs in the country to reduce its traffic impacts and its carbon footprint. Transportation, including commuters and University fleet vehicles, accounts for 16 percent of the University's greenhouse gas emissions.

The 2000 General Use Permit establishes a target of no net new trips above the number of peak hour trips to and from the campus that occurred in 2001. The University's TDM programs are intended to meet this target, but they also are designed to reduce total daily trips rather than simply shifting trips to off-peak hours.

Principles

The University's principles for transportation include:

- **Plans for the Future:** Maintain a Campus Transportation Plan
- **Incentives:** Create incentives that make alternative transportation affordable, comfortable and attractive.
- **Partnerships:** Develop strategic partnerships into regional transportation providers.
- **Alternatives:** Provide the University community with a range of transportation choices.
- **Energy Efficiency:** Encourage Use of Low and Zero Emissions Vehicles
- **Innovation:** Prepare to incorporate emerging technologies that improve fuel economy and lower emissions in University transit and fleet vehicles.

Strategy and Actions

Campus and Regional Planning: Integrate principles to a campus Transportation Plan and apply to program implementation by addressing access needs to, from, and around the campus and its off-campus locations.

INCENTIVES TO REDUCE TRIPS: Create a campus community where employees and students can live, work, and study, while reducing drive-alone trips and use of vehicles. The University has:

- Developed and implemented an innovative program that encourages the use of public transit, carpooling, bicycle, and pedestrian modes of transportation
- Discouraged commuting by single-occupant vehicles
- Minimized the number of vehicle trips to and from campus
- Strived to reduce continually GHG emissions from campus-owned vehicles and commuter vehicles
- Maintained the number of peak hour vehicle trips to and from campus at or below 2001 levels, per the 2000 GUP requirements (See Transportation Highlights sidebar)

PARTNERSHIPS: Continue to work with local and regional transportation providers to plan services that meet the needs of the university as well as local communities.

- AC Transit to establish the Line U Express from the East Bay, and to plan the Line M route to serve sites in Redwood City
- Caltrain to establish the GO Pass which offers free transit on the commute train
- Valley Transit Authority and the City of Palo Alto on the development of the Palo Alto Community Bus Study
- City of Palo Alto and Research Park businesses in the development of Stanford's free Research Park shuttles
- Silicon Valley Leadership Group on various transportation issues

ALTERNATIVE TRAVEL MODES AND PATTERNS: Regularly identify and monitor the points of origin and the methods of travel of University commuters. The University determines points of origin and methods of travel of its commuters through commute mode surveys, shuttle ridership data, and GIS tools. TDM program results are measured through traffic counts, Commute Club membership, parking lot surveys, and parking permit sales. Continue to develop transportation management measures to meet projected University transportation demands, with a focus on minimizing the number of drive-alone commuters.

Examples of efforts in transportation include:

- A robust TDM program to minimize traffic to and from the campus, through the use of the assessment tools, as well as planning efforts that occur on an ongoing basis. The University has achieved the 2000 GUP peak-hour trip goals. Compliance and progress are measured and reported by the County of Santa

FREE SHUTTLE:
The Marguerite bus system provides free transit to the Stanford community and the public. More than a dozen routes take riders to campus locations, regional transit systems, Stanford hospitals, and local shopping, dining, and entertainment destinations. The system serves the campus and surrounding community (transit center, shopping, dining, etc.) with 39 buses, 85,000 hours of service annually, 13 routes, and 160 stops, and all shuttles run on biodiesel fuel. To augment this service, Stanford has partnered with several regional transit agencies to create no-cost options for commuting to campus.

COMMUTER INCENTIVES
Employees and students who travel to work by means other than driving alone can earn cash payments through the Commute Club program. Employees who carpool or vanpool get free parking passes and reserved spaces; vanpools get $200 monthly subsidies. Stanford also offers $50 to those who return parking permits or refer friends to the Commute Club, and prize drawings for those who pledge to commute during off-peak hours or use alternative transportation at least part-time. Stanford offers personalized commute planning assistance and an Emergency Ride Home program for all Stanford alternative transportation users.

Eligible employees can get free passes for Caltrain and the Santa Clara Valley Transportation Authority (VTA) bus, express bus, and light-rail system and for the Transbay Express bus service on the Dumbarton Express.

BIKE-FRIENDLY CAMPUS

Stanford offers a 1-week free bike rental and $100 toward the purchase of selected folding bikes for eligible employees and students. Stanford's bicycle program provides bike and clothes lockers, access to shower facilities, a free bike light and pant leg band with bicycle registration, gift card incentives, and an extensive bicycle infrastructure (including a Central Campus Cyclist and Pedestrian Zone).

CARSHARING

Employees and students get discounted rates and the membership fee is waived on the Zipcar carsharing service, with 6 locations and 10 vehicles on campus. In addition, Stanford Commute Club members (those who use alternative transportation to commute to Stanford) receive up to $96 a year in free Zipcar credit. Most of the cars are Toyota Prius hybrids.

FACILITIES OPERATIONS

The Facilities Operations department is taking steps to green its fleet and operations. A motor pool launched in 2008 provides:

- **3 electric vehicles for the department administrators;**
- **27 electric cart parking and charging stalls, and seven electric service vehicles, which were added in 2008; and**
- **more electric service vehicles, as well as 2 hybrid courtesy vehicles for fleet garage customers, are arriving in 2009.**

Clara through annual counts, which are published in the Annual Report for the 2000 GUP.

- Rewards in "Clean Air Cash" to eligible employees or students who choose not to drive alone to and from campus. The University provides free transit passes to eligible employees, offers commute planning, ride matching services, free car rental vouchers, an emergency-ride-home program, and vanpool subsidies, among other incentives.
- Staff assistance through the efforts of a campus-wide peak trip reduction task force and a full-time staff of three dedicated to alternative transportation. It conduct an annual commute survey and offers free commute planning assistance, extensive alternative transportation marketing and incentives, and targeted outreach to encourage the use of alternative transportation. The results of commute trips reduction is evident by the fact that Stanford has one of the highest percentage of on-campus housing for students, faculty, and staff of any major university in the nation (95 percent of undergraduates, 60 percent of graduate students and 30 percent of faculty are currently housed on campus). Stanford also prohibits freshman from having cars on campus.
- Annual survey to identify unmet transportation and service demands that may help reduce commute trips.
- Ongoing monitoring to ensure that the service has sufficient capacity to meet the growing ridership demands.

ENCOURAGE USE OF LOW AND ZERO EMISSIONS VEHICLES: Encourage use of low- and zero-emission vehicles by supporting infrastructure for electric and alternative-fueled vehicles, running Marguerite buses on alternative fuels, and purchasing low- or-zero emission fleet vehicles.

- All 39 Marguerite buses run on 5 percent biodiesel, and two diesel-electric hybrid buses are joining the fleet. Nearly one-third of Stanford's 1,021 fleet vehicles are electric, 10 are hybrids, and one is an experimental solar vehicle.
- Other efforts to operate a cleaner fleet include replacing larger buses on midday routes with

smaller, more fuel-efficient buses and offering hybrid vehicles in the carsharing program. The University is further intensifying its efforts to secure vehicles that minimize impacts on the environment.

- All new transit buses will be diesel-electric hybrids, and whenever possible, other vehicle acquisitions will be electric or hybrids. A large majority of the shuttle bus fleet is made up of buses manufactured since 2003 that meet California Air Resources Board strict requirements relative to diesel emissions. Two diesel-electric hybrid buses (35-foot, transit-style) have been ordered for delivery in 2009, and shuttle-system operations were changed in June 2008 to replace larger buses used on midday routes (with lighter ridership) with smaller buses with twice the fuel efficiency.

INNOVATION: Respond to new ideas, programs, and technological advances as they come forward, including use of alternative fuels and cleaner-burning engines.

Next Steps

The Transportation SWT will establish additional metrics as needed to monitor progress and will continue to develop updated TDM strategies and strategies to encourage low and zero-emissions vehicles as new information and technologies become available.

Conclusion

Stanford's commitment to teaching, learning, and practicing sustainability is evident in its environmental commitment and leadership, its inclusion in The Stanford Challenge, the growth in sustainability-focused academic programs such as the Woods Institute, and the creation of a Sustainability and Energy Management Department. The work and collaboration among the different entities discussed in this report will result in constant improvement even if quantifiable goals and targets are not established for all elements.

The University's sustainability efforts generally fall within four categories: energy and atmosphere, water, waste minimization, and transportation. Stanford's green buildings program brings these categories together when planning and constructing new buildings and major renovations. To better inform the public as to the University's work in sustainability, Stanford suggests that a new section be added to the Annual Report prepared under the 2000 GUP. The Annual Report currently identifies annual water

ADDITIONAL EFFORTS BY THE STANFORD TRANSPORTATION OFFICE INCLUDE:

Planning actions include the following:

- **Projections of campus population and trends in traffic counts to plan changes to the TDM program to reduce vehicle traffic**
- **Assessment of additional transportation options and potential partnerships on an ongoing basis**
- **Financial and programmatic incentives, as well as parking policies, to encourage the use of mass transit, or other forms of transportation other than single-occupant vehicles**
- **Shuttle bus acquisition programs to ensure sufficient equipment is available**
- **Collaboration with regional transportation system planners to understand overall regional demands, and to develop joint plans for meeting them**

The University maintains a transportation capital plan that projects and provides for campus road and parking needs consistent with the campus land use plan, as well as bicycle and pedestrian facilities, shuttle buses and related facilities, and other infrastructure elements to support alternative transportation.

consumption and peak hour trips to and from the University. The suggested new section would provide the following:

The **Annual Report** will include a brief description of the University's major sustainability accomplishments over the past year, such as completion of the Climate Plan, completion of the Sustainable Water Management Plan, and release of new internal guidelines pertaining to green buildings, along with those new buildings subject to or performing under those guidelines. The University has dedicated a website to its sustainability programs and will be providing updated information as it is developed. Additional information to include:

- **Energy Consumption:** The University will report on its most recent consumption of electricity, steam, and chilled water
- **GHG Emissions:** The University will report on its most recent greenhouse gas emissions inventory as reported to the California Climate Action Registry
- **Waste Minimization:** The University will report its annual tonnage of waste generated and waste diverted
- **Water Management Plan:** The University will report its most recent year inventory of water sources and consumption

SUSTAINABLE DEVELOPMENT STUDY
APPENDIX A-1,2,3: REQUIREMENTS

Appendix A-1,2,3: Table of Requirements Stanford Community Plan References General Use Permit References

This Appendix supplements Chapter 2, providing (1) Table of Requirements, (2) references to the Sustainable Development Study in the Stanford Community Plan, and (3) Requirements and references to the Study in the 2000 General Use Permit conditions of approval.

Table of Requirements

Table A-1 identifies the substantive requirements for the Sustainable Development Study.

Table A-1

MAXIMUM PLANNED BUILDOUT	REFERENCE
"Determine and define the long-term incremental growth potential for Stanford lands, and identify the maximum planned buildout potential and all appropriate areas of potential development through completion of a Sustainable Development Study."	SCP-GD 12, p. 18
"Demonstrate how future development will be sited to prevent sprawl into the hillsides, contain development in clustered areas, and provide long-term assurance of compact urban development."	SCP-GD 12, p. 19

NATURAL RESOURCE PROTECTION	REFERENCE
"Provide for protection and/or avoidance of sensitive plant and animal species and their habitats, creeks and riparian areas, drainage areas, watersheds, scenic viewsheds, and geologic features such as steep or unstable slopes, and faults."	SCP-GD 12, p. 19
"Coupled with new zoning that promotes clustering of development, the Sustainable Development Study will address issues of resource protection with a view beyond the 25-year time frame of the AGB."	SCP-GD, Strategy #2, p. 17

FUTURE DEVELOPMENT IN THE FOOTHILLS	REFERENCE
"With respect to the foothills, the Sustainable Development Study shall identify all area(s) of potential future development. The potential development areas(s) shall be consistent with the Community Plan strategies and policies, which include but are not limited to the strategies and policies relating to compact urban development, conservation of natural resources, open space protection, maintenance of scenic values, and avoidance of hazards."	SCP –GD, (i) 4, p. 19

Approval Process

Table A-2 identifies the specific references in the General Use Permit and Stanford Community Plan regarding the steps for approval of the Sustainable Development Study.

Table A-2.

PROCEDURE	REFERENCE
"The Sustainable Development Study shall be completed and approved prior to acceptance of applications for the second 50% of the academic development allowed under the 2000 GUP."	SCP-GD (i) 3, p. 19
"Stanford will be required to prepare, at its own expense and in cooperation with the County Planning Office, a Sustainable Development Study…"	SCP-GD, Strategy #2, p. 17
"Stanford shall complete and submit to the Planning Office for Board of Supervisors approval a Sustainable Development Study. The study shall be completed in accordance with the Community Plan. After the Sustainable Development Study is deemed adequate by the County Planning Office, it shall be presented to the CRG."	GUP Condition E.5, p. 7
"After presentation to the CRG, the study shall be forwarded to the County Planning Commission for a recommendation regarding its approval by the Board of Supervisors."	GUP Condition E.5, p. 7
"The Sustainable Development Study shall be approved by the Board of Supervisors prior to County acceptance of applications for non residential development, which will result in development of a cumulative total of more than 1,000,000 net new square feet of nonresidential development that counts toward the GUP building area cap."	GUP Condition E.5, p. 7

Outcomes of Study

Approval of the Sustainable Development Study fulfills the requirement for continued academic development as approved under the General Use Permit and fully analyzed in the 2000 General Use Permit EIR. It does not change the existing permit limitations or conditions of approval or create entitlements for any future development.

"The County's approval of the Sustainable Development Study shall in no way be construed as the County's agreement to or approval of the amount, type, or location of development proposed in the Study."	SCP-GD (i) 3 p. 19

Strategies, Policies and Implementation

Strategy #1: Promote compact development and conservation of natural resources through use of an Academic Growth Boundary.

The County General Plan promotes the use of long-term urban growth boundaries by cities to delineate areas intended for future urbanization from those not intended for future urban use. Unlike an Urban Service Area boundary, which typically indicates the areas in which a city is able and willing to provide urban services in the short term (5 years), an urban growth boundary is meant to provide adequate land to accommodate urban development for a significantly longer time period of approximately 20 years. The delineation of urban growth boundaries can promote compact urban development and conservation of natural resources by (a) channeling development within existing urban areas and (b) excluding important habitat, hazard, or open space areas from the urban growth boundary area.

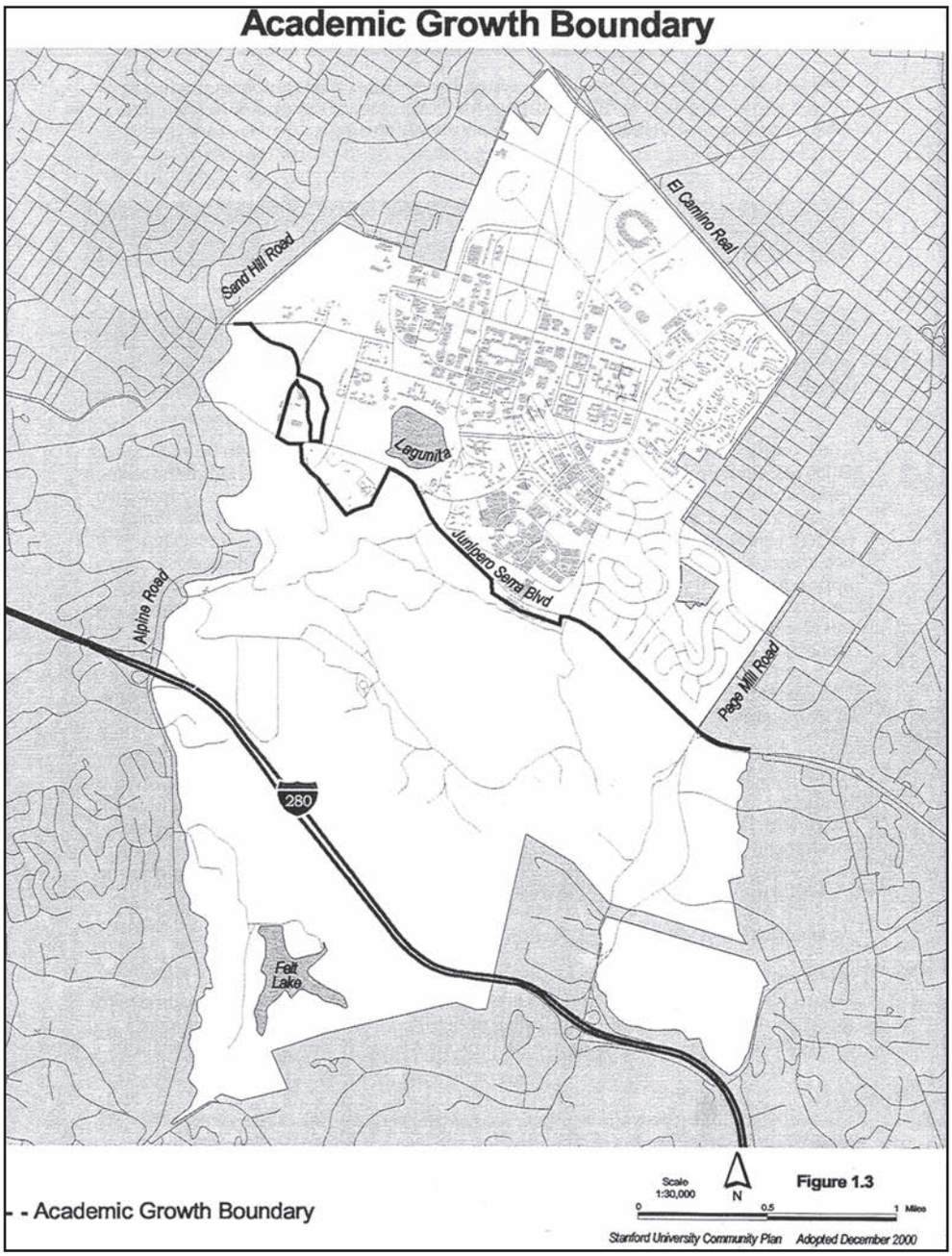
The General Plan identifies considerations for the establishment and periodic review of urban growth boundaries between the County and incorporated cities.

The Community Plan applies the concept of an urban growth boundary to Stanford in the form of an "Academic Growth Boundary" (AGB). The concept of the growth boundary as it applies to Stanford is a basic one: development must occur within the AGB, with lands outside the AGB remaining in open space. The AGB is the primary mechanism for promoting compact urban development and resource conservation in the Community Plan, and it serves as the basis for associated policies throughout the plan that reinforce this basic demarcation line.

Academic Growth Boundary Location

The Academic Growth Boundary generally parallels existing developed areas (see Figure 1.3 – Academic Growth Boundary). The purpose of this selected location is to direct all new development to infill sites rather than expansion areas, allowing for a compact form of urban development that promotes use of non-auto transportation

Figure 1.3 – Academic Growth Boundary



modes and that conserves land and other natural resources. Over time, this location will primarily result in a central campus at Stanford that is developed more intensively than the campus today. The location of the AGB also allows for a variety of settings to meet different academic and research needs.

Throughout the Community Plan, areas within the AGB (generally north of Junipero Serra Boulevard) are considered "central campus" and the areas outside the AGB (generally south of Junipero Serra Boulevard) are considered "foothills" (see Figure 1.2 – Community Plan Locations).

Development Policies

Allowable development for areas within and outside the Academic Growth Boundary is defined in the Land Use chapter of the Community Plan. Different land use designations are applied in those areas that direct development to land inside the growth boundary. Essentially all uses associated with the educational and residential function of the campus are directed inside the boundary, while areas outside the boundary are reserved for open space and academic activities that require the foothill setting for their basic functioning. A major existing use which is outside the AGB is the Stanford Golf Course, which is considered an open space use under the Community Plan.

Academic Growth Boundary Timing

The Academic Growth Boundary is not meant to be a permanent planning boundary, but it does need to remain in place for a long enough period of time to ensure that development will be directed toward the central campus over the long term. The AGB will remain in the established location for a period of at least 25 years. The Community Plan requires a vote of four-fifths of all members of the Board of Supervisors to modify the AGB location during this 25 year time period, in contrast to the simple Board majority required for other General Plan amendments.

Based on the historic growth rate of approximately 200,000 square feet of additional development per year for the past 40 years, 25 years of development would total an additional 5 million square feet, excluding faculty/staff housing which is separately regulated. Adding 5 million square feet to the current total would result in a central campus building area of approximately 17,300,000 square feet, excluding faculty and staff housing. In addition to the time limitation, this amount of cumulative development is a prerequisite or "trigger" for possible modification of the AGB. No modification of the growth boundary may be proposed or approved prior to 25 years from approval of the Community Plan and total building area on the central campus reaches 17,300,000 square feet.

The land area in which this development would be located is 1,370 acres, which is the area of the central campus excluding the current and proposed future faculty/staff residential area.

This AGB threshold serves several purposes:

- ∞ It defines the point at which expansion of the portion of the campus designated for academic and related development may be considered.
- ∞ It defines the development intensity level for the Academic Campus land use designation (see Land Use Chapter) under the Community Plan.
- ∞ It provides for an adequate amount of additional building area to serve Stanford's needs over the long term.
- ∞ It specifically aims to provide a concentration of people and activity conducive to use of transit and non-automobile trips.

It is important to distinguish that the AGB modification threshold in no way serves as an approval by the County of this amount of development. Actual development and population growth proposals by Stanford, both in the form of General Use Permit applications and as applications for individual building projects under the GUP, will continue to be evaluated for their environmental and policy impacts by County staff, the Planning Commission, and the Board of Supervisors.

Accommodating all future additional development within the AGB may require exploration of new areas for development in the future, such as the area of the west campus currently expected to remain undeveloped according to the development agreement between the City of Palo Alto and Stanford for the Sand Hill Road Corridor Projects. A higher level of building intensity through increased building height may also be needed.

Concurrent with their application for a General Plan amendment in the form of a Community Plan, Stanford University filed an application with the County for a new General Use Permit, requesting 2,035,000 additional square feet of academic and support space, 2,000 housing units for students, 350 units for postdoctoral fellows, and up to 668 housing units for faculty and staff. Excluding faculty and staff housing and assuming 550 square feet per unit of student housing and 1,000 square feet per unit of postdoctoral fellow housing, this development application requests an additional 3,485,000 square feet of new building area on the campus over the next 10 years. Despite this accelerated rate of new development compared to past years, the AGB will remain in place for 25 years, indicating that growth rates would need to decline in the future. The calculations for the AGB threshold are summarized in Table 1.3:

Table 1.3 – AGB Threshold Calculations	
Land area (excluding faculty/staff residential areas)	1,370 acres
Current building area	12,300,000 square feet
Current building intensity ratio (building area/land area)	0.21
40-year annual growth rate	200,000 square feet per year
25-year growth allocation (growth rate * 25 years)	5,000,000 square feet
AGB threshold building area	17,300,000 square feet
AGB threshold building intensity (AGB threshold building area/land area)	0.29
Proposed General Use Permit development	3,485,000 square feet
Amount remaining in AGB threshold after GUP development	1,515,000 square feet

Calculations of current and future on-campus building area do not include faculty/staff housing. Development in residential areas is regulated in the Community Plan under a different land use designation that defines allowable residential density for these areas, consistent with the historical practice of excluding faculty/staff housing from the General Use Permit.

Community Plan Policies Supporting Academic Growth Boundary

The following table describes some means by which the Academic Growth Boundary, and the associated concepts of compact urban development and resource conservation, are reinforced in other chapters of the Community Plan.

Table 1.4 – Community Plan reinforcement of AGB	
Chapter	**AGB Reinforcement**
Land Use	Land Use designations within and outside the AGB
Housing	Identification of housing sites within the AGB; promotion of higher-density housing
Open Space	Protection of open space outside the AGB; promotion of balance between high intensity development and open space inside the AGB
Circulation	"No net new commute trips" standard, which promotes compact development to allow for use of transit, bikes and walking

Policies

SCP-GD 1
Establish and maintain an Academic Growth Boundary (AGB) as shown on Figure 1.3. Direct future development on Stanford lands within the AGB, consistent with the Community Plan land use designations.

SCP-GD 2
Retain the location of the AGB as shown in Figure 1.3 for at least 25 years, and until the building area of academic and support facilities and student housing reaches 17,300,000 square feet.

SCP-GD 3
Allow modification of the location of the AGB within 25 years of its initial approval only upon a four-fifths vote of the Board of Supervisors.

SCP-GD 4
The design and intensity of growth within the AGB should facilitate transit usage. There should be a mixture of uses to allow for a high degree of pedestrian and bike trips. The location of uses should facilitate non-auto trips.

SCP-GD 5
The design and intensity of development outside the AGB should be very low intensity supporting academic field research, research needing remote locations, agricultural and recreational uses.

SCP-GD 6
Incremental additional development within the AGB may only be permitted through a General Use Permit approved by the County.

Strategy # 2: Engage in Co-operative Planning and Implementation

The policies associated with this strategy articulate and reinforce the decision making and co-operative arrangements among Stanford, the City of Palo Alto and the County of Santa Clara which have been in place for several decades. These policies clearly articulate a departure from General Plan policies for other urban unincorporated areas of the county; however, because the County's intentions regarding annexation, use regulation, and service provision differ from other urban areas it is appropriate that specialized policies and consultation procedures apply to Stanford.

The 1985 Land Use Policy agreement stipulates that Stanford will provide all municipal services to unincorporated portions of Stanford lands, including contractual arrangements for services as needed. The Community Plan and new General Use Permit create a need to ensure that service

use by Stanford residents and Stanford's provision or contracting of services are consistent with one another.

The policies also reflect the County's desire to understand the University's long-term development plans so that such development may accomplish the University's academic mission in a manner consistent with quality planning practices and the County's planning objectives. The Community Plan represents a commitment to quality stewardship of a unique regional asset.

To provide for consideration of these issues, Stanford will be required prepare, at its own expense and in cooperation with the County Planning Office, a Sustainable Development Study covering all of its unincorporated lands in Santa Clara County. This study will be required to be completed during the time that the 2000 General Use Permit is in effect to ensure that both growth under the 2000 General Use Permit and future growth patterns are consistent with the recommendations of the study regarding the appropriate location and manner of development.

The Sustainable Development Study shall be based upon and meet planning principles and criteria established by the Board of Supervisors in the Community Plan and 2000 General Use Permit, as supplemented by the County Planning Office. These principles and criteria will include, but not be limited to, recognition, protection and avoidance of important natural resources including sensitive plant and animal species and their habitats, creeks and riparian areas, drainage areas, watersheds, scenic viewsheds, and geologic features such as steep or unstable slopes, and faults. The Sustainable Development Study shall identify the maximum planned buildout potential for all of Stanford's unincorporated Santa Clara County land, demonstrate how development will be sited to prevent sprawl into the hillsides, contain development in clustered areas, and provide long-term assurance of compact urban development. In the interest of maintaining hillside views, developable areas should generally be limited to those with an elevation lower than 200 feet. Coupled with new zoning that promotes clustering of development, the Sustainable Development Study will address issues of resource protection with a view beyond the 25-year time frame of the AGB.

The County may, at Stanford's expense, choose to conduct a parallel study to the Sustainable Development Study prepared by Stanford, or may choose to do additional work to supplement Stanford's study. The Sustainable Development Study will be submitted to the Board of Supervisors for approval.

Policies

SCP-GD 7

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The use and development of Stanford lands in the unincorporated area of Santa Clara County shall be consistent with:

- the County General Plan, including this Community Plan;
- the County Zoning Ordinance;
- a conditional use permit known as the Stanford University General Use Permit;
- other use permits and approvals as required, granted by the County within the parameters of the Zoning Ordinance and the General Use Permit; and,
- the Land Use Policy Agreement among the County, the City of Palo Alto, and Stanford.

SCP-GD 8
Academic and related development on unincorporated lands of Stanford University within Palo Alto's urban service area shall not be required to conform to the City of Palo Alto's Comprehensive Plan.

SCP-GD 9
The provision of urban services to the academic lands of Stanford University shall be the responsibility of the University. This may be accomplished through direct provision of such services by Stanford, payment of in-lieu fees, or appropriate contractual relationships with local jurisdictions.

SCP-GD 10
Annexation of Stanford lands shall be in accordance with the 1985 Land Use Policy Agreement:

- Academic land uses, for which the University provides or obtains its own services, will not be required to annex to a city.
- Open space and agricultural uses of land will remain unincorporated.
- Other non-academic uses of University land should be subject, in appropriate cases, to city annexation, as agreed to in the Land Use Policy Agreement.

SCP-GD 11
In accordance with the adopted Land Use Policy Agreement and Protocol, provide opportunities for the City of Palo Alto to review and comment upon projects and proposals involving Stanford University that may affect the City.

SCP-GD 12
Determine and define the long-term incremental growth potential for Stanford lands, and identify the maximum planned buildout potential and all appropriate areas of potential development through completion of a Sustainable Development Study. The Sustainable Development Study shall accomplish the following:

- ∞ Demonstrate how future development will be sited to prevent sprawl into the hillsides, contain development in clustered areas, and provide long-term assurance of compact urban development; and
- ∞ Provide for protection and/or avoidance of sensitive plant and animal species and their habitats, creeks and riparian areas, drainage areas, watersheds, scenic viewsheds, and geologic features such as steep or unstable slopes, and faults.

Implementation Recommendation

SCP-GD (i) 1
Revise the Protocol, which is maintained under the stipulations of the 1985 Land Use Policy Agreement, to reflect changes in land use policies and review procedures resulting from adoption of the Community Plan and the 2000 General Use Permit.

SCP-GD (i) 2
Identify urban service levels and service needs of Stanford residents. If Stanford is not providing an appropriate level of urban services to its residents, require that Stanford either provide any needed municipal services, pay in-lieu fees, or contract with the appropriate agencies to provide them. Contractual agreements or services required by the County will recognize that individuals commonly use services independent of jurisdictional boundaries, that jurisdictions may employ policies that give priority to their residents for service use, and that service levels differ among jurisdictions.

SCP-GD (i) 3
Require that Stanford prepare and submit to the Board of Supervisors for approval a Sustainable Development Study to determine the maximum appropriate buildout and development location potential for all of Stanford's unincorporated lands. The Sustainable Development Study shall be completed and approved prior to acceptance of applications for the second 50% of the academic development allowed under the 2000 GUP. Further, the County shall not accept any further use permit applications until the Sustainable Development Study is completed. If appropriate, the County Planning Office may conduct additional work related to the Sustainable Development Study. All work associated with the study shall be conducted at Stanford's expense. The County's approval of the Sustainable Development Study shall in no way be construed as the County's agreement to or approval of the amount, type, or location of development proposed in the Study.

SCP-GD (i) 4
With respect to the foothills, the Sustainable Development Study shall identify all area(s) of potential future development. The potential development area(s) shall be consistent with the Community Plan strategies and policies, which include but are not limited to the strategies and policies relating to compact urban development, conservation of natural resources, open space protection, maintenance of scenic values, and avoidance of hazards.

CONDITIONS OF APPROVAL

The following conditions have been established for the Stanford University General Use Permit (GUP). The conditions describe the distribution of additional building area, procedures under which construction may occur, and associated measures which must be accomplished before, during and after construction.

E. Academic Building Area

5. Stanford shall complete and submit to the Planning Office for Board of Supervisors approval a Sustainable Development Study. The study shall be completed in accordance with the Community Plan. After the Sustainable Development Study is deemed adequate by the County Planning Office, it shall be presented to the CRG. After presentation to the CRG, the study shall be forwarded to the County Planning Commission for a recommendation regarding its approval by the Board of Supervisors. The Sustainable Development Study shall be approved by the Board of Supervisors prior to County acceptance of applications for nonresidential development which would result in development of a cumulative total of more than 1,000,000 net new square feet of nonresidential development that counts toward the GUP building area cap. All work associated with the Sustainable Development Study conducted by Stanford, the County, and/or an independent consultant shall be completed at Stanford's expense.

SUSTAINABLE DEVELOPMENT STUDY
APPENDIX B: SENSITIVITY ANALYSIS

Appendix B: Sensitivity Analysis

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List of Figures

This appendix supplements Chapter 4, providing technical data for the Sensitivity Analysis. In order to keep the context of the analysis intact, some of the following material is repeated from Chapter 4, supplemented with additional detail.

Assumptions

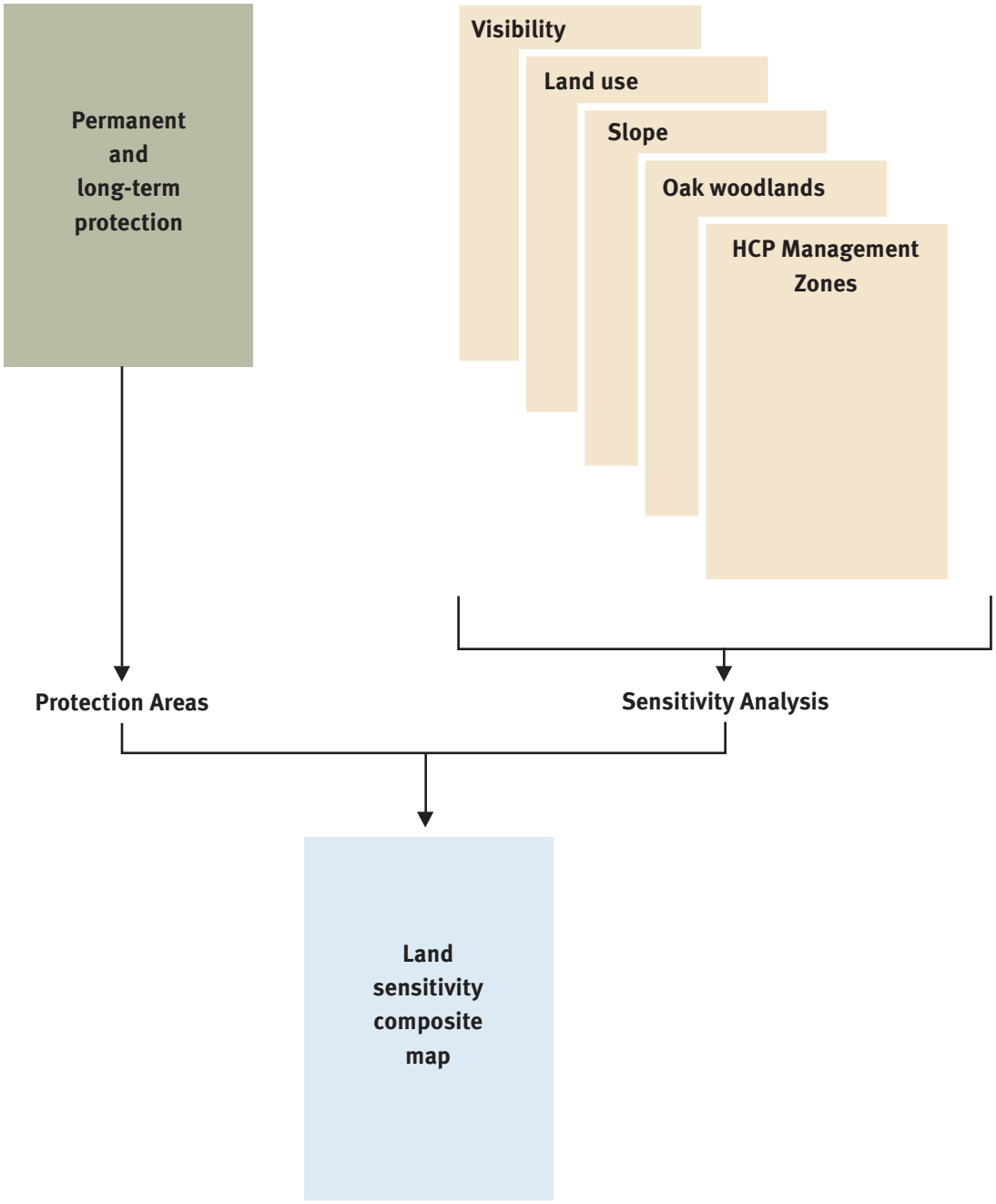
- The Study uses the current environmental information available for the purpose and scale of this analysis. Information on the data (date, source, etc.) is included in each theme summary.
- Future proposed uses will require site-specific analyses.
- Cultural resource information (e.g., archeological site locations) is confidential and not included in this Sensitivity Analysis; however, it is incorporated into all site-specific planning analyses on Stanford lands.

Methodology

The Sensitivity Analysis determines land sensitivity for resource protection in the Foothills. First, Stanford University identified the most critical habitat areas that are considered "Protection Areas". These areas have either permanent protection (mostly located in streams and riparian ecosystems) or long-term (50-year) protection. These Protection Areas cover approximately 20 percent of the Foothills. In order to assess the sensitivity of the remaining lands, the Study uses an overlay method to perform a multifaceted analysis of the region's environmental sensitivity[1]. By using this method, information can be layered and combined to identify overall sensitivity and suitability for different types of land use. In the overlay method, environmental information and other data such as regulatory constraints are depicted on individual maps called thematic maps (themes). For example, habitat zones, slope, and viewsheds would each be mapped to provide a thematic map. The University prepared six thematic maps, five of them (HCP Management Zones, Oak woodlands, Slope, Land use, and Visibility) to overlay in its Sensitivity Analysis. The overlay Sensitivity Analysis and the Protection Areas were then compiled, creating a new composite map reflecting the values of all constituent six themes.

The following flowchart summarizes this methodology.

1 Ian L McHarg (Design with Nature, 1969) overlay approach assigns values to any environmental factors or themes. In these themes, a particular attribute (class) is assigned a numerical or nominal value that is a measure of the ability of that condition to accommodate a particular use.


Permanent and long-term protection
Visibility
Land use
Slope
Oak woodlands
HCP Management Zones
Protection Areas
Sensitivity Analysis
Land sensitivity composite map

PROTECTION AREAS: MAP AND SUMMARY INFORMATION

The University is working with the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration-National Marine Fisheries Service (NOAA Fisheries) to prepare a Habitat Conservation Plan (HCP)[2]. The HCP is part of a process outlined by Section 10 of the Federal Endangered Species Act. The Stanford HCP will result in long-term (50-year) Incidental Take Permits from the USFWS and the NOAA Fisheries, providing comprehensive species protection and long-term certainty for the University's planning and land management efforts.

To prepare the HCP, Stanford studied the habitat characteristics of its lands and identified the most sensitive habitat areas. The Stanford HCP defines two types of Protection Areas in unincorporated County of Santa Clara lands: conservation easements and conservation reserves. The conservation easement areas are located in the San Francisquito/Los Trancos Creek basin and in the Matadero/Deer Creek basin. The California Tiger Salamander Conservation Reserve is located in the California tiger salamander basin.

Figure B.1 Easement – Los Trancos Creek

Figure B.2 CTS Reserve – breeding pond

Conservation easement and reserve spatial information is included, as it assists in providing protection of the most important and most sensitive zones of the Foothills to maintain protected species and associated communities. Because the Stanford HCP would prohibit development of these lands during the Study period, except for purposes of habitat enhancement, they are considered Protection Areas. These areas receive Sensitivity Analysis consideration but are then excluded from the final sensitivity gradient categories.

2 DRAFT Stanford University Habitat Conservation Plan, 2008 (http://hcp.stanford.edu)

The following categories have been included in the final composite analysis:

- **Conservation easements:** These cover approximately 140 acres.[3] Under the Stanford HCP, this area would provide permanent protection for the Covered Species.[4] This category is identified as "Permanent dedication of easements" (Figure B.3).

- **Conservation reserve:** Development within these 315 acres is prohibited for the 50-year life of the Stanford HCP. It is also the location of potential future conservation easements should California tiger salamander habitat be removed elsewhere on Stanford lands. This category is identified as "long-term" (50-year) conservation (Figure B.3).

Map source: Land Use and Environmental Planning Office, Stanford University, 2007.

3 The Stanford HCP provides continuous Conservation easements along the creeks within Stanford University's lands. Because the maps in this document provide information only for areas in unincorporated County of Santa Clara, there appears to be a gap along Deer Creek. This parcel is within Palo Alto's jurisdiction and is noted in the map with a striped pattern.
4 Covered Species are species protected by the Endangered Species Act that are included in the HCP.

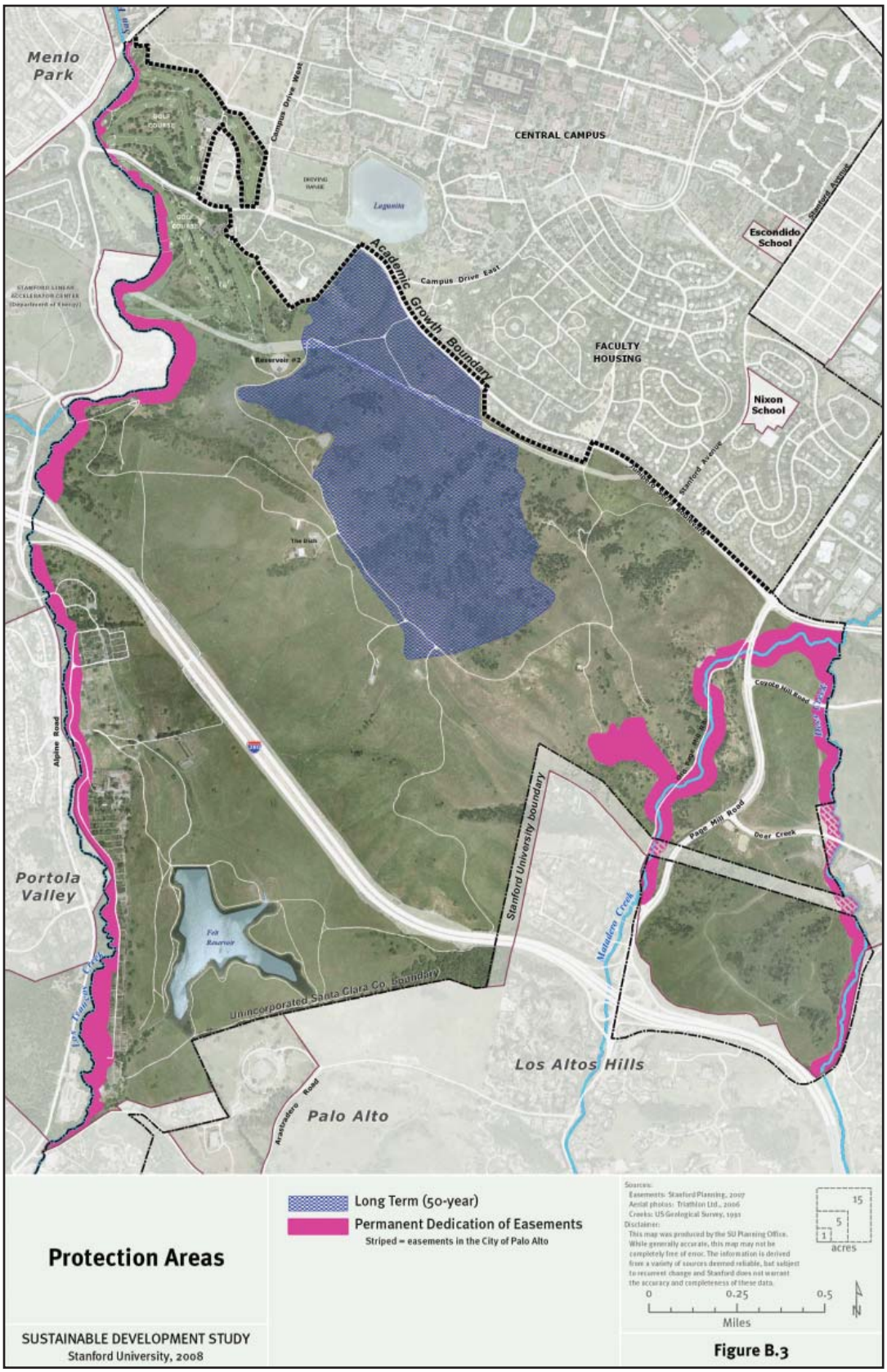
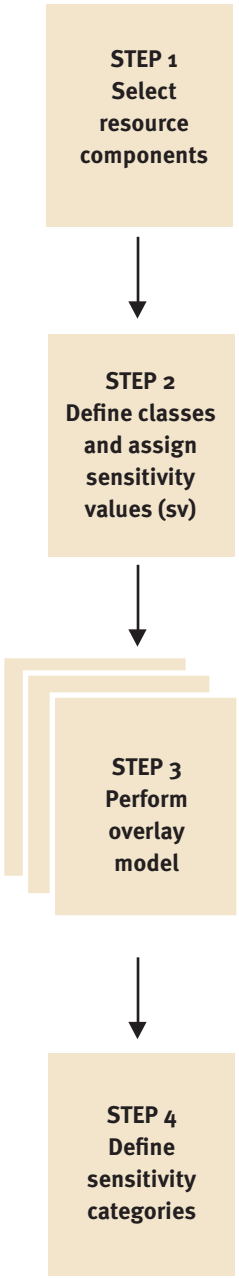

Menlo Park
CENTRAL CAMPUS
Lagunita
Escondido School
Academic Growth Boundary
Campus Drive East
FACULTY HOUSING
Nixon School
Stanford Avenue
Alpine Road
Portola Valley
Stanford University boundary
Page Mill Road
Deer Creek
Los Altos Hills
Palo Alto
Arastradero Road
Protection Areas
Long Term (50-year)
Permanent Dedication of Easements
Striped = easements in the City of Palo Alto
Miles
acres
SUSTAINABLE DEVELOPMENT STUDY
Stanford University, 2008

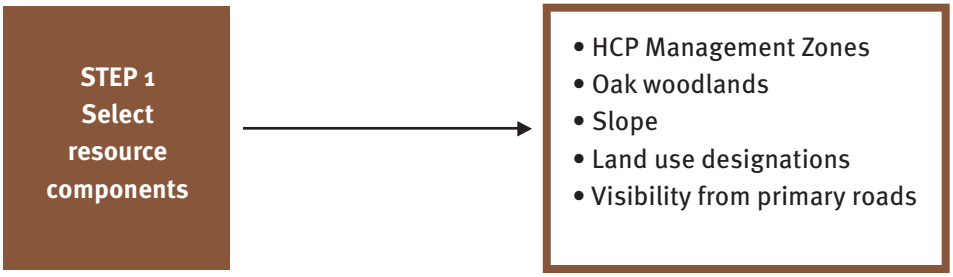
Figure B.3

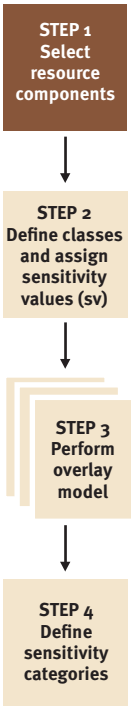
APPLICATION OF THE SENSITIVITY ANALYSIS

The application of this method to the Foothills is summarized below to provide an overview of the analysis process. A description of the methodology used for each step of the analysis follows this overview.



Step 1: Select resource components





CRITERIA

The following criteria were used to select the resource components for the Sensitivity Analysis:

- Components need to address the requirements of the Stanford Community Plan that state that the Sustainable Development Study must provide for protection and/or avoidance of sensitive plant and animal species and their habitats, creeks and riparian areas, drainage areas, watersheds, scenic viewsheds, and geologic features such as steep or unstable slopes, and faults. In addition, the Stanford Community Plan states that the Sustainable Development Study should include maintenance of scenic viewsheds.
- Spatial and temporal accuracy need to be sufficient for the analysis.

RESOURCE COMPONENTS

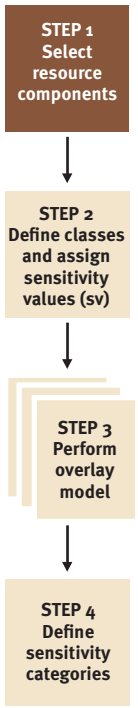
The following resource components were selected for the sensitivity study:[5]

- HCP Management Zones
- Oak woodlands
- Slope
- Land use designations
- Visibility from primary roads

These components include both environmental and regulatory information. Each of these components are defined briefly here:

- **HCP Management Zones:** In areas outside of the Protection Areas, the Stanford HCP identifies Management Zones that correspond to the relative habitat value for the Covered Species. These habitat values range from Zone 1, which has a high habitat value, to Zone 4, which has a low habitat value.

5 A detailed review of each theme is provided in each Resource Components section.



- **Oak woodlands:** Oak woodlands are located throughout the Foothills. The Stanford HCP does not prioritize oak woodlands as habitat for Covered Species, thus the Protection Areas and HCP Management Zones do not reflect the sensitivity of these lands. Oak woodlands provide nesting and roosting habitat for a variety of wildlife species, as well as important visual benefits.
- **Slopes:** Any development activities on lands with steep slopes would need to address erosion and slope stability issues. As slopes increase, these requirements would also increase.
- **Land use designations:** The County of Santa Clara designates lands in the Foothills as Special Conservation Areas or Open Space/Field Research (OS/FR). Special Conservation areas are subject to greater restrictions than OS/FR land.
- **Visibility from primary roads:** Through its OS/F zoning, the County of Santa Clara has developed a methodology for assessing the relative visibility of sites in the Foothills from defined primary roads, which would apply to future proposals in the OS/F zoning.

DATA SOURCES

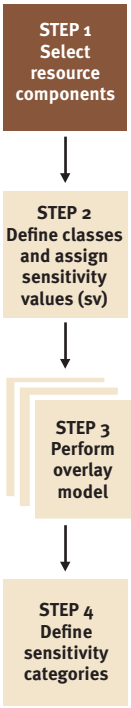
Three main sources of data have been used in this study:

- Data collected by extensive fieldwork under the supervision of the Stanford University Conservation Program Manager, such as Protection Areas, the HCP Management Zones, and Oak woodlands. Data collected through spring 2008.
- Data purchased by specialized companies (Triathlon Ldt./Psomas, 2002),[6] such as topography used to derive slope.
- Data obtained from the County of Santa Clara such as spatial information for land use designations and viewshed analysis (Land use designations, 2000; Visibility from Primary Roads, 2003).

A map and summary for each component is provided in the following pages with descriptions of the topic and data source.

6 Triathlon, 2002. Topography, 2' contour lines. Psomas is the consulting company for the Santa Clara County-wide Orthoreference Aerial Photography and Parcel Geodatabase.

HABITAT CONSERVATION PLAN MANAGEMENT ZONE



The Stanford HCP classifies lands into four Management Zones according to the habitat value of the land, if any, to the Covered Species.

- ZONE 1: Areas classified as Zone 1 support one or more of the Covered Species or provide critical resources for a Covered Species. These areas are necessary for the local persistence of the Covered Species.
- ZONE 2: Areas classified as Zone 2 are occasionally occupied by a Covered Species and provide some of the resources used by the Covered Species. These areas generally do not support individuals of the Covered Species on a year-round basis, but they provide indirect support to the Covered Species by providing a buffer between Zone 1 areas and areas that are impacted by urban and other uses. Zone 2 does not include any breeding habitat for the Covered Species.
- ZONE 3: Areas classified as Zone 3 are generally undeveloped open space lands that have some biological value but provide only limited and indirect benefit to the Covered Species. Under the Conservation Program, these areas will be operated and developed in a manner that does not adversely affect the Covered Species, but these lands are generally more desirable areas for future development than Zones 1 or 2.
- ZONE 4: Areas classified as Zone 4 do not support the Covered Species. This Zone includes urbanized areas that have been developed by the University and those areas that are completely surrounded by urban development and/or roads, or are otherwise isolated from areas that support a Covered Species. These areas are population sinks for the Covered Species.

The Stanford HCP would provide protection for the most sensitive Zone 1 land through two mechanisms:

- Permanent conservation easements along the creeks
- California Tiger Salamander Conservation Reserve

The permanent conservation easements would be created within 1 year of the approval of the Stanford HCP and issuance of Incidental Take Permits. An easement would allow conservation activities and maintenance of existing facilities, but would prohibit other development. These easements, located along San Francisquito/Los Trancos creeks and Matadero/Deer creeks, would total 140 acres in unincorporated County of Santa Clara.

The California Tiger Salamander Conservation Reserve would be established within 1 year of the approval of the Stanford HCP and issuance of the Incidental Take Permits. This 315-acre reserve in the Foothills would be managed for the benefit of the California tiger salamander. Development, such as academic buildings, residential dwelling units, or commercial buildings, would be prohibited. Utilities and other general infrastructure improvements that would not adversely affect the tiger salamander habitat could be placed within the California Tiger Salamander Reserve.

There are the four species currently covered by the draft Stanford HCP:

Figure B.4
California tiger salamander

Figure B.5
California red-legged frog

Figure B.6
Western pond turtle

Figure B.7 Steelhead

STEP 1
Select resource components

STEP 2
Define classes and assign sensitivity values (sv)

STEP 3
Perform overlay model

STEP 4
Define sensitivity categories

The HCP Management Zones spatial information is included in the land Sensitivity Analysis for the following reasons:

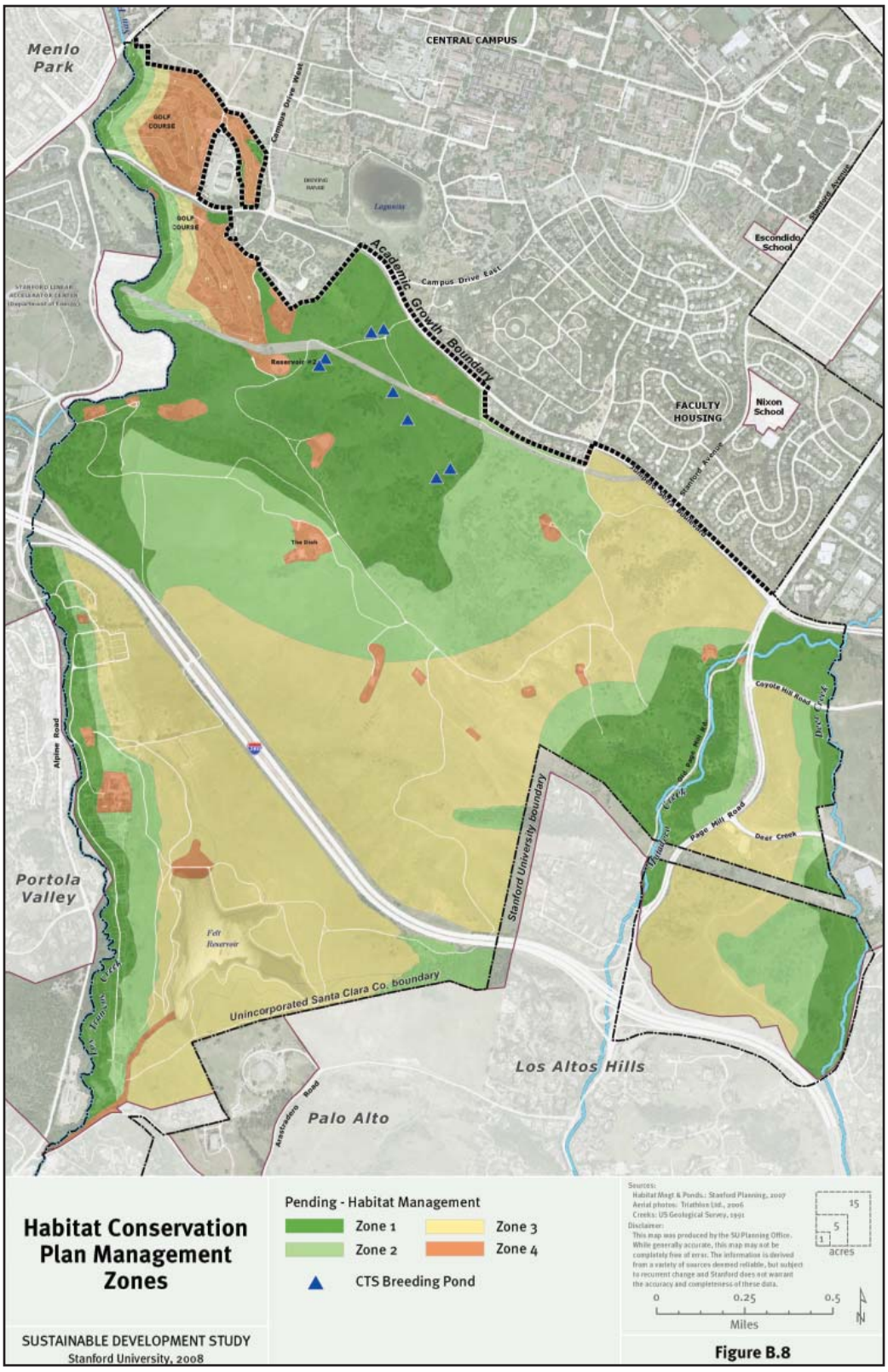
- It provides an exhaustive study of the Covered Species' habitat.
- These habitats are sensitive Foothills areas for the conservation of natural resources.
- These habitats are home to a much larger community of animals (and plants), in addition to the Covered Species.

The following HCP Management Zones[7] have been included in the analysis (Figure B.8):

- ZONE 1: This zone covers approximately 635 acres of riparian, creek and uplands, and eight experimental breeding ponds. This zone has a value of 8 in the land Sensitivity Analysis.
- ZONE 2: This zone covers approximately 530 acres in the Foothills and has a value of 5 in the land Sensitivity Analysis.
- ZONE 3: This zone covers approximately 965 acres in the Foothills and has a value of 3 in the land Sensitivity Analysis.
- ZONE 4: This zone covers approximately 125 acres in the Foothills and has a value of 1 in the sensitivity land analysis.

Map source: Land Use and Environmental Planning Office, Stanford University, 2007.

7 This map includes Felt Lake and Hetch Hetchy Aqueduct areas (total of 2,255 acres).



STEP 1
Select resource components

STEP 2
Define classes and assign sensitivity values (sv)

STEP 3
Perform overlay model

STEP 4
Define sensitivity categories

STEP 1
Select resource components

STEP 2
Define classes and assign sensitivity values (sv)

STEP 3
Perform overlay model

STEP 4
Define sensitivity categories

OAK WOODLANDS

In 1980, Stanford University started a restoration program to reestablish the oak woodlands areas after a land use study showed significant loss of these areas had occurred since 1920.[8]

Figure B.9 Oak planting

Figure B.10 Oak protection

Figure B.11 Oak restoration

The oak woodlands spatial information is included in the land Sensitivity Analysis for the following reasons:

- The oak woodlands are one of the most representative foothills native plant communities of Central California.
- The oak woodlands provide habitat for a large community of associated species of plants and wildlife, (e.g., blue elderberry, bobcat, gray fox, San Francisco dusky-footed woodrat)

The oak woodlands thematic information was generated by Stanford University's Conservation Program Manager according to the following criteria:

- Tree density of the three dominant oak species (Coast live oak, Valley oak, and Blue oak). A grouping of at least three trees within 50 meters of each other is designated oak woodland.

GUP condition K.3 requires mitigation for the identified oak woodlands areas. Therefore, two conditions have been included in the sensitivity land analysis (Figure B.12):

- Existing oak woodlands are areas of dense oak and associated community. These areas cover approximately 712 acres in the Foothills and have a value of 5 in the land use Sensitivity Analysis.
- The remaining 1,543 acres have a value of 0.

It should be noted that oak groves shrink and expand over time with the natural cycle of individual trees and in response to changes in conditions. The oak woodlands thematic layer map is a useful tool for looking at broad patterns of land sensitivity; however, it should be periodically updated and supplemented by site inspections for specific projects. In addition, isolated oak trees would be identified during the site-specific analysis.

Map source: Stanford University Conservation Program Manager, 2008.

8 Stanford University, Land Use Plan, 1980.

STEP 1
Select resource components

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STEP 2
Define classes and assign sensitivity values (sv)

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STEP 3
Perform overlay model

↓

STEP 4
Define sensitivity categories

STEP 1
Select resource components

STEP 2
Define classes and assign sensitivity values (sv)

STEP 3
Perform overlay model

STEP 4
Define sensitivity categories

SLOPE

Slope is used to describe the steepness, incline, gradient, or grade of a straight line. The Foothills north of I-280 present a complex topography, formed by a dense pattern of rolling areas. South of I-280, the slopes are gentler.

Figure B.13 Slope 0-15%

Figure B.14 Slope 15-30%

Figure B.15 Slope ›30%

Slope spatial information is included in the land Sensitivity Analysis for the following reasons:

- Higher slopes have greater potential for erosion or instability.
- Higher slopes require special protective procedures during development.

The following three groups of slope[9] have been adapted from LSA slope classification zones[10] for land management, (Figure B.16):

- Slope › 30%: When the slope is greater than 30 percent, it becomes a critical challenge for development. Erosion and land instability are frequent associated problems. This slope class covers approximately 295 acres in the Foothills. It has a value of 4 in the land Sensitivity Analysis.
- Slope 15-30%: These areas present moderate problems for almost any kind of development. With these gradients, roads must run diagonal to slope and grading is difficult. This slope's class covers approximately 830 acres in the Foothills. It has a value of 2 in the land Sensitivity Analysis.
- Slope 0-15%: These areas are not considered "hillside" for development purposes. This slope's class covers approximately 1,130 acres. It has a value of 1 in the land Sensitivity Analysis.

Map source: Land Use and Environmental Planning Office, Stanford University, 2008.

9 This map includes Felt Lake and Hetch Hetchy Aqueduct areas (total of 2,255 acres).
10 LSA Assoc. 2002. "Typical slope categories used in the Western US."

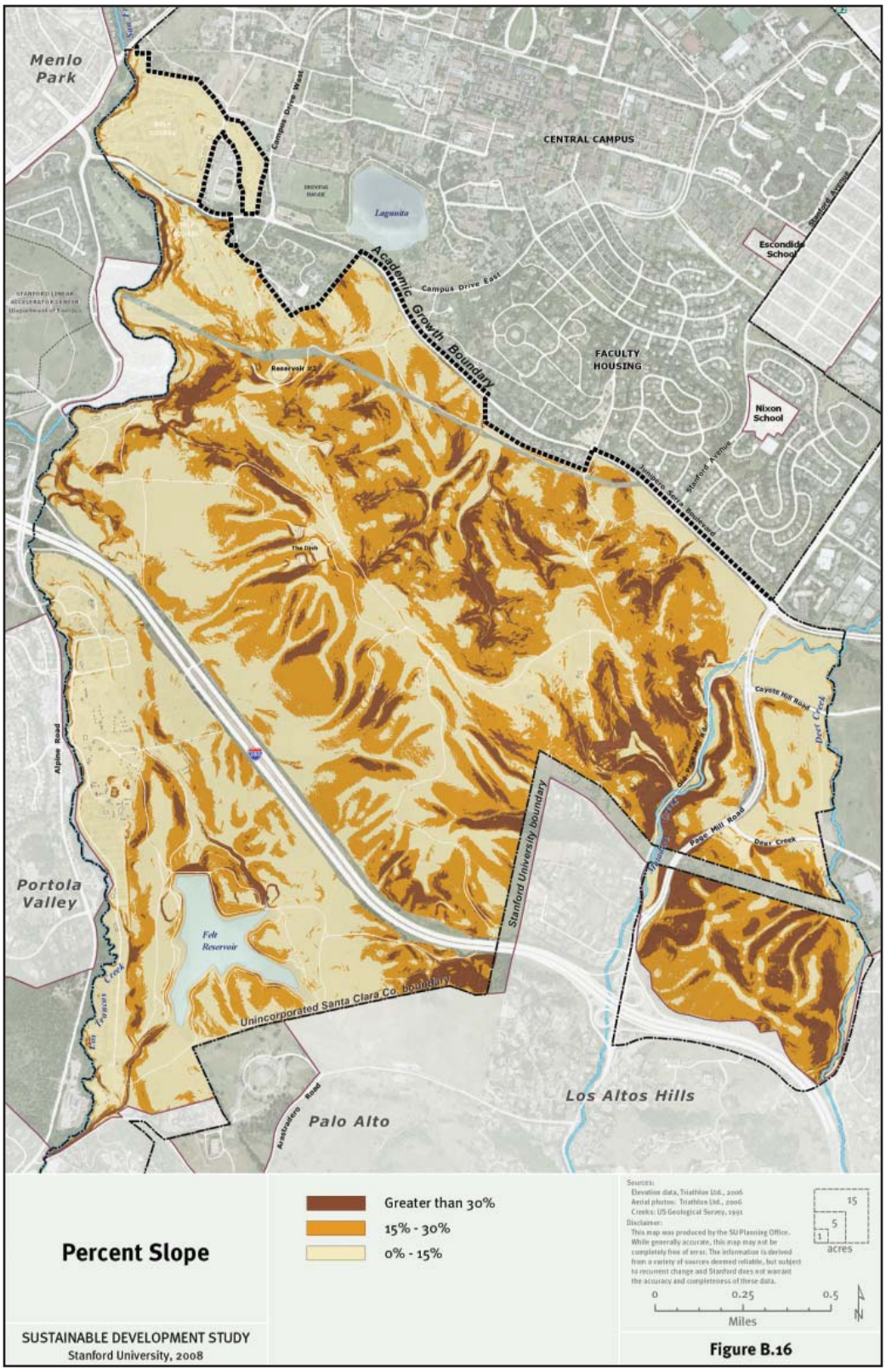


Figure B.16

STEP 1
Select resource components

STEP 2
Define classes and assign sensitivity values (sv)

STEP 3
Perform overlay model

STEP 4
Define sensitivity categories

STEP 1
Select resource components

STEP 2
Define classes and assign sensitivity values (sv)

STEP 3
Perform overlay model

STEP 4
Define sensitivity categories

LAND USE DESIGNATIONS

The Stanford Community Plan established the following land use designations (Figure B.21):

- Special Conservation Areas (SCA): These areas are unsuitable for development due to the following natural resources constraints:
  - Steep and unstable slopes
  - Seismic or other geologic hazards
  - Riparian areas (usually 150 feet measured from the top of the bank)
  - Sensitive areas (e.g., California tiger salamander habitat)

- Open Space / Field Research (OS/FR): The regulation of these areas was formalized in the Open Space/Field Research (OS/F) Zoning District adopted in 2003.[11] The following are examples of permitted land uses in this zone[12]:
  - Field study activities
  - Utility infrastructure
  - Grazing and agricultural
  - Recreational activities which are consistent with protection of environmental resources and Foothills access
  - Antennas
  - Wood recycling

Figure B.17 SCA breeding pond

Figure B.18 SCA riparian zones

Figure B.19 OS/FR agricultural use

Figure B.20 OS/FR academic use

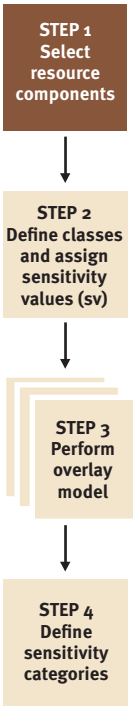
11 See zoning ordinance text 2.50.010C for purpose of the zone: to maintain open space character of those Stanford lands outside the AGB: allows utilities, low-intensity agriculture, limited agricultural research, field research, field studies, limited outdoor recreational activities, recreational trails, environmental restoration, limited ancillary facilities, etc.

12 A total of 15,000 sq. ft. of development (maximum structure size of 5,000 sq. ft.) may be approved, subject to a corresponding decrease in square feet elsewhere within Stanford University development districts.

Land use designation spatial information is included in the land Sensitivity Analysis because it includes natural resources factors (e.g., delineation of riparian zones and other sensitive areas) and physical constraints factors (e.g., unstable slopes and seismic hazards).[13]

- Special Conservation Areas: Covers 385 acres and has a value of 7 in the Sensitivity Analysis.
- Open Space/Field Research: Covers approximately 1,870 acres and has a value of 1 in the land Sensitivity Analysis.

Map source: County of Santa Clara Planning Office, 2003.



13 This map includes Felt Lake and Hetch Hetchy Aqueduct areas (total of 2,255 acres).

STEP 1
Select resource components

↓

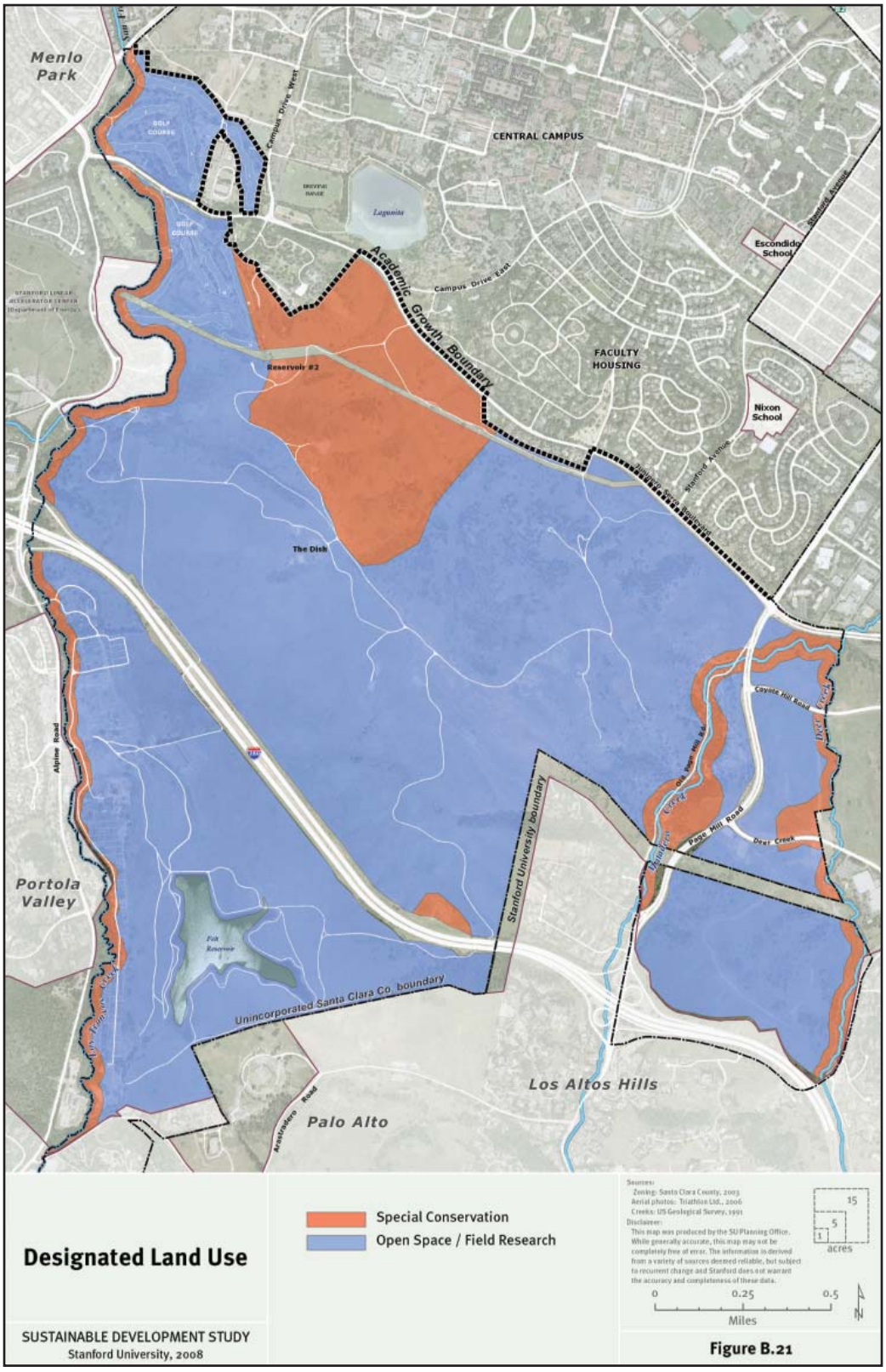
STEP 2
Define classes and assign sensitivity values (sv)

↓

STEP 3
Perform overlay model

↓

STEP 4
Define sensitivity categories



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STEP 1
Select resource components

STEP 2
Define classes and assign sensitivity values (sv)

STEP 3
Perform overlay model

STEP 4
Define sensitivity categories

VISIBILITY FROM PRIMARY ROADS

The County of Santa Clara Open Space/Field Research Viewshed Analysis[14] adopted in 2003 was included in the Land Sensitivity Analysis as a visibility factor. Section 2.50.040 B of the County of Santa Clara zoning code describes the methodology for conducting the viewshed analysis. Under the required methodology, views from identified corridors have been mapped, and the number of times a given area would be visible from individual corridors has been calculated. This frequency is then used to designate visibility zones that are high, medium-high, medium, or low.

Figure B.22 View from Palm Drive

Figure B.23 View from Junipero Serra Boulevard/ Stanford Avenue

Figure B.24 View from I-280

The viewshed analysis is a tool to be used in conjunction with review of individual development projects. Additional view analysis would be performed for each project.

The viewshed corridors dictated by the OS/F zone are:

- Junipero Serra Boulevard (from San Mateo County border to Page Mill Road) ,
- Page Mill Expressway (from Junipero Serra Boulevard to Arastradero Road) ,
- Arastradero Road (from Page Mill Road to Alpine Road; and from Page Mill Road to Deer Creek Road) ,
- Alpine Road/Sand Hill Road corridor (from Arastradero Road to Arboretum Road) ,
- Interstate 280 (from Sand Hill Road to Arastradero/Purisima Road),
- Stanford Avenue approach to the Stanford "Dish Trail" access, and
- Palm Drive (from Arboretum Road to the end of the Stanford "oval").

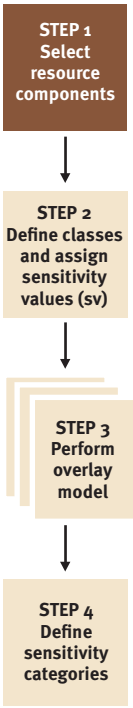
Because the software model does not account for existing ground features, such as trees, rocks, or minute topographic detail, or for constructed features, such as buildings, structures, or infrastructure, project-specific site analysis should be used to verify or revise site-specific visibility ratings.

14 County of Santa Clara, Planning Office, 2003. "Open Space/Field Research Viewshed Analysis." Aggregated Analysis.

The County of Santa Clara's hillside visibility mapping method results in the following coverage areas on the Foothills portion of the Stanford campus[15] (Figure B.25):

- High visibility: This area covers approximately 180 acres and has a value of 6 in the sensitivity land analysis.
- Medium-high visibility: This area covers approximately 235 acres and has a value of 5 in the sensitivity land analysis.
- Medium visibility: This area covers approximately 600 acres and has a value of 3 in the sensitivity land analysis.
- Low visibility: This area covers approximately 895 acres and has a value of 1 in the sensitivity land analysis.
- Not visible: This area covers approximately 345 acres and has a value of 0 in the sensitivity land analysis.

Map source: County of Santa Clara Planning Office, 2003.



15 This map includes Felt Lake and Hetch Hetchy Aqueduct areas (total of 2,255 acres).

STEP 1
Select resource components

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STEP 2
Define classes and assign sensitivity values (sv)

↓

STEP 3
Perform overlay model

↓

STEP 4
Define sensitivity categories

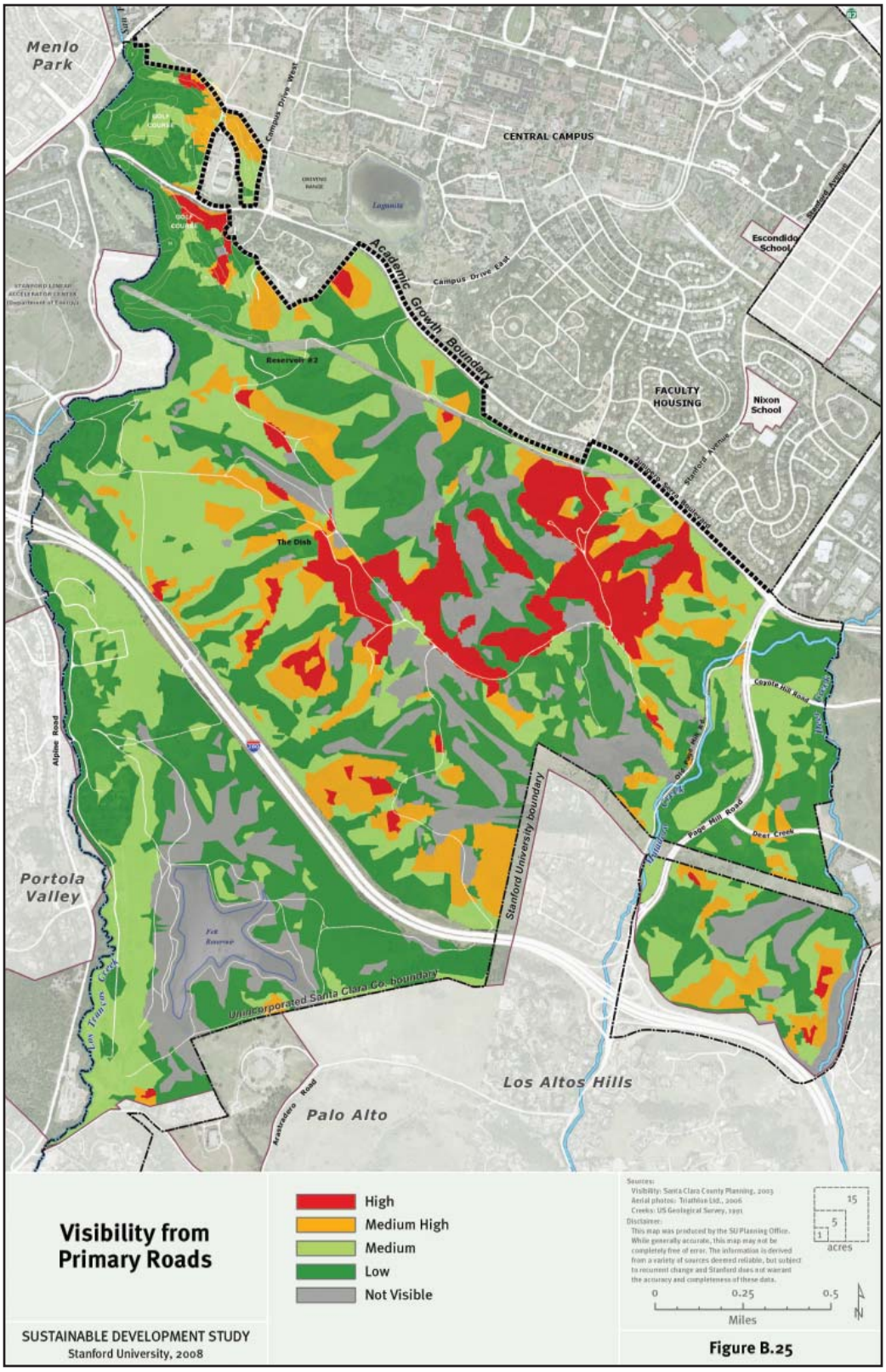

Figure B.25

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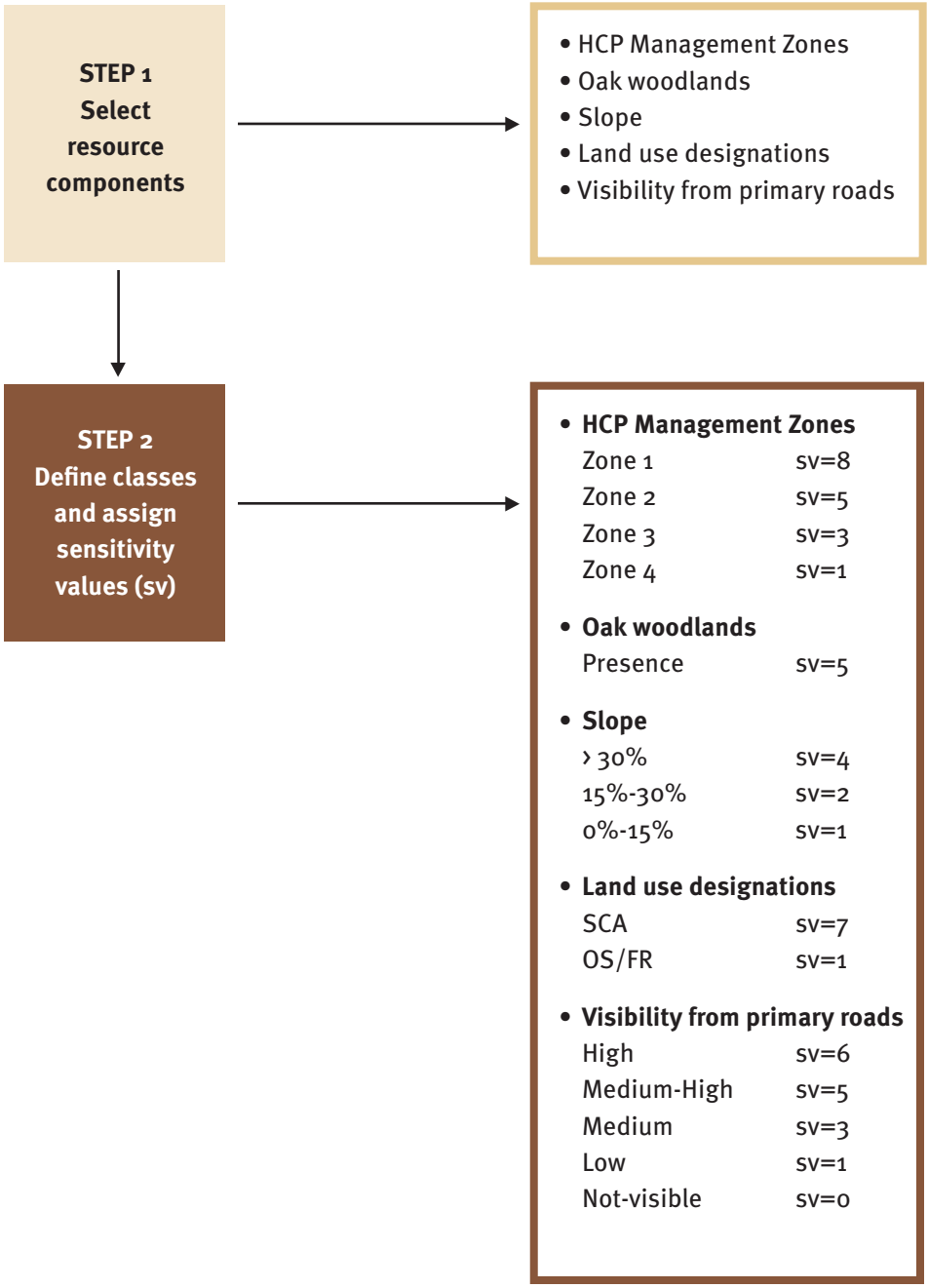
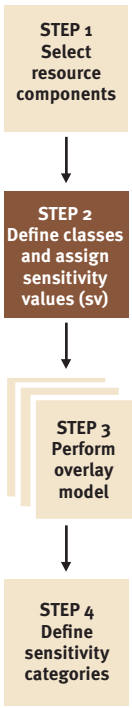
Step 2 - Classes and sensitivity values: ranking system



RANKING SYSTEM



The following criteria were used to establish the ranking system:

- When possible, classify each resource component into classes that are relevant for the study purpose.[16]
- Establish the relative importance of the classes. For example, in mapping HCP Management Zones, Zone 1 is more important than Zone 4 because Zone 1 contains higher value habitat for the covered species. Similarly, in mapping oak woodlands, areas containing existing woodlands have higher value than areas that do not contain these characteristics.
- Assign to each class a numeric value to be entered in the overlay process.
- Keep it as simple and neutral as possible.

Following these criteria, all of the above resource components were categorized into a common set of descriptive classes. For example, the slope was categorized into three planning categories; 0-15%, 15-30%, ›30%.

A numerical value from 0 (when a condition may not be present) to 8 (representing the most sensitive natural resource) was assigned to each class to reflect its relevance to land sensitivity.

The relative importance of the classes in respect to land sensitivity was assigned based on professional judgment, giving the highest sensitivity values to the most sensitive areas with respect to the conservation of natural resources. For example a value of 8 was given to the HCP Management Zone 1, which represents the areas that support one or more of the Covered Species in the HCP or provides critical resources for them.

Each component is broken into several classes to allow relative ranking of sensitivity within the component. Geographic Information System mapping is used to assign a sensitivity value to each cell that represents a 5' x 5' area of land. For example, a thematic map depicting oak woodlands would include cells with a higher value assigned to them in locations where woodlands are present and cells with a zero value assigned to them in locations where woodlands are absent.

The numerical values of all the classes were added in each cell to produce the total score of land sensitivity per cell. This simple weighting scheme was utilized to prioritize the resource components or environmental factors in a way that clearly shows relative importance with respect to the other factors.

16 Usually data are already classified and it is not possible to re-classify them for a different purpose (e.g., the HCP Habitat Management Zones are already mapped and the categories remain as defined in the draft Stanford HCP study. On the other hand, the slope is derived from the topographic data and can be classified in categories 3 or 5 depending on their application).

STEP 1
Select resource components

STEP 2
Define classes and assign sensitivity values (sv)

STEP 3
Perform overlay model

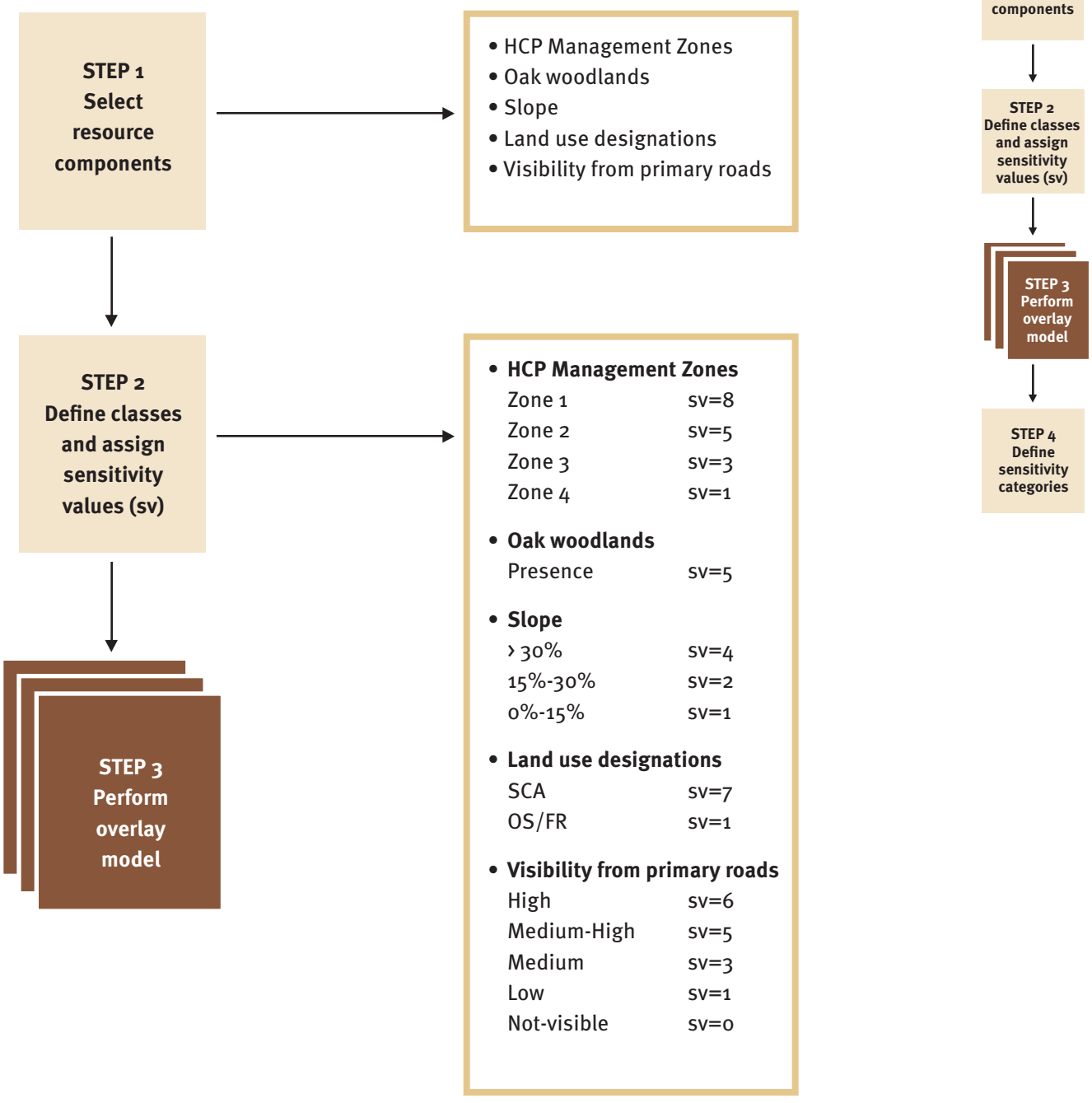
STEP 4
Define sensitivity categories

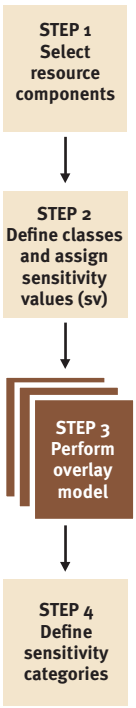
It should be noted that while this analysis assigns values to existing resources in the Protections Areas, the University did not include the Protection Areas in the final sensitivity gradient categories. Instead, these areas were included in the final land sensitivity composite map as areas that are off-limits to development. A complete description of these values is presented in Table A.1.

Table A.1 Land Sensitivity Analysis: ranking system

Environmental Factor		Ranking value								
Theme	**Class**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
HCP Management Zones	1									•
	2						•			
	3				•					
	4		•							
Oak Woodlands	YES (present)						•			
	NO	•								
Slope (%)	>30					•				
	15-30			•						
	0-15		•							
Land use Designation	SCA								•	
	OS/FR		•							
Visibility from Primary Roads	High							•		
	Medium-high						•			
	Medium				•					
	Low		•							
	Non-visible	•								

Step 3 - Overlay model





Step 3 - Perform overlay model

The individual thematic maps for each component were then combined to create one map, by adding together the sensitivity values assigned to each cell on the component maps thus creating a single sensitivity value for each 5' x 5' cell. It should be noted that this overlay method will purposely heighten certain sensitivities. For example, a cell that represents land that is located both within HCP Zone 1 habitat and within the Special Conservation Areas land use designation would receive a higher combined score than a cell that represents land that is located both within HCP Zone 1 habitat and within the OS/FR land use designation. This difference in combined value reflects that, in addition to being sensitive species habitat, there would also be the greater regulatory restrictions that would apply to a proposal to develop Special Conservation Areas land, as compared to OS/FR land.

PROJECTION

All of the data used in this study are projected in State Plane California Zone III (NAD 1983). This is a very common projection used in land analysis and the one currently used by the County of Santa Clara for spatial data.

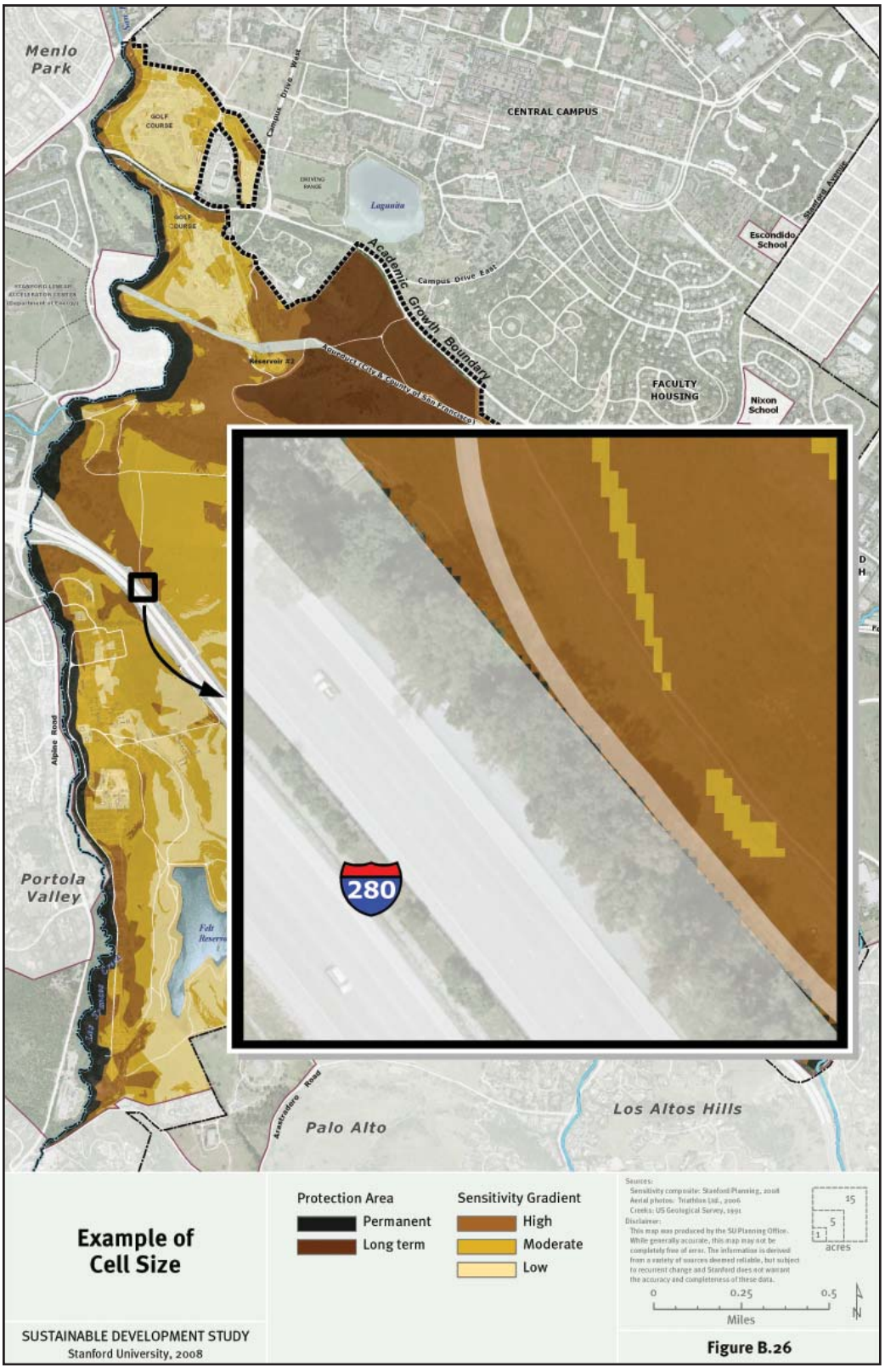
CELL SIZE

In this study, the cell size is 5'x 5'cell. There are approximately 3.9 million cells in the 2,255 acres being analyzed. This cell size was chosen because it represents a reasonably small amount of land that could be disturbed, for example, by an antenna base. (Figure B.26). [17]

SOFTWARE

A computer-based GIS model was designed to contain digital data about the Foothills, perform analyses, and produce maps and tabular information. The GIS program used to perform these analyses is ArcMap 9.2 produced by the Environmental Systems Research Institute (ESRI).[18] Some of the spatial operations performed in this analysis included deriving slope from topography, intersecting thematic spatial features, and reclassifying and aggregating classes.

17 The power of today's computers makes analysis at this resolution practical.
18 ESRI of Redlands, California, provides the GIS software used for spatial analysis in both application and research of land management and marine environments www.esri.com.



STEP 1
Select resource components

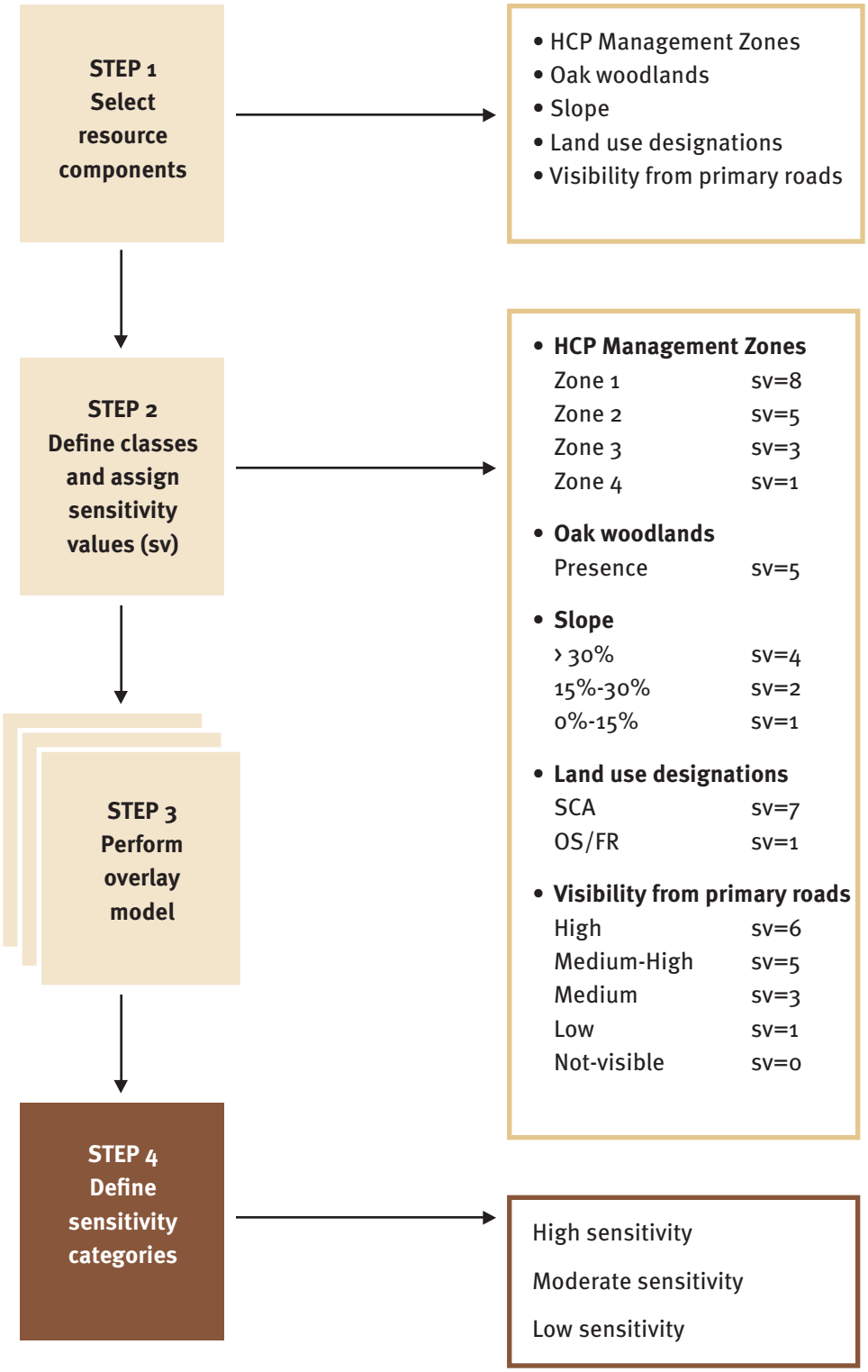
STEP 2
Define classes and assign sensitivity values (sv)

STEP 3
Perform overlay model

STEP 4
Define sensitivity categories

Figure B.26 Example of cell size

Step 4 – Define sensitivity categories

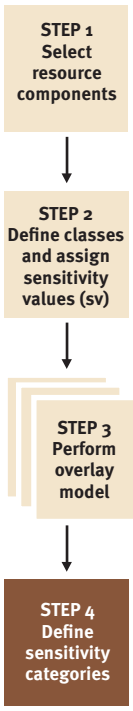


The following criteria were used to define the sensitivity categories:

- Use a logical number of categories to divide the results of the analysis
- Break the classes into sensitivity characteristics

Overlaying the various values for the five resource components forms 240 possible combinations. To provide a useful tool, three categories were established to provide relative sensitivities.

The sum of each combination ranges from a score of 3 to 30 per cell. The final sum for each cell, obtained by the overlay process, was used to place the cell into one of the following sensitivity categories: LOW, MODERATE, and HIGH.[19] Analysis of the data showed a relevant change in the sensitivity characteristic between the category values of 7-9 and between the category values of 12-14. Based on these groupings, the following categories were established:



CATEGORY	LOW SENSITIVITY	MODERATE SENSITIVITY	HIGH SENSITIVITY
VALUE RANGE	3-7	8-12	13-30

- The high sensitivity category contains cells with sum values of 13-30. With only a few exceptions, a sum of 13 or higher requires that at least two of the five factors are assigned the maximum class value, e.g., an HCP Management Zone with sensitivity value of 8 and a slope value of 4.
- The moderate sensitivity category contains cells with sum values of 8-12. The cells in this category represent a varied combination of environmental conditions. Some have the maximum class value in one factor and low class values in the others, while other cells have mid-range values in all the classes.
- The low sensitivity category contains cells with sum values of 3-7. Inclusion in this category indicates that none of the environmental factors is assigned the maximum class value, with a few exceptions. The low sensitivity area includes HCP zones with sensitivity values of 3 or 1, have an OS/FR land use designation, and are not highly rated visually.

19 For overlay analysis, when numeric scores are applied, three categories are usually appropriate to represent the analysis.

LAND SENSITIVITY COMPOSITE RESULTS

This study identifies and ranks the land sensitivity in the Foothills using parametric values for several environmental factors. The results of the analysis of Protection Area and composite of land sensitivity categories are shown in Table B.2 and B.3 and Figure B.27. The composite map of the Protection Areas and land sensitivity components resulting from the spatial overlay of environmental factors is presented in Figure B.28.

Table B.2 Protection Areas

TYPE	TIME	LOCATION	AREA (ACRES)	FOOTHILLS PERCENTAGE
Conservation easement	Permanent protection	Los Trancos/San Francisquito creeks; Matadero/Deer creeks	140	6%
Conservation reserve (50 years)	Long-term protection	California tiger salamander habitat	315	14%
		Total[20]	**455**	**20%**

Table B.3 Land sensitivity areas – Areas of Potential Development

CATEGORY	AREA (ACRES)	FOOTHILLS PERCENTAGE
High sensitivity	575	26%
Moderate sensitivity	760	34%
Low sensitivity	420	19%
Total[20]	**1,755**	**79%**

20 Of the 2,210 acres of land analyzed, Felt Lake, approximately 30 acres and Hetch Hetchy Aqueduct, approximately 10 acres are not included in the analysis.

- The most critical areas for the conservation of natural resources (Protection Areas) cover approximately 455 acres, about 20 percent of the Foothills. Under the Stanford HCP, development of this area will be restricted either permanently (6 percent) or for the 50-year life of the Stanford HCP (14 percent).

Approximately 26 percent of the land is ranked High sensitivity. The highly sensitive areas typically represent high values in at least two of the resources components such as HCP Management Zone 1 and presence of oak woodland. Examples of environmental factors combined in this category are:

High Sensitivity

HCP-Zone 1(8)	Oak w. (5)	Slope 0-15% (1)	SCA (7)	Visibility high (6)	**Total= 27**
HCP-Zone 1(8)	Oak w. (5)	Slope ›30% (4)	OS/FR (1)	Visibility med-high (5)	**Total= 23**
HCP-Zone 1(8)	No oak (0)	Slope 0-15%(1)	SCA (7)	Visibility medium (3)	**Total= 19**

The Moderate sensitivity area covers approximately 34 percent of the land and it represents a varied combination of environmental conditions, frequently having one resource component with the highest rank. Examples of environmental factors combined in this category are:

Moderate Sensitivity

HCP-Zone 4 (1)	Oak w. (5)	Slope 15-30% (2)	OS/FR (1)	Visibility low (1)	**Total= 10**
HCP-Zone 2 (5)	No oak (0)	Slope 15-30% (2)	OS/FR (1)	Visibility medium (3)	**Total= 11**
HCP-Zone 3 (3)	No oak (0)	Slope 15-30% (2)	SCA (7)	Not Visible (0)	**Total= 12**

Approximately 19 percent of the Foothills land is ranked Low sensitivity. These areas have low values of habitat, usually HCP Zone 3 or 4, no oak woodlands and no steep slopes. Examples of environmental factors combined in this category are:

Low Sensitivity

HCP-Zone 4 (1)	No oak (0)	Slope 0-15% (1)	OS/FR (1)	Visibility low (1)	**Total= 4**
HCP-Zone 3 (3)	No oak (0)	Slope 0-15% (1)	OS/FR (1)	Not visible (0)	**Total= 5**
HCP-Zone 3 (3)	No oak (0)	Slope 0-15% (1)	OS/FR (1)	Visibility low (1)	**Total= 6**

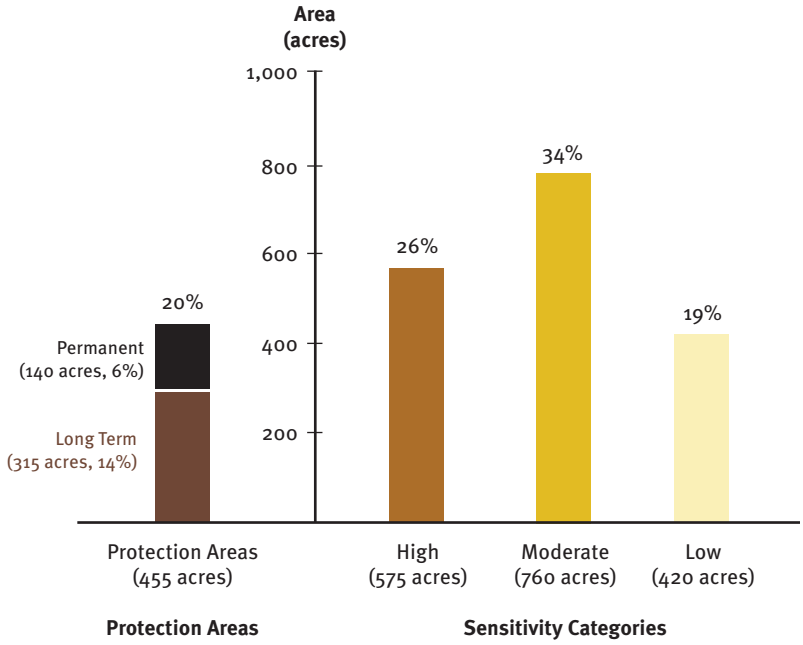


Figure A.27 Protection Areas and Land Sensitivity Summary Chart [21]

With the exception of the High sensitivity areas located in the riparian corridors, the spatial distribution of these categories shows the following regions of predominant land sensitivity (Figure B.28):

High land sensitivity in the areas located:

- Between Junipero Serra Blvd. and the Dish's ridgeline[22]
- Between Junipero Serra Blvd. and Coyote Hill Road
- Between Deer Creek Road and I-280

Moderate land sensitivity in the areas located:

- Between the Dish area's ridgeline and I-280
- Between Coyote Hill Road and Deer Creek Road

Low land sensitivity in the areas located:

- South of I-280
- Between the Academic Growth Boundary and northwest of Hetch Hetchy Aqueduct (current golf course area only)

21 Felt Lake, approximately 30 acres, and Hetch Hetchy Aqueduct, approximately 10 acres, are not included in the analysis. These areas add to a total of 2,255 acres.
22 With the exception of the golf course area

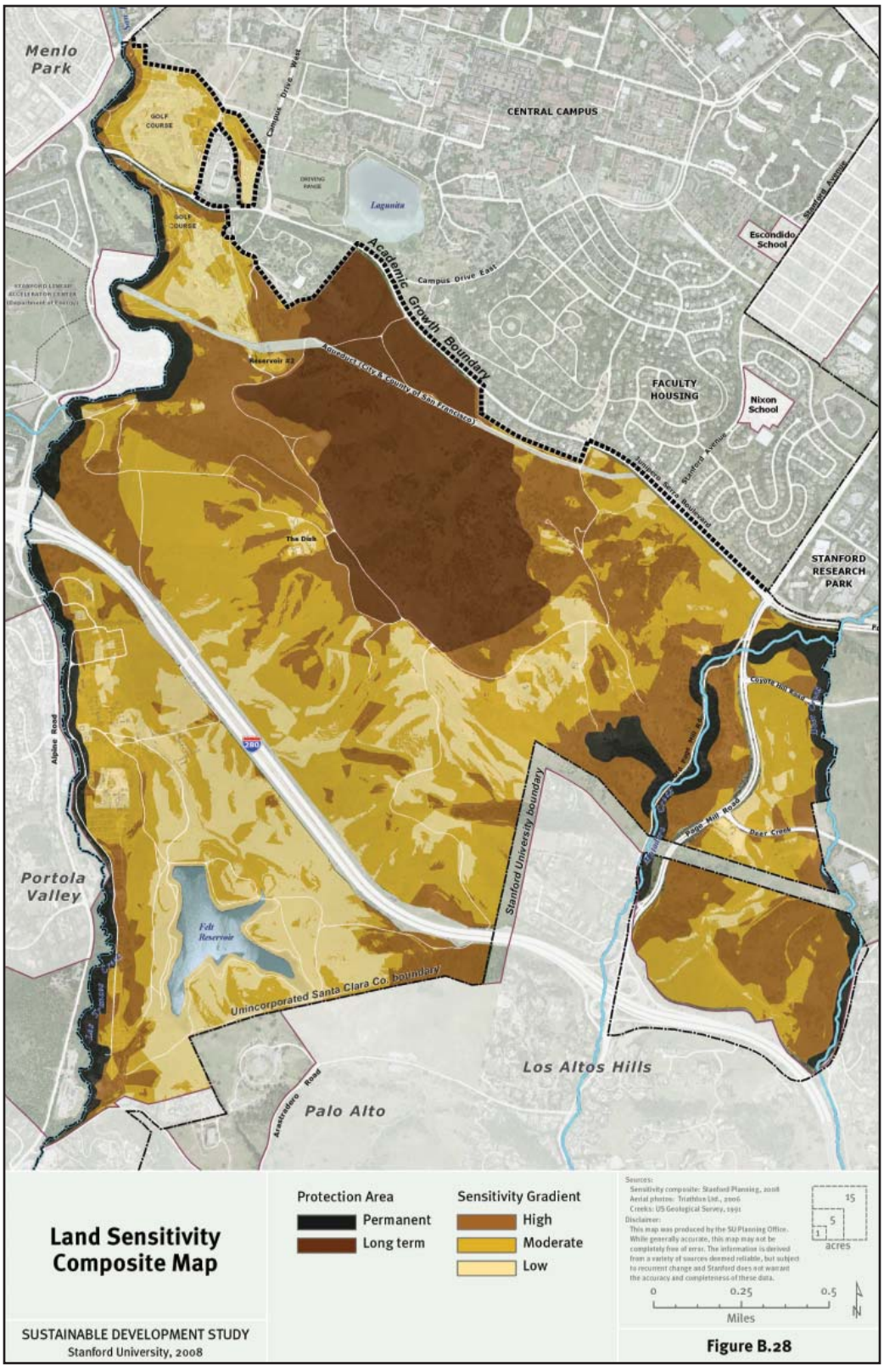

Menlo Park
CENTRAL CAMPUS
GOLF COURSE
Campus Drive West
Lagunita
Academic Growth Boundary
Campus Drive East
Escondido School
Stanford Avenue
Reservoir #2
Approved Extra Territorial Boundary (City & County of San Francisco)
FACULTY HOUSING
Nixon School
Junipero Serra Boulevard
The Dish
STANFORD RESEARCH PARK
Coyote Hill Road
Alpine Road
280
Stanford University boundary
Page Mill Road
Bear Creek
Portola Valley
Felt Reservoir
Unincorporated Santa Clara Co. boundary
Los Altos Hills
Arastradero Road
Palo Alto
Land Sensitivity Composite Map
Protection Area
Permanent
Long term
Sensitivity Gradient
High
Moderate
Low
Sources:
Sensitivity composite: Stanford Planning, 2008
Aerial photos: Triathlon Ltd., 2006
Creeks: US Geological Survey, 1991
Disclaimer:
This map was produced by the SU Planning Office. While generally accurate, this map may not be completely free of error. The information is derived from a variety of sources deemed reliable, but subject to recurrent change and Stanford does not warrant the accuracy and completeness of these data.
15
5
1
acres
0
0.25
0.5
Miles
N
SUSTAINABLE DEVELOPMENT STUDY
Stanford University, 2008

Figure B.28

The result of this analysis can be used in aggregated form as presented in Figure B.28 to inform broader, planning- level decisions about the use of Foothills lands, such as identifying areas that might be suitable for uses that require a remote setting but that should not be located near sensitive environmental resources. For example, agricultural land uses generally do not need to be located in High sensitivity areas.

It is also possible to use this analysis to identify each of the sensitivities and values assigned to each specific 5'x 5' cell. This finer level of detail could be used when siting an individual structure, such as a research field station or an antenna. These types of uses might need to be located in areas with high or moderate sensitivities, but the analysis can be used to identify specific sites that are designed to avoid environmental harm. Therefore, the information produced by this analysis may be used by both County of Santa Clara and Stanford University planners when factoring resource conservation into the initial decision-making processes.

The Sensitivity Analysis initially will be used by Stanford University to determine whether a development project should be proposed in the Foothills and, if so, where the development project could be sited to avoid or minimize effects on sensitive resources. the University would then submit the proposal to the County of Santa Clara for its review, as occurs for all development proposed under the GUP. For projects proposed in the Foothills, the County of Santa Clara would determine whether the proposed use was consistent with the 2000 GUP limitations and the applicable zoning. The County of Santa Clara also would undertake the visual analysis specified in the OS/F zoning and determine whether the environmental impacts of the project have been addressed in the GUP EIR. This determination would take into account project-specific visual analyses, as well as the specific characteristics of the proposed development project and its setting. The County of Santa Clara would have the information in the Sensitivity Analysis to assist in its review, but the County of Santa Clara would also conduct further site-specific investigation to the extent it determines such investigation is needed.

Generally, the County of Santa Clara review would be conducted through the Architectural and Site Approval Committee process. If an initiative were to require an amendment to the GUP or a change in County of Santa Clara land use regulation or policy, action would be required by the County of Santa Clara Planning Commission and/or Board of Supervisors.

The Sensitivity Analysis is only one step in an internal university review and approval process. Before planners begin to evaluate sites, academic officers (president, provost, and deans) must approve any initiative as essential to the academic mission and functioning of the University (Figure B.29). All projects and changes in land use must be approved by the Stanford University Board of Trustees. After a potential site is identified through the Sensitivity Analysis, other operational and programmatic factors are evaluated. Factors evaluated would include but not be limited to infrastructure needs and availability, traffic and access, proximity, and affinity to other programs and facilities. A hypothetical case study, applying the Sensitivity Analysis, follows.

Hypothetical Case Study

INTRODUCTION

A case study has been developed for inclusion in this appendix to describe the planning and approval process for facilities that would be located in the Foothills. This case study involves a future hypothetical academic facility.

For this case study, it is assumed that the academic officers have reviewed the program request and decided that the proposed program is consistent with academic priorities. At that point, Stanford University planners would normally identify appropriate alternative sites after considering all 8,000 acres of Stanford lands. However, in order to demonstrate how the Sensitivity Analysis for unincorporated County of Santa Clara would be used, alternative sites for this facility have been identified only in the Foothills.

The case study concludes with site-specific information for three alternative sites. Were this an actual project, the next planning steps would involve selection of a preferred site, development of plans specific to the site, and development of resource protection measures. Following internal university approval, the proposed project would be submitted to the County of Santa Clara for processing and consideration. The County of Santa Clara would either approve the project with conditions or deny it (Figure B.29).

PROGRAM REQUIREMENTS

The Center for Environmental Product and Field Testing (CEPFT) is a hypothetical program initiative providing a research and development facility, and a site to test products and innovations in the field of energy, water, and food management. Internationally solicited program initiatives would be received by the CEPFT, with priority given to projects that work toward products aimed to manage and reduce the decline of natural resources.

Facility description: Laboratory and support facilities to test products or programs

- A 5,000 - gsf building, partially below- grade, built to high-performance standards for resource conservation and management (e.g., construction of building-contained water management program or on-site waste management program and self-contained energy recycling).
- A portion of the facility would need to include a laboratory with near vibration-free conditions, as well as a total dark facility, a plant growth facility, a set of product design stations, and a product development prototype shop.
- Testing of products could generate noise, use air space above the project site, and/or contain some “high security” aspects, limiting access to and from public corridors.

Site: 10 acres for field research uses and testing area

- Programs may need access to varied terrain (e.g., robotic transfer pods or dry food production on steep slopes for projects associated with plant research in micro-climatic and localized growth habits).

Hypothetical Case Study

SITE CONSIDERATIONS

Based on the program requirements there are three key site considerations required to sustain this program:

1. Sound mitigation

As the testing would generate noise, the site should be located at an appropriate distance from the surrounding communities to avoid this impact. Locating the facility at a minimum distance of 1,000 feet, from potential adjacent communities would assure that the communities would not have a sound impact in average weather pattern. Sound levels would be 50 decibels at this distance. The following communities are included in the analysis:

- Cities: Los Altos Hills, Portola Valley, Menlo Park
- Stanford Districts: West Campus, Lagunita, San Juan, Lathrop
- Stanford Research Park

2. Vibration control

As the testing needs to be free of external vibration, the site would avoid any unstable slope areas and be located not closer than 300 feet from the highways and major roads to avoid potential vibration produced by large trucks. The following roads are included in the analysis:

- I-280
- Page Mill Road
- Deer Creek Road
- Coyote Hill Road
- Sand Hill Road
- Alpine Road
- Arastradero Road
- Junipero Serra Boulevard

3. Varied terrain

As the experiments could require different terrain, the field area will have a combination of slope ranges.

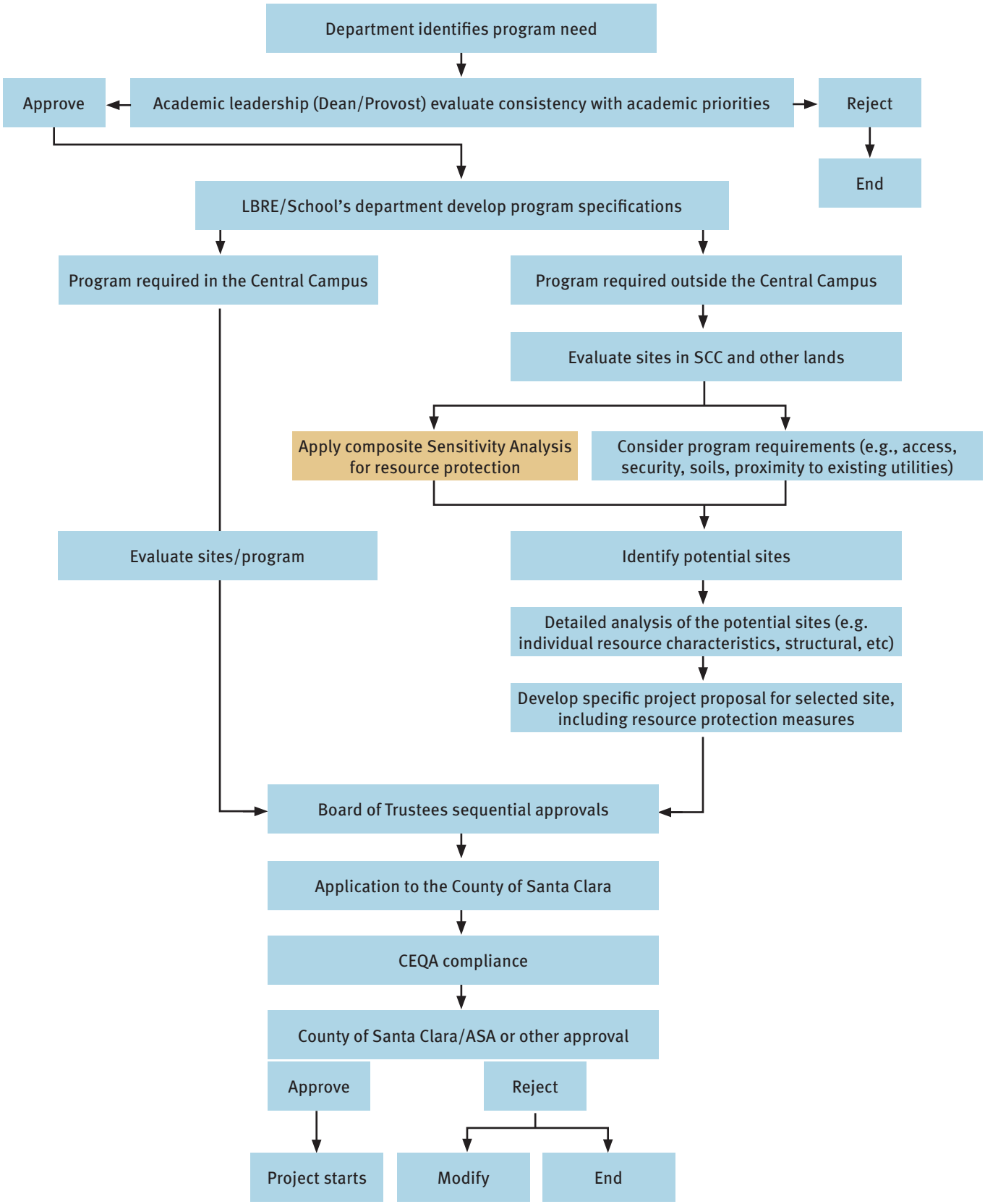


Figure B.29 Planning process for siting academic facilities

Hypothetical Case Study

POTENTIAL SITES

The potential sites are selected by considering the following:

- Foothills planning principles
- Land sensitivity composite map for resource protection
- Program requirements

FOOTHILLS PRINCIPLES

- Protect and enhance natural resources
- Avoid development in high sensitive areas unless a specialized program use has unique siting requirements
- Maintain flexibility to accommodate current and future University needs

LAND SENSITIVITY COMPOSITE MAP

This composite Sensitivity Analysis uses the analysis previously described in this appendix (Figure B.28).

Hypothetical Case Study

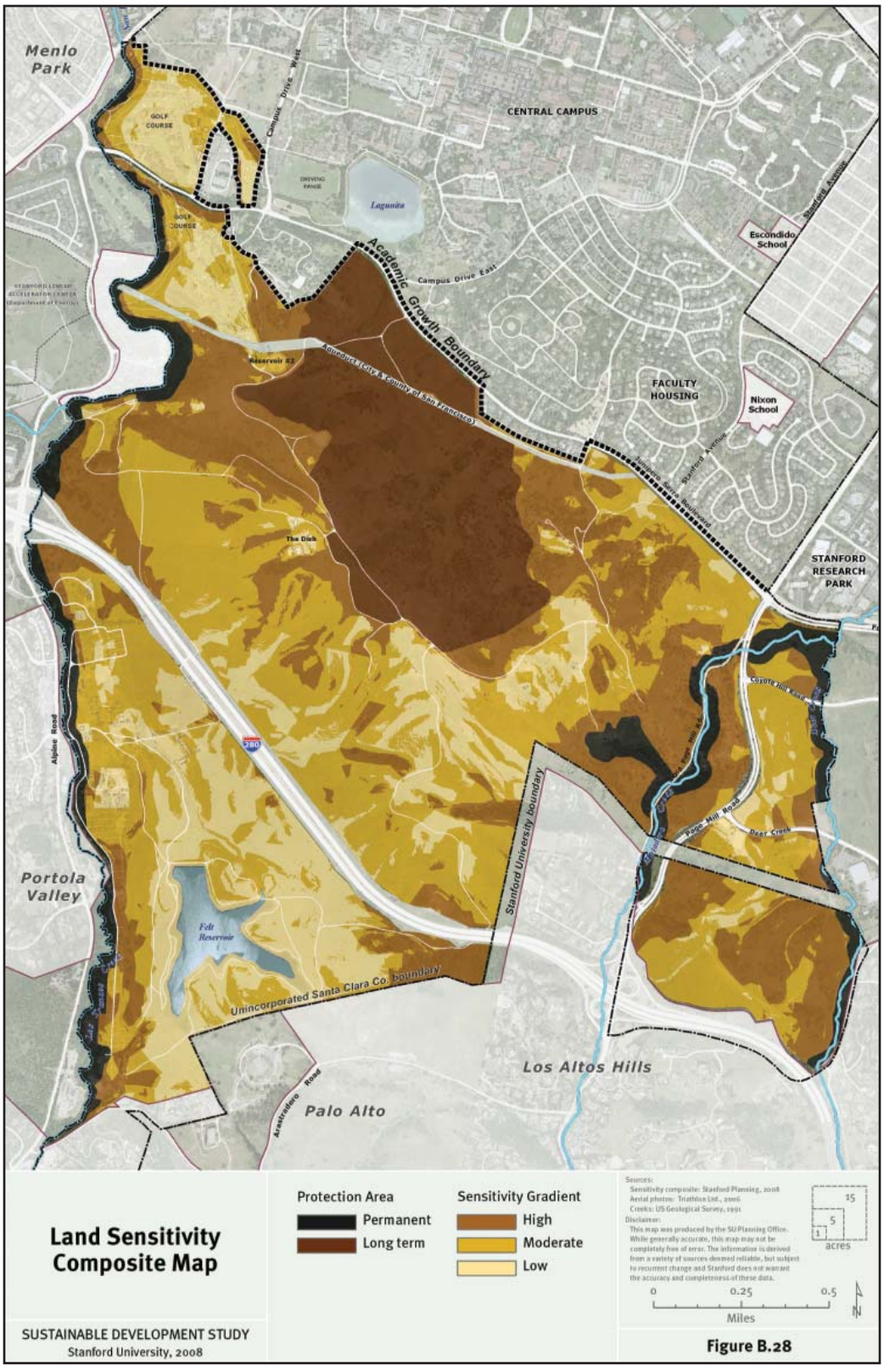


Figure B.28

Hypothetical Case Study

PROGRAM SITE CONSIDERATIONS

- To mitigate sound from the facility, any potential site should be a distance of 1,000 feet from the edge of the surrounding communities (Figure B.30).
- To avoid any vibration, the site should be at least at 300 feet from major roads and avoid any areas of unstable slopes (Figure B.30).
- Site is to include a varied terrain (Figure B.31).

Figure B.30

Hypothetical Case Study

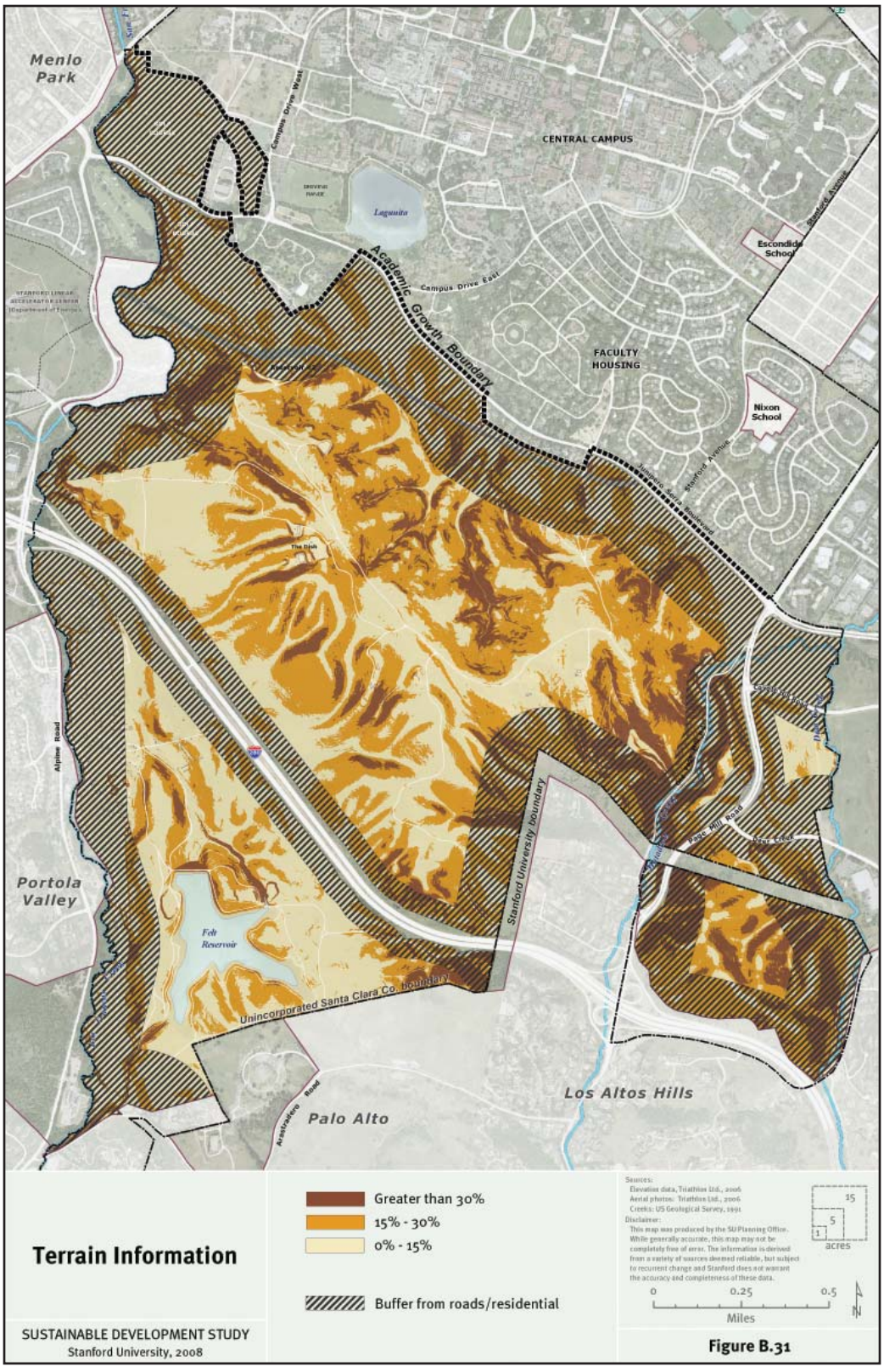


Figure B.31

Hypothetical Case Study

The next step is to identify several potential locations that would fulfill the program requirements (i.e., 10 acres in a varied terrain, without external vibration), while also resulting in relatively low impacts to the land resources and to the surrounding community. For this case study, three locations have been sited in areas that have mostly moderate and low sensitivity characteristics (Figure B.32).

Each circle represents approximately 15 acres of land, within which 10 acres for the project could be located.

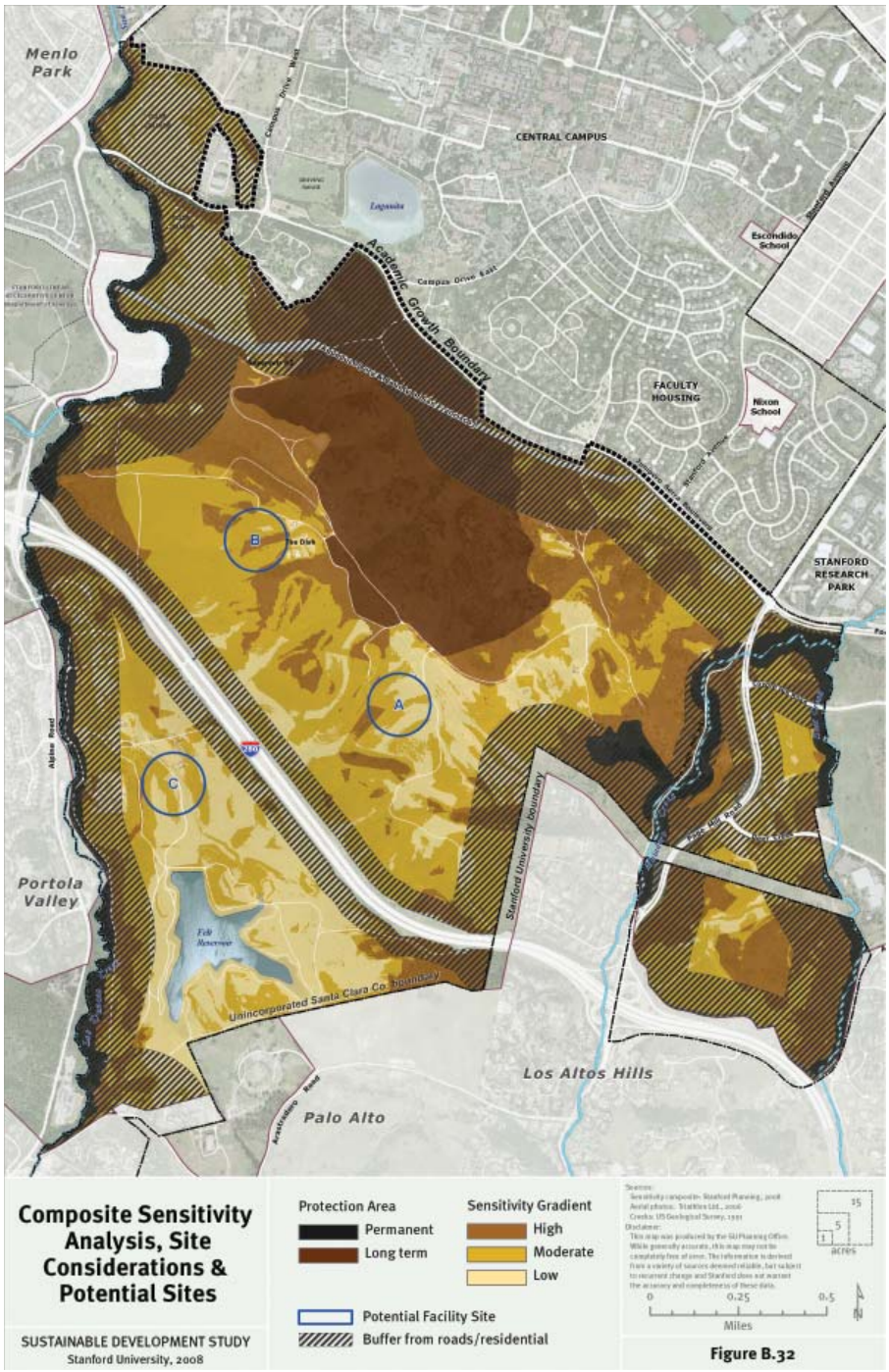


Figure B.32

Table B.4 Existing conditions of potential sites

SITE LOCATION	SPECIFIC SENSITIVITY EVALUATION	
SITE A	**Protection Areas**	Site is not located in the Protection Areas.
	HCP Management Zones	Site is mostly in HCP Zone 3.
	Oak Woodlands	There is a very small patch of oak woodland at the edge.
	Slope	Wide range of terrain (From 0 to >30% slopes)
	Land use Designation	Current zoning is Open Space/Field Research
	Visibility from Primary Roads	Site located on mostly Not visible and Low visibility areas with minimum representation of “Medium” and “Medium-High” categories
SITE B	**Protection Areas**	Site is not located in the Protection Areas.
	HCP Management Zones	Site is mostly in HCP Zone 2.
	Oak Woodlands	There is a very small patch of oak woodland at the edge.
	Slope	Wide range of terrain (From 0 to >30% slopes)
	Land use Designation	Current zoning is Open Space/Field Research
	Visibility from Primary Roads	Site located on Low visibility, Medium and Medium-High” categories

Hypothetical Case Study

SITE LOCATION	SPECIFIC SENSITIVITY EVALUATION	
SITE C	**Protection Areas**	Site is not located in the Protection Areas.
	HCP Management Zones	Site is mostly in HCP Zone 3 (Zone 2 present).
	Oak Woodlands	No presence of oak woodland
	Slope	Wide range of terrain (From 0 to >30% slopes)
	Land use Designation	Current zoning is Open Space/Field Research
	Visibility from Primary Roads	Site located mostly on Low visibility areas with minimum representation of Medium and Not visible categories

The following pages present the six themes considered in the analysis with the location of the potential sites (Figures B.33 to B.38).

As the introduction and flow chart (Figure B.29) describe, planners would conduct additional operational and programmatic analysis to identify a single preferred site. Plans for the development of facilities and the site would be prepared along with measures to reduce any adverse effects of the development. A proposal would be carried forward for approval by the University, further assessment, evaluation, consideration, and possible approval by the County of Santa Clara.

Hypothetical Case Study

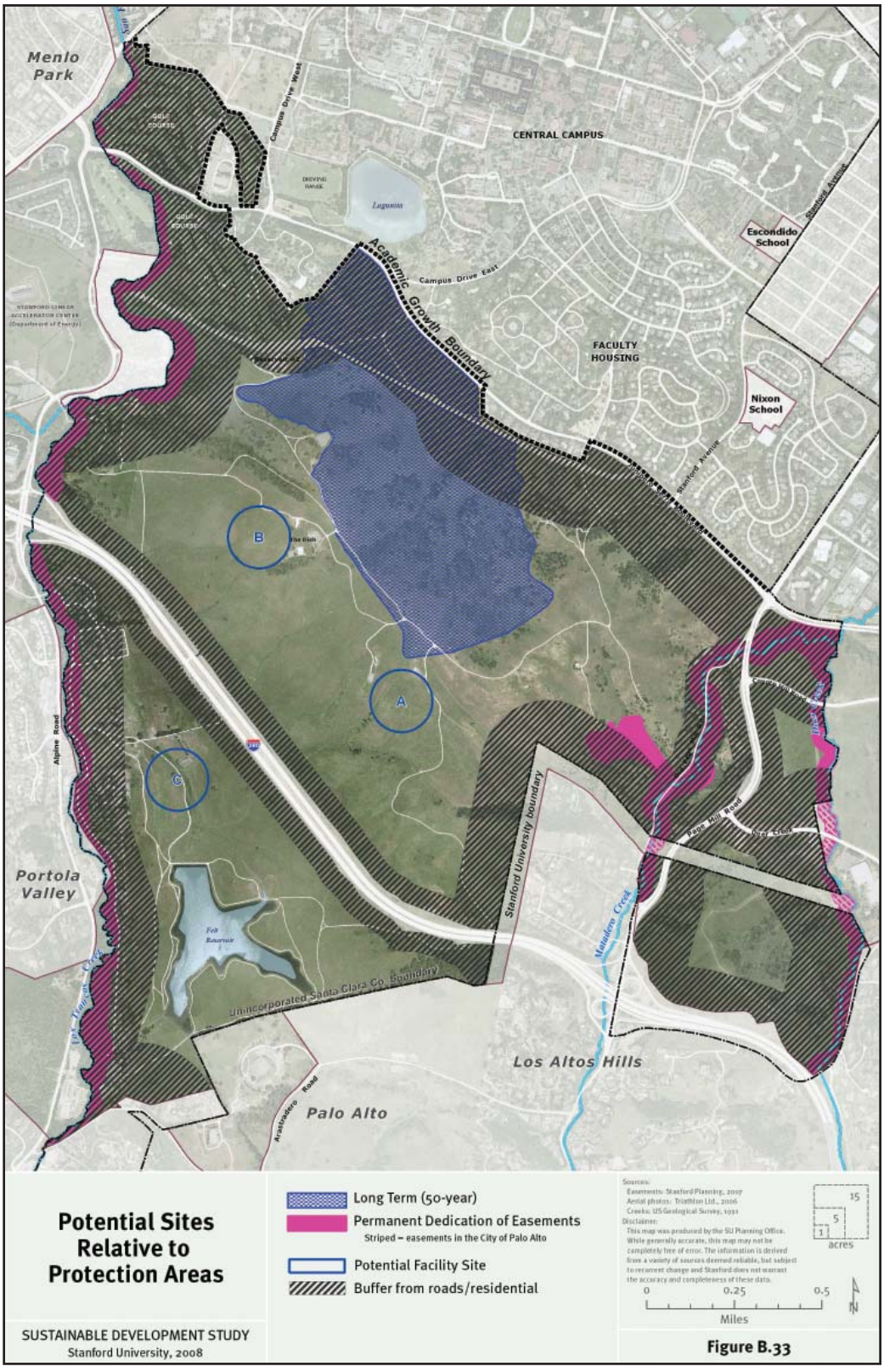


Figure B.33

Hypothetical Case Study

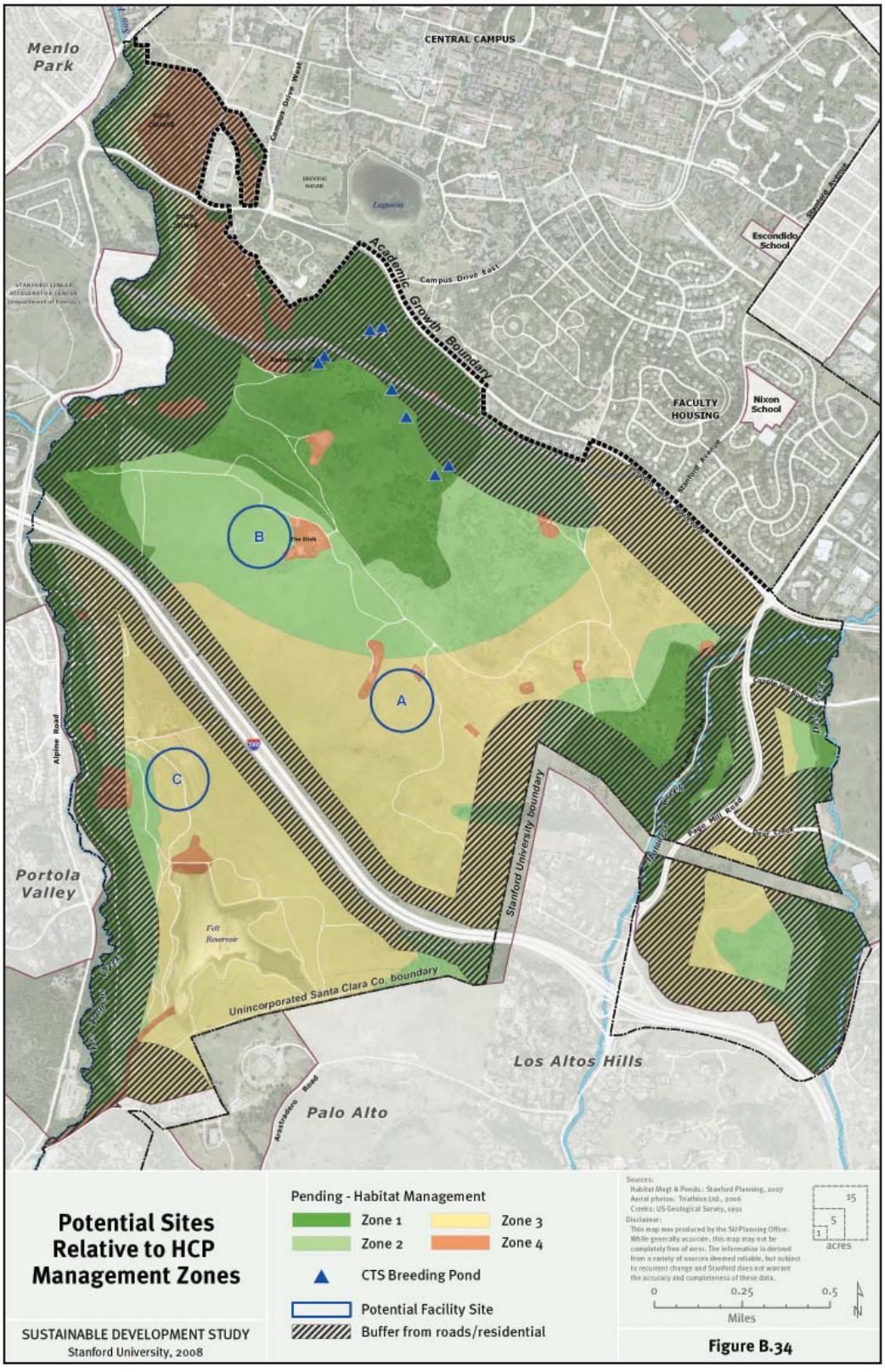
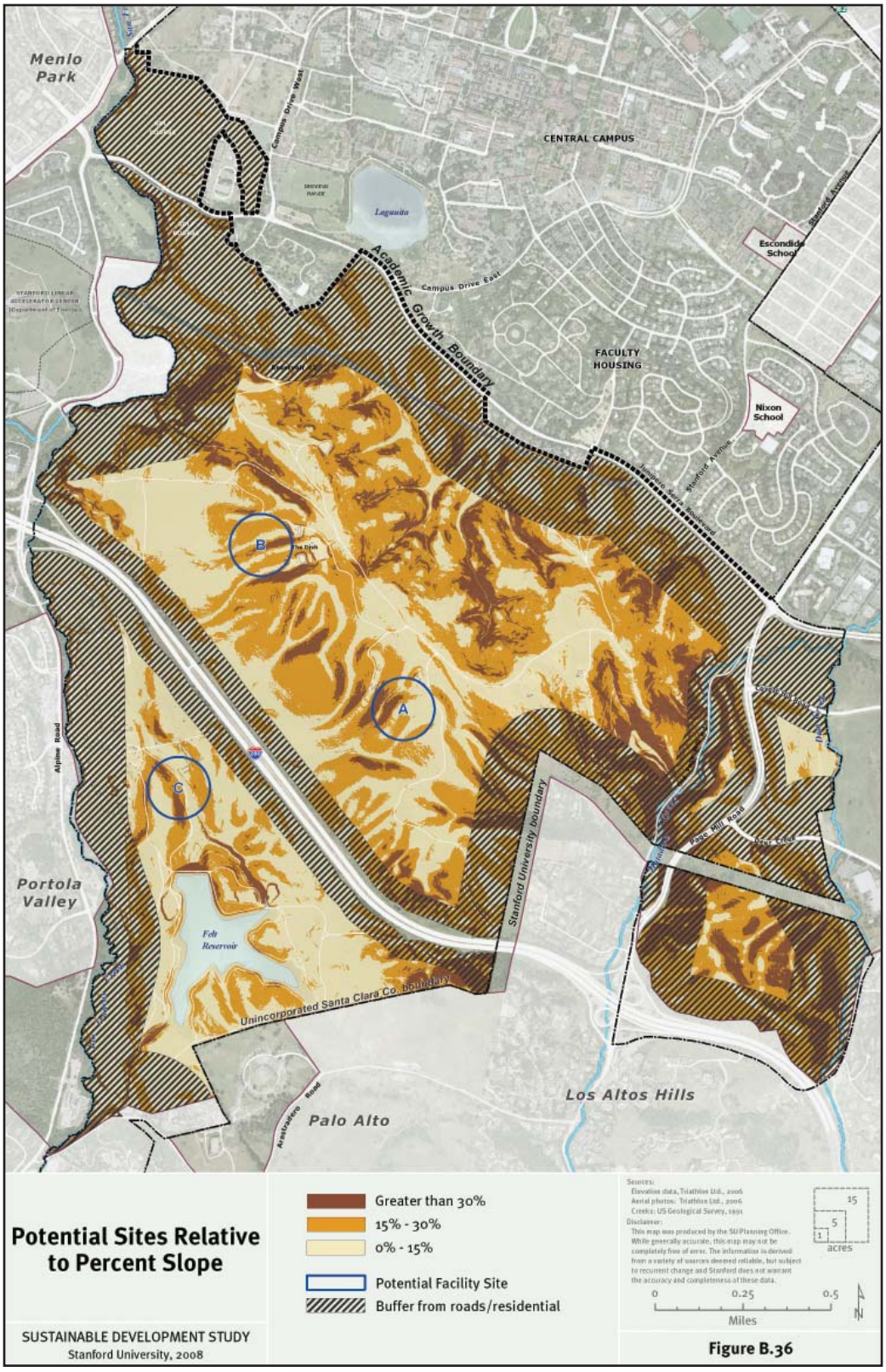


Figure B.34

Hypothetical Case Study

Figure B.35

Hypothetical Case Study



Hypothetical Case Study

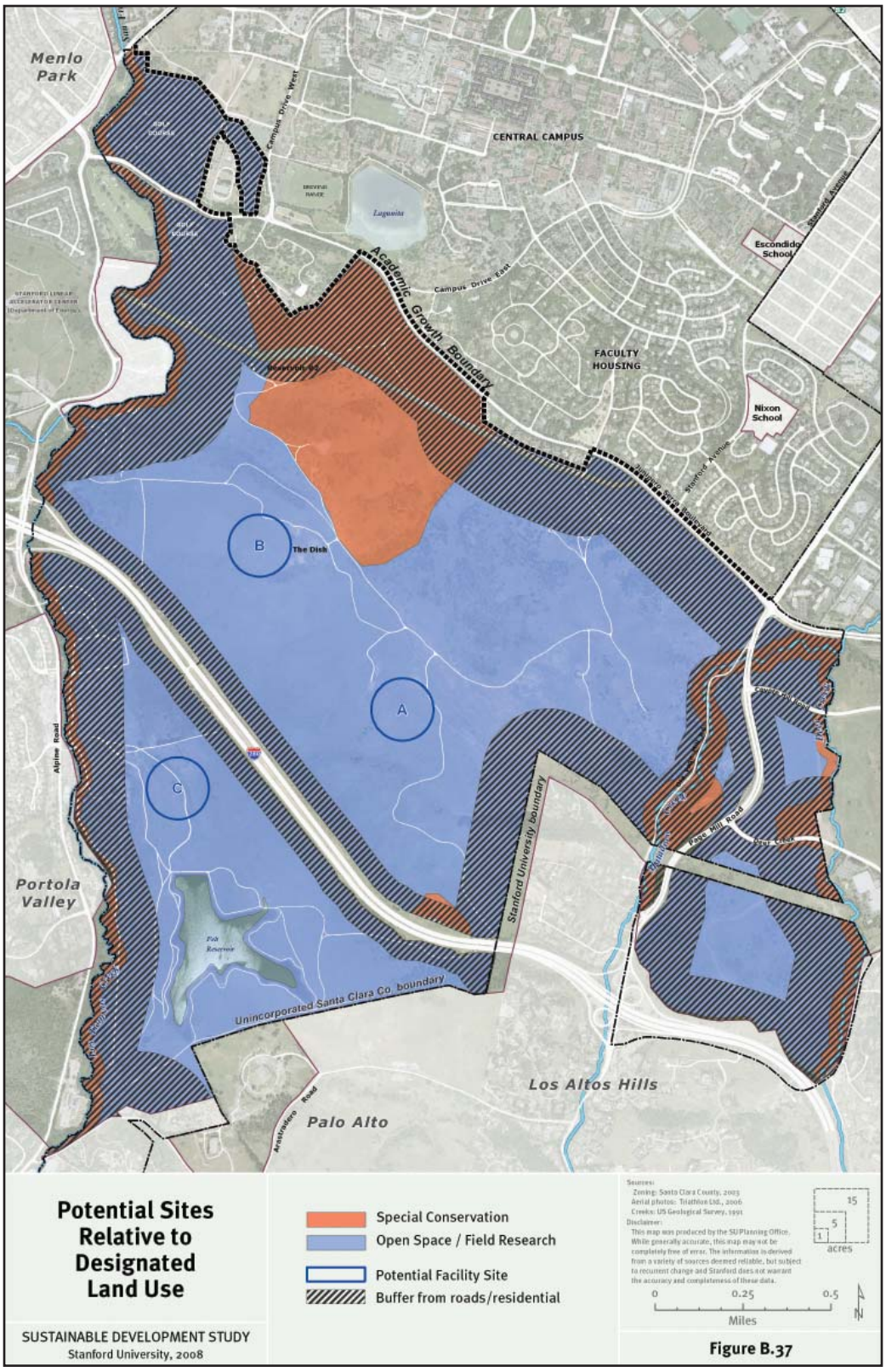


Figure B.37

Hypothetical Case Study

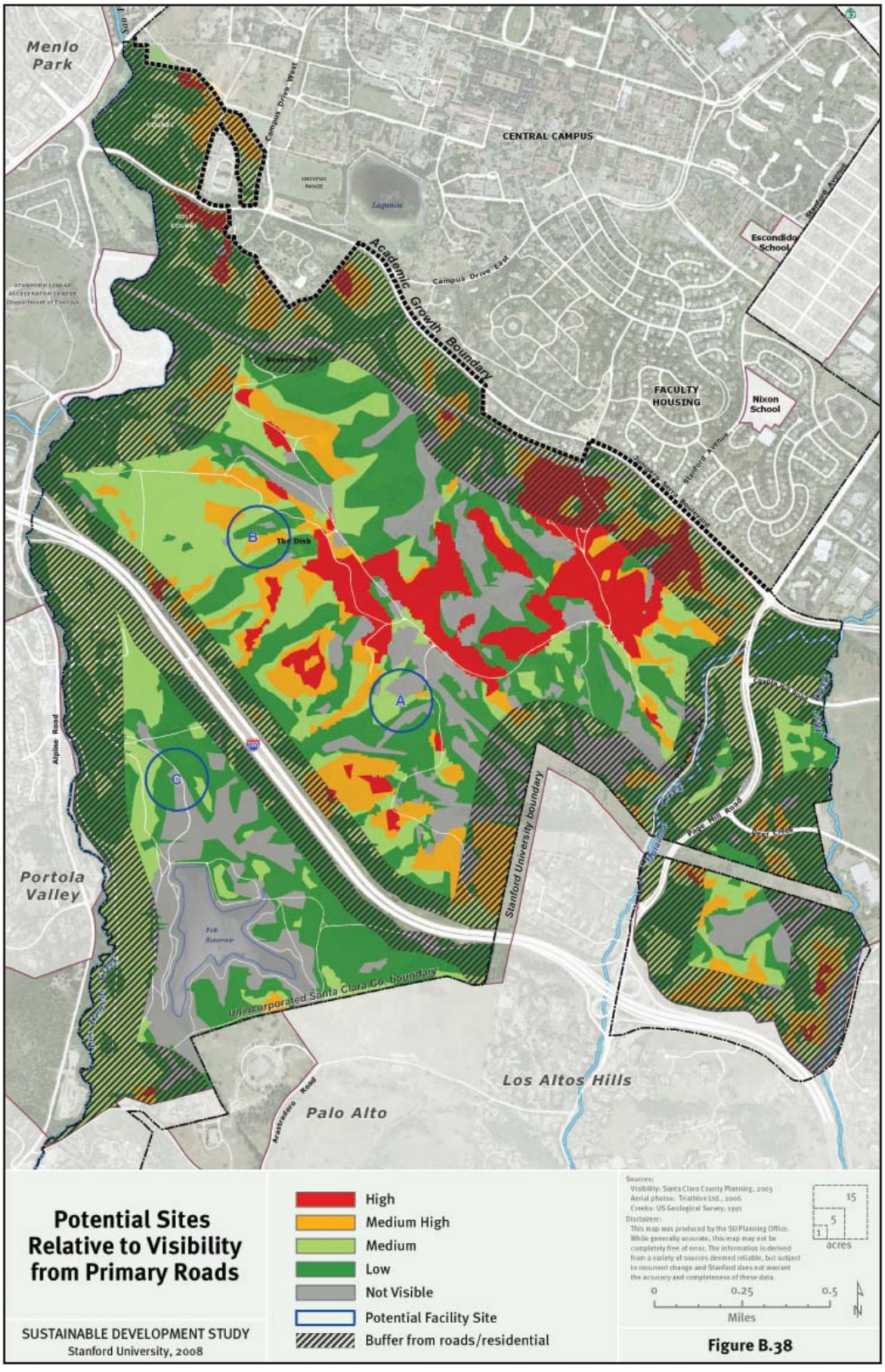
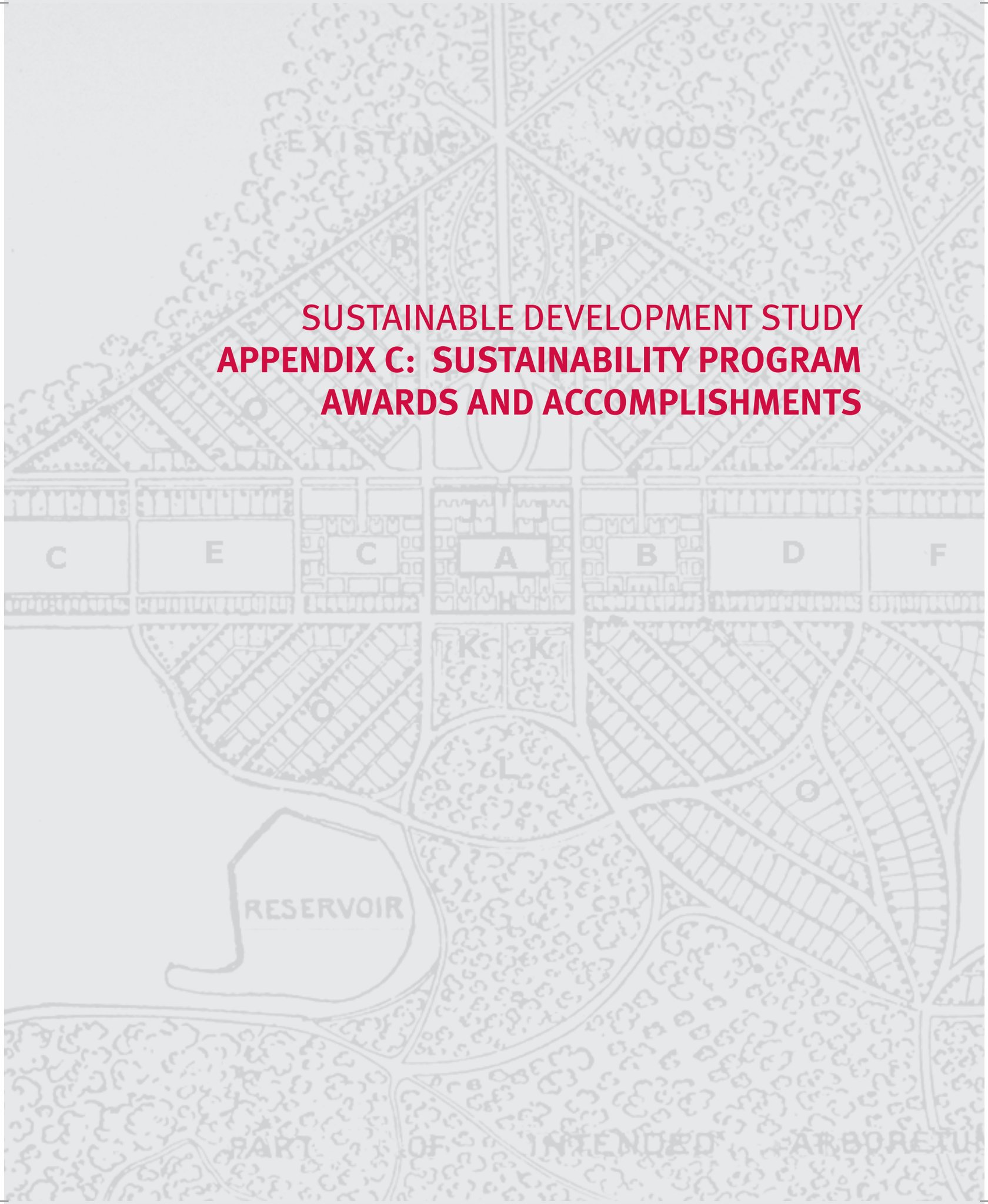


Figure B.38

SUSTAINABLE DEVELOPMENT STUDY

APPENDIX C: SUSTAINABILITY PROGRAM AWARDS AND ACCOMPLISHMENTS



Appendix C: Sustainability Programs Awards and Accomplishments

Overall College Sustainability Leader

Stanford has scored in the top tier of the most recognized nationwide study of sustainability practices on college campuses. Only 15 of the 300 colleges and universities studied including Stanford earned the title "overall college sustainability leader" in the 2009 College Sustainability Report Card. The report is released annually by the Sustainable Endowments Institute in Cambridge, Mass., and is a special project of Rockefeller Philanthropy Advisors.

TRANSPORTATION

- Best Workplaces for Commuters, U.S. Environmental Protection Agency (EPA)/Center for Urban Transportation Research at the University of Florida (2002–07)
- Green Business Award for the Stanford Fleet Garage from the County of Santa Clara for dedication and commitment to environmentally responsible operations (2004-07)
- Association for Commuter Transportation Leadership Award for non-elected individual or private organization (2006)
- Best of Universities and Colleges and Gold Prize for Transportation Coordinator, EPA/ Department of Transportation Best Workplaces for Commuters' Race to Excellence (2006)
- "Top 50" Award for Regional Transportation Initiative employer, Bay Area Council (2004)
- Business Environmental Award, Commute and Transportation category, Acterra (2004)
- Clean Air Award, American Lung Association of the Bay Area (2003)
- Bicycle Friendly Community Recognition, League of American Bicyclists (2003)

GREEN BUILDING

- Best Green Building in the Bay Area, San Francisco Business Times, March 2008 (Y2E2)
- "A" for Green Building, Sustainable Endowments Institute College Sustainability Report Card (2007 and 2008)
- Top 10 Green Projects, American Institute of Architects Committee on the Environment (Jasper Ridge, 2005)
- Energy and Sustainability Award, American Institute of Architects, San Francisco Chapter (Jasper Ridge, 2005)

ENERGY

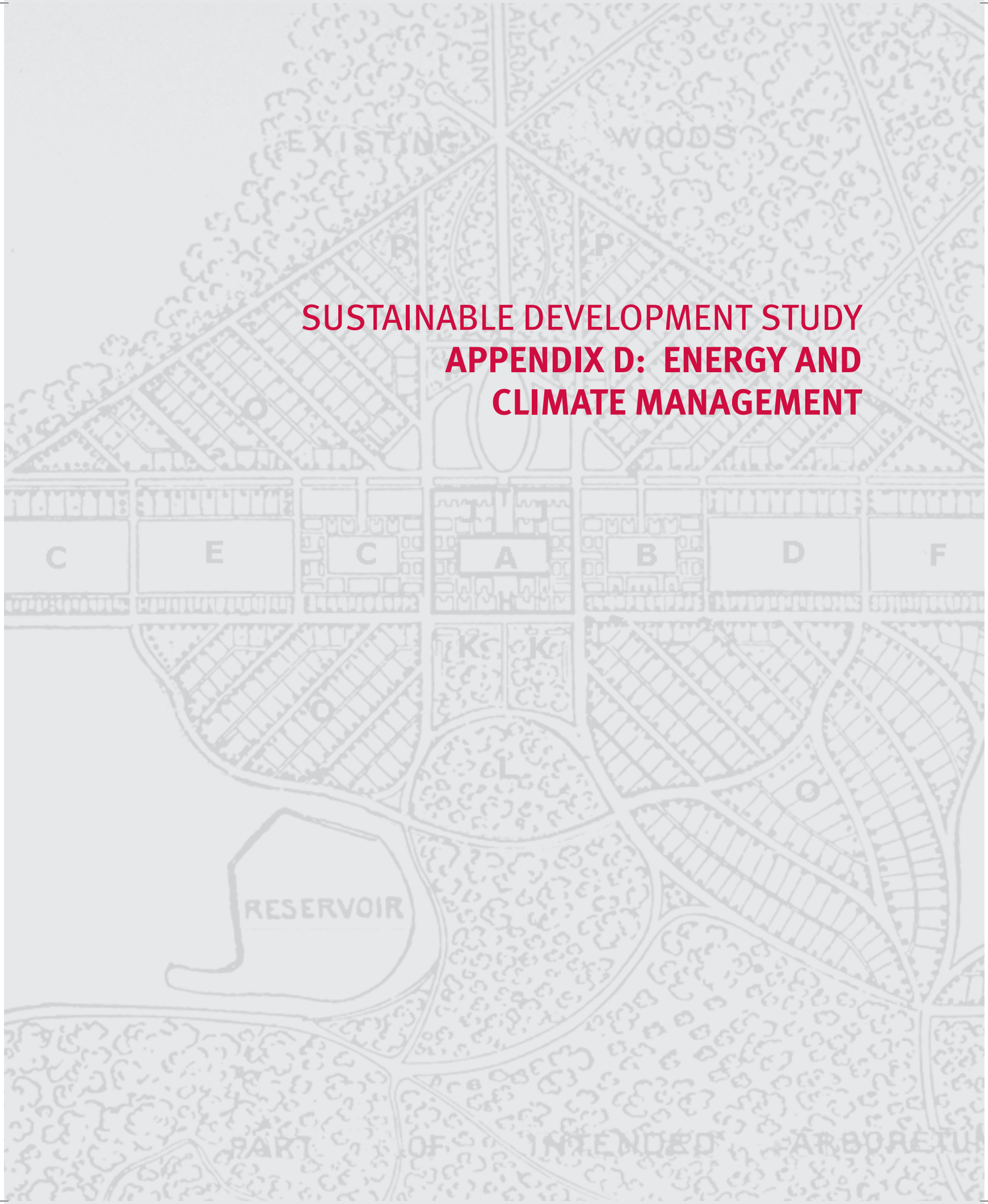
- Stauffer Chemistry HVAC Retrofit project earned a $180,000 rebate from PG&E (2007)
- Climate Action Leader (2006)
- Honorable Mention, Flex Your Power awards (2005)
- Reservoir 2 photovoltaic project earned a $135,000 rebate from PG&E (2004)

WASTE

- First place, "Gorilla Prize" in the RecycleMania contest for colleges and universities for highest gross weight (1.23 million pounds) of diverted recyclables (2008)
- Second place for highest gross weight (1.356 million pounds) of diverted recyclables and third place for paper recycling (25.37 pounds per person)., RecycleMania (2007)
- Environmental Achievement Award for battery recycling and mercury thermometer replacement programs, U S. Environmental Protection Agency 2002

WATER

- Clean Bay Award, Palo Alto Regional Water Quality Control Plant (annual recipient for the past 10 years)
- Leadership recognition, Palo Alto Regional Water Quality Control Plant, for eliminating the use of antibacterial soaps (2007)
- Santa Clara Valley Urban Runoff Pollution Prevention Program award for the site design for storm water pollution prevention at the Stanford Stadium (2007)



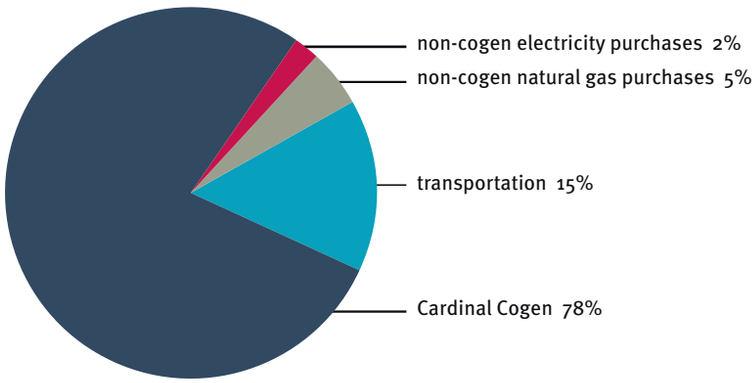
SUSTAINABLE DEVELOPMENT STUDY

APPENDIX D: ENERGY AND CLIMATE MANAGEMENT

Appendix D: Energy and Climate Management

Emissions Inventory

Stanford University joined the California Climate Action Registry and completed an initial inventory (carbon dioxide only) of its greenhouse gas (GHG) emissions in 2006. This inventory of 165,453 metric tons of carbon dioxide equivalent emissions per year and Stanford's updated 2007 inventory are publicly viewable at https://www.climateregistry.org/CARROT/public/reports.aspx on Stanford University website.



Sources of Stanford GHG emissions in 2007

Greenhouse Gas Reduction Planning

In February 2008, Stanford prepared an initial assessment of greenhouse gas emissions reduction options. This assessment contains a detailed analysis of Stanford's energy consumption and associated GHG emissions, and sets forth a number of options for GHG reduction.

This initial assessment of GHG reduction options indicates that opportunities for significant energy conservation, aggressive as they may be envisioned at Stanford, might be able to achieve only about 15 percent reduction in overall campus GHG emissions. It further concluded that anticipated campus growth would offset reductions achieved from energy conservation in existing buildings and that movement away from 100 percent fossil fuel fired energy generation, even efficient cogeneration, and toward use of energy

from renewable sources to partially supplant the use of fossil fuel would be required to achieve substantial GHG emission reductions over the long term.
Additional investigations by the University are under way to gather additional information.

These additional investigations are required because one of the realities identified in this process when contemplating options for reducing GHG emissions significantly below current levels is the challenge of being an "early adopter." The University has had robust energy metering in place, has been vigorously pursuing energy conservation for well over a decade, and, even more significantly, has been obtaining virtually all of its energy from an efficient natural gas-fired combined heat and power plant (Cardinal Cogeneration) since the late 1980s. Although gas-fired cogeneration does emit GHGs, it is one of the most efficient forms of fossil-fuel-based energy production.

Both the European Union and State of California have adopted policies and regulations favoring increased use of cogeneration as a means of achieving overall GHG reductions. Therefore, while the University's initial investigations point to the need to move away from fossil fuel fired cogeneration if it is to significantly reduce its GHG emissions, there may be strong regulatory and environmental reasons to retain the cogeneration facility at Stanford, which must be explored further.

Also, because of limitations in California law that currently prohibit Stanford from choosing its sources of electricity (Direct Access) beyond the use of on site generation such as the Cardinal Cogeneration plant, it is uncertain whether the University will be able to employ power generation technologies that are even greener than cogeneration at a scale large enough to significantly reduce its current GHG emissions, should it decide to move away from cogeneration. In the absence of such authority, one of the few potential options left for large-scale GHG emission reductions might be Renewable Energy Credits (RECs) and carbon offsets. However, the development of a bona fide government recognized Cap and Trade system and availability of these tools for GHG reduction are speculative at this time.

For these reasons, the University could not set a specific new GHG reduction goal based solely on options identified in the February 2008 GHG Reduction Options Report. Therefore, to continue work toward achievable GHG reduction goals, in May 2008 the University president convened a blue-ribbon task force consisting of the Executive Director of the Department of Sustainability and Energy Management (SEM) and five faculty experts in the field of energy and the environment to further explore:

- potential fossil fuel-fired cogeneration sites in a future University energy mix,
- if the University could gain legal authority to invest in off-site renewable energy in the future, and
- availability of bona fide RECs and carbon offsets over the long term.

Climate Plan – Emissions Reduction Options

1. DEMAND SIDE ENERGY MANAGEMENT

a. Energy Efficiency and Conservation in New and Existing Buildings

i. Energy Retrofit Program – minor capital retrofits to existing buildings. Define gains thus far and additional gains possible, cost and schedule for implementation.

ii. Capital Retrofit Program – major capital retrofits of existing buildings. Define gains achieved thus far, and additional gains possible, cost and schedule for implementation.

iii. Energy Conservation Incentive Program - Incentive for building occupants to conserve electricity. Define gains achieved thus far and potential for increase, cost, and schedule for implementation.

iv. Building Operations Strategies – Optimizing HVAC and lighting program operation to building operating schedules. Define gains achieved thus far and potential for increase, cost, and schedule for implementation.

v. Excessive Use Monitoring – Analysis of building energy use vs expected to identify waste from system trouble and other causes. Define gains achieved thus far and potential for increase, cost, and schedule for implementation.

vi. New Building Energy Efficiency & GHG Emissions Design Standards – Identify expected energy and GHG emissions from new buildings based on current design standards. Identify opportunities for improvements above current standards and cost and schedule for implementation.

vii. Strategic Plan for Research and Administrative Computing – Identify opportunities for reducing energy use and GHG emissions through consolidation of administrative and research computing and/or application of server virtualization, low energy servers, and other innovative computing technologies and practices.

viii. Building Re-commissioning – Non-capital restoration of building energy systems to original specifications to save energy and GHG emissions. Identify potential gains, cost, and schedule for implementation.

b. Campus Owned Vehicles

i. Marguerite Fleet – Identify opportunities for reducing GHG emissions from fleet, cost and schedule for implementation.

ii. Building Maintenance and Grounds Fleet – Identify opportunities for reducing GHG emissions fleet, cost and schedule for implementation.

iii. All Other Campus Owned Vehicles – Identify opportunities for reducing GHG emissions from fleet, cost and schedule for implementation.

2. SUPPLY SIDE ENERGY MANAGEMENT

a. Clean Electricity Supply

i. Low Head Tidal Power – Identify opportunities for direct campus construction & operation, third party contracting, or open market procurement of power, including cost and schedule for implementation. Combine with other bay/ocean-based technologies to optimize utility corridor and ocean space planning.

ii. Tidal Current Power – Identify opportunities for direct campus construction and operation, third party contracting, or open market procurement of power, including cost and schedule for implementation. Combine with other bay/ocean-based technologies to optimize utility corridor and ocean space planning.

iii. Wave Power – Identify opportunities for direct campus construction and operation, third party contracting, or open market procurement of power, including cost and schedule for implementation. Combine with other bay/ocean-based technologies to optimize utility corridor and ocean space planning.

iv. Solar Photovoltaic (PV) Power - Identify opportunities for direct campus construction and operation, third party contracting, or open market procurement of power, including cost and schedule for implementation.

v. Wind Power - Identify opportunities for direct campus construction and operation, third party contracting, or open market procurement of power, including cost and schedule for implementation.

vi. Geothermal Power - Identify opportunities for direct campus construction and operation, third party contracting, or open market procurement of power, including cost and schedule for implementation.

vii. Biomass Power - Identify opportunities for direct campus construction and operation, third party contracting, or open market procurement of power, including cost and schedule for implementation.

viii. Low Head Hydroelectric Power and/or Pumped Storage - Identify opportunities for direct campus construction and operation, third party contracting, or open market procurement of power, including cost and schedule for implementation.

ix. Fuel Cell Power – investigate potential benefits to GHG reduction from use of fuel cells for power generation. Identify opportunities for direct campus construction and operation, third party contracting, or open market procurement of power, including cost and schedule for implementation.

x. Cogeneration Plant Modernization – Identify options for continued use of cogeneration (combined heat and power) for future campus energy supplies, effects on GHG reduction and energy cost.

xi. Transmission Options – Investigate options for use of 230 KV transmission services versus 60 KV service for campus connection to energy grid to reduce cost of imported electricity and/or improve system capacity & reliability.

b. Clean Thermal Supply

i. All Electric Boiler and Chillers and Clean Energy Supply – Investigate mixed use of electric boilers and chillers at the Central Energy Facility, coupled with varying degrees of clean electricity supply, to reduce campus GHG. Include mixed use of gas fired boilers and/or steam fired chillers with fuel switching based or short and long term market pricing of gas vs electricity for system optimization.

ii. Optimized Load Management and Energy Storage – Investigate opportunities for additional use of campus energy load management techniques and thermal and electric storage technologies to reduce cost and GHG emissions.

iii. Ocean and Lake Cooling – Investigate use of ocean and lake cooling to reduce energy use and GHG emissions for chilled water service to campus. Combine with other use of bay/ocean-based technologies to optimize utility corridor and space planning.

iv. Solar Steam Generation – Investigate use of solar steam production at the Central Energy Facility and/or building scale. Combine use of other space intensive technologies to optimize utility corridor and space planning.

v. Solar Hot Water Generation – Investigate use of solar hot water production at building scale for application to existing buildings. Share information with new building design standards sub-working group for potential application for new buildings.

vi. Geothermal Heating and Cooling – Investigate use of geothermal heating and cooling at building scale. Share information with new building design standards sub-working group for potential application for new buildings.

SUPPLY SIDE ENERGY MANAGEMENT TECHNOLOGIES INVESTIGATED

Low Head Tidal Power

Low head tidal power can be a cost-effective power source in the proper geographic location. The power available from the tides increases geometrically with the mean tidal range because both the mass of water and the height of the center of mass increase. Tidal ranges of 16 feet or more are necessary for cost-effective power generation. With tidal ranges around 4 feet in the San Francisco area, a low head tidal power plant would be at least 16 times more expensive than a plant with a 16-foot tidal range.

Tidal Current Power

Tidal current power can be a cost-effective energy source in the proper geographic location. The Golden Gate and Tacoma Narrows are the most suitable locations on the U.S. West Coast, but the extractable power is relatively small (35 Megawatt for the Golden Gate) compared to the power demands of the West Coast. A permit to generate electricity at the Golden Gate has already been issued to Golden Gate Energy, and it has teamed up with PG&E and the City of San Francisco to investigate and develop this site.

Wave Power

Wave power may be a cost-effective energy source in the future. There are many competing designs, but none has been proven on a commercial scale. Recent announcements of plants planned for the West Coast have raised hopes for wave power, but the proposed plants are pilot projects that will generate only a few megawatts initially.

Solar Electric or Photovoltaics

Solar electric or photovoltaics (PV) power uses light from the sun to produce electricity. The greatest appeal of solar electric is that once installed, there are no fuel costs and only minor maintenance costs. The solar industry is currently in a growth spurt fueled partly by the California Solar Initiative and substantial rebates offered for new systems. There are essentially two options for furthering the use of PV power on campus: the first is to install PV on campus rooftops with good solar orientation. The second is to install PV in an open field arrangement and connect to the existing electrical infrastructure.

Wind Power

Wind power is the component of the sustainable power portfolio with the greatest potential and least impact. There is a well-established, burgeoning industry developing wind power. The rate of wind's development will increase dramatically when all levels of government commit to greenhouse gas reduction and remove the laws that currently impact sustainable-power generation.

Stanford has prominent faculty and significant student resources to support this component. A student group is already the early stages developing a pilot wind-power project. With the vast potential of wind power throughout the United States, Stanford could consider adding components of wind generation to its sustainable portfolio at any time. If a fast start along the path to sustainability is desired, Stanford could enter into a power purchasing agreement for wind-generated power this year, 2008.

Geothermal Power Generation

Geothermal is a proven power technology that uses either dry steam direct or flashed steam from hot brine geothermal wells to drive steam turbines to generate electricity. As of the end of 2006, the total U.S. installed geothermal capacity was 3,100 megawatt from 212 plants, with a proposed 15,000 megawatt available using current technologies. Power plant availability exceeds 90 percent in most cases as a base-load 24 hour/day renewable power.

Biomass Power

Biomass is any organic material made from plants or animals. Domestic biomass resources include agricultural and forestry residues, municipal solid wastes, industrial wastes, and urban green waste. Use of biomass power to displace fossil-fuel-generated power results in a reduction of GHG emissions equal to that of the fossil-fuel displaced because the carbon output for biomass power plants is net zero, as the carbon-based fuel would otherwise decompose naturally, releasing the carbon dioxide to the environment over time. This means that biomass is a fully renewable resource and that its use for biomass- derived fuels, power, chemicals, materials, or other products essentially generate no net greenhouse gas. As of the end of 2006, the total U.S. installed bioenergy capacity was 10 gigawatt, with 7 gigawatt from forest and agricultural wastes and 2.5 gigawatt from municipal waste.

Low Head Hydroelectric Power and/or Pumped Storage

Low head hydroelectric power (LHHP) uses the energy of flowing water from rivers or dams to turn turbines and generators to produce electricity. Stanford has dams and creeks and an extensive nonpotable water supply piping system from its foothills; however, installation of such a system at Stanford's Searsville Dam was studied in 1982 and not pursued. The San Francisco Bay Area's primarily winter rainy season decreases the productivity and cost-effectiveness of such systems. Pumped storage systems use the same power-generating approach but incorporate pumping water back up into reservoirs during off-peak hours, basically setting up a circulating system; however, this arrangement provides more financial benefit of off-peak power use than GHG emissions reducing benefit because off-peak power is still needed to pump the water back uphill. Implemented LHHP installations, one at Searsville and one elsewhere on the lake water system, could likely produce 94,000 kWh of power (average) per year and would cost approximately $300,000 to implement. While not as highly cost effective as solar power production, LHHP could serve to seasonally complement solar for remote small-scale, GHG-free power supply applications.

Fuel Cell Power

Fuel cell technology was first invented in 1839. After nearly 170 years of development and refinement, fuel cells are finally poised to become a viable alternative to conventional power generation in more widespread contexts. While fuel cells have been implemented in a wide variety of applications, from small electronics to transportation, the most suitable option for Stanford would be one or a series of larger, stationary commercial/industrial-scale fuel cells. Fuel cells operate on the basis of reverse electrolysis so byproducts are limited to water (or steam) and heat. The primary input is either pure hydrogen or hydrogen acquired through a reformation process from other hydrocarbons (i.e., natural gas, ethanol, methane). In addition to the benefit of reduced greenhouse gas emissions, fuel cells also achieve, on average nearly twice the efficiency of an internal combustion engine.

Solar Steam Generation

Concentrating solar power plants (CSP) convert solar energy from the sun into heat, which is then used to produce electricity. CSP plants are typically built on a utility scale in desert locations to maximize the infrastructure requirements and the solar resource. In general, these plants are built by utilities to meet their own renewable energy commitments.

Solar Hot Water Generation

Solar water heating (SWH) uses radiation from the sun to produce heat energy. Currently, the major applications of SWH are heating swimming pools, heating water for domestic use, and space heating of buildings. Several buildings on campus have SWH systems, but the use of SWH systems could be expanded to almost any building with a high domestic water-heating load, such as dorms, athletic buildings, or pool facilities. Because the cost and benefits of solar water heating are specific to each building, a thorough survey should be undertaken to determine the most cost-effective locations and to determine SWH full potential on campus.

Thermal Measures

Geo-exchange systems use the Earth's energy storage system to heat and cool buildings and to heat hot water systems. The EPA has identified that ground source heat pumps as a technology that significantly reduces energy needed for the heating and cooling of homes, small buildings, hotels, and schools. Installations require adequate land space for the ground heat exchanger.


EXISTING
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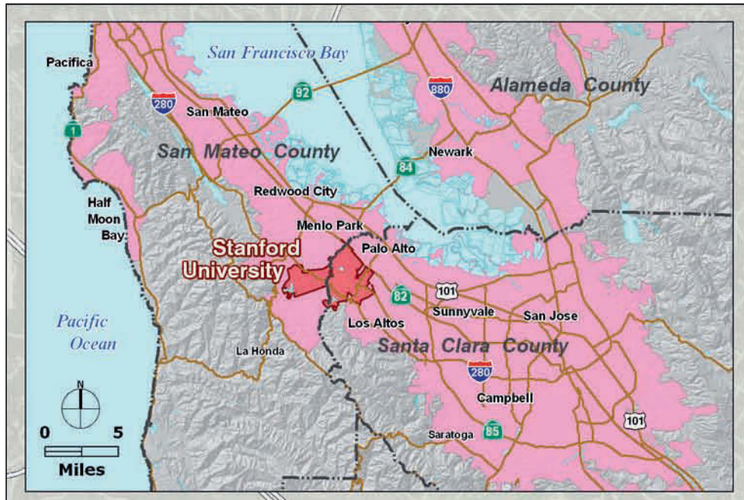
RESERVOIR
PART OF
INTENDED
ARBORETUM

Sustainable Development Study

Foothills Context



MENLO PARK

PALO ALTO

WOODSIDE

PORTOLA VALLEY

LOS ALTOS HILLS

Francisquito Creek

San Francisquito Creek

Stanford Shopping Center

Stanford Medical Center

Arboretum Road

Palm Drive

El Camino Real

University Ave.

Alma Street

Oregon Expr.

Sand Hill Road

Campus Drive West

Campus Drive East

Stadium

CENTRAL CAMPUS

Lagunita

Driving Range

Golf Course

Stanford Linear Accelerator Center

Faculty/Staff Housing

Junipero Serra Boulevard

ACADEMIC GROWTH BOUNDARY

Peter Coutts Rd.

Stanford Avenue

California Avenue

Page Mill Road

Stanford Research Park

Matadero Creek

Bol Park

The Dish

FOOTHILLS

Foothill Expressway

Mill Road

Page Mill Road

Deer Creek

Arastradero Road

Barron Creek

Alpine Road

Los Trancos Creek

Felt Reservoir

Arastradero Road

Bear Creek

Sand Hill Road

Jasper Ridge Biological Preserve

Searsville Reservoir

Middle Searsville

Upper Searsville

Mapache Pond

Corte

Text

280

Graphic Scale

1 Inch = 0.5 Miles

0 0.5 1 Miles

N

Stanford University Land Use & Environmental Planning

Date Printed: October 26, 2008

Sources:

Aerial photos: Aerotopia, 1999, Triathlon, 2006

Creeks: US Geological Survey, 1991

Disclaimer:

This map was produced by the SU Planning Office. While generally accurate, this map may not be completely free of error. The information is derived from a variety of sources deemed reliable, but subject to recurrent change and Stanford does not warrant the accuracy and completeness of these data.

Figure 1.1

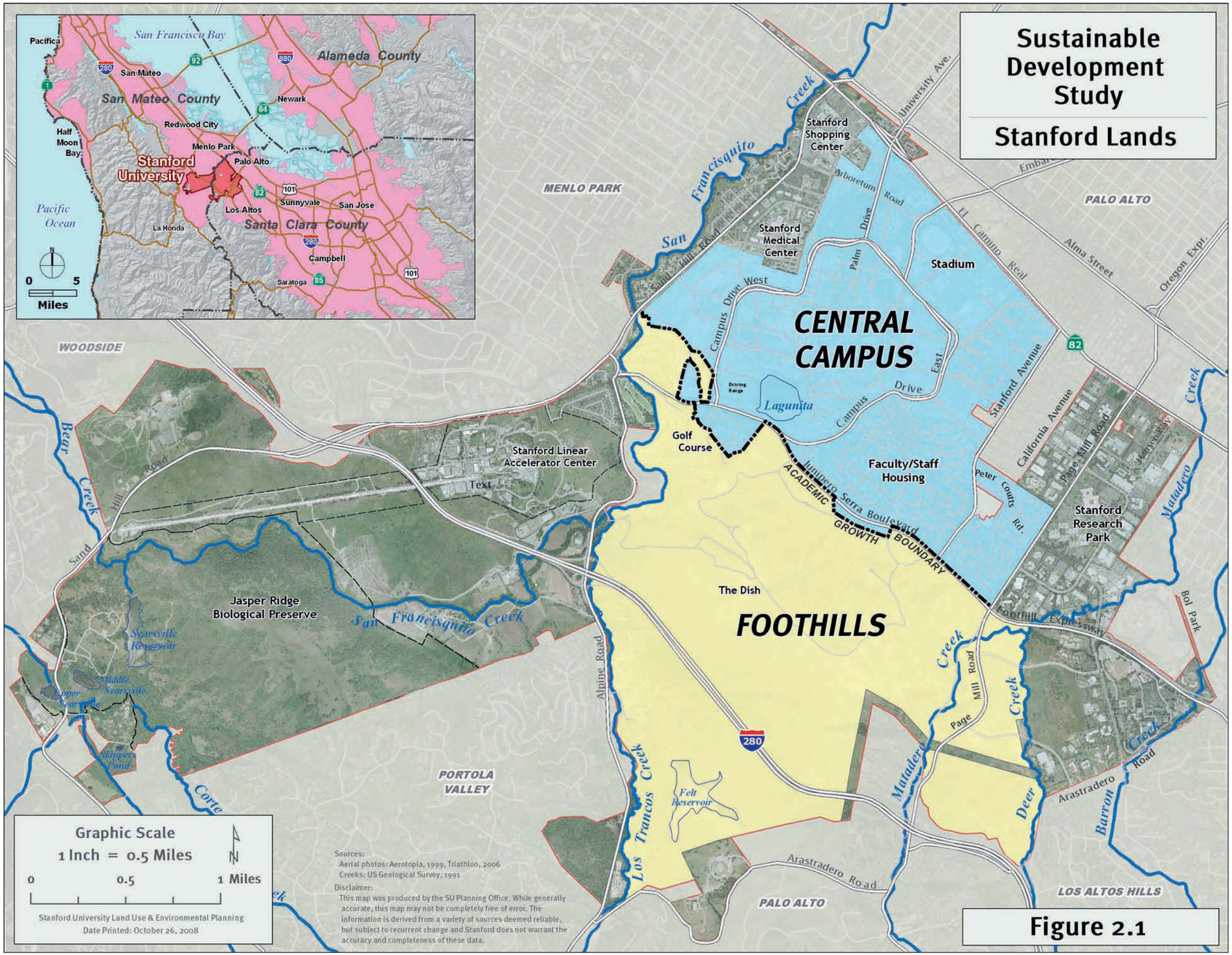

Sustainable Development Study
Stanford Lands
San Francisco Bay
Pacific Ocean
Pacifica
San Mateo
San Mateo County
Alameda County
Newark
Redwood City
Half Moon Bay
Menlo Park
Palo Alto
Stanford University
Sunnyvale
San Jose
Los Altos
La Honda
Santa Clara County
Campbell
Saratoga
0 5 Miles
MENLO PARK
PALO ALTO
WOODSIDE
PORTOLA VALLEY
FOOTHILLS
LOS ALTOS HILLS
CENTRAL CAMPUS
Stanford Shopping Center
Stanford Medical Center
Stadium
Arboretum
Palm Drive
El Camino Real
Alma Street
Oregon Expr.
University Ave.
Campus Drive West
Campus Drive East
Lagunita
Driving Range
Golf Course
Faculty/Staff Housing
Stanford Avenue
California Avenue
Page Mill Road
Peter Coutts Rd.
Stanford Research Park
Junipero Serra Boulevard
ACADEMIC GROWTH BOUNDARY
Stanford Linear Accelerator Center
The Dish
Foothill Expressway
Arastradero Road
Jasper Ridge Biological Preserve
Searsville Reservoir
Middle Searsville
Upper Searsville
Hampers Pond
Felt Reservoir
Alpine Road
Sand Hill Road
Bear Creek
San Francisquito Creek
Los Trancos Creek
Matadero Creek
Deer Creek
Barron Creek
Bol Park
Graphic Scale
1 Inch = 0.5 Miles
0 0.5 1 Miles
N
Stanford University Land Use & Environmental Planning
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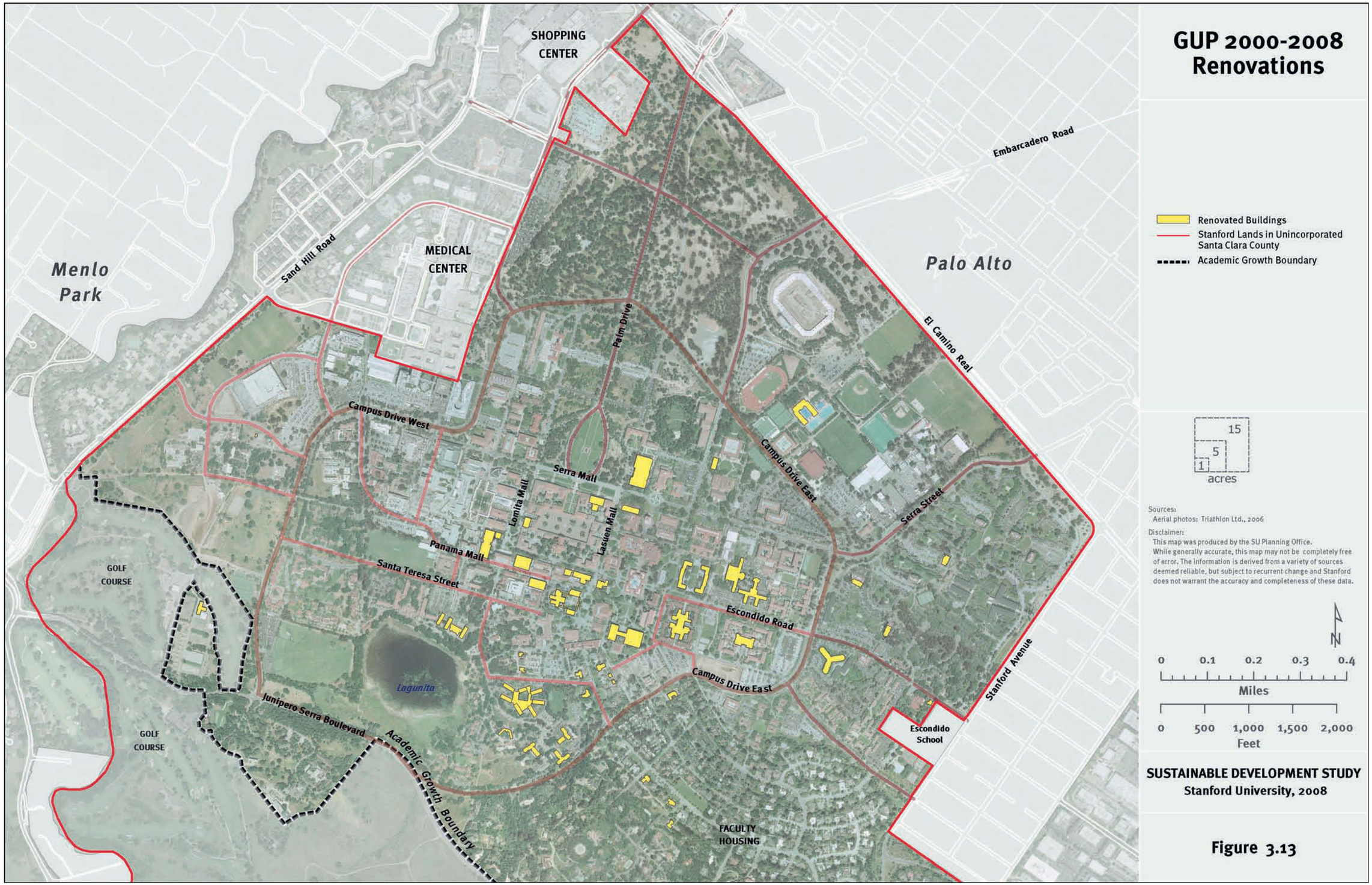
Figure 2.1


SHOPPING CENTER
MEDICAL CENTER
Menlo Park
Palo Alto
Sand Hill Road
Embarcadero Road
El Camino Real
Palm Drive
Campus Drive West
Campus Drive East
Serra Mall
Lomita Mall
Lasuen Mall
Panama Mall
Santa Teresa Street
Serra Street
Escondido Road
Stanford Avenue
Campus Drive East
Lagunita
Junipero Serra Boulevard
Academic Growth Boundary
GOLF COURSE
GOLF COURSE
Escondido School
FACULTY HOUSING
GUP 2000-2008 Renovations
Renovated Buildings
Stanford Lands in Unincorporated Santa Clara County
Academic Growth Boundary
15
5
1
acres
Sources:
Aerial photos: Triathlon Ltd., 2006
Disclaimer:
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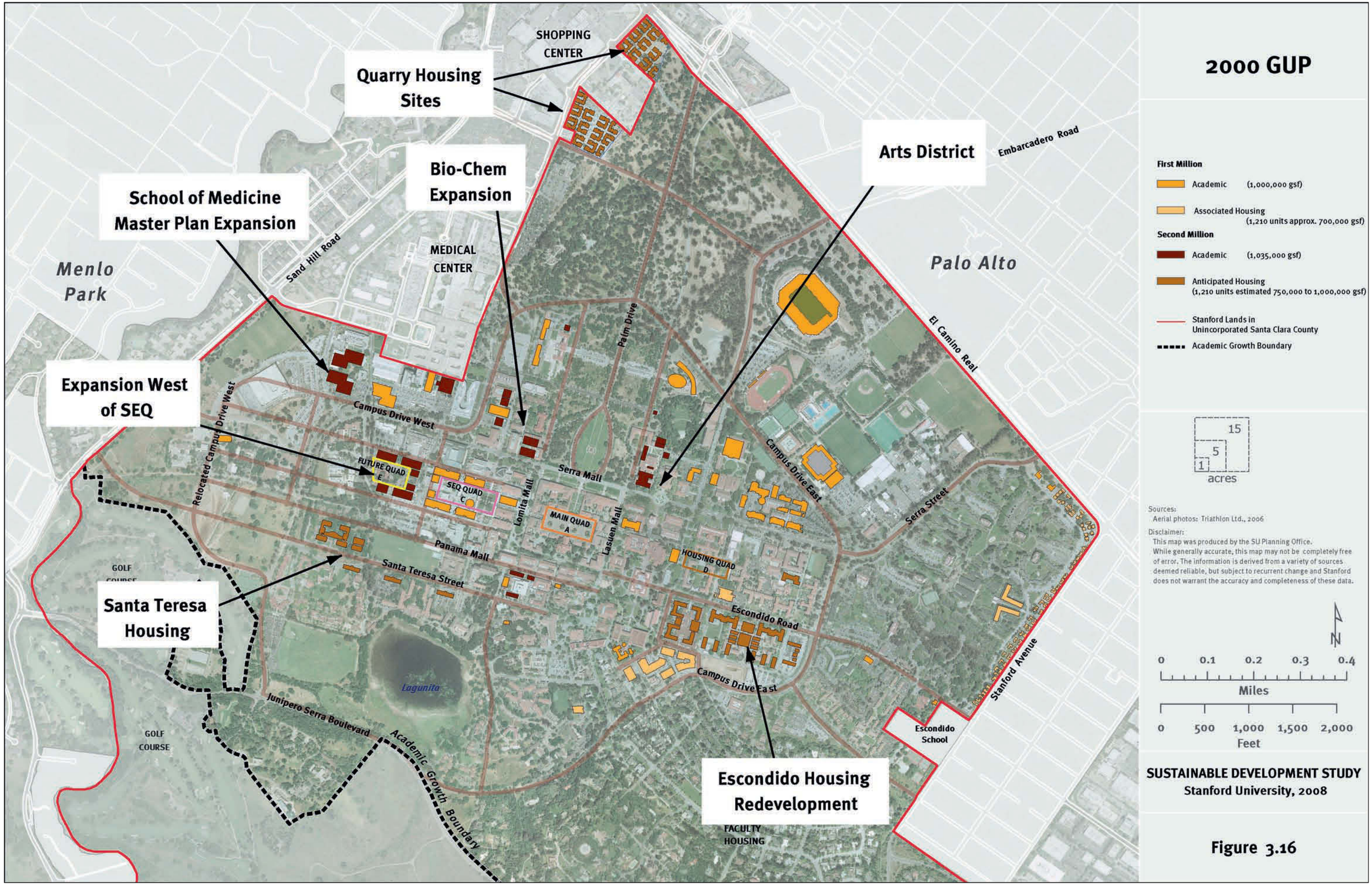
N
0 0.1 0.2 0.3 0.4
Miles
0 500 1,000 1,500 2,000
Feet
SUSTAINABLE DEVELOPMENT STUDY
Stanford University, 2008

Figure 3.13


Quarry Housing Sites
SHOPPING CENTER
Bio-Chem Expansion
School of Medicine Master Plan Expansion
MEDICAL CENTER
Arts District
Embarcadero Road
Menlo Park
Palo Alto
Sand Hill Road
Palm Drive
El Camino Real
Expansion West of SEQ
Campus Drive West
Relocated Campus Drive West
FUTURE QUAD E
SEQ QUAD C
Serra Mall
Lomita Mall
MAIN QUAD A
Lasuen Mall
Campus Drive East
Serra Street
Panama Mall
Santa Teresa Street
HOUSING QUAD D
Escondido Road
Santa Teresa Housing
GOLF COURSE
Lagunita
Junipero Serra Boulevard
Academic Growth Boundary
Campus Drive East
Stanford Avenue
Escondido School
Escondido Housing Redevelopment
FACULTY HOUSING
2000 GUP
First Million
Academic (1,000,000 gsf)
Associated Housing
(1,210 units approx. 700,000 gsf)
Second Million
Academic (1,035,000 gsf)
Anticipated Housing
(1,210 units estimated 750,000 to 1,000,000 gsf)
Stanford Lands in Unincorporated Santa Clara County
Academic Growth Boundary
15
5
1
acres
Sources:
Aerial photos: Triathlon Ltd., 2006
Disclaimer:
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N
0 0.1 0.2 0.3 0.4
Miles
0 500 1,000 1,500 2,000
Feet
SUSTAINABLE DEVELOPMENT STUDY
Stanford University, 2008

Figure 3.16

2000 GUP Density Diagram

- Low Density
- Medium Density
- High Density
- Stanford Lands in Unincorporated Santa Clara County
- Academic Growth Boundary

15
5
1
acres

Sources:
Aerial photos: Triathlon Ltd., 2006

Disclaimer:
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N

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Miles

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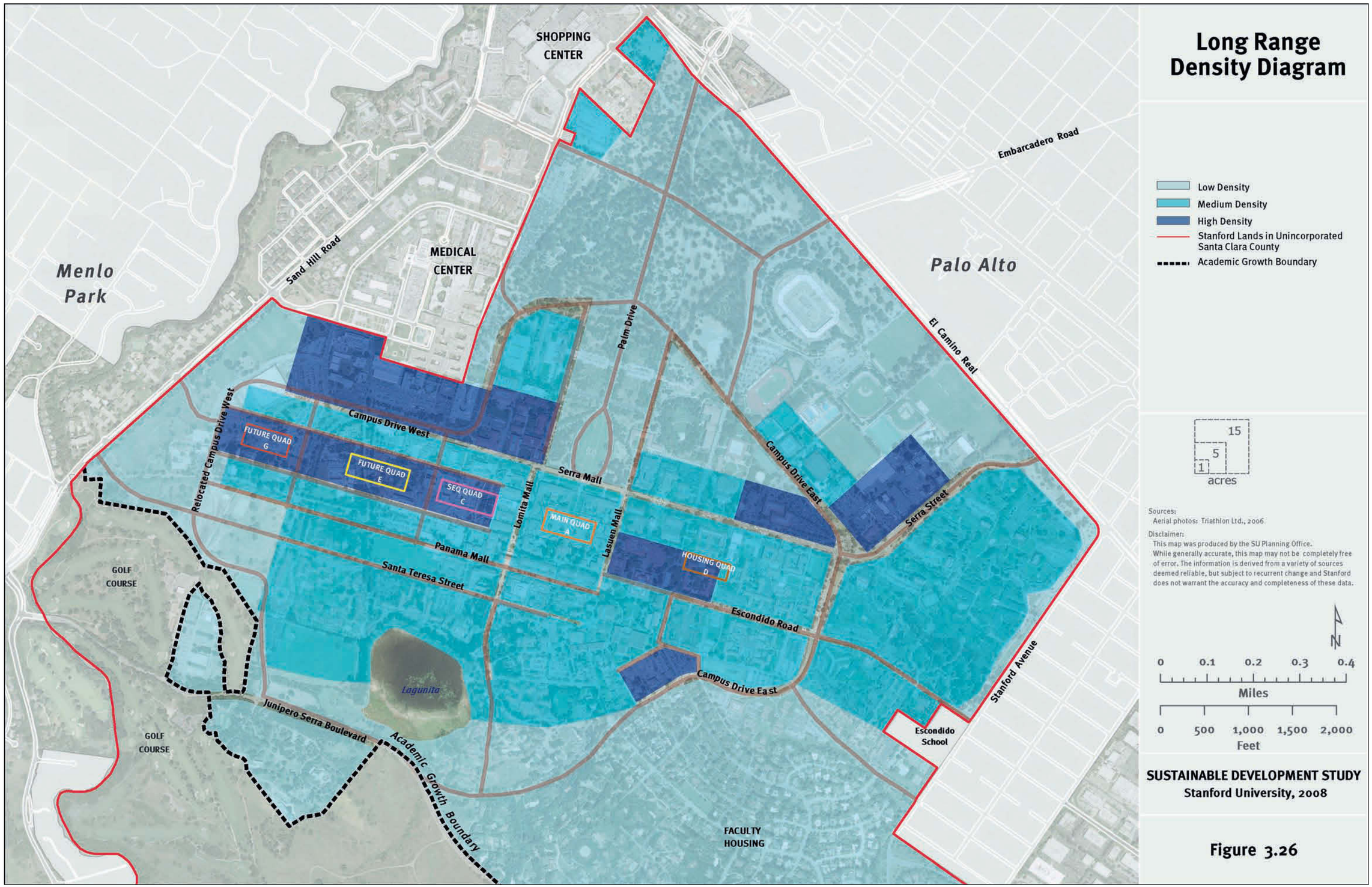
Feet

SUSTAINABLE DEVELOPMENT STUDY
Stanford University, 2008

Figure 3.25



Long Range Density Diagram

- Low Density
- Medium Density
- High Density
- Stanford Lands in Unincorporated Santa Clara County
- Academic Growth Boundary

15
5
1
acres

Sources:
Aerial photos: Triathlon Ltd., 2006

Disclaimer:
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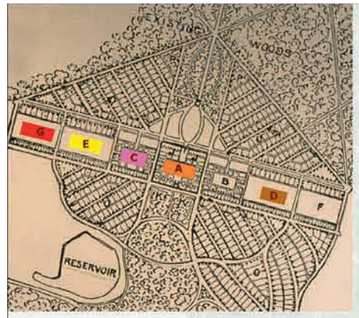
Miles

0 500 1,000 1,500 2,000
Feet

SUSTAINABLE DEVELOPMENT STUDY
Stanford University, 2008

Figure 3.26



SHOPPING CENTER

MEDICAL CENTER

Menlo Park

Palo Alto

Sand Hill Road

Palm Drive

El Camino Real

Campus Drive West

Campus Drive East

FUTURE QUAD G

FUTURE QUAD E

SEQ QUAD C

MAIN QUAD A

HOUSING QUAD D

Serra Mall

Lomita Mall

Lasuen Mall

Serra Street

Panama Mall

Santa Teresa Street

Escondido Road

Stanford Avenue

GOLF COURSE

GOLF COURSE

Lagunita

Junipero Serra Boulevard

Academic Growth Boundary

Escondido School

FACULTY HOUSING

Scenario A
2 million sf Growth

- Medium Density
- High Density
- Stanford Lands in Unincorporated Santa Clara County
- Academic Growth Boundary

15
5
1
acres

Sources:
Aerial photos: Triathlon Ltd., 2006

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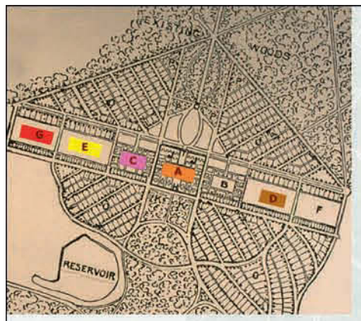
N

0 0.1 0.2 0.3 0.4
Miles

0 500 1,000 1,500 2,000
Feet

SUSTAINABLE DEVELOPMENT STUDY
Stanford University, 2008

Figure 3.29



Scenario B
3.5 million sf Growth

SHOPPING CENTER

MEDICAL CENTER

Menlo Park

Palo Alto

Sand Hill Road

Relocated Campus Drive West

Campus Drive West

FUTURE QUAD G

FUTURE QUAD E

SEQ QUAD C

Serra Mall

Lomita Mall

MAIN QUAD A

Lasuen Mall

Panama Mall

Santa Teresa Street

Palm Drive

El Camino Real

Campus Drive East

Serra Street

HOUSING QUAD D

Escondido Road

Stanford Avenue

Escondido School

GOLF COURSE

GOLF COURSE

Lagunita

Junipero Serra Boulevard

Academic Growth Boundary

FACULTY HOUSING

Low Density

Medium Density

High Density

Stanford Lands in Unincorporated Santa Clara County

Academic Growth Boundary

15
5
1
acres

Sources:
Aerial photos: Triathlon Ltd., 2006

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N

0 0.1 0.2 0.3 0.4
Miles

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Feet

SUSTAINABLE DEVELOPMENT STUDY
Stanford University, 2008

Figure 3.32

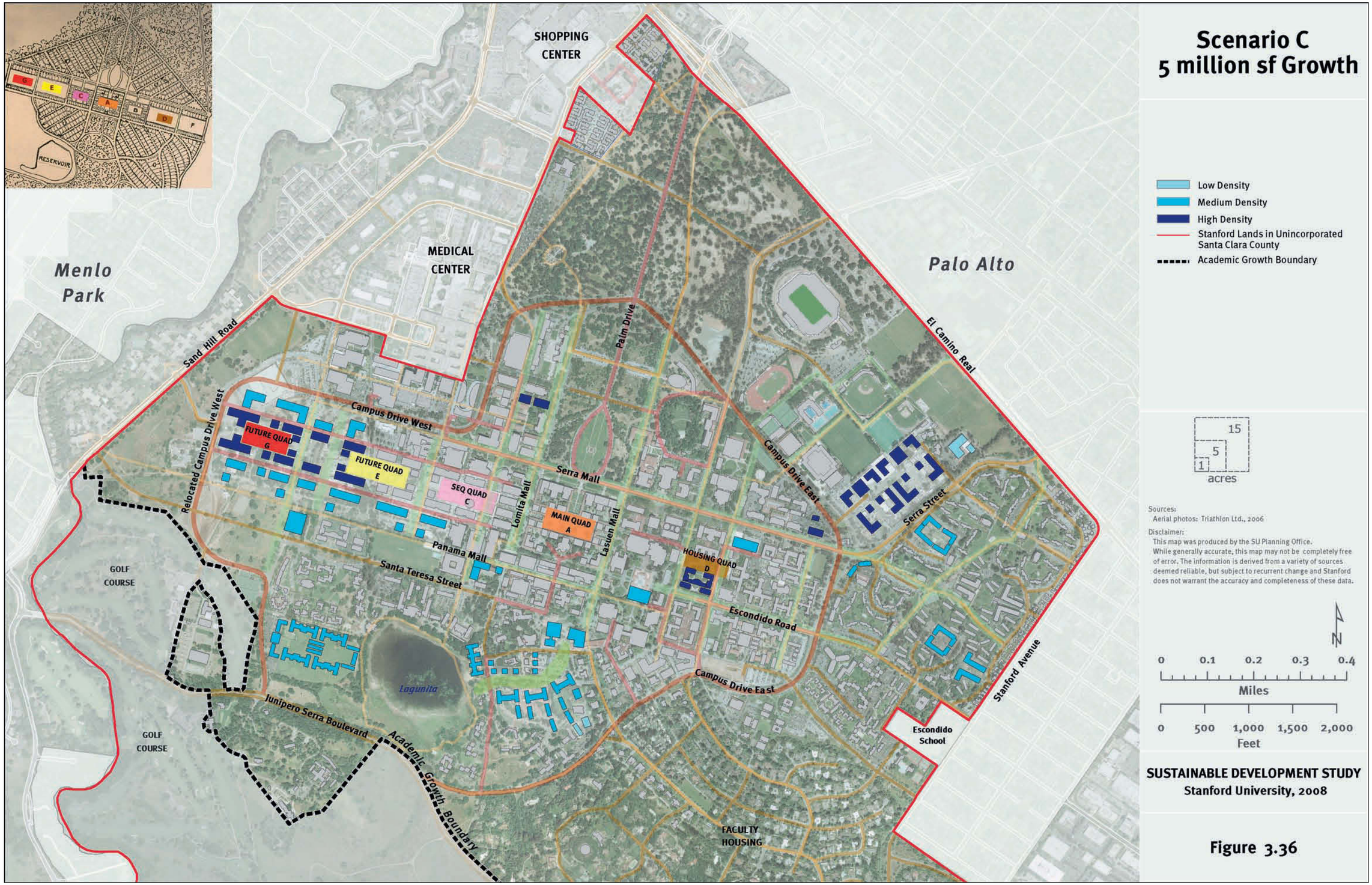
Scenario C
5 million sf Growth
Low Density
Medium Density
High Density
Stanford Lands in Unincorporated Santa Clara County
Academic Growth Boundary
15
5
1
acres
Sources:
Aerial photos: Triathlon Ltd., 2006
Disclaimer:
This map was produced by the SU Planning Office.
While generally accurate, this map may not be completely free of error. The information is derived from a variety of sources deemed reliable, but subject to recurrent change and Stanford does not warrant the accuracy and completeness of these data.
N
0 0.1 0.2 0.3 0.4
Miles
0 500 1,000 1,500 2,000
Feet
SUSTAINABLE DEVELOPMENT STUDY
Stanford University, 2008
SHOPPING CENTER
MEDICAL CENTER
Menlo Park
Palo Alto
Sand Hill Road
Relocated Campus Drive West
Campus Drive West
Palm Drive
El Camino Real
Campus Drive East
Serra Mall
Lomita Mall
Lasuen Mall
Panama Mall
Santa Teresa Street
Serra Street
Escondido Road
Stanford Avenue
FUTURE QUAD G
FUTURE QUAD E
SEQ QUAD C
MAIN QUAD A
HOUSING QUAD D
GOLF COURSE
GOLF COURSE
Lagunita
Junipero Serra Boulevard
Academic Growth Boundary
Escondido School
FACULTY HOUSING
RESERVOIR
WOODS

Figure 3.36

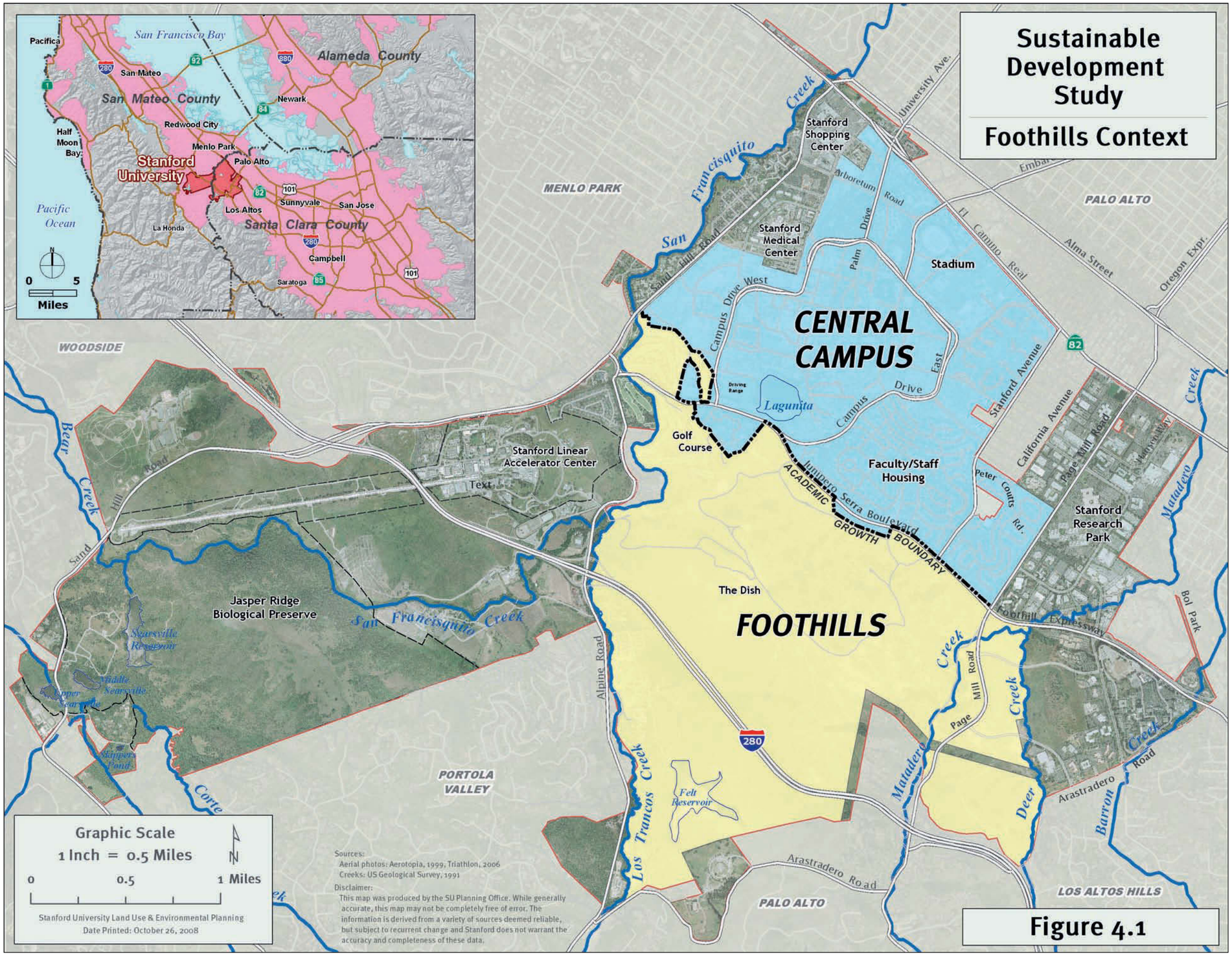
Sustainable Development Study
Foothills Context
San Francisco Bay
Pacific Ocean
Pacifica
San Mateo
San Mateo County
Half Moon Bay
Redwood City
Menlo Park
Palo Alto
Stanford University
Alameda County
Newark
Sunnyvale
San Jose
Los Altos
Santa Clara County
La Honda
Campbell
Saratoga
0 5 Miles
MENLO PARK
PALO ALTO
WOODSIDE
PORTOLA VALLEY
LOS ALTOS HILLS
San Francisquito Creek
Stanford Shopping Center
Stanford Medical Center
Arboretum
Palm Drive
El Camino Real
Alma Street
Oregon Expr.
University Ave.
Stadium
CENTRAL CAMPUS
Campus Drive West
Campus Drive East
Lagunita
Driving Range
Golf Course
Stanford Linear Accelerator Center
Faculty/Staff Housing
Junipero Serra Boulevard
ACADEMIC GROWTH BOUNDARY
Peter Coutts Rd.
Stanford Avenue
California Avenue
Page Mill Road
Stanford Research Park
Matadero Creek
Bol Park
Foothill Expressway
The Dish
FOOTHILLS
Jasper Ridge Biological Preserve
Searsville Reservoir
Middle Searsville
Upper Searsville
Mapache Pond
Alpine Road
Los Trancos Creek
Felt Reservoir
Arastradero Road
Deer Creek
Barron Creek
Bear Creek
Sand Hill Road
Corte
Graphic Scale
1 Inch = 0.5 Miles
0 0.5 1 Miles
N
Stanford University Land Use & Environmental Planning
Date Printed: October 26, 2008
Sources:
Aerial photos: Aerotopia, 1999, Triathlon, 2006
Creeks: US Geological Survey, 1991
Disclaimer:
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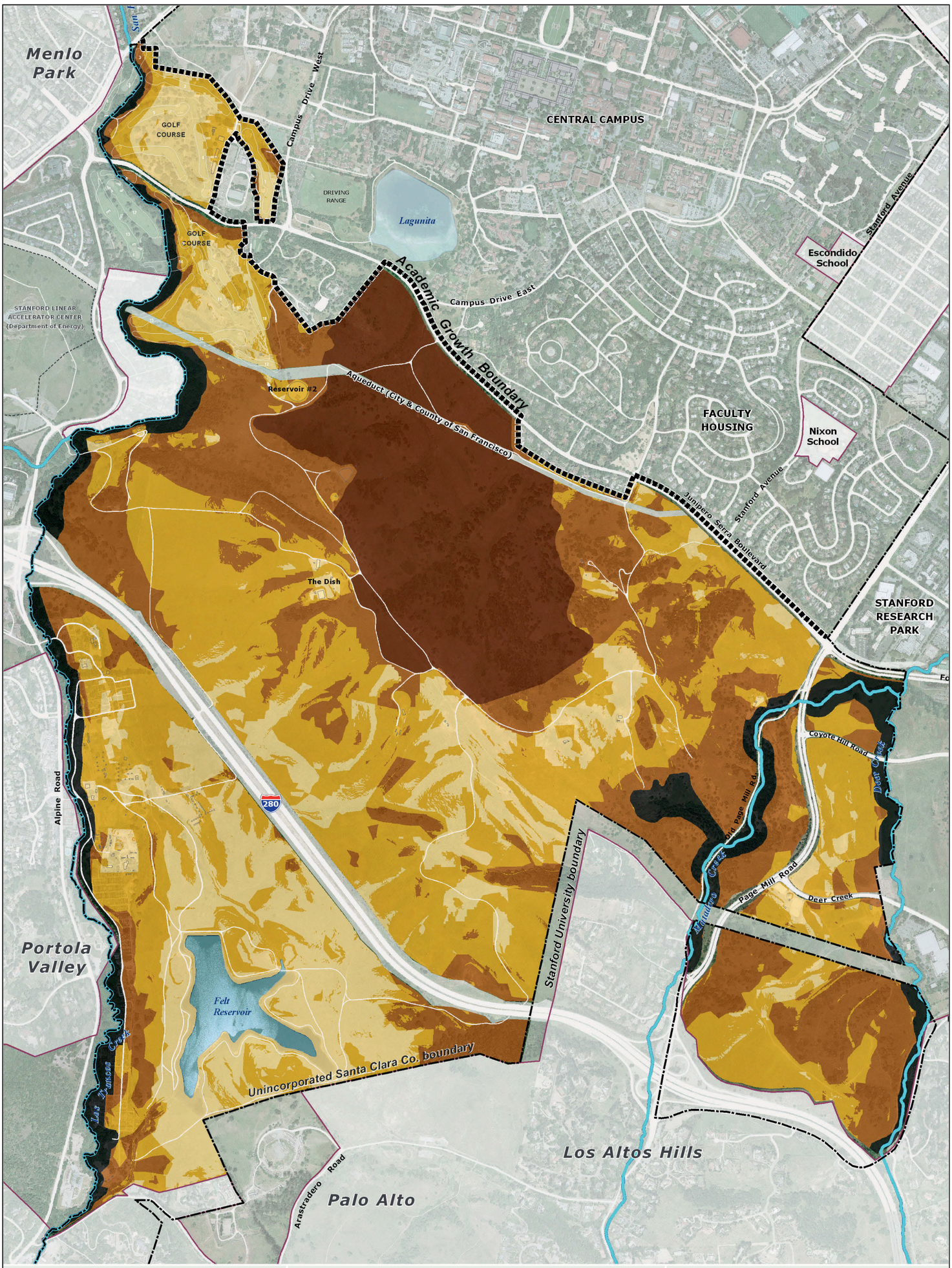
Figure 4.1



Land Sensitivity Composite Map

Protection Area
- Permanent
- Long term

Sensitivity Gradient
- High
- Moderate
- Low

Sources:
Sensitivity composite: Stanford Planning, 2008
Aerial photos: Triathlon Ltd., 2006
Creeks: US Geological Survey, 1991

Disclaimer:
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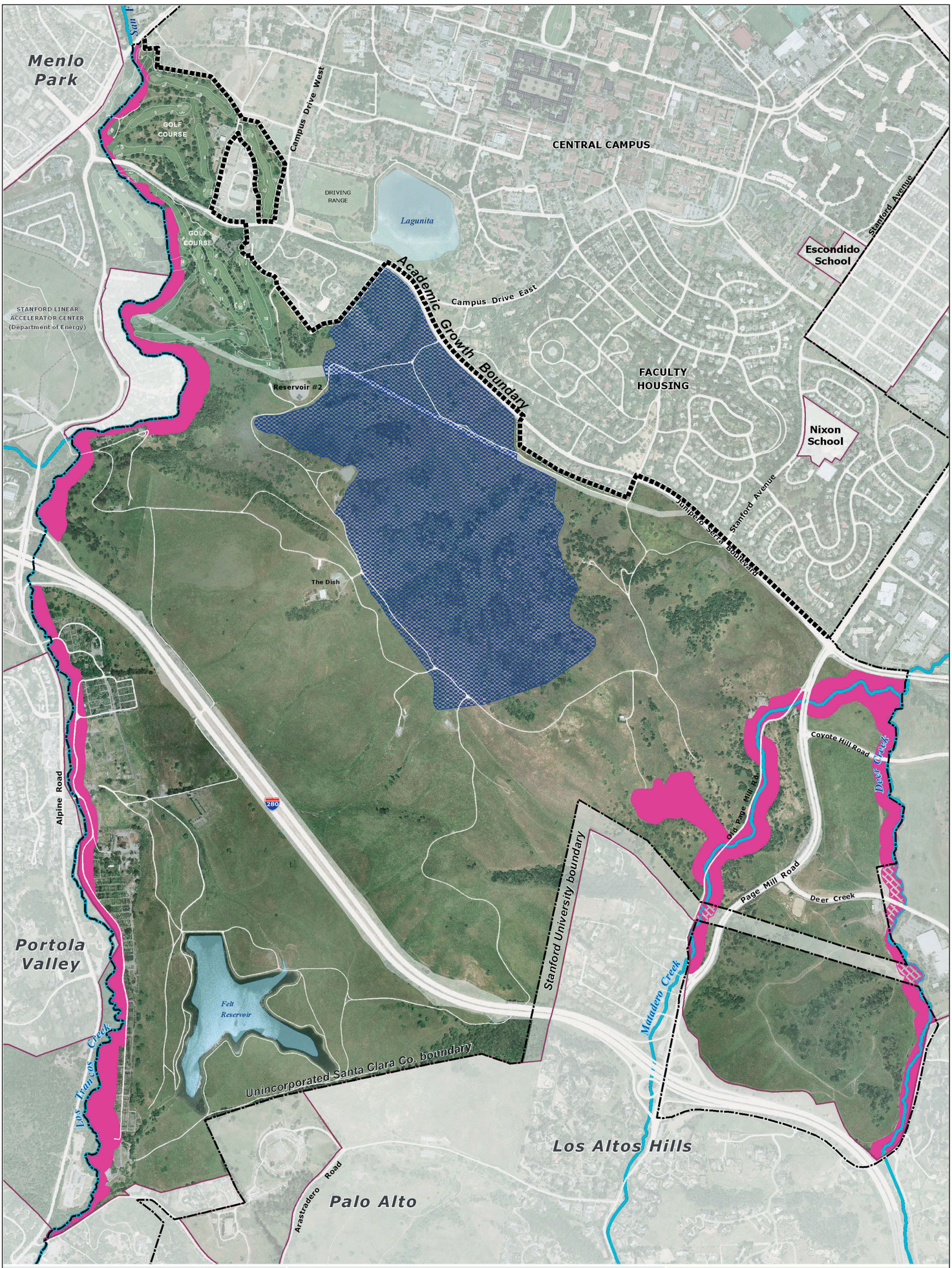
15
5
1
acres

0 0.25 0.5
Miles

N

SUSTAINABLE DEVELOPMENT STUDY
Stanford University, 2008

Figure 4.10



Protection Areas

Long Term (50-year)

Permanent Dedication of Easements

Striped = easements in the City of Palo Alto

Sources:
Easements: Stanford Planning, 2007
Aerial photos: Triathlon Ltd., 2006
Creeks: US Geological Survey, 1991

Disclaimer:
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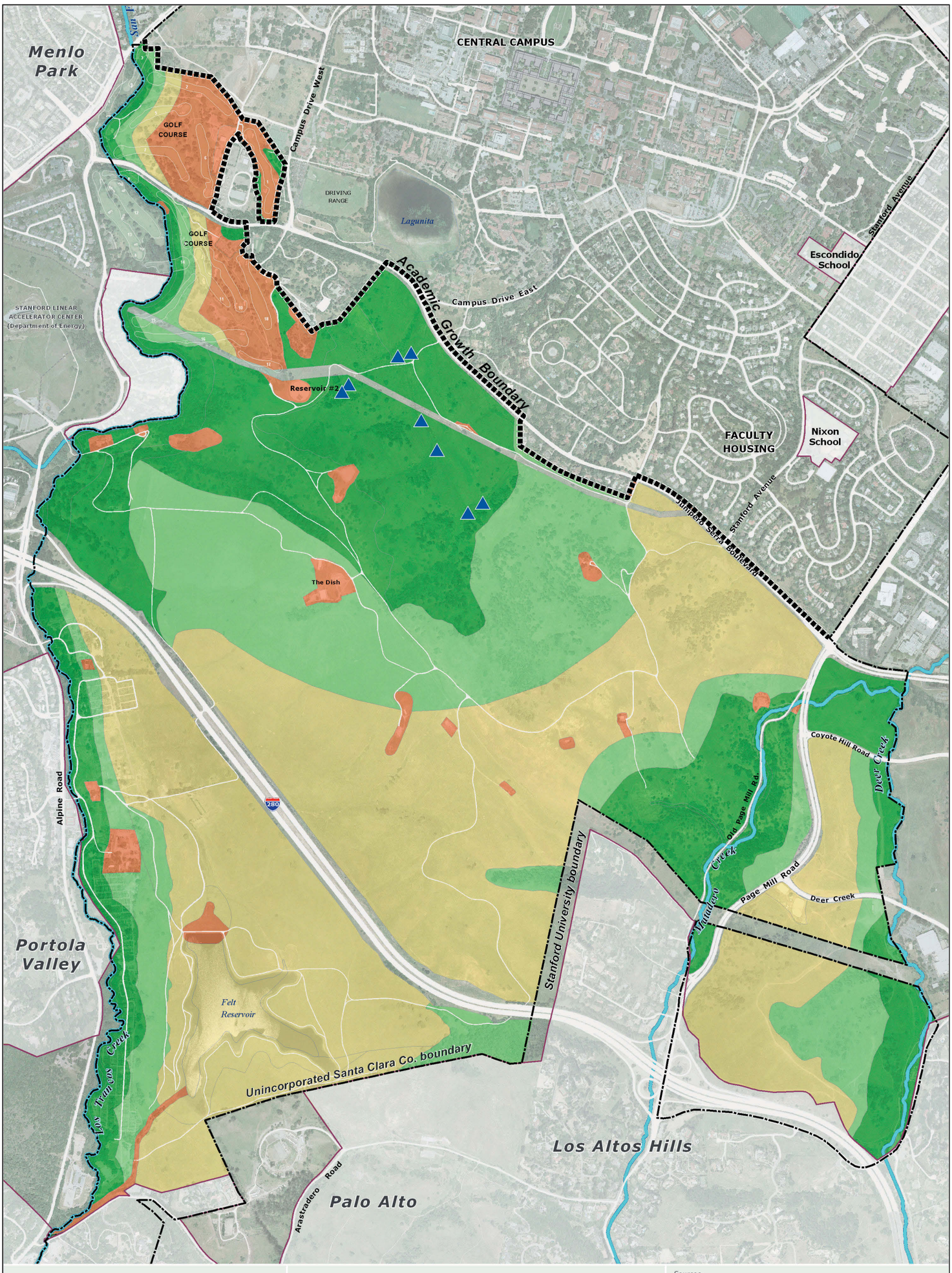
15
5
1
acres

0 0.25 0.5
Miles

N

SUSTAINABLE DEVELOPMENT STUDY
Stanford University, 2008

Figure B.3



Habitat Conservation Plan Management Zones

Pending - Habitat Management

- Zone 1
- Zone 2
- Zone 3
- Zone 4
- CTS Breeding Pond

Sources:
Habitat Mngt & Ponds.: Stanford Planning, 2007
Aerial photos: Triathlon Ltd., 2006
Creeks: US Geological Survey, 1991

Disclaimer:
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15
5
1
acres

0 0.25 0.5
Miles

N

SUSTAINABLE DEVELOPMENT STUDY
Stanford University, 2008

Figure B.8

Oak Woodlands

Oak woodlands

Sources:
Oak woodlands: Stanford Planning, 2008
Aerial photos: Triathlon Ltd., 2006
Creeks: US Geological Survey, 1991

Disclaimer:
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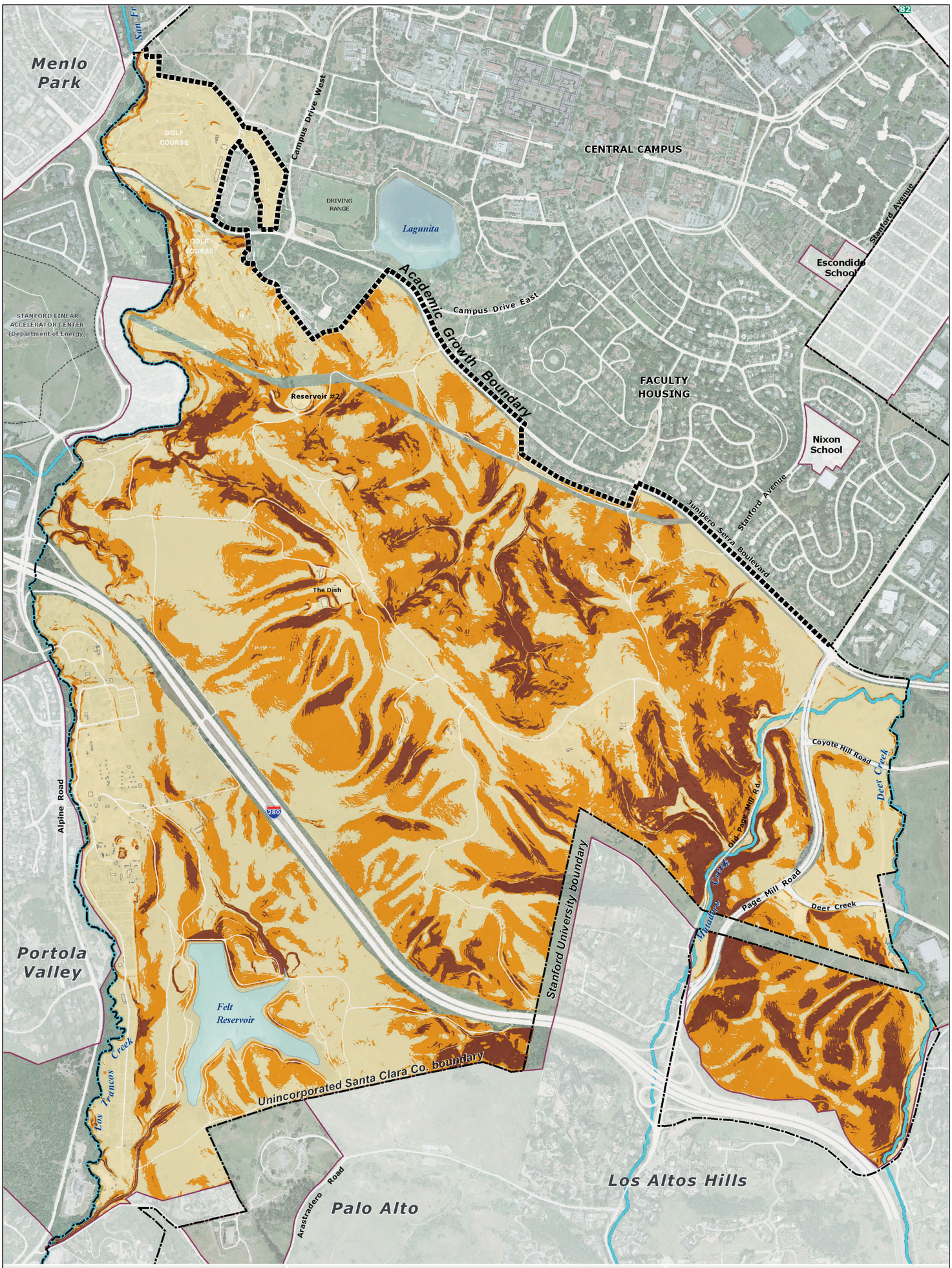
15
5
1
acres

0 0.25 0.5
Miles

N

SUSTAINABLE DEVELOPMENT STUDY
Stanford University, 2008

Figure B.12



Percent Slope

Greater than 30%

15% - 30%

0% - 15%

Sources:
Elevation data, Triathlon Ltd., 2006
Aerial photos: Triathlon Ltd., 2006
Creeks: US Geological Survey, 1991

Disclaimer:
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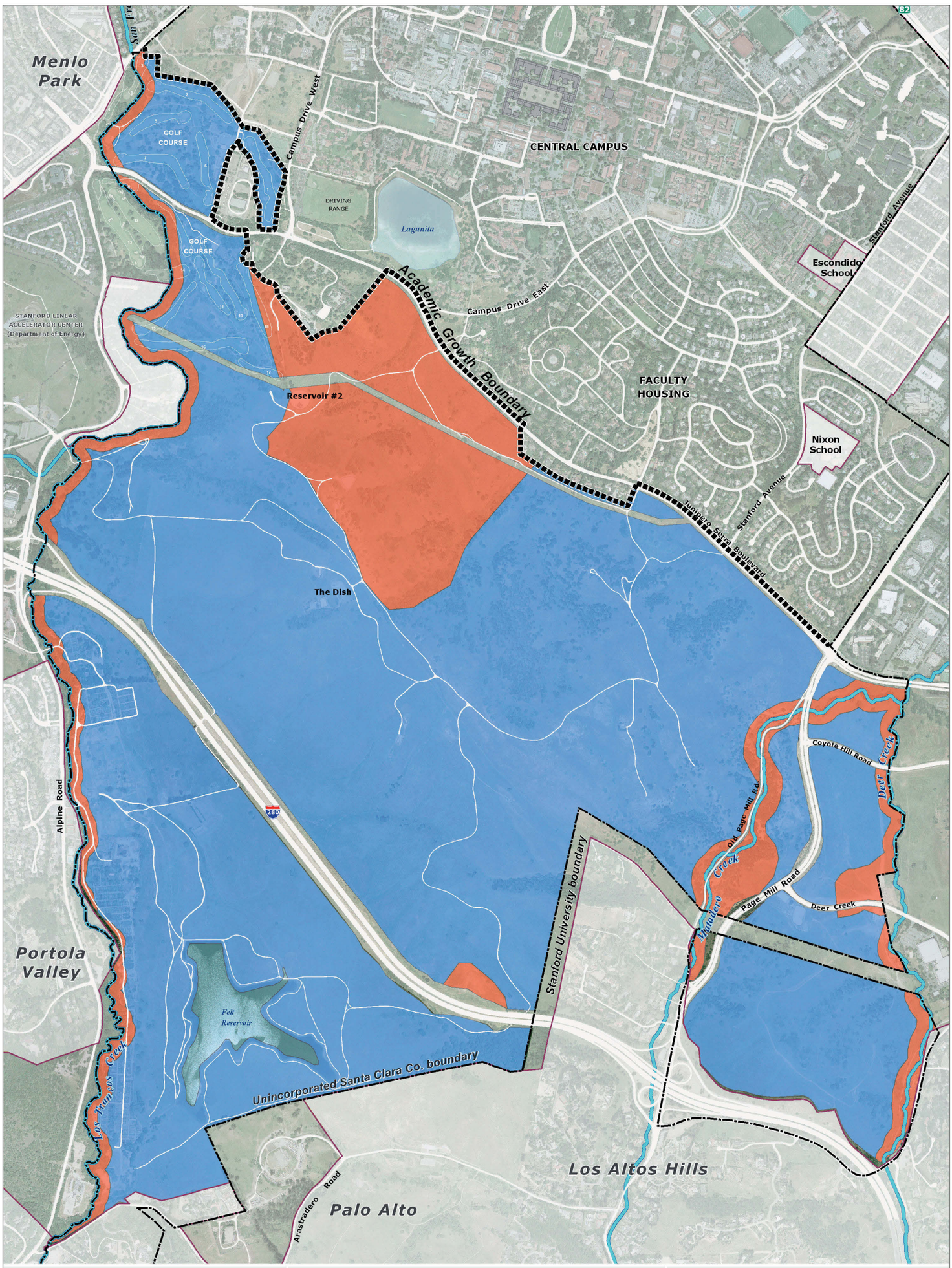
15
5
1
acres

0 0.25 0.5
Miles

N

SUSTAINABLE DEVELOPMENT STUDY
Stanford University, 2008

Figure B.16



Designated Land Use

Special Conservation

Open Space / Field Research

Sources:
Zoning: Santa Clara County, 2003
Aerial photos: Triathlon Ltd., 2006
Creeks: US Geological Survey, 1991

Disclaimer:
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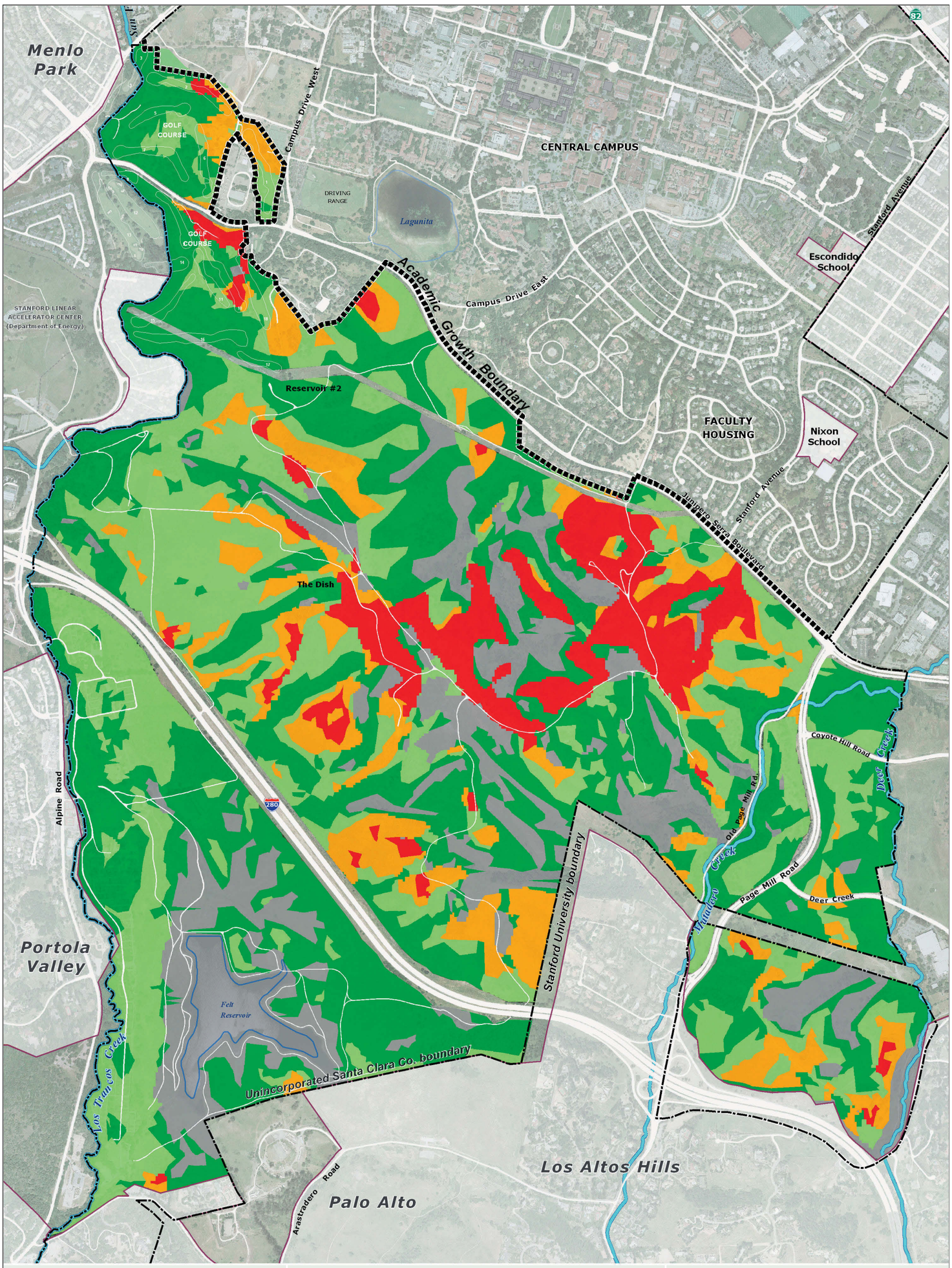
15
5
1
acres

0 0.25 0.5
Miles

N

SUSTAINABLE DEVELOPMENT STUDY
Stanford University, 2008

Figure B.21



Visibility from Primary Roads

Sources:
Visibility: Santa Clara County Planning, 2003
Aerial photos: Triathlon Ltd., 2006
Creeks: US Geological Survey, 1991

Disclaimer:
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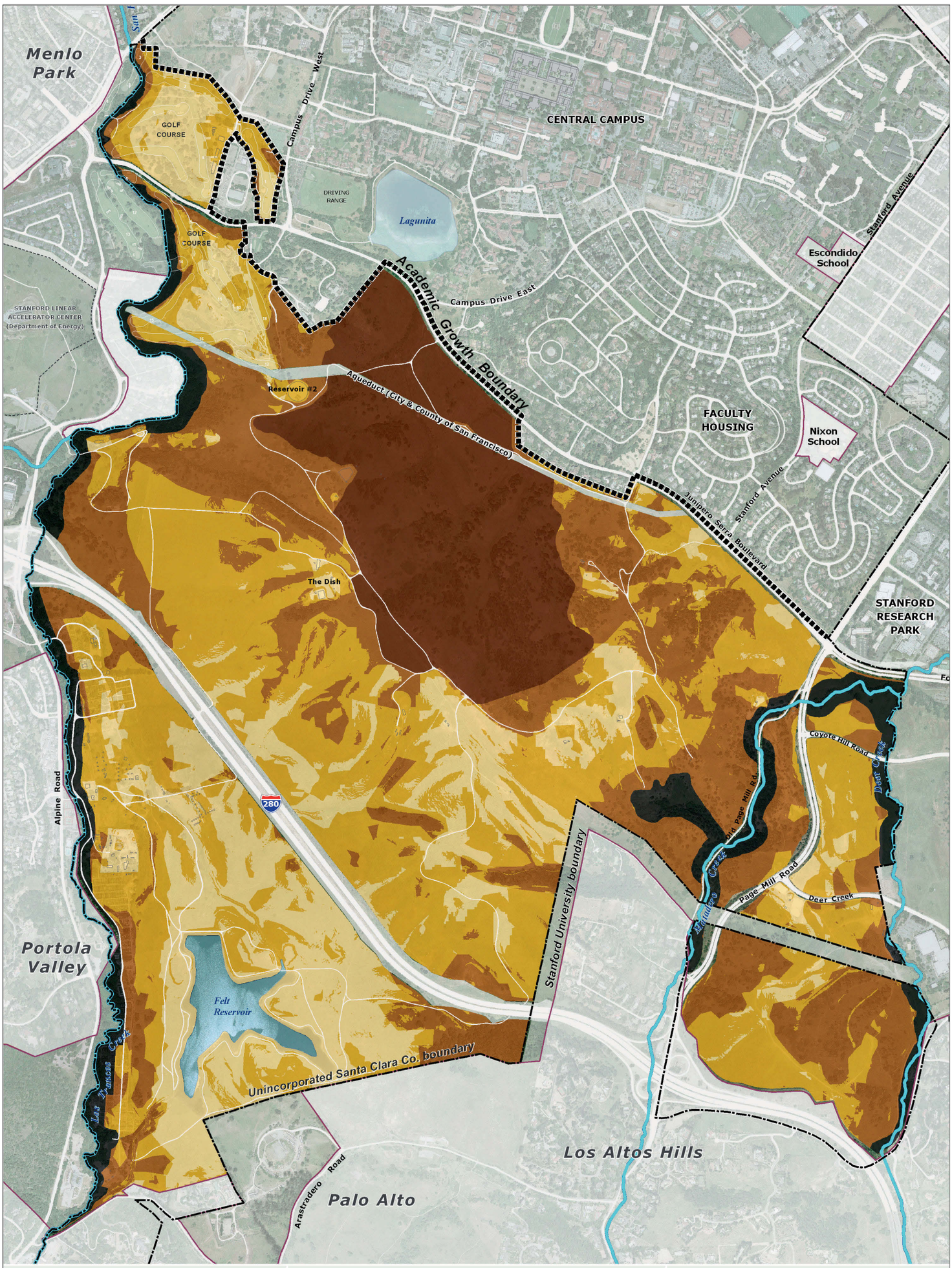
SUSTAINABLE DEVELOPMENT STUDY
Stanford University, 2008

Figure B.25



Land Sensitivity Composite Map

Protection Area
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- Long term

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- Moderate
- Low

Sources:
Sensitivity composite: Stanford Planning, 2008
Aerial photos: Triathlon Ltd., 2006
Creeks: US Geological Survey, 1991

Disclaimer:
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15
5
1
acres

0 0.25 0.5
Miles

N

SUSTAINABLE DEVELOPMENT STUDY
Stanford University, 2008

Figure B.28

STANFORD
UNIVERSITY