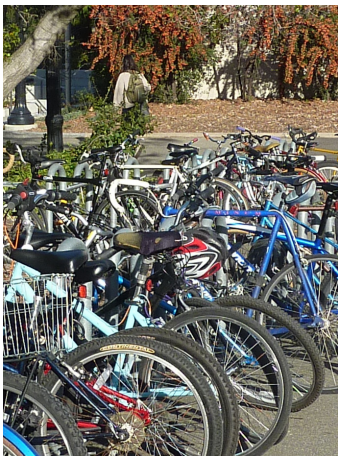
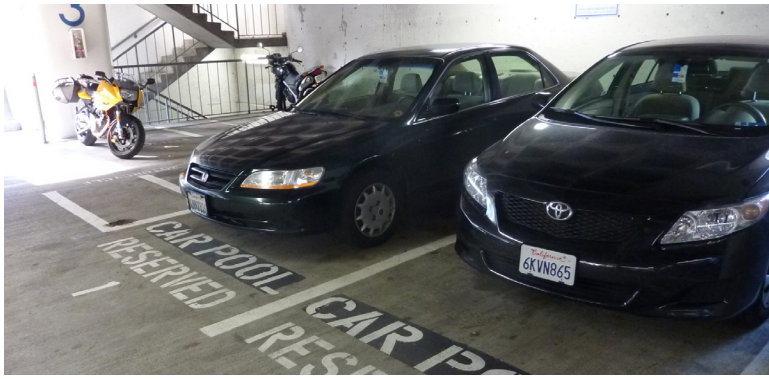
University of California, Berkeley

PARKING AND TRANSPORTATION DEMAND MANAGEMENT MASTER PLAN

February 2011





Nelson|Nygaard
consulting associates

UNIVERSITY OF CALIFORNIA, BERKELEY

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Chapter 1. Summary

Introduction

Parking is an important campus resource. A rich and vital academic community is highly dependent on the interactions among faculty, students and researchers. Convenient campus access facilitates that interaction; and parking plays a key role in supporting access.

For some faculty members, especially, adequate parking is critical in creating and maintaining campus intellectual life—the campus as a place to come frequently and to spend long periods of time. At the same time, parking poses difficult land use, sustainability and cost questions, especially for campuses like Berkeley with limited available land and challenged budgets.

In 2009, UC Berkeley commissioned a study, funded by campus Parking and Transportation, to provide information needed to address planning issues related to 21st century campus parking and transportation demand management (TDM). The study was timely. The Chancellor's Parking Oversight Committee had become increasingly concerned about the loss of existing parking areas to proposed building projects; and the campus needed guidance on mitigating the impacts of that lost parking. The goals of the study were to evaluate supply and demand of the campus parking resource and to make recommendations to address future parking need.

Regional policies related to congestion, access and climate change are shaping current thinking about parking; and this study provided an opportunity for the campus to look comprehensively at these issues. The study was done at the same time as a similar study for the City of Berkeley to allow both City and campus to coordinate efforts, specifically in the Downtown Area.

Under the 2020 Long Range Development Plan (LRDP) Settlement Agreement, provisions for Transportation Demand Management, UC Berkeley provided additional funding for both UC Berkeley and City studies to allow for a coordinated approach that integrates parking and transportation demand management.

Parking Supply and Demand

Today the UC Berkeley campus has about 7,000 parking spaces, including approximately 550 attended (stacked) spaces. Analysis of existing conditions indicates a locational disparity between supply and demand, creating an impression of overall scarcity. Demand varies by campus location but, without taking into account preference for shortest walking distance to destination, the campus experiences a surplus of nearly 1,400 spaces during periods of peak demand—midweek, midday.

Currently demand for UC Berkeley parking facilities is highest on the west side of campus, adjacent to downtown. Vacancies are most often found in the Hill Campus lots and in the Underhill Garage. In the future, if current policies are maintained, this geographic imbalance of supply and demand will likely continue as a significant amount of University growth is projected for the west side of campus near downtown Berkeley and on the Southside.

Over the next 10 years, the campus plans to use most of its surface lots for buildings as shown in the 2020 Long Range Development Plan (LRDP). This could reduce the parking supply to about 4,600 spaces and result in an overall shortfall of spaces – a deficit of between 500 and 700 total spaces depending upon geographic boundaries of the analysis.

Strategies to Address Demand

Building a new parking facility to ameliorate this deficit will cost an estimated $28 million (overall project cost for 700 spaces @ $40,000, exclusive of on-going maintenance funding and savings needed to recapitalize spaces that have exceeded their lifespan.) Whether this facility is located in the downtown where demand is likely to be greatest, or at another location, a new parking facility will not solve the geographic imbalance of supply and demand in other areas.

An alternate approach is to consider the parking deficit in the context of the overall campus goal of supporting ease of access to the campus.

In supporting access, strategies and recommendations related to parking fall under two broad categories: 1) those that **rebalance** demand (both geographically and by transportation mode); and 2) those that **reinvent** the systems that provide the actual parking spaces. Strategies in both categories have the advantage of significantly moving the University toward its goals for environmental sustainability but do not preclude future construction of a parking facility if demand cannot be met. The main strategies in each category are listed below in order of effectiveness, cost and ease of implementation.

Rebalancing Strategies

- Expand transit programs
- Aggressively market alternatives to driving alone
- Improve efficiency of existing parking supply: consider separately and in combination expanded attended (stacked) parking, valet parking, expanded enforcement, and shuttle improvements
- Use pricing to reduce and redistribute parking demand
- Use technology to direct drivers to available spaces
- Improve bicycle and pedestrian experience
- Enhance car share programs

Reinventing Strategies

- Explore opportunities for shared use of existing UC Berkeley and City of Berkeley parking inventory in and near downtown
- Retool the campus parking system to establish fees based on daily use
- Explore construction of new parking facility with City of Berkeley and/or other partners

Recommendations

Rebalancing: Expanding transit incentives, along with improved marketing of alternatives to driving alone, should continue to be the first demand reduction strategy. Recognizing that proposed AC Transit service cuts may make East Bay bus transit unattractive, the campus should push BART to offer incentives, expand car-share membership and support bicycle and pedestrian commute options. See Strategy One in Chapter Five.

Rebalancing: As noted in Chapter 2, no data sources were available that differentiate demand by permit type. However, anecdotal experience indicates that some lots and garages experience vacancies or over-demand according to permit type. A tool for rebalancing and addressing perceived scarcity would allow collection of real time occupancy and vacancy information, and expand systems for advising commuters of available spaces. See Strategy Three in Chapter Five.

Rebalancing: Prices should be adjusted to reflect the market value of commuter parking supply, and for individual lots and garages based on demand. Over-sale of under priced permits contributes to perceived scarcity of the parking resource, and should be addressed through permit pricing that at least is increased to match the local market. Additionally, lowering price for underused campus facilities may help balance supply and demand in some sectors, shifting demand to less impacted facilities such as the Underhill Garage and the Foothill lot east of Gayley Road. Attended parking could be expanded to allow the space inventory to expand and contract to meet campus needs. The campus could also use valet parking with drop-off and pick-up points to make better use of existing parking in distant areas. The campus should suspend the parking replacement policy which is counter to current system-wide policy and campus sustainability policy. To provide additional parking, if later shown to be needed, the campus can establish a policy for funding new parking from user fees or through another campus-wide program consistent with Regents policy. See Strategy Four in Chapter Five.

Reinventing: Over 5,000 campus faculty, staff and students purchase monthly, semester and annual parking passes each year. These allow the permit holder unlimited parking and discourage consideration of the marginal cost of parking each day, creating an incentive to drive to campus. Switching to daily fees would allow a commuter to save money every time s/he uses an alternative to parking in University facilities. See Strategy Five, Chapter Five.

Reinventing: As soon as possible, the campus and the City of Berkeley should begin to explore ways in which they might share existing parking resources. In general, for the campus, this would involve the day time use of excess City and/or private garage capacity; and for the City, this would involve the night time and weekend use of excess campus lot capacity. See Strategy Two in Chapter Five.

Table 1-1 Summary of Strategies (See Chapter Five)

Strategies		Spaces Gained / Mitigated	Total Cost	Cost / Space / Yr
Rebalancing				
	Expand transit programs	260	$527,000	$2,000
	Aggressive marketing	TBD*	$170,000	TBD
	Expanded attended parking	450	$638,000	$1,400
	Valet Parking	400	$797,000	$2,000
	Differential pricing***	200	$122,000**	$600
	Guidance technology***	TBD*	$396,000**	TBD
	Bicycle and pedestrian programs	25	$61,500**	$2,500
	Enhance carshare	25	$50,000	$2,000
Reinventing				
	Explore Shared Parking Downtown Berkeley	TBD	TBD	$1,800
	Establish Daily Use Fee***	100	TBD	TBD
	Explore Partnership to Build New	TBD	TBD	$3,200
		1,460		

* Linked to above

** One time costs; does not include any affiliated recurring costs

*** Assumes technology infrastructure improvements associated with new Parking Access and Revenue Control System; based on estimated budget from the FHWA Value Pricing Pilot Program grant, 2010

Partnership Strategies with the City Of Berkeley

Locating more UC Berkeley functions in or near the downtown creates opportunities for shared parking as well as for greater use of transit. The most recent available data found that downtown Berkeley had a significant amount of available parking during peak demand hours. Occupancy counts showed that many metered on-street spaces are occupied by long-term parkers, but downtown garages had excess capacity of close to 1,000 spaces. Although, in the future, increased enforcement of time limits and residential permit parking rules may push some on-street parkers into garage spaces and additional downtown development may lead to increased use of the garages, the combined inventory for UC Berkeley and downtown Berkeley may well continue to exceed the needed capacity during peak day time demand hours. Both the City of Berkeley and the University may benefit from collaborative management of this inventory.

Existing Policies

Parking is addressed in the campus 2020 LRDP (2005) and in Regents and University of California, Office of the President (UCOP) policies. Although the LRDP and University of California (UC) Systemwide parking policies reflect a general institutional approach to parking,

the campus faces immediate and long-term decisions about parking for which this study proposes specific recommendations.

- **UC Systemwide Parking Policies**
  In 2002 UCOP codified existing parking policies, including the following principles:

  1. The cost of capital and operating expenses related to the parking system shall be recovered from the users of the parking system. (Principle 9) and
  2. Employee parking fees shall not be paid for by funds available to the University (Principle 8) and
  3. Parking in the core campus is an interim land use, subject to displacement by essential core facilities as the campus grows. The University views the use of this core campus land for parking facilities as an interim subsidy. (Principle 12)

  See http://www.ucop.edu/ucophome/coordrev/policy/parking-principles2002.pdf

  In 2003 The Regents adopted their first system wide sustainability principles, which were revised to incorporate sustainable transportation policies. See http://www.universityofcalifornia.edu/sustainability/documents/policy_sustain_prac.pdf

  In 2007 and 2008 UCOP established a requirement that parking structure projects must be supported by a sustainable transportation business case analysis, examining alternative solutions including policy changes and program changes. See http://www.universityofcalifornia.edu/sustainability/documents/buscase_guidelines.pdf

- **2020 LRDP Parking Policies**

  1. The 2020 LRDP established policies related to parking and projected the number of new spaces needed. LRDP parking policies are linked to the principle of the contiguity of academic programs—the goal of locating the academic enterprise "in close proximity… to foster the formal and informal interactions that lead to synergy and discovery."
  2. Increase the supply of parking to accommodate existing unmet demand and future campus growth.
  3. Reduce demand for parking through incentives for alternative travel modes. Collaborate with cities and transit providers to improve service to campus.
  4. Replace and consolidate existing university parking displaced by new projects.
  5. Minimize private vehicle traffic in the Campus Park. Locate new campus parking at the edge or outside the Campus Park.

Revising LRDP Findings

The 2020 LRDP notes that parking targets may be adjusted in the future to reflect changes in market conditions and parking demand (2020 LRDP p. 28). The LRDP estimated latent parking demand, including parking in the adjacent neighborhoods that, since associated with the campus, seemed appropriate to direct to University garages (2020 LRDP EIR Vol 1 p. 4.12-18 and p. 4.12-55). Since the time of the LRDP analysis, campus drive-alone rates have continued to decline, and the increasing focus on sustainability and carbon reduction goals have contributed alternative means of campus access. This study reviewed LRDP findings and the above policies and recommends revisions based on new demand data and campus sustainability goals.

The LRDP projected a net additional increase in parking need of 2,300 spaces provided in two phases. Phase 2, 500 spaces, would be deferred until after 2020 if the AC Transit Bus Rapid Transit Telegraph route was approved and the system under construction by January, 2010. Although BRT is now stalled and unlikely to go forward as envisioned in the LRDP, this study does not identify a similar parking need. In fact, this study suggests that there is a parking surplus, especially when considering UC Berkeley's demand together with the downtown Berkeley inventory.

Personal Experience

Because all faculty, staff and students come to campus, everyone has experience with campus parking and transportation whether through walking, biking, driving or taking transit. Although campuses across the US face similar issues of parking shortages, traffic congestion, ineffective transit and more, each campus has characteristics that appear unique—topography, land costs, weather, culture. Nonetheless, transportation planners, engineers and researchers are reaching general conclusions about parking and transportation that challenge people's understanding based on their individual experience. The recommendations in this study rely on research and data being used throughout the US to establish and implement parking and transportation policies for the 21st century.

Chapter 2. Introduction

Purpose of Plan

The primary purpose of this plan is to address the following:

1. Anticipated gap between projected parking supply and demand in 2020 as described in *Parking Supply & Demand Assessment*, May 2010.
2. Current parking conditions including perceived shortages in some campus locations.

The plan proposes strategies and makes recommendations consistent with the following overall campus goals:

- Provide excellent access to campus whether through driving, carpooling, bicycling, walking or using public transportation *(2020 LRDP)*
- Maintain a sufficient supply of parking on campus *(2020 LRDP; Strategic Academic Plan)*
- Provide effective transportation services *(2020 LRDP; Strategic Academic Plan)*
- Maintain the financial integrity of the parking and transportation system for the University *(Operational Excellence goals, Regents policies)*
- Support the University's mission as an environmental steward and "green" university *(CalCAP goals, Regents and UCOP policies)*

To achieve these goals, the plan identifies the parking and transportation strategies that have the greatest potential to reduce parking demand at the University, quantifies the likely costs of the strategies, and determines the most cost-effective combination of these. The plan also identifies the points at which it would be more cost-effective for UC Berkeley to make additional investments in transportation demand management programs rather than to construct new parking.

The plan provides a comprehensive transportation strategy for UC Berkeley, balancing access needs of the University community with broader University goals related to environmental stewardship. The plan acknowledges the reality of cost, land scarcity, and the regional transportation impact of the University. The plan reflects current policy thinking and scholarship related to transportation planning.

Approach

In developing this plan, consultants and campus staff evaluated the effects of maintaining status quo parking and transportation policies for the next 10 years, assuming that the proposed campus building program (including new buildings and surface parking lot closures) continued and that no new or replacement parking facilities were built. The best snapshot of campus supply and demand available at the time of this writing was taken in the fall of 2009. Since the time that data was collected, a small number of parking spaces have both left and returned to the inventory. Such small changes in one direction or another are expected and do not discount the future space estimates and the broad, programmatic recommendations in this study. These changes reflect the fluid nature of a healthy parking system, and effective day-to-day parking management accounts for them.

Plan authors note that the economic climate is very different from what it was at the time of the writing of the LRDP. In addition, Operational Excellence initiatives underway underscore the importance of UC Berkeley's transportation programs being self-supporting. These programs will continue to seek value-added solutions to transportation related issues; solutions that can provide both fiscal and environmental savings.

This report is structured as follows:

- **Chapter 3: Existing & Projected Future Conditions** evaluates the campus and downtown Berkeley parking supply and demand, and projects the implications of changes. It is based largely on the work reflected in the technical memoranda in Appendices B, C and D
- **Chapter 4: Life Cycle Costs of Parking & TDM** reviews the costs for existing TDM programs, assesses the cost-effectiveness of these programs using a lifecycle cost analysis approach, and compares them to the cost of building additional parking
- **Chapter 5: Recommended Strategies** describes a variety of strategies to rebalance parking demand and to reinvent the systems that provide it. Technical transportation modeling, more fully described in Appendix A, is the basis for identifying, evaluating and supporting these strategies
- **Chapter 6: Conclusions & Next Steps** summarizes the plan

Scope of Work

The essential tasks in this study included:

1. Reviewing existing data and previous studies
2. Reviewing published studies and the experience of other universities with a variety of parking and transportation demand management strategies
3. Projecting future parking supply and demand under a "status quo" scenario
4. Estimating the cost of balancing supply and demand by building additional parking
5. Estimating the cost of balancing supply and demand by enhancing transportation demand management
6. Developing recommendations on specific transportation demand management strategies and policies

Data Sources, Citations and Technical Resources

The following section provides a brief summary of the data sources and technical resources used in this study. An expanded description of these, along with tables and charts considered too detailed or lengthy to be included in the body of the report, is provided in the appendices and in the separate Parking and Demand Reduction spreadsheet model.

- **Data Sources and Citations.** This study relied on a variety of data sources provided by UC Berkeley staff and the City of Berkeley. Existing data and previous studies were used to establish the existing and projected campus parking supply, occupancy rates, parking operations and finance, as well as the operations and finance of existing transportation

demand management programs. Previous parking studies were used as the basis for establishing the expected cost of adding additional parking supply.

Data sources reviewed included the following:

1. Student Housing and Transportation Surveys conducted since 1997
2. Faculty and Staff Housing and Transportation Surveys conducted since 1997
3. Fall 2009 Parking Inventory and Occupancy Surveys conducted by UC Berkeley Parking and Transportation
4. Parking and transportation revenue and expense data (current and projected) provided by UC Berkeley Parking and Transportation
5. Population and built space data (current and projected) provided by the Office of Physical and Environmental Planning
6. City of Berkeley Parking Inventory and Occupancy Surveys from 2005-2009, provided by the City of Berkeley, Transportation Division.[1]

While these data sources provided a great deal of valuable information, there were also limitations. The parking occupancy surveys for most non-UC Berkeley facilities were conducted in 2007 when the economy was more robust and therefore may overstate demand. The Fall 2009 campus parking surveys do not fully distinguish parking demand by type of campus permit holder. Therefore, while total number of cars parked in each facility at the peak hour is known, the peak-hour demand for various types of parking permit holders is estimated from permit sales data and other sources.

Desirable areas for additional data and future research include: (1) Berkeley-specific data on sensitivity to parking price changes and transit fare changes (with careful controls for other variables); and (2) more fine-grained data on UC Berkeley commuter patterns, such as the ratio of permits sold to permit-holders parked at the peak hour for various permit types.

Published academic studies and the experience of other universities were used to estimate key variables in the parking model (such as the expected response of commuters to parking price changes) and to assess the feasibility of potential transportation demand management strategies.

- **Technical Resources.** Future parking supply and demand, as well as Parking and Transportation revenues and expenditures, were analyzed with the use of a spreadsheet model developed specifically for the UC Berkeley campus. This model has been provided to UC Berkeley staff. The model uses analytical methods developed previously by Nelson\Nygaard and used for many other campus, institutional and community parking and transportation demand management studies. The spreadsheet model is tailored for UC Berkeley's particular circumstances.

[1] Nelson\Nygaard Consulting Associates, City of Berkeley Existing Parking & Transportation Demand Management Programs, Conditions & Practices Technical Memorandum, May 2010, 10-27.

Appendix A describes the model's assumptions and presents a detailed analysis of the two basic scenarios: solving the projected future gap between parking supply and demand by building more parking, versus solving it by improving transportation demand management.

Chapter 3. Existing & Projected Future Conditions

Existing Conditions

Supply and Demand

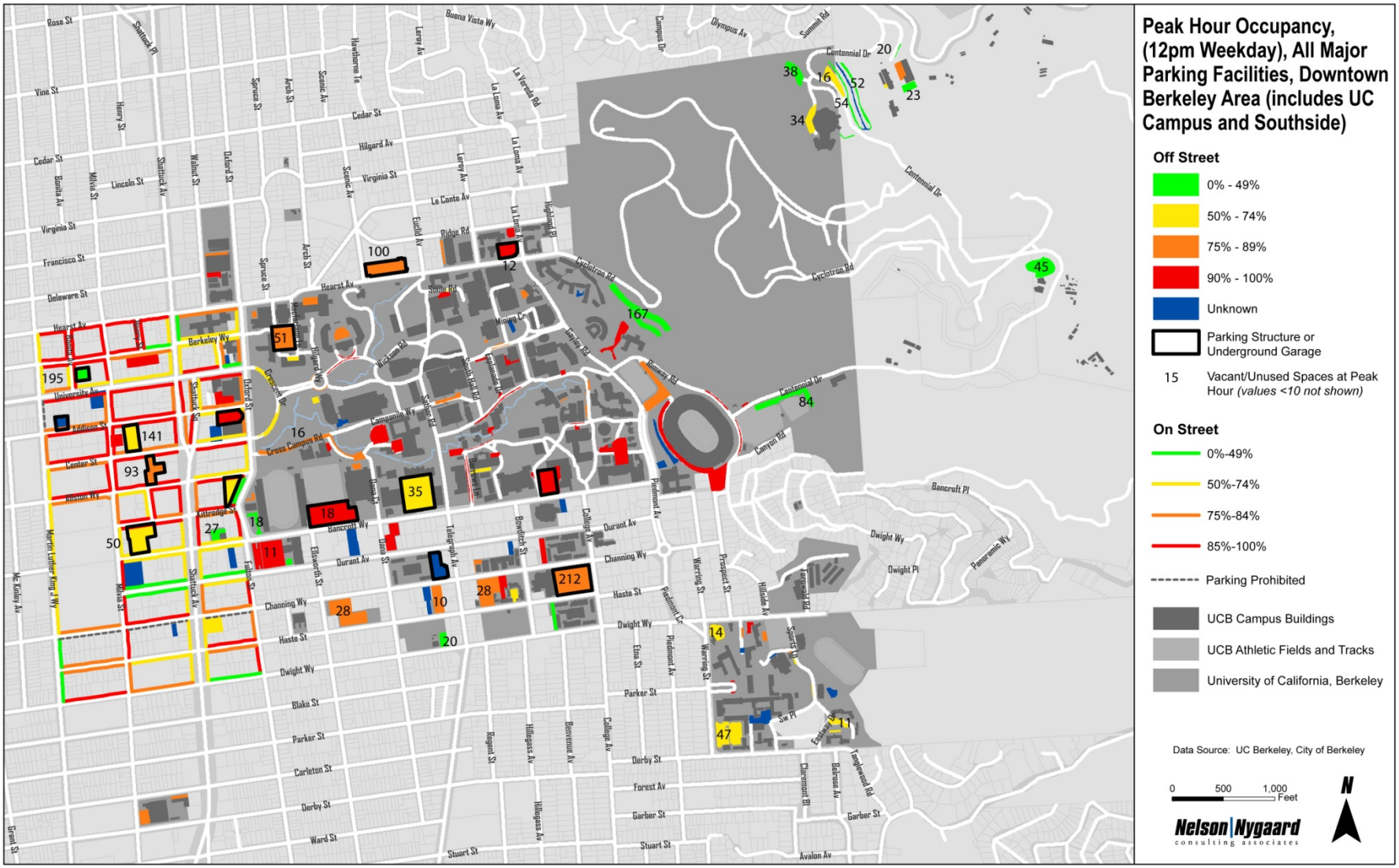
As of Fall 2009, campus parking supply was 6,952 spaces. This total included 554 attended (stacked) parking spaces. (Attended spaces are those created by parking cars more than one car deep, using parking attendants to move vehicles.) Parking occupancy counts conducted by UC Berkeley Parking and Transportation staff in Fall 2009 show a midweek, midday peak-period demand of 5,531 occupied spaces (80% of total). However, in some locations, there are acute shortages. Some lots and structures are 100% occupied at the peak hour, leading to the perception of an overall shortage of parking spaces on campus. The current spot shortages and surpluses in the campus parking system leave some campus parking facilities oversubscribed while others experience significant vacancies.

UC Berkeley's parking demand is unevenly distributed across campus. Many available spaces are inconvenient—both for the perceived length of time between parking and arrival at a campus destination, and for topography, because they require a hike down to and a climb up from the central campus. This is especially true of the 200+ spaces available on the hill above campus at Lawrence Hall of Science and the Space Science Laboratory. Although a campus shuttle service reaches these lots, it operates too infrequently to be useful to most drivers.

Most drivers opt to park in the area bounded by Gayley Road, Durant Avenue, Shattuck Avenue and Ridge Road, close to the central campus and the majority of campus buildings. There are many vacant spaces within a five minute walk of many campus buildings. Some parking lots with vacancies, like the Foothill lot (167 vacant spaces) and the Witter Field lot (84 vacant spaces) are not on the Central Campus. The Lower Hearst Garage (102 vacant available attended spaces) is across the street from the Central Campus; and the Genetics and Plant Biology Garage (52 vacant spaces) is on the Central Campus.

The three diagrams following illustrate 1) peak hour parking occupancy for all parking facilities on and near the campus (Figure 3-1); 2) five minute walk range for each campus parking area with over 50 spaces capacity and more than 20% vacancy during peak hours (Figure 3-2); and 3) five minute walk range for selected campus buildings and areas (Figure 3-3). These diagrams suggest that there are opportunities within the existing inventory to rebalance parking demand.

Figure 3-1 UC Berkeley, Downtown & Southside Parking Occupancy*



* UC Berkeley occupancy data collected in 2009; most non-UC occupancy data collected in 2007

Figure 3-2 Five Minute Walk Range for Campus Parking Facilities with 20% Vacancy

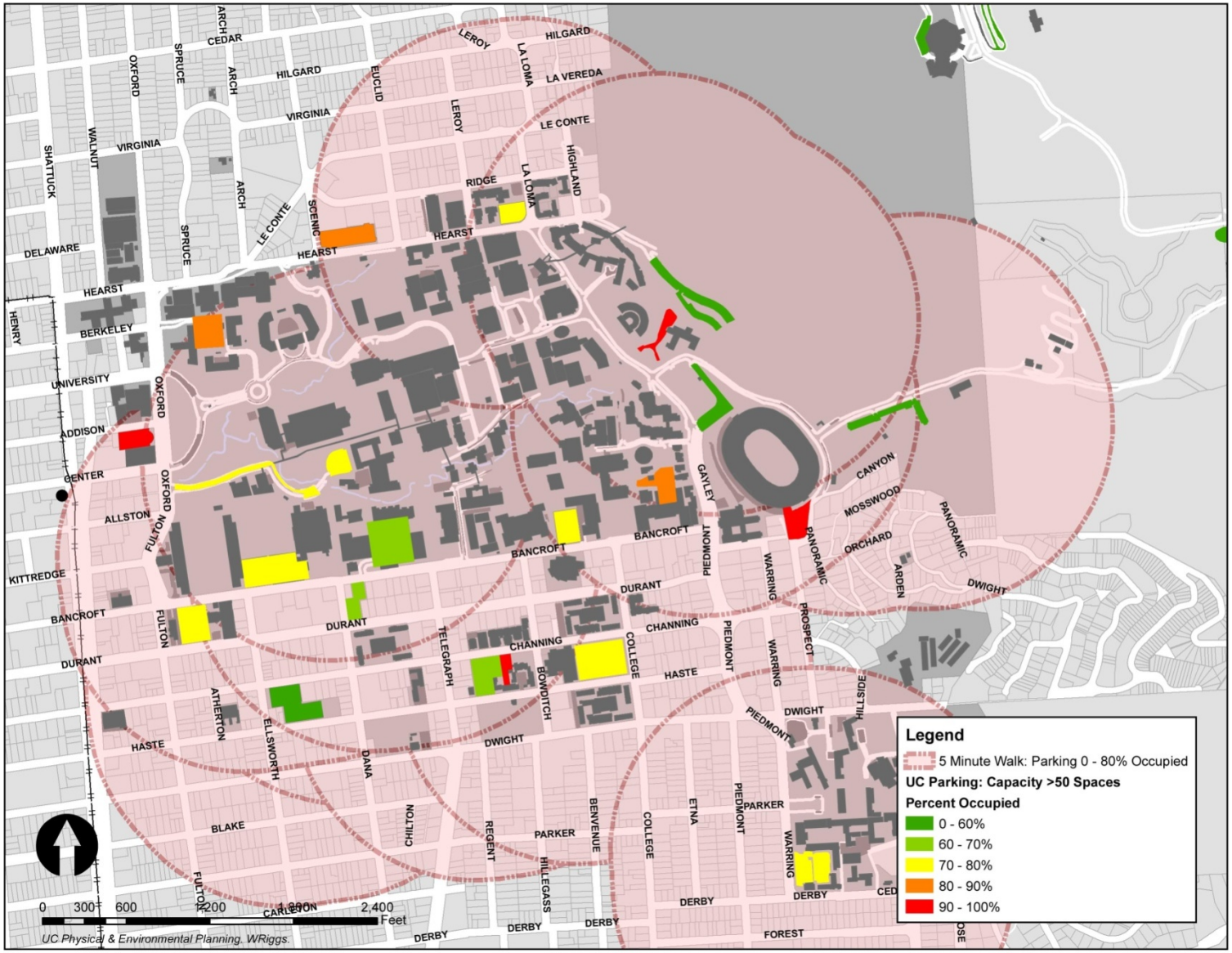
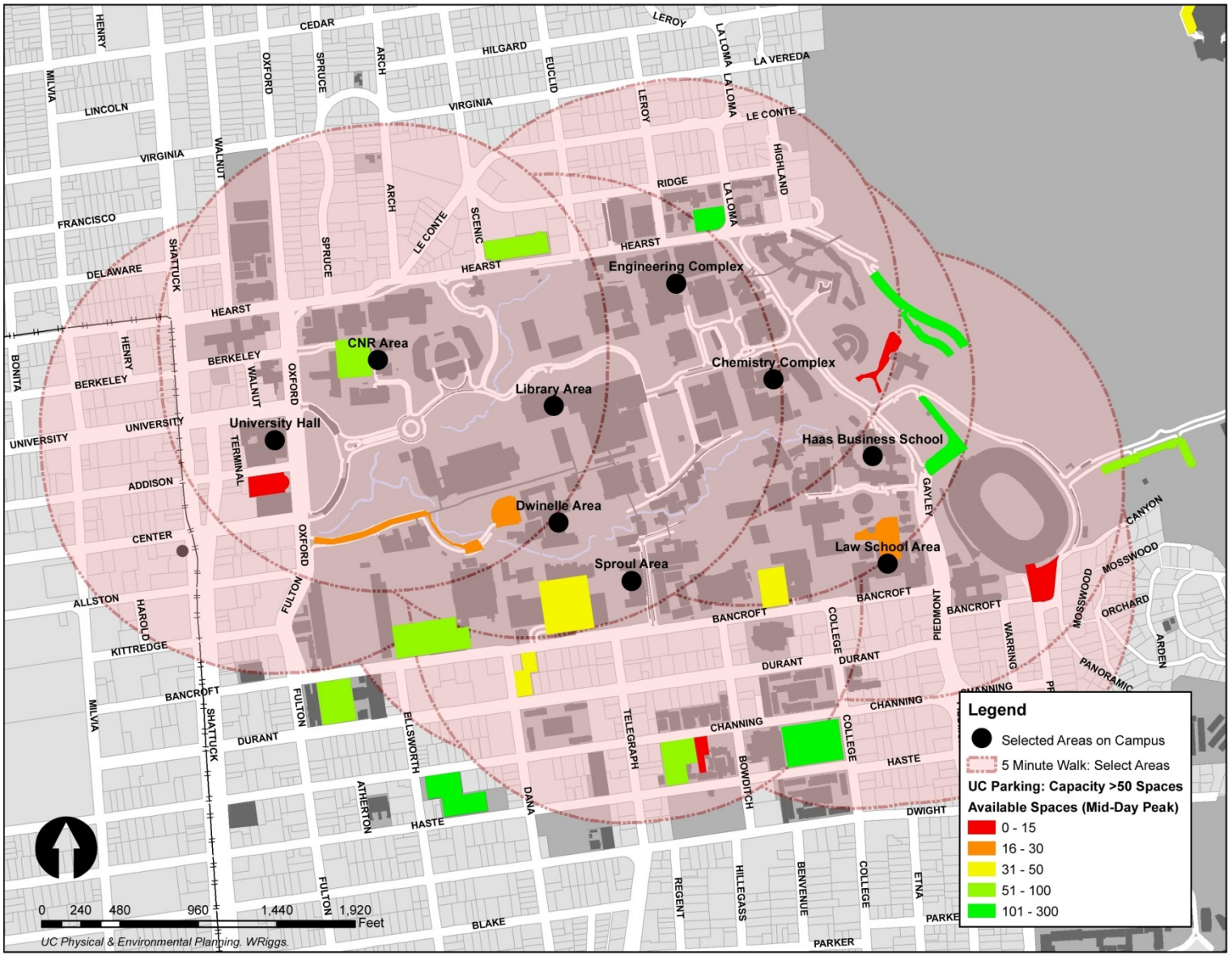


Figure 3-3 Five Minute Walk Range for Selected Campus Areas



Parking and Transportation Budget. UC Berkeley Parking and Transportation has an annual budget of approximately $16 million per year. This revenue is generated by parking permit sales, hourly parking sales, special event parking revenue, parking citations, shuttle system fare box revenues, student Class Pass fee revenues, and transit pass purchases by campus faculty and staff. This revenue funds operations and maintenance of parking facilities as well as transportation demand management programs. Parking and Transportation also pays $2.9 million in debt service on existing parking facilities.

Parking Pricing. Parking is priced by type of permit not by specific location although permit prices are tiered to location. Faculty and staff have two rates, a standard "F" rate and a higher "C" rate which permits access to Central Campus lots. Most staff members are not eligible for C rate permits. Students pay one monthly rate regardless of which student lot they use. Finally, there is a lower-cost "Hill Permit" which allows for parking in some spaces in certain lots east of Gayley Road. UC Berkeley permit pricing is generally lower than City of Berkeley garages or private garage rates. The following tables show parking options on and near campus with monthly, effective daily and daily rates.

Table 3-1 UC Berkeley Parking Permit Rates

Permit	Eligibility	2009-2010 Permit Price (per month)	2009-2010 Daily Rate* (effective)	2009-2010 Daily Rate (scratch off)
C	**Central Campus Annual Permit:** Faculty; staff with 20+ years of service	$124	$6.20	$16.00
RH	**Residence Hall Permit:** Students or faculty/staff residing in residence halls	$101	$5.05	NA
F	**Faculty/Staff Annual Permit:** All faculty and staff (except UC Extension staff)	$90	$4.50	$12.00
S	**Student Annual:** Available to all graduate and undergraduate students residing at least two miles away	$73	$3.65	$10.00
E	**Emeriti:** Retired/Emeritus Faculty (E Permit holders may park in all "C" spaces/lots)	$38	$1.90	NA
H	**Hill Area Annual:** Certain designated hill campus parking spaces	$67	$3.35	$8.00
C CP	**Central Campus Annual Carpool Permit:** C permit eligible faculty/staff may purchase; single occupancy trips require purchase of daily ticket	$44 (per person)	$2.20	NA
F CP	**Faculty/Staff Annual Carpool Permit:** F permit eligible faculty/staff may purchase; single occupancy trips require purchase of daily ticket	$29 (per person)	$1.45	NA
S CP	**Student Annual Carpool:** S permit eligible students may purchase; single occupancy trips require purchase of daily ticket	$26 (per person)	$1.30	NA

* Effective daily rate assumes 20 commute days per month.

Table 3-2 City of Berkeley Garages Parking Rates

Lot/facility	Monthly Rate	Daily Rate* (effective)	Daily rate (9:00 AM-5:00 PM)
Center Street Garage (City-Owned)	$150	$7.50	$15.00
Oxford Garage (City-Owned)	$150	$7.50	$15.00
Telegraph/Channing Garage (City-owned)	$150	$7.50	$20.00

* Effective daily rate assumes 20 commute days per month.

Table 3-3 Private Downtown Garages Parking Rates

Lot/facility	Monthly rate	Daily Rate* (effective)	Daily rate (9:00 AM-5:00 PM)
Allston Way Garage **	$160	$8.00	$14.00
Berkeley Way Lot	N/A	N/A	$13.00
Kittredge Garage (Library Gardens) ***	$125	$6.25	$15.00
Milvia Street Lot	N/A	N/A	$14.00
Promenade Garage	$143	$7.15	$11.00
Golden Bear Garage (UC-Berkeley owned) ***	$170	$8.50	$14.00

* Effective daily rate assumes 20 commute days per month.

** The Allston Way Garage charges $195 per month for a reserved space, an effective daily rate of $9.75.

*** The Kittredge Garage and the Golden Bear Garage offer discounts for building tenants.

Table 3-4 Private Parking Spaces Advertised Rates*

Location	Asking Price (per month)
Euclid and Ridge Avenue	$150
Hilgard and Scenic	$130
Durant and Milvia	$100
Dwight and Dana	$90
Ellsworth and Parker	$80
MLK, Jr. and Allston	$75

* Sampling from Craigslist, February 2010

Projected Population. The LRDP projects campus population declining slightly by 2020 from 51,549 people in 2009 to 51,260 in 2020. The absolute number of students may decrease by a small number altering the proportion of faculty and staff to students. Although the population shift is marginal, it may change parking demand slightly since more faculty and staff than students drive to campus.

Projected New Building and Lost Parking. The LRDP also projects built space on the campus increasing by approximately 10% , some of which has already been completed. These newly constructed buildings can be expected to shift or create new focal points of parking demand on campus. Potential major development projects on existing parking sites are shown in Table 3-5.

As built space increases, parking supply will decrease as illustrated in Table 3-5. As many as 1,485 campus-managed parking spaces will be removed from the inventory as existing surface parking lots and Central Campus parking structures make way for new buildings. This would leave the campus with a total of 5,467 spaces. As lots are taken out of service, the remaining parking spaces are typically reallocated to provide the appropriate number of spaces for each permit type. The permit types served by these parking lots are shown in Table 3-6. Since the Central Campus is losing the most parking, C permits may be of particular concern; however, as noted in Chapter 2, occupancy and vacancy rates are not yet collected by permit type so the extent of impact is not known. Currently, there are approximately 1,200 C permit spaces on campus. Approximately 1,300 C permits are sold each year.

Table 3-5 Parking Facilities Slated for Removal 2010-2020

Site	Possible Project	Lost Parking	Estimated Date
Anna Head West	New housing replacing surface parking lot	216 spaces	2010
Bancroft / Fulton (Tang Lot)	New housing and administrative space replacing surface parking lot	279 spaces	2015
Bancroft / Kroeber	New academic space replacing structure over parking	161 spaces *	2018
Boalt Lot	New academic space replacing surface parking lot	134 spaces *	2018
Dana/Durant	New administrative space replacing surface parking lot	126 spaces *	2020
Dwinelle Lot	New academic space replacing surface parking lot	120 spaces *	2016
Ellsworth Structure	New housing replacing structure over parking	198 spaces	2016
Memorial Stadium	Circulation and facility improvements replacing surface parking	33 spaces	2011
University Hall Structure	New academic space (BAM) and surface parking replacing parking structure	138 spaces *	2016
Witter	Temporary Facilities for Memorial Stadium**	80 spaces	2010
TOTAL		**1,485**	

* Includes attended parking

** Although a temporary loss Witter represents the fluid nature of the inventory with spaces leaving and returning to the inventory on a regular basis

Table 3-6 Permit Types in Parking Facilities Slated for Removal 2010-2020

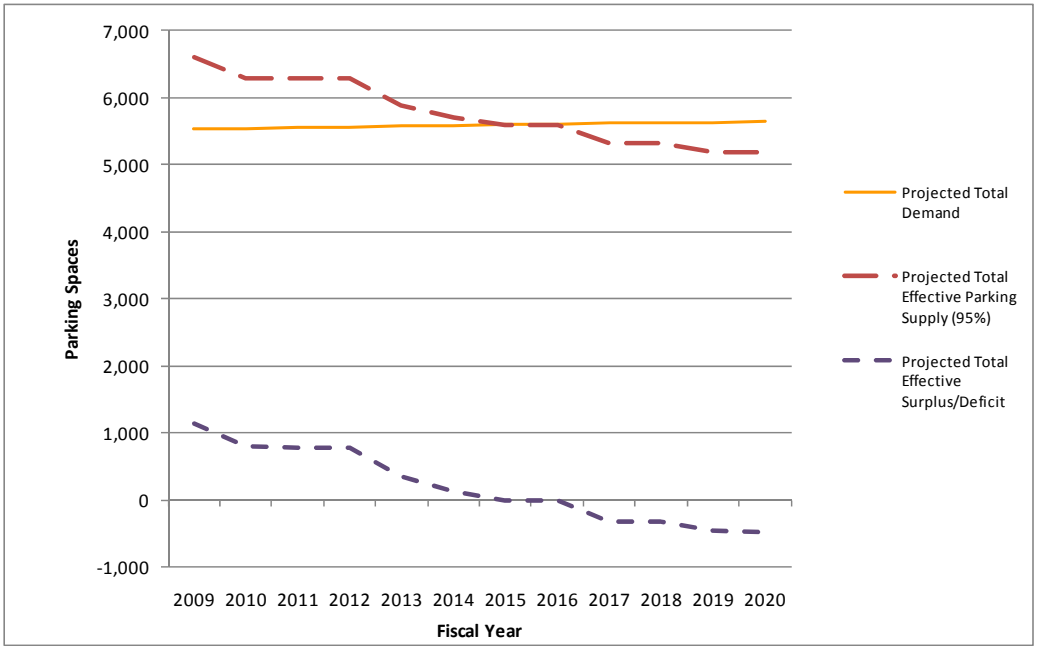
Parking Location	Estimated Date	Permit types served		Lost Parking*
Anna Head West	2010	C		216 (public)
		F		
		Other	216	
Bancroft / Fulton (Tang Lot)	2015	C		279
		F	279	
		Other		
Bancroft/Kroeber	2018	C	161*	161*
		F		
		Other		
Boalt Lot	2018	C	134*	134*
		F		
		Other		
Dana/Durant	2020	C		126*
		F	126*	
		Other		
Dwinelle Lot	2016	C	120*	120*
		F		
		Other		
Ellsworth Structure	2016	C		198 (S)
		F		
		Other	198	
Memorial Stadium	2011	C		33
		F	33	
		Other		
University Hall Structure	2016	C	138*	138*
		F		
		Other		
Witter	2010	C		80
		F	80	
		Other		
TOTAL			**1,485**	

* Includes attended parking

Projected Parking Demand: With the anticipated changes in the existing inventory, the future demand can be summarized as outlined below and illustrated in Figure 3-4**.**

- Peak-hour demand: Campus has 6,952 parking spaces (6,398 marked and 554 attended), 80% of which (5,531 spaces) are occupied during the peak hours from 12 pm to 1pm.
- Projected peak-hour demand: Although overall campus population is projected to decrease slightly, parking demand could increase slightly due to increases in proportion of faculty/staff population projected in the LRDP. By 2020, peak-hour parking demand could increase from 5,531 to 5,658 spaces if current travel patterns continue.
- Projected inventory: Removing 1,485 parking spaces to make way for new buildings would reduce the campus inventory from 6,952 to 5,467 spaces.
- Inventory contingency: Parking managers usually provide a few spaces more than projected demand to reduce the amount of time parkers have to hunt for a space and to account for potential blockages of spaces due to construction, special events, or cars parked over the line. If a 5% demand cushion is built into the calculations, the campus would need 5,956 spaces to handle future demand, if current demand rates hold.
- Supply/demand gap: Assuming demand of 5,956 spaces at the peak-hour and with 5,467 spaces in the inventory, the gap between supply and demand would be 489. This is the gap after all new projects are complete and reflects no effort at rebalancing or reinventing—no new parking, no price changes, no new transportation programs.
- Supply/demand gap without Hill area: The gap increases to 700 if the approximately 1,000 spaces located in the Hill area (east of Gayley) are omitted from the inventory. The gap does not increase by the full 1000 spaces because omitting these spaces from the inventory also removes existing demand associated with them. However, the spaces at Foothill, Witter and the Stadium are still close to campus and may more easily be filled through changes in pricing and/or management. For parkers at the top of the hill, valet pick-up and drop-off at individual offices (for a premium price) or central location might provide a way, although costly, to maximize inventory.
- Supply/demand gap estimate for planning: This plan uses a 450 space gap which the consultants feel accommodates day-to-day changes in the number of spaces available due to short term projects, special events and changes in the parking system. This takes into account the system as a whole and assumes minimal changes in management of the inventory.

Figure 3-4 Projected Parking Supply & Demand, Status Quo Scenario



Uneven Parking Distribution: Consistent with the campus Strategic Academic Plan (http://opa.berkeley.edu/StratPlan/AcademicStrategicPlan.pdf), growth of the academic enterprise is accommodated on campus or in its immediate vicinity, and not necessarily near existing parking structures or available parking supply. Off the Central Campus, sites identified as potential campus building sites are located on the west or southside of campus. Appendix B provides maps and additional detail on the lots identified for new development. In Berkeley's downtown, replacement of the University Hall Parking Structure with a new museum use, and the construction of both the new Biomedical Health Sciences building and the new Helios Energy Research Facility could shift demand toward the west side of campus. Notably, however, downtown is also well served by the regional dedicated rail transit system (BART) and many bus lines.

UC Berkeley Commuter Profiles: As shown in Figure 3-5 and Figure 3-6 many UC Berkeley students, faculty and staff live in close proximity to campus and/or to transit. The diagrams do not reflect absolute numbers of students—only those students who identify a college address in campus data bases. In addition, many student addresses are the same (residence halls, for example) so the circles representing them overlap.

Figure 3-5 Student Addresses

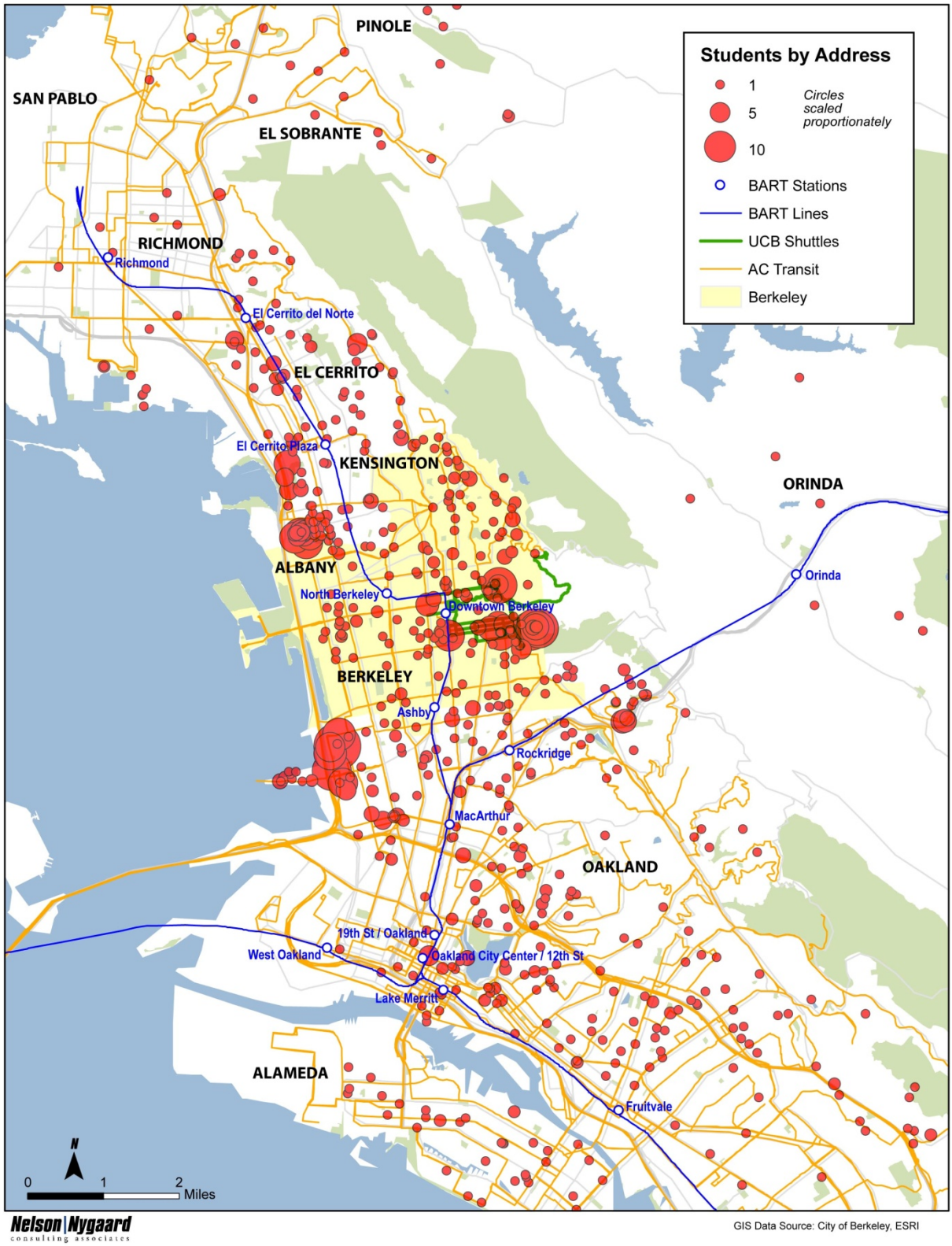
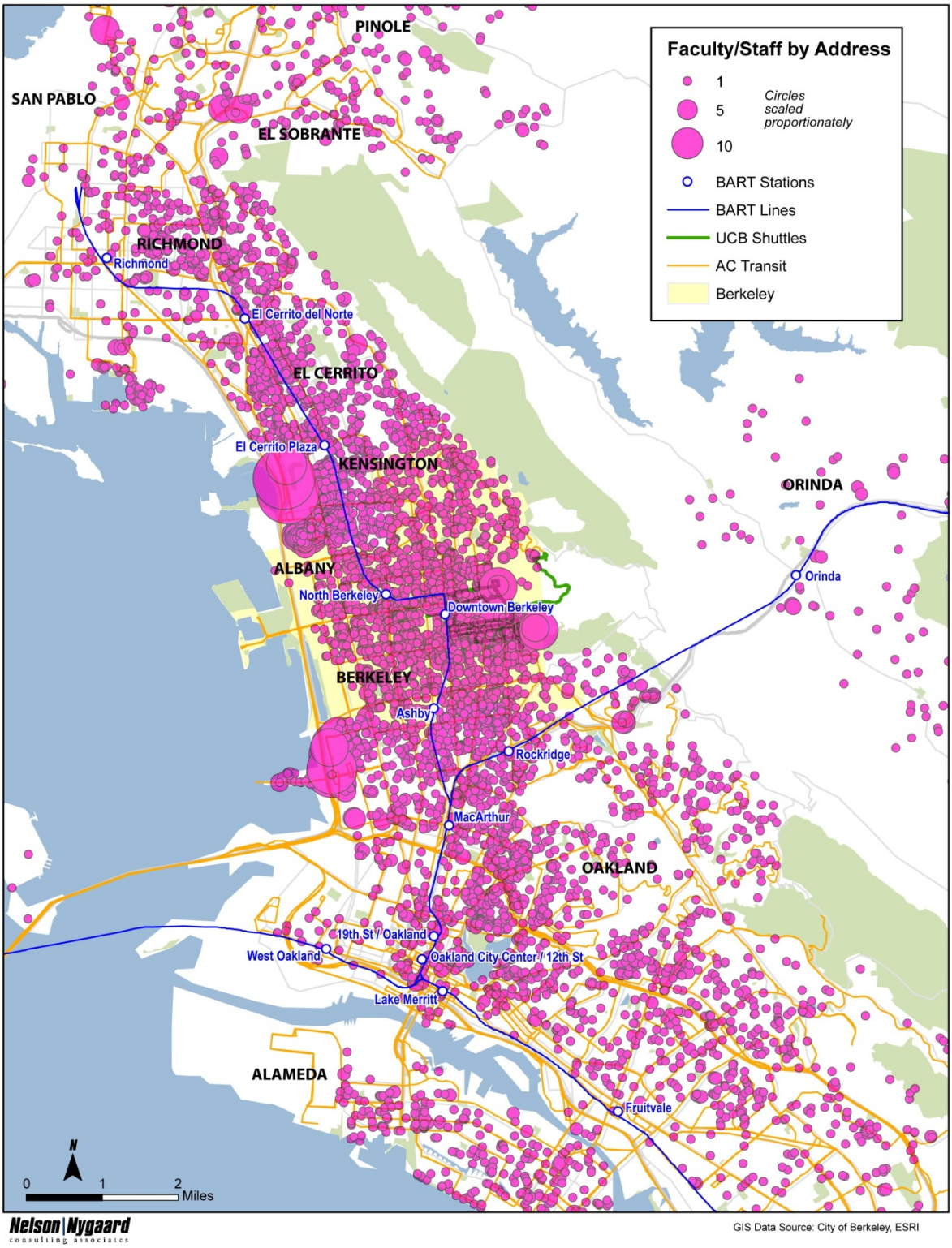


Figure 3-6 Faculty/Staff Addresses



Proximity to Campus. The table following (Table 3-7) provides information on where students, faculty, and staff customers of Parking and Transportation live. These customers are primarily permit holders. 26% of the student and 24% of faculty and staff addresses are within two miles of campus. Current campus policy prohibits students from purchasing parking permits if their residence is within two miles of campus unless there are extenuating circumstances. In general, a two-mile travel distance is considered a reasonable bicycling distance—although bicycle commuting is not appropriate for all individuals.

Table 3-7 Student, Faculty and Staff Permit Holders: Distance from Campus

	Students		Faculty/Staff		Combined	
Distance from center of campus	**#**	**%**	**#**	**%**	**#**	**%**
Less than ¼ mile	173	11%	502	5%	675	5%
Between ¼ to ½ mile	37	2%	274	3%	311	3%
Between ½ to 1 mile	45	3%	560	5%	605	5%
Between 1 and 2 miles	151	10%	1,202	11%	1,353	11%
Between 2 and 5 miles	443	28%	2,596	24%	3,039	25%
More than 5 miles	717	46%	5,619	52%	6,336	51%
Total	**1,566**	**100%**	**10,753**	**100%**	**12,319**	**100%**

Proximity to Transit Services: The tables below show proximity of students, faculty and staff permit holders to transit services including BART, AC Transit and UC Berkeley shuttles. Walking distance is considered to be ½ mile, approximately 10 minutes.

Table 3-8 shows the percentage of faculty, staff and student addresses near a BART station. A slightly higher percentage of faculty and staff customer addresses (17%) are within walking distance of BART compared to student customers (13%).

Table 3-9 shows the percentage of student, faculty, and staff addresses near a UC Berkeley shuttle route. Distances are measured from the shuttle stops. The data show that, in general, student locations are closer to a shuttle route than faculty and staff customers.

Table 3-10 shows that over two thirds of student, faculty, and staff addresses are within walking distance (½ mile) of an AC Transit bus route. However, this analysis does not take into account which routes directly serve the campus (nor recent or proposed service cuts) so these numbers cannot be used as a basis for policy development. Further research and analysis is needed since it is likely that bus services will continue to play an important role in campus transportation.

Table 3-8 Student, Faculty and Staff Permit Holders Distance from BART

	Students		Faculty/Staff		Combined	
Distance from BART station	**#**	**%**	**#**	**%**	**#**	**%**
Less than ¼ mile	40	3%	471	4%	511	4%
¼ to ½ miles	151	10%	1,449	13%	1,600	13%
½ to 1 miles	352	22%	3,065	29%	3,417	28%
1 to 2 miles	604	39%	3,033	28%	3,637	30%
More than two miles	419	27%	2,735	25%	3,154	26%
Total	**1,566**	**100%**	**10,753**	**100%**	**12,319**	**100%**

Table 3-9 Student, Faculty and Staff Permit Holders Distance from UC Berkeley Shuttle

	Students		Faculty/Staff		Combined	
Distance from UC Berkeley Shuttle Routes	**#**	**%**	**#**	**%**	**#**	**%**
Less than ¼ mile	166	11%	611	6%	777	6%
¼ to ½ miles	51	3%	278	3%	329	3%
½ to 1 miles	50	3%	598	6%	648	5%
1 to 2 miles	156	10%	1,171	11%	1,327	11%
More than two miles	1,143	73%	8,095	75%	9,238	75%
Total	**1,566**	**100%**	**10,753**	**100%**	**12,319**	**100%**

Table 3-10 Student, Faculty and Staff Permit Holders Distance from AC Transit

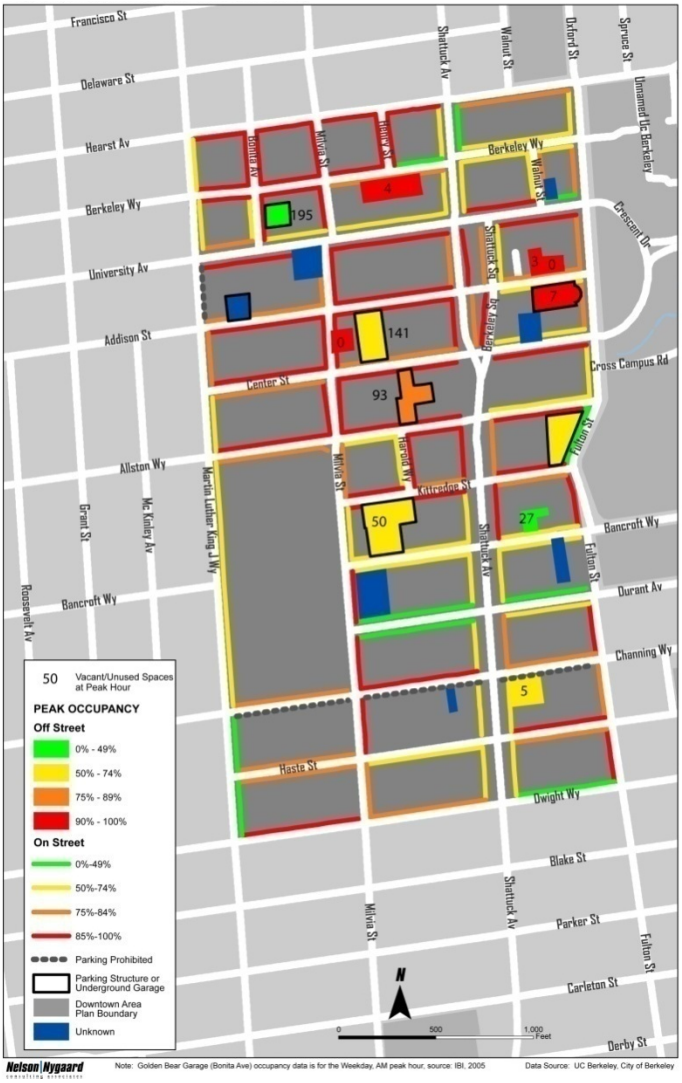
	Students		Faculty/Staff		Combined	
Distance from AC Transit bus routes	**#**	**%**	**#**	**%**	**#**	**%**
Less than ¼ mile	1,015	65%	7,043	65%	8,058	65%
¼ to ½ miles	78	5%	421	4%	499	4%
½ to 1 miles	20	1%	170	2%	190	2%
1 to 2 miles	42	3%	324	3%	366	3%
More than two miles	411	26%	2,795	26%	3,206	26%
Total	**1,566**	**100%**	**10,753**	**100%**	**12,319**	**100%**

Downtown Berkeley Supply & Demand

Table 3-11 Downtown Berkeley Parking Occupancy *

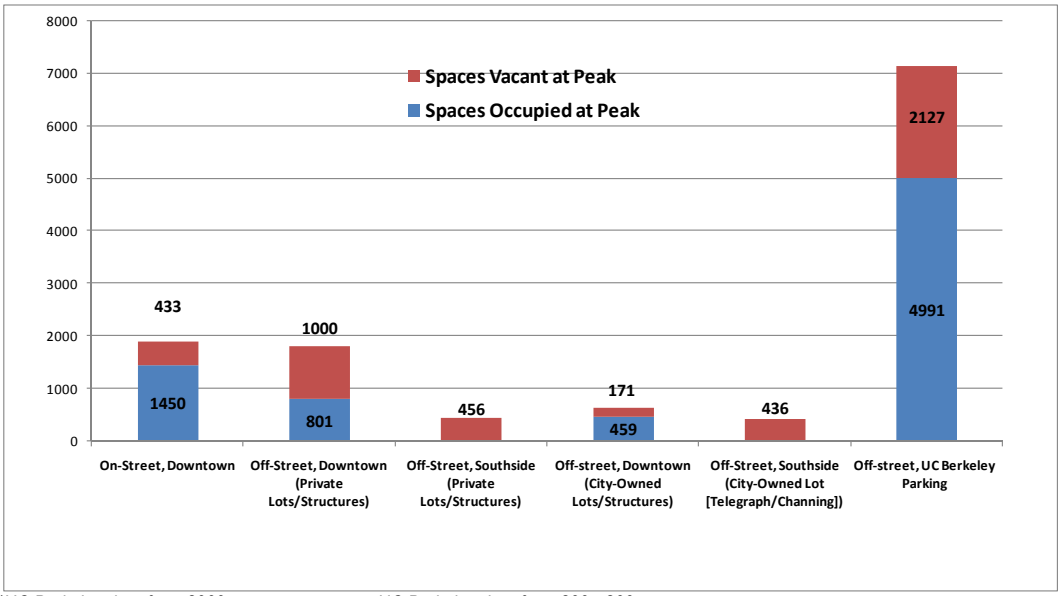
City of Berkeley / Other Public Parking				
	Spaces	**Occupied (Peak)**	**% Occupied**	**Surplus / (Gap)**
Current	4,305	3,292	76%	1,013

* City of Berkeley Existing Parking & Transportation Demand Management Programs, Conditions & Practices Technical Memorandum, May 2010, p10-27



The relationship between UC Berkeley and other non-campus parking is important because of the shared market for parking in places around Berkeley. In many cases neighborhood curb parking is occupied by "spill-over" parking from UC Berkeley, other institutions, or local shopping areas. Metered on-street spaces are sometimes occupied by long-term parkers who evade time limits by periodically moving their cars. In the most recent parking surveys, many downtown garages were found to have excess capacity. For example, the City of Berkeley owned Center Street Garage had 141 vacant spaces on average during peak hours. In total, downtown lots and garages were found to have an excess capacity of close to 1,000 vacant spaces on average. A summary of this inventory can be found in the adjacent figures. The monthly permit prices in the downtown are generally higher than UC Berkeley permit prices although private parking operators with unused inventory may offer lower prices on a temporary basis. In the case of a private operator, any unsold parking represents on-going lost revenue so there is incentive to fill spaces at any price.

Figure 3-7 Downtown Berkeley & UC Berkeley Occupancy*



*UC Berkeley data from 2009 surveys; most non-UC Berkeley data from 2005-2007 surveys.

As can be seen in the table above, even with a loss of spaces, the combined parking inventory for UC Berkeley and thae downtown Berkeley may exceed the needed capacity during peak hours. At minimum, the available parking in the downtown (City and privately owned parking facilities) offers an opportunity to help meet the short-term needs of UC Berkeley when it demolishes the University Hall garage. For example, the available parking spaces in the City of Berkeley's Center St. garage may be convenient for visitors to the new Berkeley Art Museum or be used by the campus to help accommodate any supply/demand gap as programs locate on the west side of campus.

Considering UC Berkeley, City of Berkeley and privately owned parking together, the current total supply of parking appears to be adequate. This suggests that, in addition to using TDM to reduce parking demand, the City and the University should consider sharing existing inventory and/or build jointly if more parking is needed in the future.

Since both UC Berkeley and the City will need to use parking revenue to fund any new parking supply, it is important that each considers the parking plans of the other. In the downtown area, parking garages (whether City of Berkeley, private, or UC Berkeley-owned) are competing for the same limited pool of customers. If too much parking capacity is built, then the danger is that none of the garages will attract enough paying customers to meet their revenue projections.

Chapter 4. Life Cycle Costs of Parking & TDM

As described in Chapter 3 the projects envisioned in the 2020 LRDP will alter demand patterns and remove some parking. This plan projects a 450 space gap in the campus parking inventory based on the LRDP. This projected gap takes into account the system as a whole and assumes minimal changes to existing parking management practices.

To solve the projected gap between parking supply and parking demand on the central campus, there are two basic options: (1) build about 450 new structured parking spaces; or (2) reduce demand by enhancing the University's existing transportation demand management programs or by intensifying the use of the existing inventory. Both options require additional funding and potentially higher parking permit fees.

This chapter is designed to compare the potential cost implications of each option. The first part of the chapter examines the cost of adding a new 450-space parking structure to serve the Central Campus. The second part of the chapter briefly describes the University's existing transportation demand management programs and suggests options for intensified use. For programs where sufficient data was available, the cost per commuter served for each program was estimated.

The Cost of Adding Additional Parking Structure Spaces

In estimating the cost of adding 450 structured parking spaces to serve the Central Campus, the cost of the preferred design alternative described in the recent Walker Parking Consultants *University Hall West Parking Garage Parking Study* (2009) was used.

As described in the study, the preferred design ("Scheme 2") would provide a 1,071 space parking garage on a site just west of University Hall, in the block bounded by University, Oxford, Addison, and Shattuck. This scheme consists of a 10-level conventional above-grade parking facility. The total project cost is estimated at $37,500 per space. (The cost per space gained is $39,260, which takes into account the 48 existing surface spaces on the site that would be displaced). Operation and maintenance costs were estimated at $536 per space per year. Since only 450 parking structure spaces are needed to close the projected gap between supply and demand, our analysis assumes that a 450-space garage could be built and operated on the same site for about the same cost per space.

To facilitate cost comparisons across modes, the cost of a parking structure can be expressed in terms of the annual cost per space per year. To estimate this cost, the following assumptions were used:

1. The parking structure can be expected to have a useful life span of 35 years (industry standard, Nelson\Nygaard)
2. If a parking structure is expected to last 35 years, the capital costs can be translated into an annual cost by spreading the cost of building it over its expected 35-year lifespan, using a long-term interest rate to account for the cost of the up-front expenditure. For this plan, an interest rate of 6% was used per UCOP, February 2010

3. Operating and maintenance costs, at $536 per space per year (2009 study referenced above), are then added to the total.
4. This translates into an annual cost per space of $3,244 per year, every year for the expected life cycle of the parking structure, a per month cost of $270, and a per work day cost of $12.44

Table 4-1 presents the results of a similar lifecycle cost analysis for several other potential parking structures. The analysis for the other structures uses the same assumptions listed above. The construction costs shown for four of the other sites (the Tang lot, Dana/Durant lot, Bancroft Structure, and the Upper Hearst Structure) come from Walker Parking Consultants 2005 *Parking Structure Concept Design Study* (attached as Appendix F). For each of these four sites, the lowest-cost design alternative is shown. The lowest-cost site, Upper Hearst, is considerably less expensive than the others in part because this proposal would convert the existing structure's rooftop tennis courts to parking, and the cost of replacing the tennis courts is not included in this estimate.

The last site considered is the Dwinelle lot. The cost of adding an underground garage on this site was estimated by a consultant team, in order to show an option that would add parking capacity underground in the center of campus (although central campus parking is inconsistent with LRDP guidelines). For the Dwinelle lot, this planning-level cost estimate uses the parking industry rule of thumb that the cost of a parking space on the first level of an underground parking structure can be expected to be 50% higher than the cost for an above ground structure due to the high cost of excavating and constructing underground facilities.[2] Using our benchmark capital cost of $37,500 per space for an above-ground structure, the cost of spaces on the first level underground will be $56,250 each.

The cost of parking spaces on subsequent underground levels will be still higher, and can be expected to be approximately equal to the cost of the level above plus a constant equal to the difference between the cost of an above-ground structured space and the first-level of the underground facility, which in this case is $18,750 per space.[3] Thus, a parking space on the second level of underground parking would cost $75,000 and on the third level underground a parking space would cost $93,750. As these numbers show, while underground parking keeps land free for building projects, it requires a premium for each successive level below grade.

These costs illustrate the cost implications of constructing a major new parking structure. At UC Berkeley, the possible slight increase in faculty/staff population will not lead to a significant increase in parking demand. Instead, the 450 structured spaces would be built primarily to replace surface lots that have been converted to buildings. In this situation, the new garage generates no *new* parking permit revenue: instead, its $1.6 million per year cost adds expense to the Parking and Transportation budget.

Building enough new parking to solve the projected gap between supply and demand adds $1.6 million per year in expense to the parking system, and creates no new revenues. Lower cost alternatives might include providing additional parking spaces in other than UC Berkeley built, owned and managed garages, with contracts to space providers that cap annual fees below $1.6 million in operating costs. See Chapter 5. (Note that if UC Berkeley leases parking spaces from an outside provider at one rate, and then provides the spaces to employees at a *lower* rate, the

[2] Walker Parking Consultants, “Solutions When More Parking is Needed”, July 11, 2005.

[3] The Dimensions of Parking 5th Edition, Urban Land Institute, 2010.

University would then need to comply with state parking cash-out laws – providing the same value of the parking subsidies to non-drivers. See http://www.arb.ca.gov/planning/tsaq/cashout/cashout.htm)

Alternatively, it may be cheaper to attract more people out of their cars by improving transit, bicycle, pedestrian, carpool and vanpool programs (all categories of transportation demand management). If so, then even if parking permit fees are increased to cover the costs of these transportation demand management programs, permit fees could be lower than if permit fees were increased to cover the cost of additional parking construction. The next section assesses the effectiveness of the University's existing TDM programs in an effort to determine their effects and costs, and evaluate the potential of strengthening these programs.

Table 4-1 Projected Parking Structure Costs

Capital Costs		UC LOTS						
		University Hall (Scheme 2)	**University Hall (Scheme 2B, Alt A)**	**Tang (Alternate 1.3)**	**Dana Durant (Alternate 2.2)**	**Bancroft (Alternate 3.2)**	**Upper Hearst (Alternate 4.1)**	**Dwinelle**
a.	Spaces Built	1071	836	637	203	396	73	141
b.	Spaces Displaced	48	306	230	89	131	-62	0
c.	Net Spaces Gained (c=a-b)	1023	530	407	114	265	135	141
d.	Original Construction Costs	$32,130,000	$25,080,000	$16,944,200	$7,917,000	$10,890,000	$3,752,200	$8,636,250
e.	Soft Costs	25%	25%	25%	25%	25%	25%	25%
f.	Original Project Cost (f=d*(1+e))	$40,162,500	$31,350,000	$21,180,250	$9,896,250	$13,612,500	$4,690,250	$10,795,313
g.	Year Completed	2012	2012					
h.	Inflation Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
i.	Project Cost in Current Dollars (i=f*h)	$40,162,500	$31,350,000	$21,180,250	$9,896,250	$13,612,500	$4,690,250	$10,795,313
j.	Gross Cost per Space in Current Dollars (j=i/a)	$37,500	$37,500	$33,250	$48,750	$34,375	$64,250	$76,563
k.	**Cost per Space Gained in Current Dollars (k=i/c)**	**$39,260**	**$59,151**	**$52,040**	**$86,809**	**$51,368**	**$34,743**	**$76,563**
Resulting Costs Per Space Per Year								
	Annual Debt Service, per Space	$2,708	$4,080	$3,589	$5,988	$3,543	$2,396	$5,281
	Operations, Maintenance & Insurance, per Space	$536	$536	$536	$536	$536	$536	$536
	Total Annual Cost per Space per Year	**$3,244**	**$4,616**	**$4,125**	**$6,524**	**$4,079**	**$2,932**	**$5,817**
	Total Annual Cost per Space per Month	**$270**	**$385**	**$344**	**$544**	**$340**	**$244**	**$485**
	Total Annual Cost per Space per Workday	**$12.44**	**$17.70**	**$15.82**	**$25.02**	**$15.65**	**$11.25**	**$22.31**

Assumptions:

Variables	**Input value**	**Comments**
Expected useful life of structure:	35	years (industry standard)
Long-term interest rate (i.e., discount rate):	6.00%	Source: UCB "Rev Exp Projections (12-23-08).xls (University Hall West)
Workdays per month:	21.73	

Definitions

"Construction Costs" (aka "Hard Costs") are the brick-and-mortar expenses. Hard costs include all the costs for visible improvements, such as grading the site, pouring concrete, steel and steel workers, electrical work, carpentry and plumbing.

"Soft Costs" Soft costs are the costs that you cannot visibly see, such as architectural and engineering fees, environmental reports and any government fees, such as building permits. In the spreadsheet below, soft costs are entered as a percentage of construction costs. A typical rule of thumb is that soft costs will be equal to 27% of construction costs.

"Project Cost" equals Construction Costs plus Soft Costs.

"Inflation Factor" is defined as the cumulative rise in the building cost index since the year the structure was built, using the Engineering News Record Building Costs Index for the region, as reported at http://enr.construction.com

Assessing the Effectiveness of UC Berkeley's Existing TDM Programs

The University's faculty/staff and student transportation surveys show remarkable changes in commute behavior over the past two decades.[4] As shown in Fig. 4-1 and Fig 4-2, drive-alone rates have fallen steadily. Among faculty and staff, the drive-alone rate has fallen from 60% in 1990 to 43% in 2009. Among students, the drive-alone share fell from 16% in 1997 to 7% in 2008, while transit mode share grew from 14% in 1997 to 27% during the same period. That is, the faculty staff drive-alone rate has declined by more than a quarter and the percentage of students who drive alone to campus has declined by more than half.

While numerous factors beyond a campus' transportation demand management program can affect commute behavior (including changes in campus parking prices, gas prices, tuition increases, and construction of new near-campus housing) the recent trend in commute behavior is clear. Data suggests that the campus' TDM programs—particularly the student Class Pass program—have played a significant role in reducing drive-alone rates and parking demand rates. Among commuter students, records show that sales of regular "S" (non-carpool student) permits have declined from 2644 in 2001to 880 in 2009. That is, sales declined by nearly two-thirds.

The campus' TDM programs include reserved parking and lower parking permit prices for carpools, a student transit pass program, faculty/staff transit subsidies, a shuttle system, and a number of other programs. Faculty and staff who use any form of public transportation, walk to campus, ride a bike to campus, or come to campus in an informal carpool may enroll in the University's New Directions program. The New Directions program provides a number of benefits, including discounted transit fares, bicycle parking and reduced cost car-sharing services available pre-tax. It was established by Parking and Transportation to facilitate non-auto trips to campus. Those employees who hold an AC Transit Bear Pass, transit subsidy participants, transit pre-tax purchase participants, and carpool permit holders are automatically enrolled in the New Directions program.

In addition to these TDM programs, the campus also relies on attended parking as a tool to increase the number of cars parked at garages around campus. Parking and Transportation currently supports approximately 550 attended (stacked) spaces at a cost of $1,406 per space annually. Literature generally supports use of this strategy as a cost-effective and climate-smart manner of intensifying the use of existing garages. With more broad use, such a tool could help increase the number of cars parked in existing facilities, and thereby mitigate some of the need for new parking facilities. This and other parking management tools are discussed in greater detail in Chapter 5.

[4] Source: UC Berkeley Housing and Transportation surveys.

Figure 4-1 Faculty/Staff Drive-Alone Rate

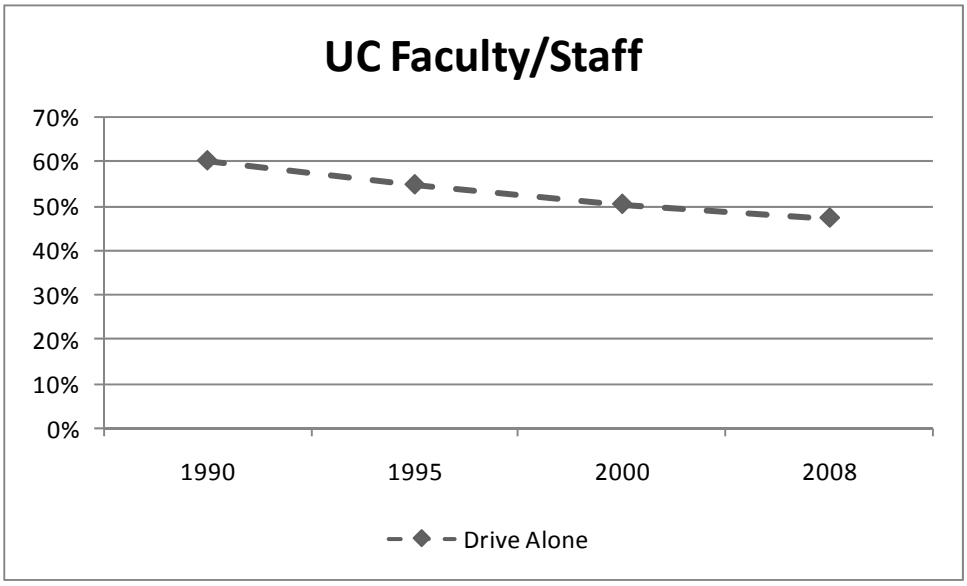
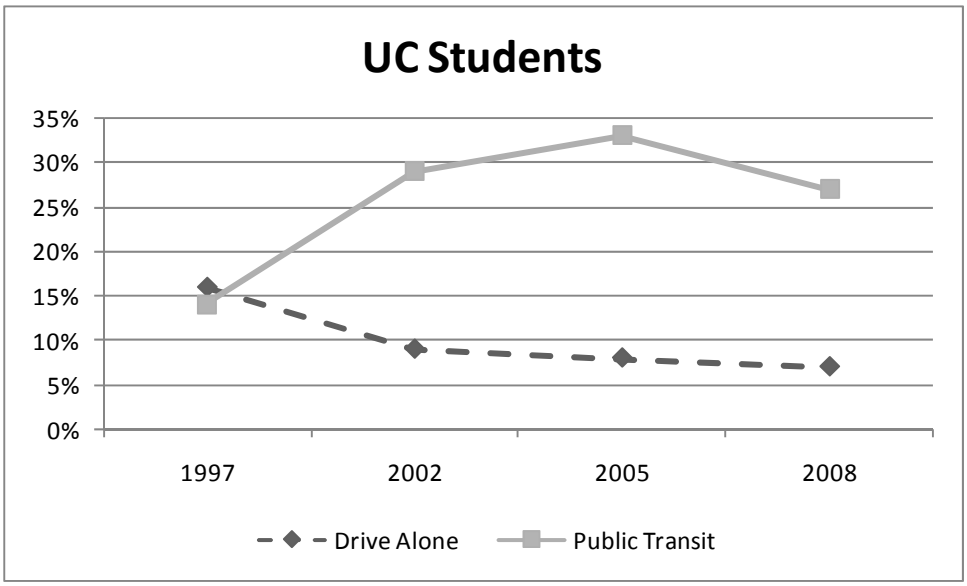


Figure 4-2 Student Drive-Alone & Transit Commute Rates



Estimating TDM program costs

For those TDM programs where sufficient data was readily available, we have estimated the number of UC Berkeley commuters served by the program and the program's *average cost per commuter*—the total cost of the transportation program, divided by the total number of users. Note that for some programs, such as the AC Transit Bear Pass for faculty and staff, a user fee covers part of the cost. The *net cost* (currently part of the Parking and Transportation budget) is therefore the total costs for the program less any user fees received.

Examining the current cost per commuter for these programs helps to reveal whether the programs are providing good value for the money invested, and can help identify where additional investment—to reduce parking demand—may be cost-effective.

Class Pass Program

All registered students are eligible to receive a Class Pass. The Class Pass enables students to ride AC Transit local and Transbay buses and Bear Transit shuttle routes free of charge. The Class Pass is a sticker that is affixed to a student's UC Berkeley student ID card. When boarding the bus, students show the bus driver their ID card with the sticker to ride free of charge. The Class Pass is funded by a $68.00 portion of every student's registration fees each semester.

The Class Pass program, which began as a pilot program in 1998, appears to have had a profound effect on the campus' mode split: the overall student transit mode share has grown from 14% in 1997 to 27% in 2008, while the student drive-alone share fell from 16% to 7% during the same period. The vast majority of the growth in student transit mode share occurred due to increasing student use of AC Transit: 20.0% of UC Berkeley students now commute by AC Transit, according to the most recent survey of student commute patterns.[5] The Class Pass program now serves more than 6,900 student commuters daily. In the 2009-2010 academic year the campus paid AC Transit $2,278,650 for the Class Pass program, while students paid $4,695,400 in Class Pass fees which includes other services such as the night safety shuttle. As shown in Table 4-2, this works out to a cost per commuter served of $330 per year.

The class pass program also provides substantial benefit to many students who do not commute by AC Transit, but who use it for many other non-commute trips: while 6,900 students commute by AC Transit, many more (about 33,000) pick up their Class Pass each year. Many students find that the program helps them meet their transportation needs without having to bring a car to campus.

Compared to the cost of accommodating a single commuter by providing a new structured parking space ($3,244 per year as described in the previous section), the Class Pass program, at $330 per year per commuter, is highly cost-effective. Moreover, since the cost of the Class Pass is paid by a fee approved by and imposed upon all students, the Class Pass program has succeeded in greatly reducing student parking demand, freeing up more spaces for other motorists, at no cost to parking permit holders.

[5] UC Berkeley 2008 Student Housing and Transportation Survey.

Table 4-2 Class Pass Per Year Information

	Cost
A. Class Pass Annual Cost—paid to AC Transit	$2,278,650
B. # of students*	34,525
C. Fees paid annually by students @ $68 x 2 (semesters)	$4,695,400**
D. % of students commuting by AC Transit	20.0%
E. # of Class Pass commuters (D = BxD)	6,905
F. Cost per Class Pass commuter per year (E = A/E)	$330
G. Cost per Class Pass commuter per month (G = F/12)	$28

* Estimated average enrollment spring and fall semesters 2009; baseline numbers consistent with 2008 GHG Emissions Inventory projections by the Office of Sustainability

** Of the total Class Pass fee, approximately half goes to AC Transit, 33% goes toward financial aid, and the remainder goes to additional transit services for students such as the campus shuttle, night safety shuttle, and technology enhancements such as NextBus (Parking and Transportation, 2010)

Bear Pass Program

Similar to the Class Pass program for UC Berkeley students, the Bear Pass provides UC Berkeley faculty and staff with unlimited rides at a deeply-discounted price on AC Transit buses. The Bear Pass includes routes serving the Transbay Terminal in San Francisco, the Night Owl service from San Francisco to Berkeley, and the Dumbarton Express service from the Fremont BART Station to Stanford University. All faculty, staff, post-doctorates, visiting scholars, and other UC Berkeley employees are eligible to participate in the Bear Pass program. As with the Class Pass, fees are negotiated with AC Transit based upon the total population to be served, i.e., all students are eligible to receive the Class Pass, and all faculty and staff are eligible to purchase the Bear Pass.

Table 4-3 shows estimated cost of the Bear Pass Program, taking into account both program expense and revenues. In Fiscal Year 2009-2010, AC Transit charged UC Berkeley $448,000 to cover all faculty and staff regardless of whether or not they take advantage of the program. This amount was negotiated between AC Transit and UC Berkeley based on an eligible population number of 11,574 with no provision for annual updates. AC Transit applies the same per-user fee for UC Berkeley employees ($38.70) that it does for other employers and universities with transit pass programs in the region. Faculty and staff who participate contribute $34 per month.

Since Parking and Transportation manages this program, it is responsible for other campus costs associated with it. These include: approximately $3,000 to manage the program, $39,000 to Wageworks to handle pre-tax payroll deductions and $37,000 to the Chancellors Office as "administrative full costing" -- a campus fee assessed on external revenue from the sales and services of educational activities, auxiliary enterprises, service enterprises, and other operating revenue and intended to reimburse central campus units for the additional workload they incur because of those external funds. See http://campuspol.chance.berkeley.edu/policies/adminfullcosting.pdf.

In total, Faculty and staff participating in the Bear Pass program paid $335,000 in fees to receive their passes. The FY 2009-2010 Parking and Transportation budget subsidy to the Bear Pass program was $192,000. Since 821 commuters participated in the FY 2009-2010 Bear Pass program, the cost of the subsidy per commuter per year was $234 or approximately $19 per month. The total cost (including fees paid and subsidy paid) per commuter was $53 per month.

Note that the cost per commuter student is higher because proportionally fewer students identify the Class Pass as their sole means of commuting. Without revenue from the faculty and staff participants, Parking and Transportation's expenses for the Bear Pass program would be substantially higher (assuming the same number of commuters), although the overall cost would be the same. Table 4-4 illustrates this scenario. If a commuter pass were established to include both AC Transit and BART, costs would likely increase, however the number of subscribers would also likely increase given the number of commuters who use BART as their primary mode of transportation.

Table 4-3 Bear Pass Per Year Information (With Current Subsidy)

	Cost/Revenue
A. Bear Pass cost—paid to AC Transit	$448,000
B. Parking and Transportation cost to manage program	$3,000
C. Wageworks fee to manage pre-tax deductions	$39,000
D. Administrative full costing	$37,000
E. Subtotal program cost (A+B+C+D)	*$527,000*
F. # of Bear Pass commuters (purchasers FY 2009-2010)	821*
G. Annual fees paid by Bear Pass commuters @ $34 per month	$335, 000
H. Subtotal—net Bear Pass program cost (H=E-G)	*$192,000*
I. Cost of campus subsidy per Bear Pass commuter per year (I=H/F)	$234
J. Cost of campus subsidy per Bear Pass commuter per month (J=I/12)	$19

* Number of Bear Pass subscribers changes month-by-month and semester-by-semester; as of December, 2010, there were approximately 700 participants

Table 4-4 Bear Pass Per Year Information (Without Subsidy)

	Cost/Revenue
A. Bear Pass cost—paid to AC Transit	$448,000
B. Parking and Transportation cost to manage program	$3,000
C. Wageworks fee to manage pre-tax deductions	$39,000
D. Administrative full costing	$37,000
E. Subtotal program cost (A+B+C+D)	*$527,000*
F. # of Bear Pass commuters (purchasers FY 2009-2010)	821*
G. Annual fees paid by Bear Pass commuters @ $34 per month	$0
H. Subtotal—net Bear Pass program cost (H=E-G)	*$527,000*
I. Cost of campus subsidy per Bear Pass commuter per year (I=H/F)	$642
J. Cost of campus subsidy per Bear Pass commuter per month (J=I/12)	$53

* Number of subscribers likely to rise with free program

Bicycle and Walking Programs

Currently, 9% of staff and faculty walk to campus and an additional 9% bike to campus. Just over half (51%) of students walk to campus and 12% bike to campus. Faculty and staff bicycle or pedestrian commuters who enroll in the New Directions program are eligible for a number of benefits, including guaranteed rides home in the event of a personal emergency. For occasional days when the commuter wishes to drive, participants may purchase up to 48 daily scratch-off hang-tag parking permits per year at a 50% discount ($6 per day rather than the $12 per day for a paid daily parking permit). See http://pt.berkeley.edu/pay/newdirections/faculty#benefits.

On a per person basis, bicycle facilities costs are estimated to be relatively small. Cost figures for UC Berkeley's past investments in bicycle lockers and bicycle racks were not available. Therefore, in order to provide a sense of the relative cost of supporting bicycle commuters with investments such as secure bicycle storage facilities, the following costs were obtained from a comparable university program (in this case, Cal Poly San Luis Obispo).[6] Bicycle lockers cost approximately $820 per bicycle stored, and have an expected useful life span of 15 years, resulting in an annualized capital cost of $79 per year per locker per bike (assuming a 5% interest rate over 15 years).[7] Maintenance cost is estimated at $12 per locker per year, assuming a maintenance cost of 1.5% of original construction cost per year. The resulting total life cycle cost is approximately $91 per locker per year per bike. A similar analysis of bicycle racks, which have a capital cost of $75 per bicycle space, shows a life cycle cost of $8 per bicycle rack space per year.

Other Programs

The campus also employs other TDM tools. While these are important parts of the program and deserve mention, sufficient data was not available to estimate their costs per commuter.

Pre-Tax Program: The University offers a pre-tax transit pass purchase program that allows staff and faculty to purchase transit tickets and passes from a number of transit providers through automatic payroll deduction, using pre-tax dollars.

Carpools and Vanpools: Faculty and staff who carpool or vanpool to campus are eligible for discounted carpool parking permits and are not required to pay the $36 annual transportation fee which is added to the price of ordinary campus parking permits. Reserved carpool parking spaces are available throughout the campus. These reserved spaces are open to all carpoolers on a first-come first-served basis, on weekdays until 10:00 a.m. Faculty and staff can find carpool partners using the 511 Regional Rideshare Program's online ridematch service. In addition, carpool participants are eligible for the Guaranteed Ride Home program. The University does not have an active vanpool program.

Carsharing: UC Berkeley has a variety of car sharing services on, or immediately adjacent to, campus including City CarShare, Zipcar and Enterprise. Car sharing programs allow people to have on-demand access to a shared fleet of vehicles on an as-needed basis. Usage charges are assessed at an hourly and/or mileage rate once participants pay a refundable deposit and/or a low annual membership fee. City CarShare offers a discounted City CarShare membership to all UC Berkeley students. UC Berkeley students receive the same rates as the ShareLocal plan at a

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[6] Nelson \ Nygaard Consulting Associates. Cal Poly Mobility Study Existing Conditions Technical Memorandum, September 2005.

[7] Nelson \ Nygaard Consulting Associates, 2010.

special discount and pay no monthly fee. Staff and faculty, however, do not receive discounted City CarShare memberships. Zipcar offers a discounted annual membership for students, faculty and staff.

Guaranteed Ride Home Program: UC Berkeley participates in the Alameda Congestion Management Agency's Guaranteed Ride Home (GRH) program. All faculty and staff are eligible for the GRH, which provides UC Berkeley employees with up to six free rides home per year in the event of a personal emergency. Employees must be using a commute alternative the day they use the GRH.

Zimride: ZimRide is an online ridesharing service that enables campus affiliates to connect with other campus members to share open seats in their car or to catch a ride with friends, classmates, and coworkers who are going to the same destination. This service is free and available to all University staff, faculty, and students with a campus email address. The online interface allows ZimRide members to post offers or request rides for commutes, road trips, and popular events. This enables car owners to split the costs of driving by offering rides and allows non car owners to find rides.

Transportation Information Centers: UC Berkeley provides campus affiliates and visitors with information regarding transportation options and services via the Parking and Transportation website as well as in person at the Parking and Transportation Department's customer service counter. In addition, the University Police Department also provides transportation information at their office.

Campus Shuttle: The UC Berkeley Parking and Transportation Department operates the Bear Transit shuttle system, which is comprised of five daytime shuttle routes (P, R, C, H, and RFS) and three nighttime shuttle routes providing service between the campus and Downtown Berkeley BART, parking lots, Clark Kerr campus, the Hill area, residence halls, Richmond Field Station (RFS), and the north and south sides of campus. Anyone may ride Bear Transit, however rides on daytime routes P, R, C, and H are only free for campus affiliates. The fare for all other users is $1. The Richmond Field Station (RFS) shuttle charges a fare of $1.50 for all riders regardless of affiliation. Daytime shuttle service operates Monday to Friday from approximately 7:00 a.m. to 7:00 p.m.

Bear Transit nighttime Safety Shuttles are free to all, including members of the general public. The Southside and Northside Safety Shuttles operate everyday from 7:30 p.m. to 3 a.m. and run from points on campus to BART, Clark Kerr campus and residence halls. The "To-Your-Door" service operates Friday to Sunday from 8:00 p.m. to 3:00 a.m. and will pick up riders at indicated bus stops and will drop riders almost anywhere within service area boundaries.

The University's Police Department operates a demand-responsive nighttime van transport service, the Owl Line. The Owl Line covers most of Berkeley and operates everyday from 2 a.m. to 6 a.m. provides door-to-door shuttle service from campus, Bear Transit shuttle stops, and campus housing facilities

Summary

To solve the projected gap between parking supply and parking demand for on and near campus, there are two basic options: construct a new structure providing approximately 450 new parking spaces, or reduce demand by enhancing the University's existing transportation demand management programs and/or by intensifying the use of existing spaces. As shown in this chapter, the cost of constructing additional structured parking spaces is high. If a new structure is added near or adjacent to the Central Campus, the cost per space is estimated to be between

$3,000 and $5,000 per year, every year for the expected 35 year life cycle of the parking structure. At minimum this would mean a cost of roughly $244 per month.

The University's existing transportation demand management programs appear, based upon the significant reductions in faculty/staff and commuter drive-alone rates in recent years, to have helped the University avoid significant parking construction costs. The faculty/staff drive-alone rate has fallen by more than one quarter, while the student drive-alone rate has fallen by more than half. The evidence available for many of the campus TDM programs suggests that they are serving many UC Berkeley commuters well, and at reasonable cost. For example, the cost to the campus to subsidize the Bear Pass for faculty/staff is only $234 per year per commuter served, or just over $19 per month. Likewise greater use of attended parking could also serve commuters cost-effectively, at roughly half the cost of constructing new spaces. Potentially, expanding these programs may achieve further reductions in parking demand.

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Chapter 5. Recommended Strategies

The present plan considers the anticipated parking deficit in the context of the overall campus goal of supporting ease of access to the campus. This chapter recommends strategies for promoting access to campus with resource sustainability and fiscal responsibility in mind.

Rebalancing Strategies

One of the keys to rebalancing parking demand is to resolve spot shortages and alleviate pressure at the most heavily demanded campus lots and structures. This is especially critical as the parking lots and structures on and near the Central Campus become sites for new buildings per the LRDP. In addition, the campus must provide convenient ways to use its inventory more flexibly since existing supply may be designated for one type of permit holder and since many of its spaces are distant from the Central Campus. Parking demand will also be rebalanced as the number of people driving to campus decreases as the result of TDM measures. Rebalancing strategies fall into the following general categories:

- Develop a comprehensive transportation demand management program—expand transit programs
- Aggressively market alternatives to driving alone
- Improve efficiency of existing parking supply: consider attended (stacked) and valet parking; consider expanded enforcement combined with shuttle improvements
- Use pricing to reduce and redistribute parking demand
- Use technology to direct drivers to available spaces
- Improve bicycle and pedestrian experience
- Enhance car share programs

Reinventing Strategies

The Parking Supply and Demand Assessment projects a parking deficit of approximately 450 spaces. The campus must seek alternative access for the people who would use those spaces: this can include providing parking spaces in other than UC Berkeley built, owned and managed garages and/or the use of daily permits to provide a more flexible way to assure access more broadly. Reinventing the ways in which parking is delivered to campus users may result in more efficient use of existing parking inventory and may suggest financially prudent ways to add spaces to the inventory. Reinventing strategies fall in the following general categories:

- Explore opportunities for shared use of existing UC Berkeley and City of Berkeley parking inventory in and near downtown
- Retool the campus parking system to establish fees based on daily use
- Explore construction of new parking facility with the City of Berkeley and/or other partners

The following section describes these strategies.

Rebalancing

UC BERKELEY PARKING & TDM STRATEGY 1
Expand and aggressively market a comprehensive transportation demand management program that includes a universal transit pass for faculty and staff similar to the Class Pass for students
ELEMENTS
Fully subsidize transit pass program so it is free to commuters ("Universal Transit Pass")
Establish and operate a comprehensive marketing campaign
Negotiate to include the regional dedicated rail system, BART, in the universal transit pass
GOALS ADDRESSED
Increase faculty/staff use of alternatives to driving alone to reduce commuter parking demand
Support campus access without capital costs placed on parking
Educate faculty/staff about the full menu of transit options
Decrease campus-generated carbon emissions from commuting
PRELIMINARY COST CALCULATIONS
Transit Pass (current fees and calculations, without BART): $527,000 annual cost to campus
Marketing & TDM Staff: $120,000 annual cost to campus (scaleable)
Marketing Budget: $1 per person x 51,000 people = $51,000 annual cost to campus (scaleable)
ESTIMATED REDUCTION IN 2020 PARKING DEMAND
261 spaces

Discussion: Fully Subsidized Transit Pass

More people choose transit when universities and municipalities offer free (universal) transit programs: between 9% to 24% have selected transit modes, with an average change of 20%. See Table 5-1. These programs are considered to be an effective means to reduce the number of car trips, and therefore parking demand, at universities.

As described in the previous chapter, the student Class Pass, which began as a pilot program at UC Berkeley in 1998, has had a profound effect on the student (and thus overall campus) mode split: student use of transit for commuting has grown from 14% in 1997 to 27% in 2008, while the drive-alone share fell from 16% to 7% during the same period. This is reflected in decreased demand for student parking. Student fees pay for the Class Pass, but, since there is no cash transaction, most students consider it a "free" transit program.

Currently, for faculty/staff, the Bear Pass is the subsidized transit pass program. The program was free for a period of approximately 2 months when it was introduced. The program is still subsidized but costs $34 per month ($408 per year) made through payroll deduction from pre-tax earnings. Therefore, the impacts of a free Bear Pass have not been fully explored. Though the fee is substantially lower than the price of a parking permit (at $90-124 per month), the cost still creates a financial barrier and added inconvenience for employee transit use.

When the campus launched the Bear Pass, it also launched an intensive marketing campaign that substantially increased enrollment. In subsequent years without marketing, enrollment declined. Transportation planners recommend continuous marketing to achieve results. On-going marketing is a key component of a successful transit pass program.

In the future, the University should create a universal transit employee program equivalent to the Class Pass student program by fully subsidizing transit passes for all faculty and staff. To further maximize success of the program, the universal transit program for UC Berkeley would include BART. There may be partnership opportunities with the City and/or with downtown businesses. Funding to support a universal transit program may be available from sources in addition to parking permit fees—for example, programs to meet greenhouse gas reduction goals.

Reduction in UC Berkeley's parking demand was estimated based on UCLA's experience. At UCLA, transit use increased by 62.5% following implementation of a subsidized universal pass for faculty. Currently, 6.25% of faculty and staff, or 729 faculty/staff commuters, at UC Berkeley use AC Transit to get to campus. If UC Berkeley's experience echoes that of UCLA, the AC Transit mode split will increase 62.5%, adding 474 new transit commuters. Assuming that the new rider profile echoes the current faculty staff mode split, 55% of these new riders will be former drivers (drive alone and carpoolers). Therefore, a universal transit pass program should yield 261 fewer drivers and a proportional reduction in parking demand. Table 5-2 shows this calculation.

Table 5-1 Effects of Universal Transit Pass Introduction, Trip to Work/School*

	Drive to work or school			Transit to work or school		
Location	**Before**	**After**	**Delta**	**Before**	**After**	**Delta**
Municipalities						
Santa Clara (VTA)	76%	60%	-16%	11%	27%	16%
Bellevue, Washington	81%	57%	-24%	13%	18%	5%
Ann Arbor, Michigan	N/A	-4%	-4%	20%	25%	5%
Downtown Boulder, Colorado	56%	36%	-20%	15%	34%	19%
Universities						
UCLA (faculty and staff)	46%	42%	-4%	8%	13%	5%
Univ. of Washington, Seattle	33%	24%	-9%	21%	36%	15%
Univ. of British Colombia	68%	57%	-11%	26%	38%	12%
Univ. of Wisconsin, Milwaukee	54%	41%	-13%	12%	26%	14%
Colorado Univ. Boulder (students)	43%	33%	-10%	4%	7%	3%

* Source: Nelson\Nygaard, 2009

Table 5-2 Estimated Reduction in Parking Demand at UC Berkeley with Introduction of Universal Pass for Faculty/Staff

		Percentage	# of Commuters
A	Faculty/Staff eligible (total FTE)		11,574
B	Current AC Transit use	6.3%	729
C	Projected increase in AC Transit use	62.5%	474
D	**Projected AC Transit mode split (B+C)**	**10.4%**	**1,203**
E	Drive alone and Carpool mode split	55.0%	261 of the 474
F	Projected Reduction in Parking Demand (E)		261

Benefits of Universal Transit Pass

In many settings, transit pass programs have been shown to reduce both existing and future parking demand.

- Santa Clara County's (CA) ECO Pass program resulted in a 19% reduction in parking demand;
- UCLA's BruinGo! program resulted in 1,300 fewer vehicle trips which resulted in 1,331 fewer students on the wait list for parking permits (a 36% reduction);

- University of Washington's U-Pass program helped avoid construction of 3,600 new spaces, saving $100 million. (Since 1983 the university population has increased by 8,000 but the number of parking spaces has been capped at the current 12,300 spaces).[8]

Universal transit passes can support change in individual behavior—the program provides an incentive for all current and, especially, future faculty, staff and students to use transit. This is critical for campuses to achieve greenhouse reduction goals. Offering transit free to the commuter makes transit a particularly attractive option for new employees who are just beginning to establish their commuting habits. University campuses have dynamic populations—new people regularly developing patterns of access—thus many opportunities for changing behavior.

Calculating Cost of an Employee Universal Transit Program

In order to understand the costs of a universal transit program, this study used the Bear Pass as an example. Currently, the program costs approximately $527,000 of which $448,000 is paid to AC Transit. Participants pay $408 per year which provides approximately $335,000. The program currently requires a $192,000 subsidy so fully funding the program would cost the campus an additional $335,000 (includes Wageworks, administrative full costing, and Parking and Transportation management).

Cost Comparison Case Study: Transit Pass and Parking

The cost required to fully subsidize passes has been shown in other university settings to be less than to construct new parking. At the University of Colorado, implementation of a U-pass program allowed every eligible permanent faculty or staff member to ride local or regional buses by showing their University identification card. This freed up 350 parking spaces as some employees choose to take transit instead of driving to campus. As illustrated below, it was 2.4 times more expensive to build a new parking space than to eliminate demand for one parking space through funding this transit pass program. The net annual savings to the University was $566,000.[9] (Although recommended as a means to further increase transit usage, including BART in the universal pass program would increase its expenses. BART does not currently offer a comparable universal transit pass program outside of the City of San Francisco, however recent agency staff reports have suggested the concept to the BART board for consideration.[10])

Table 5-3 Comparative Parking and Transit Pass Costs University of Colorado

Annual Cost of Transit Pass Program	Parking spaces freed up	Annual Cost per reduced space	Annual debt service for one new parking space	Per Space Cost Comparison	Money Saved
93,400	350	$1,124	$2,723	2.4	$559,650

[8] UW Campus Masterplan: Transportation Management Plan http://www.washington.edu/community/cmp_site/cmpfinal/07_TMP_FP.pdf

[9] University of Colorado Environmental Center 2002, pp. 18-19, cited in "The Road Less Traveled: Sustainable Transportation for Campuses" by Will Toor. *Planning for Higher Education,* March-May 2003, p. 135.

[10] Roth, M. "Streetsblog San Francisco » BART Board Member Urges Agency to Consider Unlimited Monthly Pass," September 21, 2010. http://sf.streetsblog.org/2010/09/21/bart-board-member-urges-agency-to-consider-unlimited-monthly-pass/.

Discussion: Marketing Alternative Transportation

Berkeley has a broad range of non-auto transportation options for getting to and around campus. Both BART and AC Transit directly serve the campus. The University itself provides shuttle and rideshare services, there are many bicycle racks, and there is excellent campus pedestrian connectivity.

However, currently there is no single way for the campus community to learn about these options. Disseminating transportation information and marketing of transportation alternatives is done on an *ad hoc* basis. The campus needs a comprehensive approach to communicate to faculty, staff and students the full range of available transportation options to ensure that driving alone is not encouraged through lack of knowledge. Creating a unified, broad-based and on-going marketing campaign is an especially important measure for a dynamic population.

Some programs, such as the Class Pass are well advertised and participation reflects this. However, other programs such as the carsharing membership discounts, vanpool and ridesharing programs are much less well known. For new programs, such as carsharing, promotion is particularly important.

Ideas that have been used effectively elsewhere include transportation welcome packets provided to all new students and employees to help establish alternative commute habits. These packets could also be sent to new students and parents at enrollment when they are making the decision about whether or not to bring a car to campus. The packets should include description of all transportation programs, information about how to use them and a cost comparison of out-of-pocket costs associated by each. These packets should also include where parking lots/structures are located and the price incentives for parking in more remote lots.

Targeted marketing using GIS tools has been used on a number of campuses (Emory University, University of Chicago, San Jose State University) to reach users in a common geographic area—to match car and vanpoolers, for example, or to create and promote location specific transit options.

Calculating Cost

A full time manager of a robust transportation demand management program will cost approximately $120,000. The non-staff marketing budget is estimated at $1 per year per person. The campus population is approximately 51,000 people so the cost of a marketing program envisioned in this recommendation is $171,000. Both staff and non-staff costs are scaleable.

Reinventing

UC BERKELEY PARKING & TDM STRATEGY 2
Manage the public (City and University) parking inventory, especially in and near Downtown, to appropriately accommodate commuter use during the day and visitor use nights and weekends
ELEMENTS
Develop programs (including competitive pricing, improved signage and simple pay stations) that allow UC Berkeley inventory to be used more easily by public during nights and weekends.
Negotiate agreement to allow UC Berkeley permit holders to use City of Berkeley and/or private garages—appropriate payment, logistics, implementation, etc.
Support potential implementation by the City of Berkeley, of a Residential Parking Benefit Area for blocks within a 5-10 minute walk of campus boundaries.
Improve parking data-sharing and compatibility for UC Berkeley and the City of Berkeley
GOALS ADDRESSED
Maximize fiscal and community benefit of existing parking inventory
Increase parking availability without increased capital expense
Support campus access without capital costs placed on parking
Decrease campus-generated carbon emissions from commuter parking search / circling
PRELIMINARY COST CALCULATIONS
Initial staffing costs associated with joint management terms and agreements unknown
Incremental increases in costs to individual who parks
Incremental increase in revenues to City and University with expanded use of, and fees for use of, parking resources
ESTIMATED REDUCTION IN 2020 PARKING DEMAND
Demand fully accommodated within local capacity

Discussion: Sharing Inventory

As noted in Chapter 3, above, the most recent available data suggests that downtown garages have excess capacity during peak hours, while University parking facilities are largely unoccupied evenings and weekends. Since the City and the University are the largest providers of parking, they could cooperatively manage their resources.

To the general public wanting to use University parking it often appears that each lot has its own rates, time limits and policies. This information is not available in one, customer friendly place. Getting information about the current rates at the City-owned garages or after-hours public availability of UC Berkeley lots can be very time consuming. Cooperative parking management could help set signage and public information standards about available parking, and coordinate availability of information on websites or on a mobile phone application. Eventually, private parking owners may also be interested in coordinating rates and policies so that they are simpler for the public to understand.

Discussion: Residential Parking Benefit Area

Currently, parking demand from campus "spills over" into surrounding neighborhoods. Streets within a 5-10 minute walk of campus are frequently fully occupied by parked cars all day and into the evening due, in part, to University students, employees and visitors. Residential Parking Benefit Areas have been implemented by other cities in neighborhoods adjacent to college and university campuses. Residential Parking Benefit Areas are similar to residential permit parking districts, but allow a limited number of commuters to pay to use on-street parking spaces in residential areas during the day. The resulting revenues are returned to the neighborhood to fund public improvements. Developing and implementing a Residential Parking Benefit Area near the UC Berkeley campus would be a City of Berkeley initiative and is discussed here for information only.

The City of Berkeley has residential permit parking districts near large traffic generators in order to prevent excessive spillover parking into residential neighborhoods. The City issues a certain number of parking permits to residents for a nominal annual fee. These permits allow the residents to park within the district while all others are prohibited from parking there for more than 2 hours on weekdays. Many other cities and counties in the US and Canada have such residential parking permit programs.[11]

Conventional residential permit districts often issue an unlimited number of permits to residents without regard to the actual number of curb parking spaces available in the district. This often leads to a situation in which on-street parking is seriously congested, and the permit functions solely as a "hunting license", simply giving residents the right to hunt for a parking space with no guarantee that they will actually find one. Further, in the neighborhoods around UC Berkeley where many University students and visitors are only coming for short periods of time, the 2-hour time limits do not dissuade parking in the neighborhoods so curbs are completely occupied much of the day.

An opposite problem can also occur with conventional residential permit districts if non-residents are prohibited entirely from parking in neighborhoods. In that case, the surplus parking spaces available (especially during the day, when many residents are away) are underutilized because motorists who would be willing to pay to park in one of the surplus spaces are forbidden. In both

[11] "Residential Permit Parking: Informational Report." Institute of Transportation Engineers, 2000, p1.

cases, conventional residential parking permit districts prevent curb parking spaces from being efficiently used (promoting either overuse or underuse).

Residential Parking Benefit Areas can be an optimal solution for residential areas within a 5-10 minute walk of campus. Implemented properly, they may prevent excessive spillover parking into University-adjacent neighborhoods and expand parking options for campus drivers. All effective non campus parking options reduce campus demand and lessen potential need for construction of costly new parking facilities.

Examples of Residential Parking Benefit Areas

Residential Parking Benefit Areas have been implemented in various forms in many cities and university towns, including the following jurisdictions:

- Aspen, CO (non-resident permits: $5/day)
- Boulder, CO (resident permits $12/year; non-resident permits $312/year)
- Santa Cruz, CA (resident permits $20/year; non-resident permits $240/year)
- Tucson, AZ (resident permits $2.50/year; non-resident permits $200-$400/year, declining with increased distance from University of Arizona campus)
- West Hollywood, CA (resident permits $9/year; non-resident permits $360/year)

Tucson has set up a zone system for university commuters. Parkers pay the highest price for the blocks closest to the university and the lowest price for the blocks furthest away to ensure that commuters don't "bunch up" on the blocks closest to the university. Boulder, Colorado balances residential and non residential supply and demand by issuing commuter permits block-by-block and limiting their number.

Discussion: Data Sharing and Compatibility

To fully understand the parking resource and local supply/demand conditions, it would benefit the University and the City of Berkeley to coordinate their parking data gathering and parking management systems. At the minimum, coordination should include comparable parking occupancy counts (same time of year, day and format) and compatible signage so that parking options are legible to visitors regardless of location in downtown or around campus.

Rebalancing

UC BERKELEY PARKING & TDM STRATEGY 3
Use technology to monitor parking occupancy and to direct drivers to available spaces
ELEMENTS
Monitor occupied and vacant space counts at facilities
Publicize locations where parking is available
GOALS ADDRESSED
Maximize benefit of existing parking inventory
Increase perceived parking availability without increased capital expense
Support campus access without capital costs placed on parking
Decrease campus-generated carbon emissions from commuter parking search / circling
PRELIMINARY COST CALCULATIONS
Initial capital costs of installing technology
Ongoing operational costs of managing technology
ESTIMATED REDUCTION IN 2020 PARKING DEMAND
Demand partially or fully accommodated within existing capacity

Discussion: Technology

Improvements in technology will allow the campus to manage its parking inventory with greater knowledge and flexibility. Advanced parking systems now provide information regarding available spaces and tools for price to reflect supply and demand. These systems make it considerably easier to maximize the efficient use of the parking resource and set parking fees, resulting in a revenue-neutral financial outcome for the parking and transportation system. See also Strategy Four.

One strategy to facilitate management of parking resources at a detailed level is to transition parking lots to access via *proximity cards* controlled by a central Parking Access and Revenue Control (PARCS) system. Secondly, with this technology in place, it is possible to develop *dynamic information tools* with signage and software that can help drivers directly find available

parking spaces. The parking system, could also offer tools like *license plate recognition (LPR)* technology which enable on-demand parking capability and a completely 'paperless' parking permits.

Proximity Cards (Smart Cards): The installation of an updated PARC system would allow for the use of proximity cards for parking access. These tools are used in many public parking facilities such as BART and Sausalito's downtown commuter parking lots. Each registered campus driver would receive a proximity card electronically linked to an online account. Each time the driver parks in a University garage, the daily parking price for that garage would be deducted from their account, much like the FasTrak that allows drivers to pay bridge tolls in the Bay Area, or the Clipper Card for Bay Area transit. Such a system could be implemented in a gated parking facility or a pay-by-space parking facility equipped with multi-space meters. It would also make it possible to better understand parking trends by day, location and permit type.

Case Study: Sausalito is an example of a municipal parking operation that has used both of these systems. Previously, the City used gated lots with proximity cards, but has recently transitioned to a new gateless pay-by-space system with multi-space meters. Under the old system, to gain entrance to the lot, occasional users would take a parking ticket, while regular users would wave their proximity card in front of a reader at the lot entrance. This would both raise the entry gate, and cause the daily parking fee to be deducted from their account. Under the new system, each parking space is assigned a space number. Occasional customers go to the multi-space meter, enter the parking space number and pay for parking with coins, a debit card or a credit card. Regular users pay by tapping their SmartCards against a reader on the machine, which causes the daily parking fee to be deducted from their account. The new system, the City expects, will reduce maintenance and operation expenses that were associated with the previous gated system. (Wireless parking occupancy sensors have also been installed in each space, to help improve enforcement, but the occupancy sensors are not necessary for implementing a system of daily fees.)

Dynamic Information Tools: Installation of real-time occupancy devices and more sophisticated parking control systems, would allow for accurate parking information to be provided through dynamic signage, through 511.org (the region's advanced web and telephone-accessible traveler information system) and on the University's website. This would allow for UC Berkeley parkers to have information about available parking spaces before they leave home. It would help improve local traffic congestion and the GHGs generated by "circling" or "hunting" for spaces, while allowing patrons a choice to shift trips to other modes of transportation based on parking space availability.

License Plate Recognition (LPR): LPR technology paired with a pay-by-cell-phone system is another option. When regular commuters arrive at their preferred parking space, this approach requires them to telephone an automated line to inform the system that they will be parking for the day. On the first call, commuters are required to enter the code for the zone (or parking facility) in which they have parked, and to enter the license plate number of their vehicle. The appropriate daily parking fee is then deducted from the person's account, and the license plate serves as the driver's "virtual parking permit". This eliminates the need for any paper permits, or for equipment such as parking meters. For subsequent parking sessions, commuters generally do not need to reenter their license plate number unless they have switched to a different vehicle. This technological approach is particularly useful for areas, such as remote lots or residential streets, where it would be overly expensive to install multi-space meters.

Rebalancing

UC BERKELEY PARKING & TDM STRATEGY 4
Use pricing to reduce and redistribute parking demand
ELEMENTS
Set parking permit prices to achieve campus goals
Price parking to respond to site-specific demand levels
Use technology to monitor parking occupancy, manage pricing
Set parking price levels to appropriately manage demand
Establish an alternative to the parking replacement policy
GOALS ADDRESSED
Maximize benefit of existing parking inventory
Increase perceived parking availability without increased capital expense
Support campus access without capital costs placed on parking
Decrease campus-generated carbon emissions from commuter parking search / circling
Maintain solvency of Parking and Transportation unit to continuously support campus access, program improvements, demand reduction strategies and if desired, new construction
PRELIMINARY COST CALCULATIONS
Raise permit fees by 6% per year through 2018, and 5% in 2019
ESTIMATED REDUCTION IN 2020 PARKING DEMAND
Demand partially or fully accommodated within existing capacity

Discussion: Parking Permit Prices

The campus supports driving alone by under-pricing its parking. As indicated in the tabular data presented in Chapter 3, campus permit prices do not reflect the market rate for all day parking when compared to other local garages. Permit rates have been held steady in recent years without response to increasing costs to UC Berkeley or inflation. These low prices encourage commute via single occupancy vehicle, and as such, this study proposes the following changes in permit pricing through 2020:

- For Faculty/Staff/Students, raise prices by 6% per year from Fiscal Year 2011 though 2018, and 5% in 2019, in order to price parking appropriately, fund system improvements and to maintain Parking and Transportation financial stability
- For Hill Campus permits, prices should be unchanged as indicated in Table 5-4 which shows the recommended prices for 2020, in both nominal and real (inflation-adjusted) dollars

Raising parking prices has been demonstrated to reduce commuter parking demand in many cities and universities. The research literature on commuter parking prices consistently finds that all else being equal, *increasing the price of parking reduces demand for parking*. The table below shows a number of case studies. Although increased parking prices are expected to be seen initially as discouraging trips to campus, the ***overall program*** here is recommended to ***encourage*** faculty and student access to campus by all modes. This is accomplished in part by improving availability of, and access to information about, parking and transportation resources.

Financial stability for Parking and Transportation is supported by parking permit sales, a primary revenue source. However, over sale of under priced permits contributes to perceived scarcity of the parking resource, and should be addressed through permit pricing that at least is increased to match the local market.

As discussed elsewhere in this report, funding of enhanced TDM strategies is the most effective and fiscally responsible way for the University to address the decrease in parking supply over the next ten years. As shown in greater detail in Appendix A, if the University funds the most effective TDM measures, parking demand may be reduced sufficiently to close the projected gap between supply and demand. Raising parking prices, to the extent that the price increases are greater than the rate of inflation, can also be expected to reduce on-campus parking demand by encouraging people to drive less frequently, to use other modes and/or to use non-campus, private parking. In the next years, the campus will have the opportunity to test transportation demand strategies and develop a balanced overall program that supports and funds convenient access to the campus for all.

In the parking demand model developed for this study, parking price elasticity of parking demand was assumed to be -0.3. That is, a ten percent increase in real (i.e., inflation-adjusted) parking prices yields a roughly three percent decrease in parking demand. This number represents a midpoint in values found in the national transportation research literature on parking demand elasticity with respect to price which range from -0.1 to -0.6, with -0.3 being the most frequently cited value.[12]

[12] Transit Cooperative Research Program, Report 95, Chapter 13, Parking Pricing and Fees: Traveler Response to Transportation System Changes, 2005

In evaluating the impact of parking prices on parking demand, analysis must: 1) distinguish between real (inflation adjusted) and nominal parking changes; and 2) control for other variables which affect parking demand. For example, at UC Berkeley, as shown in our Existing Conditions Final Technical Memorandum (Appendix B), there has been little or no change in real (inflation-adjusted) parking prices since fiscal year 2001, so no demand reduction due to price increases during this period would be expected. Many factors, such as a change in campus population, can result in a change in total parking permit sales. Typically, the effects of parking price increases on parking demand address this population variable by evaluating the effects on *per-person* parking demand rates.

As described in the previous chapter, at UC Berkeley, drive-alone commute rates have fallen steadily, and it is likely that both parking price increases and transportation demand management would successfully reduce future parking needs. As further described in earlier chapters, UC Berkeley permit rates are below comparable City of Berkeley permit rates; further, a high percent of campus commuters live within a two mile radius of campus, a radius readily served by alternative means of access including biking, walking, bus or BART.

Table 5-4 Current and Proposed Permit Prices Per Month

Permit	2009 Nominal & Real Price	2020 Nominal Price	2020 Real Price
S	$82	$134	$97
RH	$98	$160	$116
F	$90	$147	$109
C	$124	$203	$150

Table 5-5 Employee Parking Pricing Effect on Parking Demand

Location	Scope of Study	Increase in Parking Fee in $/Month (2006 $)	Decrease in Parking Demand
Group A: Areas with little public transportation			
Century City, CA[1]	3500 employees at 100+ firms	$107	15%
Cornell University, NY[2]	9000 faculty and staff	$45	26%
Warner Center, CA[1]	1 large employer (850 employees)	$49	30%
Bellevue, WA[3]	1 medium-size firm (430 employees)	$72	39%
Costa Mesa, CA[4]	State Farm Insurance employees	$49	22%
Average		$64	26%
Group B: Areas with fair public transportation			
Los Angeles Civic Center[1]	10,000+ employees, several firms	$166	36%
Mid-Wilshire Blvd, LA[1]	1 mid-sized firm	$119	38%
Washington DC suburbs[5]	5500 employees at 3 worksites	$90	26%
Downtown Los Angeles[6]	5000 employees at 118 firms	$167	25%
Average		$135	31%
Group C: Areas with good public transportation			
University of Washington[7]	50,000 faculty, staff and students	$24	24%
Downtown Ottawa[1]	3500+ government staff	$95	18%
Average		$59	21%
Overall Average		$89	27%

Sources:

[1] Willson, Richard W. and Donald C. Shoup. "Parking Subsidies and Travel Choices: Assessing the Evidence." Transportation, 1990, Vol. 17b, 141-157 (p145).

[2] Cornell University Office of Transportation Services. "Summary of Transportation Demand Management Program." Unpublished, 1992.

[3] United States Department of Transportation. "Proceedings of the Commuter Parking Symposium," USDOT Report No. DOT-T-91-14, 1990.

[4] Employers Manage Transportation. State Farm Insurance Company and Surface Transportation Policy Project, 1994.

[5] Miller, Gerald K. "The Impacts of Parking Prices on Commuter Travel," Metropolitan Washington Council of Governments, 1991.

[6] Shoup, Donald and Richard W. Wilson. "Employer-paid Parking: The Problem and Proposed Solutions," Transportation Quarterly, 1992, Vol. 46, No. 2, pp169-192 (p189).

[7] Williams, Michael E. and Kathleen L Petrait. "U-PASS: A Model Transportation Management Program That Works," Transportation Research Record, 1994, No.1404, p73-81

Discussion: Set Parking Permit Prices to Accomplish Campus Goals

Guidelines for pricing should allow parking fees to track inflation and reflect increases in operational and capital costs. Guidelines for pricing should also allow management of inventory to address geographic imbalances. In order to balance parking demand and financial stability, pricing must not only track inflation but also provide for the resources supporting permit holders (in this case new parking spaces or enhanced TDM). While this is detailed in Appendix A, which uses a demand reduction model to estimate scenarios, adding a large new parking structure to the system would require permit holder to pay higher fees than if TDM were used more widely.

Adding an approximately 450-space parking structure to the system at an annual cost of about $3,250 per space gained per year would require parking permit prices to increase by 7% per year. These parking fee increases would reduce demand by approximately 200 spaces, and provide enough spaces to eliminate the supply gap on the Central Campus and in the Hill area. By comparison, enhancing TDM, together with improved management of the parking supply, could balance parking supply and demand at the same cost or less and with significantly less capital burden and debt.

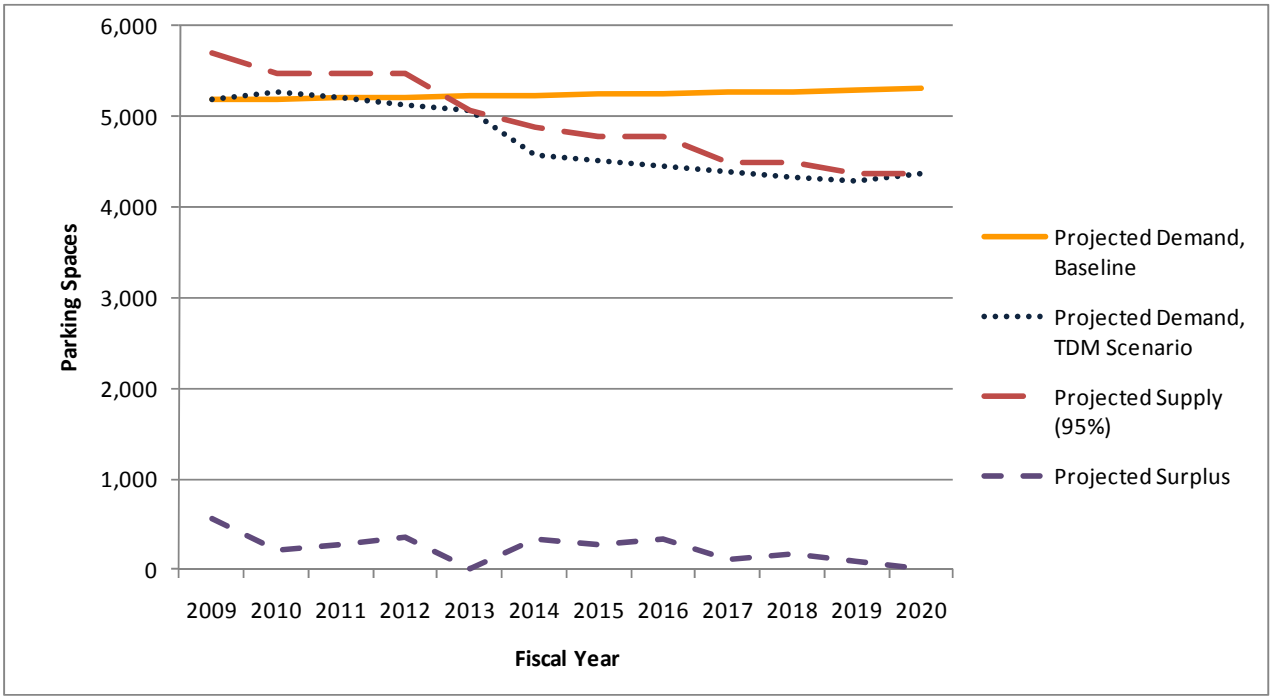
The table below shows the parking permit price increases necessary to fund these two strategies (construction of a parking garage or new/enhanced TDM programs). As this illustrates, by 2020 a faculty “F” parking permit will have to cost $147/month to pay for a new parking garage. With the revenues generated by this level of price increase, a TDM and parking management package could be implemented instead which will not only solve the parking deficit, but which have many other ancillary benefits such as reducing traffic and greenhouse gas emissions.

Table 5-6 Main Campus Monthly Parking Permit Price 2010-2020

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Enhanced TDM Scenario											
Necessary Price Increase	0%	6%	6%	6%	6%	6%	6%	6%	6%	5%	0%
Commuter Students	$82	$87	$92	$97	$102	$108	$114	$121	$128	$134	$134
Resident Students	$98	$104	$109	$116	$122	$129	$137	$144	$153	$160	$160
Faculty/Staff - "C Permit"	$124	$131	$139	$146	$155	$164	$173	$183	$193	$203	$203
Faculty/Staff - "F Permit"	$90	$95	$101	$106	$112	$119	$126	$133	$140	$147	$147
Build Parking Scenario											
Necessary Price Increase	0%	7%	7%	7%	7%	7%	7%	7%	0%	0%	0%
Commuter Students	$82	$88	$94	$101	$109	$117	$125	$134	$134	$134	$134
Resident Students	$98	$105	$113	$121	$130	$139	$150	$160	$160	$160	$160
Faculty/Staff - "C Permit"	$124	$133	$143	$153	$164	$176	$189	$203	$203	$203	$203
Faculty/Staff - "F Permit"	$90	$97	$104	$111	$119	$128	$137	$147	$147	$147	$147

All prices shown in 2010 dollars

Figure 5-1 Parking Supply & Demand, Use of Enhanced TDM



Discussion : Differential Pricing

Demand-based parking pricing combined with enhanced information, marketing and way finding signage can help make more efficient use of current parking supply, smoothing out demand and alleviating acute spot shortages. Both San Francisco and Los Angeles are exploring demand-based parking pricing (see http://www.sfexaminer.com/local/sfmta-explores-demand-based-parking-meters and http://articles.latimes.com/2010/aug/22/local/la-me-express-park-20100822).

Fall 2009 occupancy surveys show that UC Berkeley's highest demand area is its Central Campus and adjacent blocks from Gayley Road to the east, Durant Avenue to the south, Shattuck Avenue to the west, and Ridge Road/Hearst Avenue to the north. Within this zone, some acute shortages exist where facilities reach 90-100% occupancy at the peak hour. This creates the perception of an overall system parking shortage and generates traffic as drivers are forced to search for the few remaining spaces.

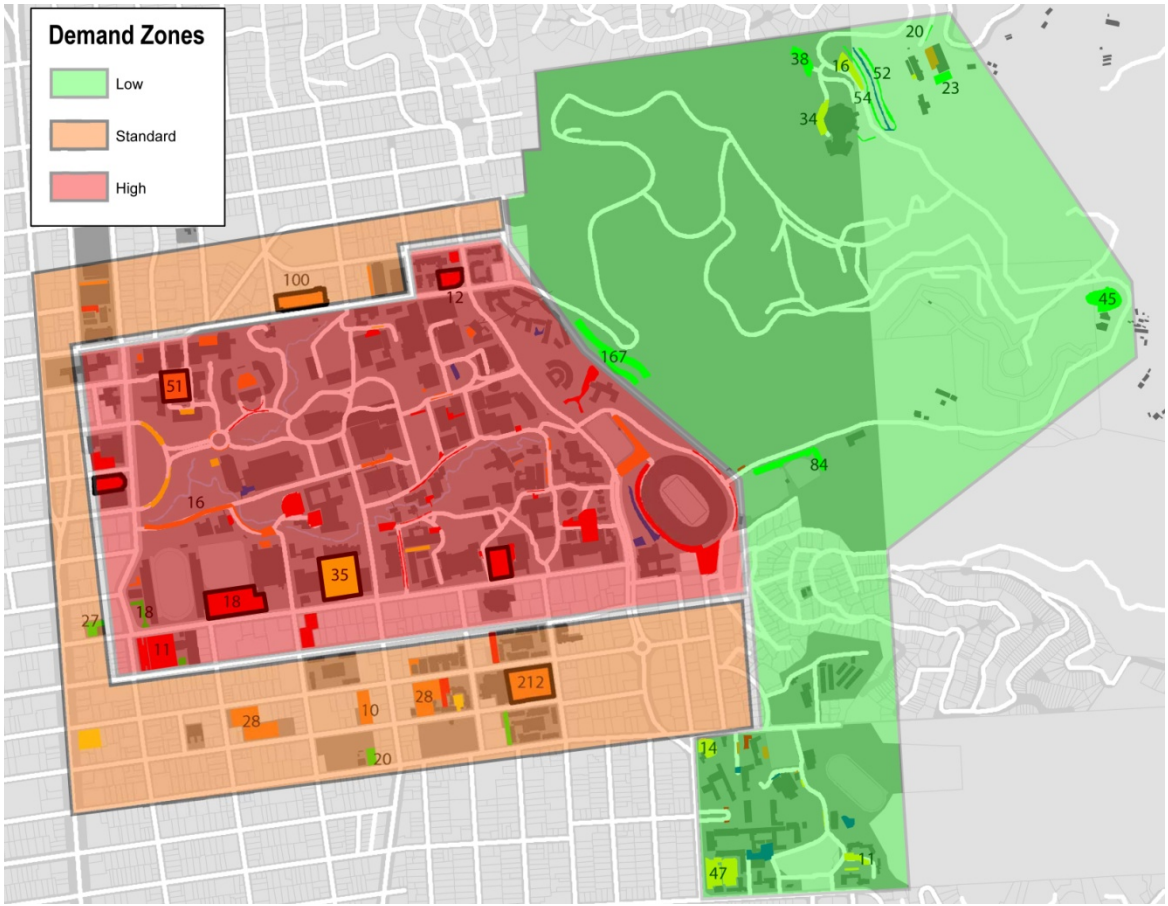
There are a number of parking facilities immediately adjacent to this "high demand zone," however, that are less than 85% occupied (some below 50%) and do not require a long or steep walk to reach central campus buildings. In fact, the largest supply of vacant parking spaces in a single location was at UC Berkeley's Underhill Garage (with 212 available spaces). This is within one block of the "high demand zone" and within easy walking distance of many campus buildings. If Downtown Berkeley is included, another 200+ vacant spaces are available at the peak hour.

The University can encourage people to use these vacant spaces by adjusting parking rates to reflect demand. For example, parking rates can be used to shift people from the heavily used lots on the southern border of campus (e.g. Bancroft/Fulton Lot, RSF, and Bancroft / Kroeber Structure) to the less used lots one to two blocks south (e.g. Ellsworth Structure-28 vacant spaces, Underhill- 212 vacant spaces) or to shift parkers from the overly full Upper Hearst

Garage immediately northeast of campus to the nearby largely vacant Foothill Parking lot (167 vacant spaces).

In the short-term, demand-based pricing could be quite simple, reflecting high, medium and low demand zones as illustrated in Figure 5-2. The low demand zone is essentially already covered by the Hill permit. A "premium" and "standard" parking permit could be established for both F and S permit types. More expensive premium permits would allow drivers to park in the "high demand zone." In the adjacent medium demand zone, standard permit prices would apply.[13]

Figure 5-2 High, Medium and Low Demand Zone Pricing Areas



In the longer term, as better occupancy data and more robust technology becomes available, the University can move to a system of garage-by-garage pricing based on demand. Per Strategy Five, if the University shifts to daily rates, it will be much easier for drivers to adjust their parking behavior according to these pricing signals, only parking in the higher priced zones when demand (or need) warrants. Also, as occupancy levels change based on new prices, prices can be further adjusted to reflect new demand patterns until optimal vacancy levels are achieved. Finally, as

[13] Since the most recent parking occupancy survey data does not fully allow us to distinguish occupancy by parking space type (e.g., the difference between occupancy rates for "F" permit spaces and disabled parking spaces), the recommendations of this section should be revisited and refined after this Fall's parking occupancy counts, which will assess occupancy in each lot by parking space type.

individual parking lots are displaced by new buildings in the coming years, it will be necessary to reallocate parking spaces to ensure that enough spaces are provided for each type of user (faculty, staff, student) and to readjust parking rates to rebalance parking supply and demand.

These recommendations would be most effective if implemented in conjunction with wayfinding signage to make finding lower cost facilities easy and convenient. The Foothill lot is a good example of an opportunity for better wayfinding signage and access improvements. Foothill is very close to Gayley Road as the crow flies; however, connecting paths are insufficient, and the lot is largely obstructed from view. Adding better access pathways and signs would make this a more viable and convenient option for the buildings on this eastern edge of central campus. This would increase the likelihood that this lot's 167 vacant spaces would be used.

This recommendation could be implemented in conjunction with the City of Berkeley as part of a coordinated parking pricing system for the downtown area.

Benefits of Demand-based Parking Pricing

Pricing parking according to demand will spread out parking demand more evenly across the University's many parking facilities. This will alleviate today's acute spot shortages at the most heavily demanded facilities, reduce circling caused by searching for the last vacant space in these high demand areas and alleviate the perception of a parking shortage held by many campus drivers. In the long term, campus parking needs can better be assessed and resources more accurately targeted.

Establish an Alternative to the Parking Replacement Policy

The Parking Replacement Policy, established by the campus in 1999, commits the campus to "replacing parking spaces and parking-related facilities removed by capital development." See http://smcp.vcbf.berkeley.edu/policy/repark.html. Currently, any new project which creates a permanent net loss of parking is required to pay a parking replacement fee of $37,700 per space. Funds for this fee come from the capital budget from each individual project and go to Parking and Transportation. This cost was set in 2007 based on the average cost of the three most recent parking structure construction projects at the time. The parking replacement fee is intended to subsidize, or ideally pay in full, the cost of replacement parking.

The parking replacement policy has a number of problems, including:

- *Paying for Existing Parking Resources:* with the exception of the debt service on Underhill, the current users of the parking system have paid very little for capital improvements to the parking system. The current permit structure accounts only for operational expenses, leaving very little funding set aside for future parking investment. Conversely, it is common practice among parking operators that fees account for future regeneration and full life cycle cost of providing parking spaces.

  The latter practice (fees supporting full life cycle cost of providing parking) is supported by UCOP policy (2002) that requires: the cost of capital and operating expenses be recovered from users of the system; *employee parking fees not be paid for by other funds available to the University* (emphasis added); parking be viewed as an interim land use,

subject to displacement as the campus grows; and the use of this land viewed as an *interim* parking subsidy.[14]

- *Inequitable Distribution of Land Costs to Projects:* The fee functions as a land cost, and it is an inconsistent way to assign land costs to projects. It unfairly imposes a substantial financial burden on any project that is constructed on an existing parking lot, regardless of the use and parking needs of the building. Current projects underway that are subject to the parking replacement fee will be required to add up to $9 million to their construction budgets. Under current fee levels, the parking replacement fee would range from $1 million to $8.5 million for the remaining large campus lots.
- *Inequitable Distribution of Parking Costs:* Particularly in the case of students, it is inequitable to require some building users to pay for parking they will never use. For example, rents at a student residence hall that displaces a parking facility must be higher than they otherwise would be to subsidize construction of parking while the parking spaces themselves are rented for prices below cost. In effect, the cost of parking is only partially unbundled from the cost of housing. The result is that all student residents must help pay for parking, but the parking benefits only those students who can afford to purchase, maintain and insure an automobile.
- *Incentivizes greenfield construction:* It creates an incentive for a project sponsor to develop on lands that have not been previously developed or that are open landscapes, rather than previously developed sites, a less environmentally responsible development option.
- *Underemphasizes Sustainability Goals:* Established in 1999, the policy does not mention sustainability, nor alternative transit goals, and creates an artificial emphasis and subsidy of parking that is contrary to sustainability goals of reducing transportation related climate impacts. As indicated in the campus Sustainability Plan[15] and the Regents Sustainable Transportation Principles (2003),[16] the primary emphasis for the UC system is to decrease reliance on the automobile. Furthermore in 2007 and 2008 UCOP established a requirement that parking structure projects be supported by a sustainable transportation business case analysis, examining alternative solutions including policy changes and program changes.[17]

The policy on parking replacement at UC Davis provides an alternative model that limits the obligation to replace parking resources to those that have been improved within the last thirty years or less, and no replacement obligation where interim surface parking occurs.[18] Such a policy appropriately compensates investments made by current users without establishing a perpetual land use entitlement to parking, at the cost of other programs. Stanford University provides a model of an 'Infrastructure Fee' which accounts for parking and other public resources

[14] UCOP Parking Policies http://www.ucop.edu/ucophome/coordrev/policy/parking-principles2002.pdf

[15] UC Berkeley Campus Sustainability Plan: http://sustainability.berkeley.edu/os/pages/plan/index.shtml

[16] Regents Sustainable Transportation Principles: http://www.universityofcalifornia.edu/sustainability/documents/policy_sustain_prac.pdf

[17] http://www.universityofcalifornia.edu/sustainability/documents/buscase_guidelines.pdf

[18] UC Davis, Replacement Parking Policy (2004)

provided on the campus.[19] Although not a user-based model consistent with UCOP policy, it could also be explored as a more effective policy to account for public realm improvements on campus.

New Parking and Transportation Demand Management policies should support the long-term financial sustainability of parking and transportation resources on campus, facilitating access. Alternative policies and programs should be established to compensate for potential revenue decreases when parking is removed.

[19] Stanford Infrastructure Program: http://lbre.stanford.edu/dpm/sites/all/lbre-shared/files/docs_public/DCPSM_sippolicy_v1%20%283%29.doc.pdf

Reinventing

UC BERKELEY PARKING & TDM STRATEGY 5
Retool parking system for daily commute decisions
ELEMENTS
Replace monthly, semester long and annual parking permits with a system of daily parking fees for faculty staff and students.
Use technology to monitor parking occupancy, manage pricing
Set parking price levels to appropriately manage demand
GOALS ADDRESSED
Increase faculty/staff use of alternatives to driving alone, to reduce commuter parking demand
Support campus access without capital costs placed on parking
Maintain solvency of Parking and Transportation unit to continuously support campus access, program improvements, demand reduction strategies
PRELIMINARY COST CALCULATIONS
One-time administrative expenses to switch to daily system
ESTIMATED REDUCTION IN 2020 PARKING DEMAND
Demand partially or fully accommodated within existing capacity

Discussion of Daily Permit System:

Under the current parking permit system, faculty and staff can buy monthly, annual or limited daily parking permits; commuter students can purchase semester-long or limited daily parking permits; and resident students can purchase an annual parking permit. Over 5,000 campus faculty, staff and students purchase monthly, semester and annual passes each year. These allow the permit holder unlimited parking for the given time period in certain lots/structures. While from an administrative perspective, this may be an easy way to provide permits, it does not yield the most efficient use of campus parking resources. Once a person purchases a pass s/he ceases to consider the marginal cost of parking each day since money cannot be saved by taking

alternative transportation to work--the permit is effectively a sunk cost. Long-term permits create an incentive to drive to campus as frequently as possible in order to take advantage of the investment. While it is important for the campus to be as accessible as possible—and for faculty members, especially, to come to campus as frequently as possible—driving to campus and parking does not have to be the most convenient and least expensive travel mode.

Further, current pricing creates an incentive for even occasional drivers to purchase a monthly permit. Even for faculty or staff members who drive only eight days per month it is financially rational to purchase a monthly pass. Current permit types and daily prices are shown in the table below.

UC Berkeley could replace long-term parking permits and switch to a system of daily parking fees, with daily fees set to balance long-term costs to parkers. A person who uses parking occasionally would pay less than someone who used parking every day, but the total cost for the frequent parker might also be less than what s/he pays for a long-term parking permit. Increasingly, technology provides a way to monitor, evaluate and price appropriately.

Under a daily fee system, each day, the student, staff or faculty member would make a conscious decision about which commute mode to use. Switching to daily fees allows a commuter to save money every time s/he uses an alternative to parking in University facilities. This will help reduce driving alone for those for whom shared or non-auto modes are reasonable alternatives.

Table 5-7 Current UC Berkeley Parking Permit Types

Permit Holder	Permit Type	Increment	Daily Cost*
Faculty	Central Campus Lots "C"	Monthly/ Annual	$6.20
	Central Campus Carpool	Annual	$2.20
	Faculty/Staff "F"	Annual	$4.50
	Faculty/Staff Carpool	Monthly/Annual	$1.45
	Night/Weekend Permit (M-F, 1:30pm - 2:00am)	Monthly/ Annual	$2.25
	Central Campus Daily Scratch-off	Daily	$16.00
	Faculty/Staff Daily Scratch-off	Daily	$12.00
	Night/Weekend Daily Scratch-off	Daily	$10.00
	Alternative Transportation Daily Scratch-off	Daily	$6.00
Emeriti Faculty	Emeriti Annual	Annual	$1.90
	Emeriti Daily Scratch-off	Daily	$4.00
Student	Resident Permit	Annual	$5.05
	Semester Pass	Semester	$3.65
	Carpool	Semester	$1.30
	Night/Weekend (M-F, 3:30pm or 2:00am)	Semester	$1.04
	Daily Scratch-off	Daily	$10.00
Other	Hill Area	Annual	$3.35
	Hill Area Daily Scratch-off	Daily	$8.00
	Satellite	Annual	$0.25
	Motorcycle	Monthly	$1.20

*Assuming 20 days of parking per month

Parking systems which have made this switch typically employ one of two approaches, undertaken carefully to ensure the fiscal stability of the parking operation. Some universities have used a pilot project approach, offering the opportunity to enroll in a pilot program to a limited number of commuters, in order to examine the effects on parking revenues and peak parking demand among the pilot group. The University of Milwaukee, for example, took this approach, allowing a limited group of commuters to pay parking fees by the hour using in-vehicle parking meters. When the pilot project was well received, the campus then expanded the program by offering the same option to all campus commuters.

A second approach is to first implement the technology necessary to study the existing parking behavior of annual and monthly permit holders to provide a clear understanding of how many days per year each annual parking permit holder parks in the facilities. Implementation of Strategy Three, above, would facilitate this approach. This makes it possible to set daily parking fees that will result in a revenue-neutral result for the finances of the parking and transportation system. In addition the new daily parking fees can be fine-tuned after each year of implementation.

The University can consider a number of low and high-tech implementation options for a daily fee system. In the short term, it can continue using the existing daily scratcher system, and/or sell books of single-day passes. In the future, the campus may use newer technologies such as gated lots accessed by proximity cards or smart cards as described in Strategy Three.

Rebalancing

UC BERKELEY PARKING & TDM STRATEGY 6
Improve efficiencies in existing supply
ELEMENTS
Valet parking
Improved enforcement of student permit restrictions
Expand shuttle use to discourage drive alone
GOALS ADDRESSED
Increase faculty/staff use of alternatives to driving alone, to reduce commuter parking demand
Support campus access without capital costs placed on parking
PRELIMINARY COST CALCULATIONS
Valet staffing expenses; student permit enforcement expenses; potentially shuttle expenses
ESTIMATED REDUCTION IN 2020 PARKING DEMAND
Demand partially or fully accommodated within existing capacity

Discussion: Improved Efficiency Strategies

While other strategies described above would improve efficiency of the existing parking resource, including for example Strategy 3 that employs technology to help manage supply, the following actions could be undertaken without new capital expense for technology or alteration of existing systems.

Expand Attended and Valet Capacity

Two methods for reducing the need for new parking facilities are greater use of attended parking and implementing valet parking for remote lots. These techniques could increase the number of cars that can be parked in existing facilities, and thereby potentially eliminate or reduce the need to construct new parking facilities. Generally, research on such parking management strategies supports them as cost-effective and climate-smart manners of expanding and contracting an

inventory to meet parking needs.[20] Research indicates that they yield a typical capacity expansion of between 5% and 15%.[21]

At UC Berkeley, the cost per attended parking space is $1,406 annually, which compares very favorably with the high cost of constructing new spaces at $3,244 per space per year (per Chapter 4, includes operations and maintenance). This cost is based on the existing on-campus attended parking provided by Parking and Transportation. It is unknown whether wider use of attended parking would change the rate for additional services. Calculations illustrated in Table 5-8 indicate that an additional 454 spaces could be provided by expanding attended service to select garages on campus (Underhill, Foothill and Genetics). The total cost for providing these spaces would be $638,324 annually ($1,406 per space X 454 spaces).

Furthermore, use of valet parking either as a premium to-and-from-your-door service or at a central campus location, could be an effective way to increase the space inventory by making better use of distant parking such as many available spaces at the Lawrence Hall of Science. Such a premium service could generate an additional 405 spaces (Table 5-9). If the same service fee of $1,406 per space were applied, plus an estimated $175,000 annual premium for the additional operational expenses of using remote sites, these spaces might cost a total of $797,202 annually to provide ($1,406 per space X 405 spaces + $125,000[22] + 40% contingency). This equates to $1,968 per space, still cheaper than the $3,244 per year it costs to build new spaces.

Table 5-8 Potential Additions in Attended Parking Capacity*

Location	Marked Spaces	Additional Attended Spaces	Total Spaces
Underhill	967	290	1,257
Foothill	229	69	298
Genetics	317	95	412
TOTAL	**1,513**	**454**	**1,967**

* Assumes an attended capacity of 30% based on Parking and Transportation vendor supplied information and the Parking Management: Comprehensive Implementation Guide, 2010.

[20] Rodier, C. J, S. A Shaheen, and A. M Eaken. “Transit-Based Smart Parking in the San Francisco Bay Area: an Assessment of User Demand and Behavioral Effects” (2004).

[21] Litman, T. “Parking Pricing Implementation Guidelines.” Victoria Transport Policy Institute (2010).

[22] Litman, T. “Parking Management: Comprehensive Implementation Guide.” Victoria Transport Policy Institute (2010).

Table 5-9 Potential Additions in On-campus Drop-off / Valet* Capacity

Location	Marked Spaces	Additional Valet Spaces	Total Spaces	2009 Occupancy Rate*	Total Valet Spaces
LHS**	357	107	464	25%	346
Botanical Gardens	79	24	103	43%	59
TOTAL	**436**	**131**	**567**	**NA**	**405**

* Assumes an attended capacity of 30% based on P&T vendor supplied information and Litman (2010).

** LHS numbers use summed space count and average occupancy for multiple lots.

Enforce and Expand Student Parking Permit Restrictions

The two existing rules for student parking permits should be strictly enforced: 1) no commuter parking permits for students who live within 2-mile radius; and 2) only residential students who show demonstrated need are eligible for student campus parking permit (LRDP TRA-2). In addition, the campus should consider giving first priority for student housing to students without cars.

LRDP EIR TRA-2 states: "Except for disabled students, students living in UC Berkeley housing would only be eligible for a daytime student fee lot permit or residence hall parking based upon demonstrated need, which could include medical, employment, academic and other criteria." Currently, although demonstrated need is mentioned on the residential parking permit application form (application states, "a limited number of spaces have been allocated to the residents on the basis of demonstrated compelling need.") a student is not actually required to describe that demonstrated need on the form, nor is there is a written policy of what qualifies as "need," or a formal system in place to evaluate the need.

Currently, once the clearly compelling cases (for example, students with disabilities which reduce mobility) are accommodated on an ad-hoc basis, other permit requests are accepted on a first-come-first-served basis. Although the high annual price does discourage most students from bringing a car to campus, there were still 334 residential student parking permits purchased in 2009. In practice, any registered student living on campus can purchase a residential parking permit on a first-come-first-served basis.

Residential student parking policy should also be expanded to include a provision that gives priority for on-campus student housing to those students who do not bring a car to campus.

A more robust carsharing program as described in Recommendation 3 would be an excellent accompaniment to this recommendation ensuring that residential students still have an affordable and convenient way to reach services, jobs, and other activities beyond the reach of transit or bicycling.

Commuter Students

Second, the regulation that parking permit sales are restricted only to those students who live outside a two-mile radius of campus should continue to be strictly enforced. Currently, students must provide proof of residency and addresses are checked against a map that has been developed by Parking and Transportation. A distance of two miles is easily traversed by bicycle, transit, or even on foot and should be reconsidered as an appropriate limit.

Benefits

There is an abundant amount of parking available for rent to residential and commuter students, in the major public and private garages downtown and on the Southside. Currently, most students do not choose to park in those garages because UC Berkeley student parking permit prices are substantially lower than the private garage prices. In addition to the major garages, such as the Allston Way Garage and the City's Center St., Oxford and Telegraph/Channing Garages, numerous spaces are available for rent in smaller lots and garages. There are also ample off-campus housing options with parking available.

Implementation of the prior recommendations regarding parking pricing, combined with these student parking permit rules, would lower student parking demand and create an incentive for students to find parking in the private market. This would allow some of these student spaces to be re-allocated to faculty or staff, alleviating the projected 2020 baseline scenario shortage.

Consider the Potential of Shuttles as a TDM Tool

The campus currently owns and operates the Bear Transit shuttle system. Anyone may ride Bear Transit; however rides on daytime routes P, R, C, and H are only free for campus affiliates. With the system currently under evaluation to increase the efficiency and quality of service, an opportunity may exist to use the shuttle system as a TDM tool to reduce future parking needs: the existing conditions analysis indicated that 26% of students and 24% of faculty and staff Parking and Transportation permit holders lived within two miles of campus. While this may be an easy walking and/or bicycling distance, reconfiguration of shuttle routes could serve many of these patrons. Additional analysis indicates that a combined 6% live within ¼ mile from existing shuttle stops. Evaluating the opportunity to convert these individuals from drivers to shuttle riders could provide an additional tool to reduce campus parking demand.

Rebalancing

UC BERKELEY PARKING & TDM STRATEGY 7
Expand campus car-share membership
ELEMENTS
Expand the on-campus presence of carshare vehicles
Negotiate a waiver or subsidize membership fees for all campus faculty, students and staff who join
GOALS ADDRESSED
Increase faculty/staff use of alternatives to driving alone, to reduce commuter parking demand
Support campus access without capital costs placed on parking
PRELIMINARY COST CALCULATIONS
Administrative expense of negotiating with carshare companies; possible cost of subsidies for carshare membership, mileage
ESTIMATED REDUCTION IN 2020 PARKING DEMAND
Demand partially or fully accommodated within existing capacity

Discussion: Car-Share Expansion

Two car share providers have a broad and active presence in the Bay Area: Zipcar and City Carshare. Both have a presence on campus. UC Berkeley should encourage the use of shared cars through negotiating a membership fee waiver, subsidizing membership fees, and conducting a more robust marketing of the carshare program. Currently, both providers offer some level of discount to UC Berkeley students, faculty and staff.[23]

Faculty and staff who currently drive alone may be reluctant to give up the flexibility of having a vehicle on campus. Responses to the Faculty/Staff Transportation survey show that having the use of a car for mid-day trips is a significant reason that people drive to work. If carshare vehicles are made more easily available for such trips, less expensive (especially for the initial use), and

[23] UC Berkeley Carsharing webpage: http://pt.berkeley.edu/around/drive/share

better known, commuters may be more willing to make use of transit, carpool, or vanpool services for their commute.

Calculating Cost

Eliminating the hurdle of an initial financial commitment would allow people to test carsharing to see if it would work for them. People may be reluctant to commit to a program that they have never tried before and that they are uncertain about whether or not they will use. People are more likely to be willing to sign up and try it out if there is no enrollment or monthly fee for the first year. The University should explore ways that to lower fees for the campus community whether through discounts with the providers or through subsidies of negotiated lowered fees. City Carshare and Zipcar fees are described below.

City Carshare: UC Berkeley students can join City Carshare for a discounted annual fee instead of a monthly fee.[24] UC Berkeley students receive the same rates as the basic City Carshare individual plan (ShareLocal). Normally this plan costs $10/month; UC Berkeley students over 21 pay a $50 Annual Fee plus a $15 Application Fee, students under 21 years pay a $50 Annual Fee plus a $115 Application Fee. City Carshare also offers a $30 driving credit to staff and faculty when they sign up for a City Carshare plan.

Zipcar: Students can join Zipcar on an Occasional Driver plan for a $25 annual fee and pay as they go or join an Extra Value Plan which has no fees but require a minimum $50 driving credit prepayment for each month in exchange for a discounted hourly rate. UC Berkeley faculty and staff can join for $25/year.

In conjunction with expanding carshare membership on campus, UC Berkeley should work with the providers to continue to provide more visible and convenient carshare locations/pods on and near central campus. Currently, Zipcar and City Carshare have many locations on the perimeter of campus and within a few blocks of campus as shown in Figure 5-3. However, there are no locations in the heart of campus. Having multiple car share locations throughout the Central Campus would improve convenience and improve visibility of the service.

UC Riverside allows Zipcar to park vehicles on campus in exchange for waiving campus membership fees for faculty, staff and students. UC Riverside also allows “visiting Zipcars to park on campus without a permit as long as they are parked in an unreserved lot.

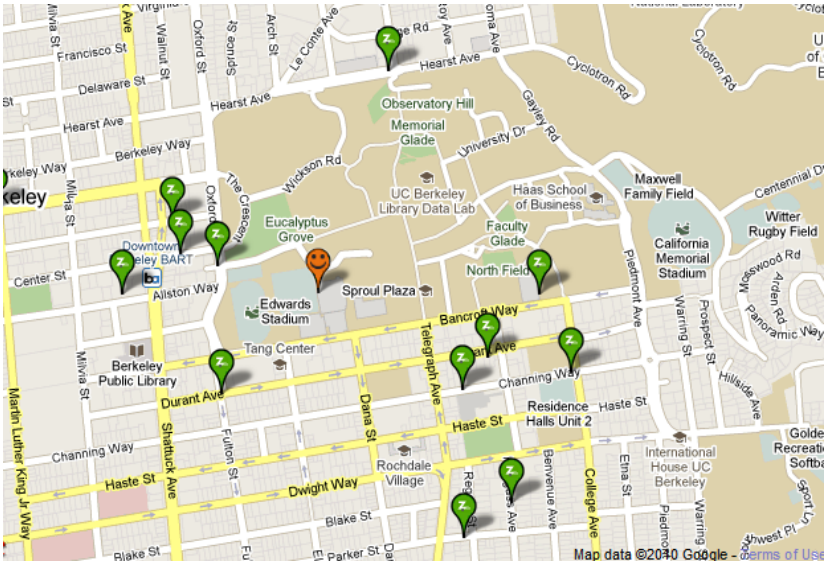
Cost Comparision: Car Sharing and Parking

The $25 membership fee is a very low annual cost. A faculty or staff member could agree not to drive—not to purchase a parking permit—in exchange for no cost car share membership and/or a certain number of hours of carshare use with the provider of their choice. This could be provided through subsidy or a fee waiver with the carsharing provider.

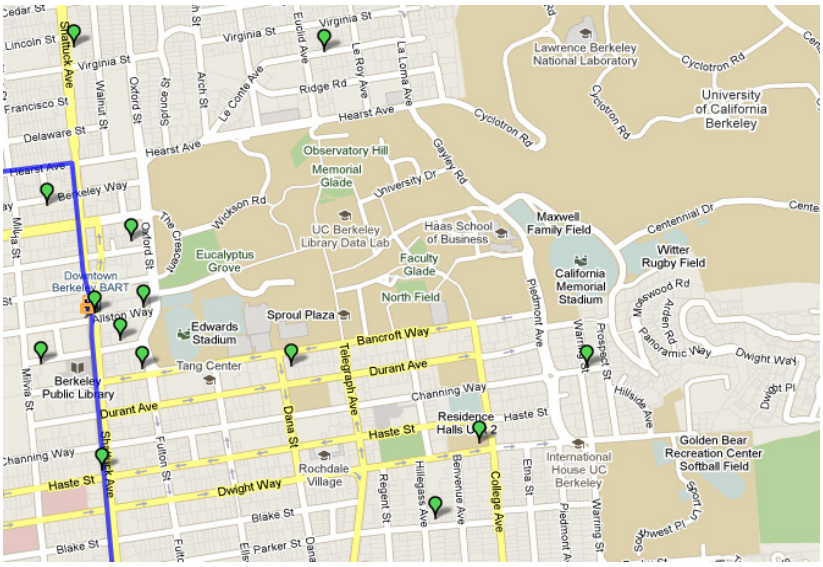
In the near term, the existing carshare membership deals and prevalence of carshare locations near campus should be promoted and marketed to new students, faculty and staff.

[24] City Carshare University of California, Berkeley Plan website: http://www.citycarshare.org/ucb.do

Figure 5-3 Carshare Locations near UC Berkeley



Zipcar Locations (www.zipcar.com)



City Carshare Locations (www.citycarshare.org)

Rebalancing

UC BERKELEY PARKING & TDM STRATEGY 8
Improve Bicycle and Pedestrian Experience
ELEMENTS
Work with City to improve bicycle and pedestrian access—enhance bike routes, improve sidewalks and intersections
Expand campus bicycle infrastructure: secure storage, shower and locker access
Support bike sharing program
GOALS ADDRESSED
Increase faculty/staff use of alternatives to driving alone, to reduce commuter parking demand
Support campus access without capital costs placed on parking
PRELIMINARY COST CALCULATIONS
Cost of bike and pedestrian related improvements
ESTIMATED REDUCTION IN 2020 PARKING DEMAND
Demand partially or fully accommodated within existing capacity

Discussion: Improve the Bicycle and Pedestrian Experience

Bicycle and pedestrian infrastructure

Bicycle commuters are looking for safe routes that minimize potential conflicts with vehicles. This is true for pedestrians as well. Key improvements to roadways, sidewalks and intersections can make both bicycle and walk commutes more attractive. Implementation of campus and City of Berkeley Bicycle Plans and on-going improvements to City bicycle streets (including development of Class 1, 2 and 3 bike routes) over time will likely increase number of bicycle commuters. The roads that border the Central Campus are particularly dangerous for bicycle riders and the campus should advocate for and support improvements to those roads. New and renovated buildings on the campus should provide shower and changing facilities for bicycle commuters;

and programs that allow bicycle commuters to use RSF and other gymnasium facilities should be maintained.

As discussed in Chapter 4, bicycle lockers cost roughly $820 per bicycle stored not including annual maintenance. Using the elasticity of -0.3, the demand reduction model estimates that an additional 25 parking spaces could be mitigated for every 75 additional secure bike parking spaces. This would cost roughly $61,500 in capital costs or $2,500 per parking space mitigated.

Bicycle share programs

Bicycle share programs may be another tool that allows people to leave cars at home. Like car share programs, a robust bicycle sharing program may provide flexibility for people who want to leave campus briefly during the work day. For a bicycle share program to be an effective component of campus TDM, the bicycle stations must be widely available on campus and off. The campus might subsidize a bicycle share program established by an independent operator—in much the same way as the car share programs might be subsidized. Subsidies to individuals who use the bike share program can be linked to forgoing purchase of a parking permit thus potentially providing some decrease in parking demand.

Over the years, bicycle sharing programs have evolved from donated bikes painted in school colors and distributed freely on campus to today's systems with purpose-designed bicycles and electronic access control. Schools that currently have modern bike sharing programs include St. Xavier University and University of California at Irvine. These programs include widely distributed parking stations, electronic access control based on student or faculty ID, and web integration to locate the nearest available bike. The University of Buffalo and Northern Arizona University both have variants of older type bicycle sharing schemes, either with free bikes or with a single central pick-up location and pre-booking like a conventional rental.

Bicycle sharing programs need to provide a sufficient number of stations in the right locations to be a viable transportation system. The successes of systems like Velib in Paris and Bicing in Barcelona stem in part from the dense network of parking stations, meaning that almost regardless of starting point and destination there will be a bicycle station nearby. In a campus context, this means that bicycle stations should be located close to major activity centers such as dorms, lecture halls, services and sports facilities.

The program could be UC Berkeley sponsored or a partnership with other local agencies. A campus-funded bike sharing program would require an estimated $600,000 in capital costs.

An alternative is to simply give students a personalized bicycle in return for a promise not to bring their car with them to campus. The University of New England and Ripon College of Wisconsin have programs in cooperation with a major bicycle manufacturer that offers freshmen bikes if they forego bringing a car to campus. Ownership provides the incentive not to neglect bikes, and the program has proven to be popular.

Reinventing

UC BERKELEY PARKING & TDM STRATEGY 9
Construct new parking facility, possibly with the City of Berkeley and/or other partners
ELEMENTS
Coordinate parking analysis and information with the City of Berkeley for campus and downtown parking facilities
If appropriate, add 135 spaces at Upper Hearst
GOALS ADDRESSED
Support campus access
PRELIMINARY COST CALCULATIONS
Capital cost of construction project; recurring debt service; recurring operations and maintenance
ESTIMATED REDUCTION IN 2020 PARKING DEMAND
135 spaces

Discussion: Explore Construction of a New Parking Facility

As discussed above, effective supply and demand management are the least expensive tools that the University can invest in to address the projected parking shortage in the baseline scenario. Modeling suggests that TDM and parking management strategies recommended in this report can eliminate the need for construction of a new parking garage.

It would benefit the University and the City of Berkeley to coordinate their parking management systems. As described in Strategy Two, at minimum coordination should include comparable parking occupancy counts (same time of year, day and format) and shared signage so that parking options are clear regardless of location in downtown or around campus. While most UC Berkeley parking is generally not available to the public during weekday business hours, distinguishing parking for visitors from commuter parking could improve inventory management. Since both entities will be competing, at least to some extent, for the same pool of customers, it is essential that the University take the City's planning into account, and vice versa, to avoid the risk of adding parking inventory that fails to live up to its financial projections.

However, if implementation of other strategies does not sufficiently reduce parking demand to eliminate the projected parking shortage, the University may consider options for the increase and placement of new parking supply. If that is the case, this report recommends targeting Upper Hearst for addition of new parking. This is based on evaluation of six garage locations. Upper Hearst was selected as the most cost-effective of all the potential locations and in an optimal location, an area of campus with relatively scarce UC Berkeley-owned parking facilities and high parking demand. The evaluation methodology and analysis is described below.

Garage Location Alternatives

Six garage locations were considered in this analysis:

- Tang lot
- Dana/Durant lot
- Bancroft / Kroeber Structure
- Upper Hearst Lot/Structure
- University Hall West
- Dwinelle

The first five of these locations were drawn from two recent parking studies conducted by Walker Parking Consultants for the University. The “Parking Structure Concept Design Study” prepared for University of California in September of 2005 by Walker Parking Consultants assesses at a conceptual level the capacity and cost of parking construction at four University-owned sites: the Tang lot, Dana/Durant lot, Bancroft Structure, and the Upper Hearst Structure. The University West Parking Concept Study prepared for the University by Walker Parking Consultants in June 2009 analyzes the feasibility of a parking facility located adjacent to the current University Hall and includes three concept design schemes. The fifth location, Dwinelle, was added by the consultant team in order to evaluate an option that would add parking capacity underground in the center of campus.

Selection Criteria

Five primary criteria were used to guide the garage location recommendation. The performance of each of the six garage locations on each of these criteria is shown below in Table 5-10.

Location Evaluation and Selection

Upper Hearst was selected because it is the most cost effective of the new structures considered and because it is located close to central campus in an area that currently has high parking demand. The Upper Hearst project would involve expansion of the existing Upper Hearst structure which currently has 416 spaces on four levels above ground with tennis courts on the roof (fifth level). The proposal is to construct three parking levels including 75 new spaces on the current Upper Hearst lot just north of the structure, and to convert the roof from tennis courts to parking for a total of 135 new spaces.

Table 5-10 Garage Location Comparison*

	Tang (Alt. 1.3)	Dana Durant (Alt. 2.2)	Bancroft (Alt. 3.2)	University Hall West (Scheme 2)	Dwinelle (2 Levels Underground)	Upper Hearst** (Alt. 4.1)
Net Spaces Gained	407	114	265	765	141	**135**
Construction Cost	$21.2 M	$9.9 M	$13.6 M	$40.2 M	$8.6 M	**$4.7 M**
Gross Cost per Space Built	$33,250	$48,750	$34,375	$37,500	$76,563	**$64,250**
Cost per Space Gained	$52,040	$86,809	$51,368	$39,260	$76,563	**$34,743**
Current Peak Demand	91%	99%	95%	98%	97%	**97%**

* Does not include operations/maintenance per Chapter 4
** Does not include tennis court replacement

Cost per space gained is one of the most important factors in evaluating a new parking garage. Upper Hearst is by far the least expensive garage on this metric. At only $34,743 per space gained, it is $4,517 less per space than the next best option – University Hall West, which builds on a site with limited existing parking. New parking supply at Upper Hearst is a very cost-efficient option because there are no parking spaces displaced and spaces can be gained from the tennis court at low cost. All other alternatives pay to replace existing spaces onsite making the net space gain less significant. The Upper Hearst alternative adds 135 spaces to the campus inventory and virtually none are lost due to construction. This explains why the gross cost per space built is so much higher than the cost per space gained.

Upper Hearst also has the lowest overall project cost at $4.7 million, less than half of the next cheapest option. The actual parking construction required for this option is comparatively low. Even including funding for a new tennis court location, Upper Hearst is the least expensive and most cost-effective option.

All of these garage locations are located in the “high demand zone” discussed in Chapter 5, and thus would all add spaces in an area already experiencing high parking demand. Current occupancy of the Upper Hearst garage is 97% at the peak hour. It is also adjacent to the northern border of campus, an area of campus with a scarcity of UC Berkeley parking facilities and limited site options for new parking structures.

Upper Hearst and the other four alternatives developed by Walker Parking are described in more detail in the Walker reports referenced above. The additional Dwinelle option is only listed for the purpose of comparing the costs of an underground lot in the heart of campus. It is not only very expensive at almost $77,000 per space gained, but would also add vehicular traffic into a part of campus that already has high pedestrian volumes. For these two reasons, it was not recommended. Full cost comparison of the Walker options can be found in Appendix F and Appendix G.

For the purposes of this study, parking at Maxwell Field was not examined. Parking at Maxwell Field was part of a previous planning study using campus demand identified through the LRDP planning process. The Maxwell Field Parking Structure was entitled through the Southeast Campus Integrated Projects. Should the need arise in the future for additional parking supply in this part of campus, the Maxwell Field Parking Structure would be evaluated.

Chapter 6. Conclusions & Next Steps

In the coming years as campus building continues to displace parking, UC Berkeley's parking system will face an increasingly complex situation: it will be as important as ever to provide easy and convenient access to campus but there will be fewer parking spaces for students, faculty and staff. Depending on where boundaries are drawn, the campus will likely experience a shortfall of up to 700 spaces assuming status quo programs and initiatives. The majority of this need will be downtown and in the west campus where substantial construction will occur.

Building a new parking facility to accommodate these cars could cost an estimated $40,000 per space gained, or approximately $28 million to gain the needed spaces. An equally cost-effective response, which will do more to move the University towards its goals for environmental sustainability, would be to use a combination of parking pricing and improved commute alternatives to bring demand into accord with future parking supply.

Locating more UC Berkeley functions in or near the downtown also creates new opportunities for shared parking as well as for greater use of transit. According to the most recent data available, downtown Berkeley has a significant amount of available parking during peak hours. Occupancy counts found that many metered on-street spaces are occupied by long-term parkers, but garages (City and privately-owned) have an excess capacity of close to 1,000 vacant spaces. This excess capacity provides a collaboration opportunity for the City and the University.

Recommended Strategies—Rebalancing and Reinventing

A combination of transportation demand management (TDM) measures is recommended to balance parking supply and demand at a reasonable cost. The construction of new parking was evaluated as part of this study. However, based on the high cost of construction, and the surplus in the downtown inventory, this study recommends first pursuing transit, other TDM incentives and collaboration with the City of Berkeley. In addition to transit passes, bicycle programs and other new ideas (car sharing, bicycle sharing) may also play a key role. Differential pricing for individual lots and garages--lowering prices for underused facilities, and raising prices for facilities that are full—will help shift parking demand to currently underutilized facilities, such as the Foothill lot and the Underhill Garage. Technology improvements—in particular, signage and wayfinding—are important components of an effective differential pricing program and the campus should begin to invest strategically in these technologies.

Construction remains an option if more growth occurs or if reconstruction of existing facilities is needed.

Next Steps

The following next steps are recommended in alignment with recommended policies and strategies:

- Develop a universal transit pass for faculty and staff, preferably including BART
- Perform regular occupancy studies in coordination with the City of Berkeley, assessing demand by permit type and include evening and special event demand

- Upgrade parking system to a "permitless" system using smartcards or proximity cards to enable more robust parking data collection, fine grained parking management and minimize staff time spent on permit issuance and enforcement
- Implement improved wayfinding to reduce space hunting and provided better information on occupancy
- Map out attended parking plans for all garages as a cost-effective strategy to maximize parking use intensity at all existing UC Berkeley parking facilities in the future.

Summary

This study concludes that UC Berkeley can meet its 2020 parking demand through a comprehensive program of parking demand management, through strategies that rebalance demand and that reinvent our parking system. In particular transportation demand management strategies have the potential to reduce parking demand while maintaining convenient campus access—the key reason that people drive to campus and park. By providing attractive alternatives to driving to campus, UC Berkeley will not only reduce parking demand, but reduce congestion and pollution. Significantly, in both short and long-term, the shared use of campus and City parking inventory can benefit the whole community. A comprehensive program of transportation demand management and efficient use of existing parking is important to everyone:

- Parking users will benefit from UC Berkeley's ability to minimize increases in parking user fees, and from improved information and certainty in trips to campus
- Alternative transportation users will benefit from expanded, enhanced and flexible options to travel to campus
- The overall campus community will benefit from the alignment between sustainability goals and the priorities of the parking and transportation system.

Ultimately, aligning these goals will relate to individual experience. All faculty, staff and students coming to campus experience campus transportation policy--whether they drive and park, take transit, walk or ride bicycles. In facing the challenges associated with developing and implementing a sound transportation policy, UC Berkeley has the opportunity to improve access to campus for its entire community and to advance sustainability goals for the campus and region. Strategies outlined in this study support campus-wide and individual stewardship of all our shared resources--parking, land, adjacent neighborhoods and the wider environment.

Acknowledgements

UC Berkeley
Project Team

Emily Marthinsen, Assistant Vice Chancellor, Physical and Environmental Planning (PEP)

Jennifer McDougall, Principal Planner, PEP

William Riggs, Principal Planner, PEP

Seamus Wilmot, Acting Director, Parking and Transportation

UC Berkeley
Reviewers

Evan Williams, Professor, Chemistry and Biophysics / Co-Chair, Chancellor's Joint Oversight Committee on Parking and Transportation

Ron Coley, Associate Vice Chancellor, Business and Administrative Services / Co-Chair, Chancellor's Joint Oversight Committee on Parking and Transportation

Elizabeth Deakin, Professor, Department of City and Regional Planning

Members, Chancellor's Joint Oversight Committee on Parking and Transportation

Members, Transportation Advisory Group

Consultants
Nelson\Nygaard Consulting Associates

Patrick Siegman, Principal

Brian Canepa, Senior Associate

City of Berkeley
Reviewers

Staff, Land Use Planning Division, Planning and Development Department

Staff, Transportation Division, Public Works Department

APPENDIX A

FUTURE SCENARIOS AND PARKING DEMAND MODEL

Appendix A: Future Scenarios and Parking Demand Model

Introduction

As reported in Nelson\Nygaard's previous technical memorandum ("Parking Supply & Demand Assessment" attached as Appendix B), status quo continuation of current policies and programs is expected to result in a peak hour parking deficit by 2020. This projection was generated by creating a Baseline Scenario (that assumes continuation of status quo policies and programs) and running it through a demand assessment model developed by Nelson\Nygaard for UC Berkeley.

The present report was developed to help UC Berkeley decide how to address this projected parking shortage. There are two basic ways to eliminate a deficit: either reduce demand or increase supply. For this report, two new scenarios were developed in order to evaluate these two approaches. Each scenario was run through the multi-stage demand assessment model.

The two scenarios are:

- "**Build Parking Scenario**" assumes the University opts to increase supply through construction of a new parking garage to address the projected parking deficit.
- "**Enhanced TDM Scenario**" assumes that the University opts to reduce demand through an expansion of their TDM programs to address the projected parking deficit.

The model was designed to project how each scenario would affect parking supply and demand and to project the financial impacts of each scenario. In both scenarios, the University is assumed to raise permit prices to cover new costs associated with either building a parking garage or funding new/enhanced TDM programs.

This Appendix explains the assumptions that went into the model and the scenarios, as well as the results of each scenario.

The Model

How the Model Works

Most simply, the model was designed to evaluate how each scenario helps solve the projected parking deficit. Also important to the University, however, is how these scenarios impact the Parking and Transportation Department's revenues and expenses, and how the scenarios would affect its customers' finances (e.g., changes projected in parking prices and transit fares). The Parking and Transportation Department is required to maintain a financial reserve equal to at least 125% of its annual debt service payments. Therefore, the model simultaneously evaluates the impact that each scenario has on Parking and Transportation revenues, expenses, and reserves.

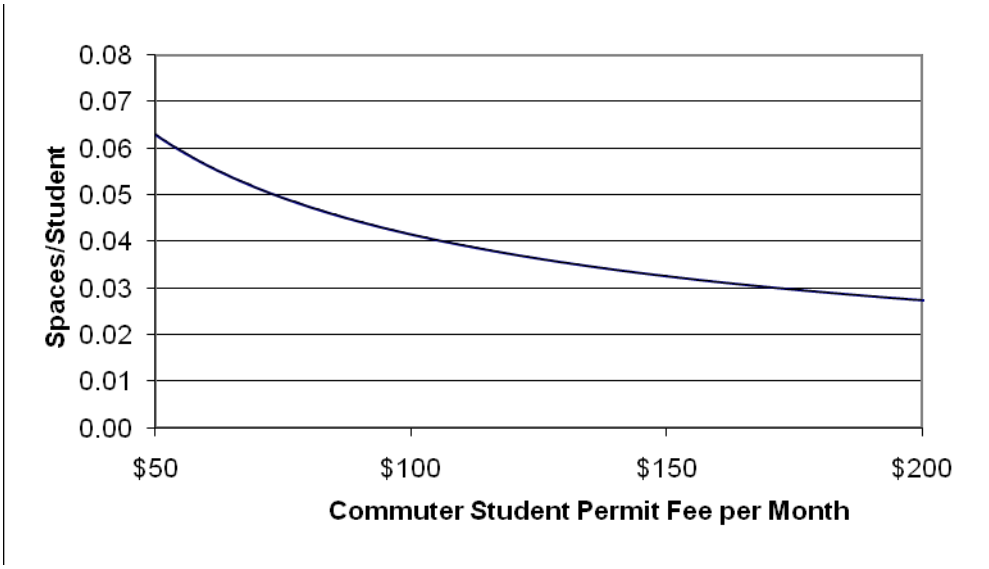
Inputs to the model (such parking permit prices and new garage construction) were adjusted, in an interative fashion, to simultaneously achieve two goals: to balance revenues and expenses and maintain an adequate account balance, and to eliminate the parking deficit. The model takes into account the fact that permit price adjustments simultaneously impact parking demand and parking revenue, and takes into account the additional costs associated with TDM measures or garage construction in each scenario. So, adjusting parking prices was a key lever used to make each scenario work.

Basic Model Assumptions

The model assumptions include the following:

- **Price elasticity of parking demand:** A critical assumption in the model is that, all else being equal, *increasing the price of parking reduces demand for parking*. Price elasticity of parking demand was assumed to be -0.3. That is, a ten percent increase in real (i.e., inflation-adjusted) parking price yields a roughly three percent decrease in parking demand. This number represents a midpoint in values found in the national transportation research literature on parking demand elasticity with respect to price which range from -0.1 to -0.6, with -0.3 being the most frequently cited value.[1] This price elasticity assumption is illustrated below. The following three figures show demand curves for each type of commuter to illustrate the effect that price has on demand.

Figure 1 Commuter Student Parking Demand Curve



[1] Transit Cooperative Research Program, Report 95, Chapter 13, *Parking Pricing and Fees: Traveler Response to Transportation System Changes*, 2005

Figure 2 Resident Student Parking Demand Curve

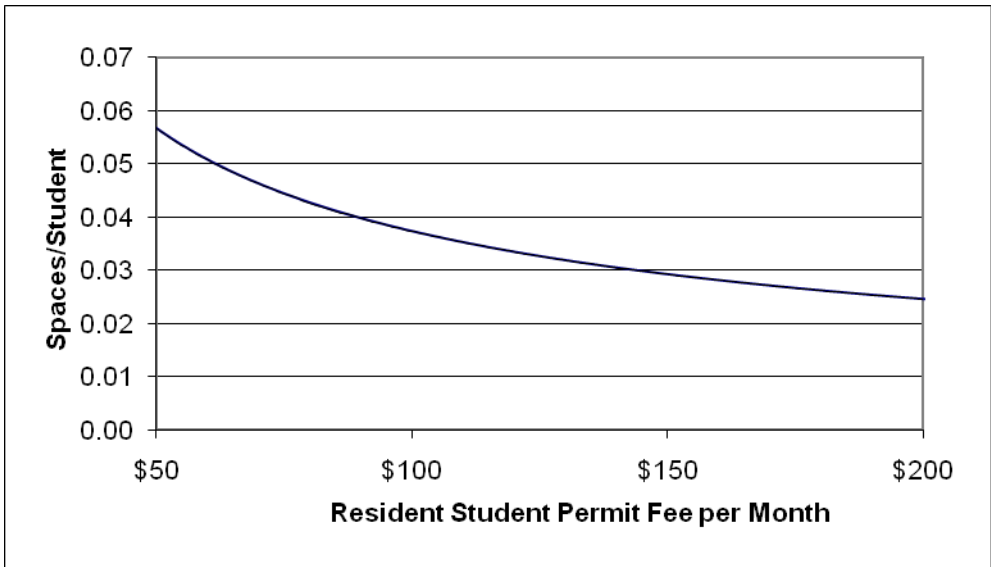
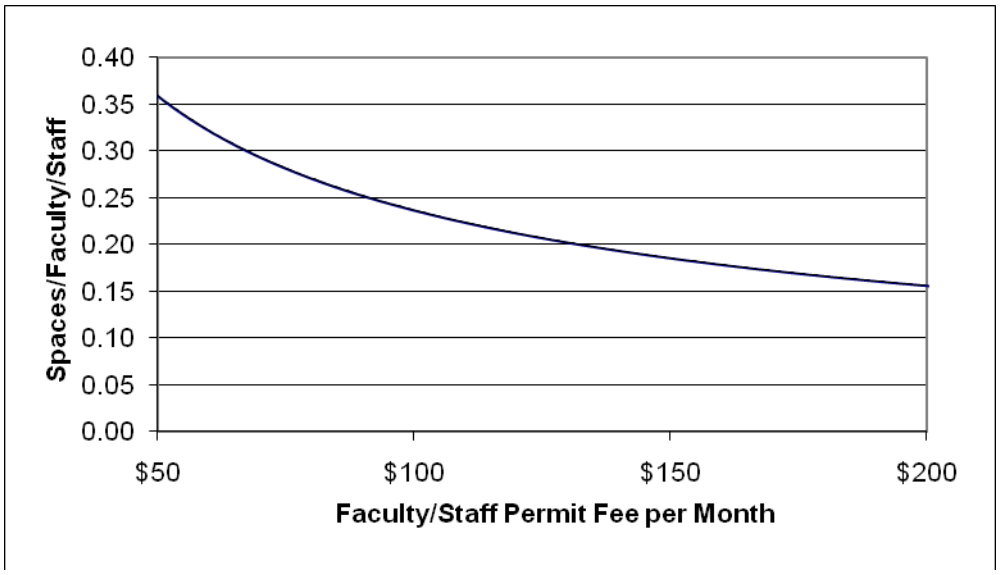


Figure 3 Faculty/Staff Parking Demand Curve



- **Permit Price Increases**: Permit prices were adjusted equally (i.e., an equal percentage point increase) for all campus permit holders.

- **Inflation**: The annual inflation rate is set at 3%. This is particularly important for parking permit prices which are shown in "Current Year Dollars" and "Real Dollars" (i.e. inflation-adjusted dollars). The primary implications of this for the model is that, in keeping with standard economic theory, price elasticity of parking demand is measured based on changes in real (i.e. after adjusting for inflation) changes in parking prices. For example, if

prices are increased only enough to keep pace with inflation, no reduction in demand due to the price change would be expected.

- **Areas of Campus**: Whereas the Parking Supply & Demand Assessment calculated baseline parking demand for the campus as a whole, this analysis of the two new scenarios calculates the parking demand for the main campus (west of Gayley Road/Stadium Rim Way) separately from the Hill Campus (east of Gayley Road/Stadium Rim Way).

- **Expense and Revenue Assumptions**:

    - Parking expense and revenue projections were provided by Parking and Transportation Services.

    - Parking and Transportation Services' revenue projections assume that the student Class Pass revenue stream is not reaffirmed in 2013. This assumption has been maintained in this analysis. If this revenue is available, it will be possible to decrease permit prices from those shown below.

    - Parking and Transportation Services' cost projections assumed the construction of the proposed University Hall West parking structure in 2014. The cost projections in this analysis assume parking construction in the "Build Parking" scenario when necessary, and in the amount necessary, to solve the shortage; the "Enhanced TDM" scenario includes no new garages.

"Build Parking Scenario"

This scenario assumes that the University constructs a parking garage to fill the gap between supply and demand. Basic assumptions of this scenario are:

- **Year of Construction**: This scenario assumes the garage is completed and opened in 2017. This is the latest year that new spaces can come online without creating a supply deficit (taking into account a 5% buffer for turnover).
- **Size of Garage**: The scenario sets the size of the garage at 450 spaces; this is just large enough to re-balance supply and demand without creating a large parking surplus.
- **Per Space Cost**: The per-space project cost used in this scenario is $37,500 per space; this is based on the per space costs for the preferred design alternative described in the recent University Hall West Parking Garage Parking Study[2].

"Enhanced TDM Scenario"

- **TDM Package**: This scenario assumes that the recommended package of TDM strategies and policies described in this report is adopted.
- **Year of Implementation**: The TDM program is assumed to go into effect in 2014; this is the latest year that the University can implement the programs (and thus incur the costs

[2] Walker Parking Consultants. *University Hall West Parking Garage Parking Study,* June 2, 2009. Attached as Appendix E.

associated with them) without creating a supply deficit. Like the garage scenario, the scenario was designed to postpone costs as long as possible without incurring a parking deficit.

- **Demand Reductions**: Parking demand reductions from new transportation demand management (TDM) measures were calculated at 5% for students and 10% for faculty/staff (with the greater figure for faculty/staff being primarily due to the implementation of a fully subsidized transit pass program). The new transportation demand management programs and their expected demand reduction effects are described in the Recommended Strategies chapter in the main body of the report.

Outcomes of the Model

Outcomes of the model for each scenario are shown below. Parking demand projections and necessary permit price changes are described for both areas of campus (Main and Hill) and for the campus as a whole. Revenue outcomes for each scenario, however, are shown only for the campus as a whole since the Parking and Transportation accounts are not dealt with in a segmented way.

Enhanced TDM Scenario

Main Campus

Parking Demand: Under the Enhanced TDM Scenario, our analysis projects a parking demand of 4,364 spaces on the Main Campus in 2020, significantly lower than the demand in the Baseline Scenario. The reduction in demand is due to two factors:

a) demand reductions stemming from permit price increases necessary to pay for the package of TDM improvements according to the -0.3 price elasticity assumption (described in model assumptions above), and

b) the effects of the TDM programs themselves (as noted above, the new TDM measures were assumed to reduce student parking demand by 5% and 10% for faculty/staff).

Parking demand is shown in Table 1 and Figure 4 below.

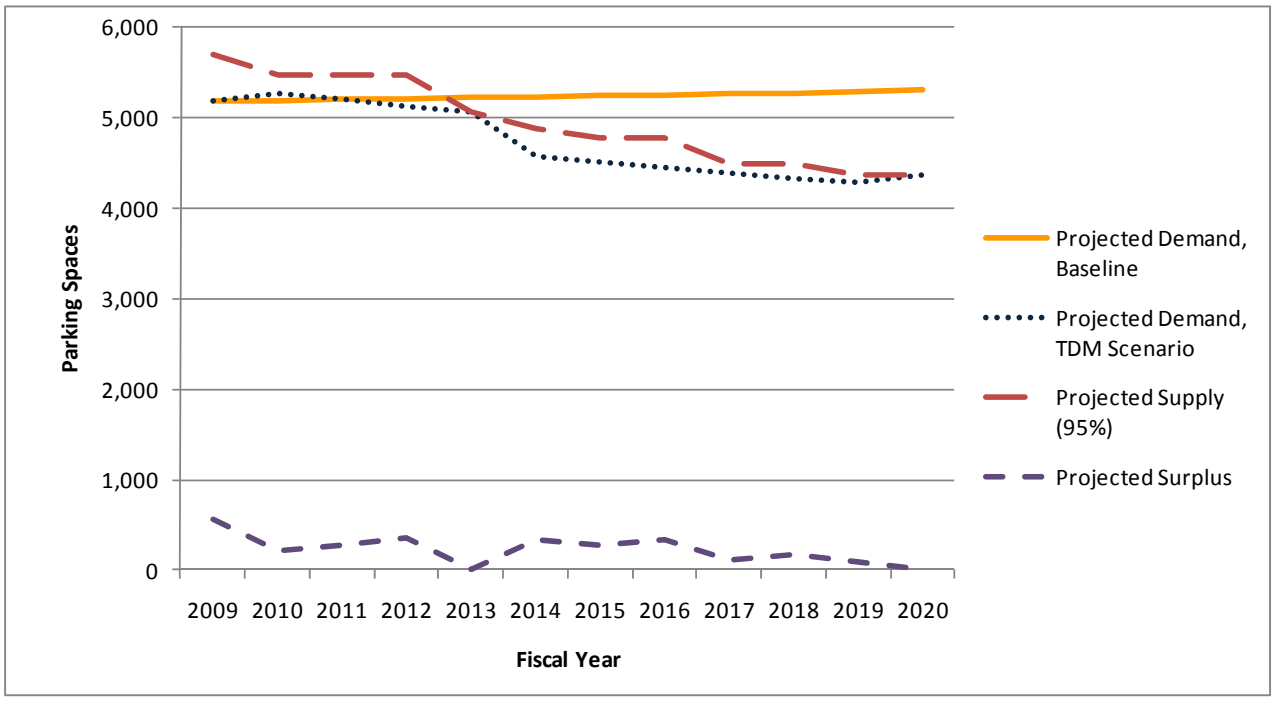
Table 1 Main Campus Parking Demand & Supply Projections "Enhanced TDM Scenario"[3]

	Projected Parking Demand	Projected Supply	Projected Effective Supply (95%)	Projected Surplus/Deficit	Projected Effective Surplus/Deficit (95%)
2009	5,173	6,000	5,700	827	555
2010	5,268	5,751	5,463	483	206
2011	5,198	5,751	5,463	553	279
2012	5,127	5,751	5,463	624	355
2013	5,058	5,334	5,067	276	9
2014*	4,560	5,136	4,879	576	336
2015	4,499	5,016	4,765	517	280
2016	4,437	5,016	4,765	579	345
2017	4,378	4,721	4,485	343	113
2018	4,319	4,721	4,485	402	175
2019	4,278	4,595	4,365	317	92
2020	4,364	4,595	4,365	231	1

**2014 is the year the TDM program takes effect*

[3] The years shown in table and charts throughout this appendix refer to fiscal years. The year "2009," for example, refers to the fiscal year starting July 1, 2009.

Figure 4 Main Campus Parking Demand & Supply Projections "Enhanced TDM Scenario"[4]



Permit Prices: In order to balance parking demand and financial stability, parking permit prices go up 6% per year through 2018, 5% in 2019. It is worth noting that 3% of this increase is just accounting for inflation. In 2020, under this scenario, main campus permit prices will be as follows (shown in current year dollars):

- Commuter Student: $134/month
- Resident Student: $160/month
- Faculty/Staff "C" Permit: $203/month
- Faculty/Staff "F" Permit $147/month

(It is worth noting that looking at these price increases in current year dollars makes them look more extreme than they might "feel" in 2020. For example, in "real" inflation-adjusted dollars, commuter student permits would be $97/month and resident student permits would be $116/month).

Hill Campus

Parking Demand: There is ample parking in the Hill Campus currently and this will continue to be the case under all Scenarios in the future. Under the Enhanced TDM Scenario, our analysis projects a parking demand of 402 spaces on the Hill Campus in 2020. Parking demand is shown in Table 2 and Figure 5 below.

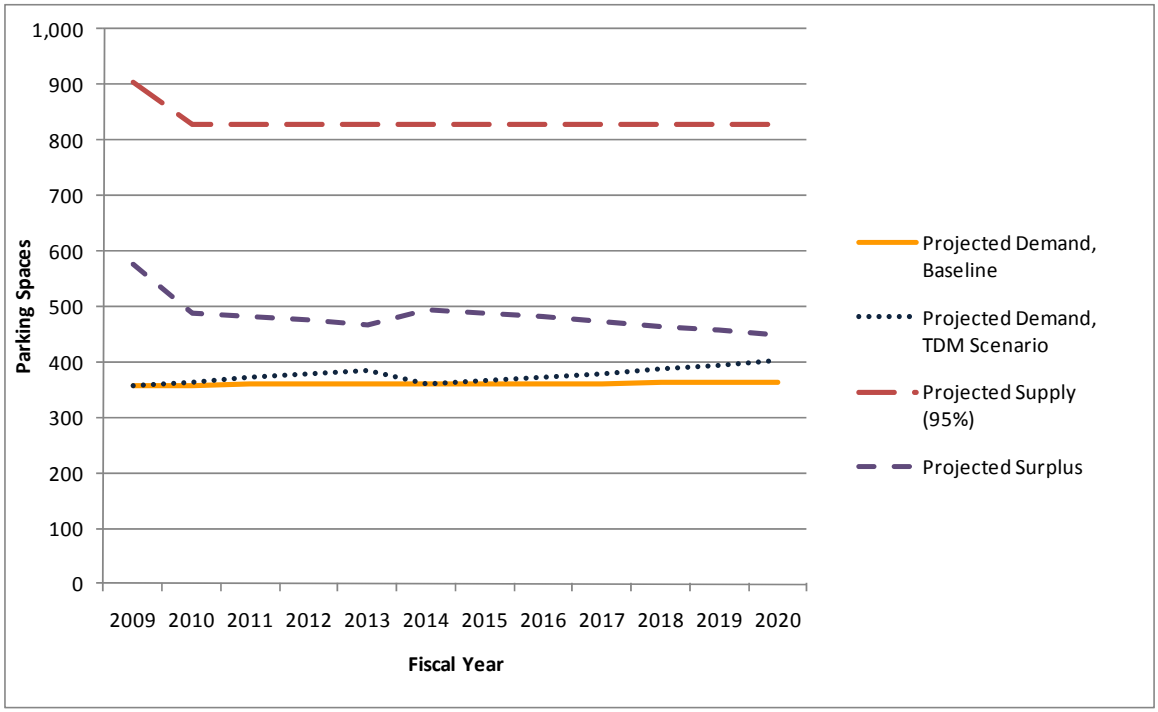
[4] The years shown in table and charts throughout this appendix refer to fiscal years. The year "2009," for example, refers to the fiscal year starting July 1, 2009.

Table 2 Hill Campus Parking Demand & Supply Projections "Enhanced TDM Scenario"

	Projected Parking Demand	Projected Supply	Projected Effective Supply (95%)	Projected Surplus/Deficit	Projected Effective Surplus/Deficit (95%)
2009	358	952	904	594	575
2010	365	872	828	507	488
2011	372	872	828	500	481
2012	378	872	828	494	474
2013	386	872	828	486	466
2014*	359	872	828	513	494
2015	366	872	828	506	487
2016	372	872	828	500	481
2017	379	872	828	493	473
2018	387	872	828	485	465
2019	395	872	828	477	457
2020	402	872	828	470	449

**2014 is the year the TDM program takes effect.*

Figure 5 Hill Campus Parking Demand & Supply Projections "Enhanced TDM Scenario"



Permit Prices: Due to this projected surplus, no parking price increases were built into the model for this Scenario, even to account for inflation. This means permit prices in real terms will decline over time. In 2020, under this scenario, Hill permit prices will be same as current prices shown below:

- Commuter Student: $82/month
- Resident Student: $98/month
- Faculty/Staff "C" Permit: $124/month
- Faculty/Staff "F" Permit $90/month

(For illustration, in "real" inflation-adjusted dollars, commuter student permits would be $59/month in 2020 and resident student permits would be $71/month in 2020).

Total Campus

Parking Demand: Under the Enhanced TDM Scenario, our analysis projects a parking demand of 4,766 spaces on the campus as a whole in 2020, significantly lower than the demand in the Baseline Scenario. As stated in the Main Campus section above, the reduction in demand is due to both price increases and the TDM package.

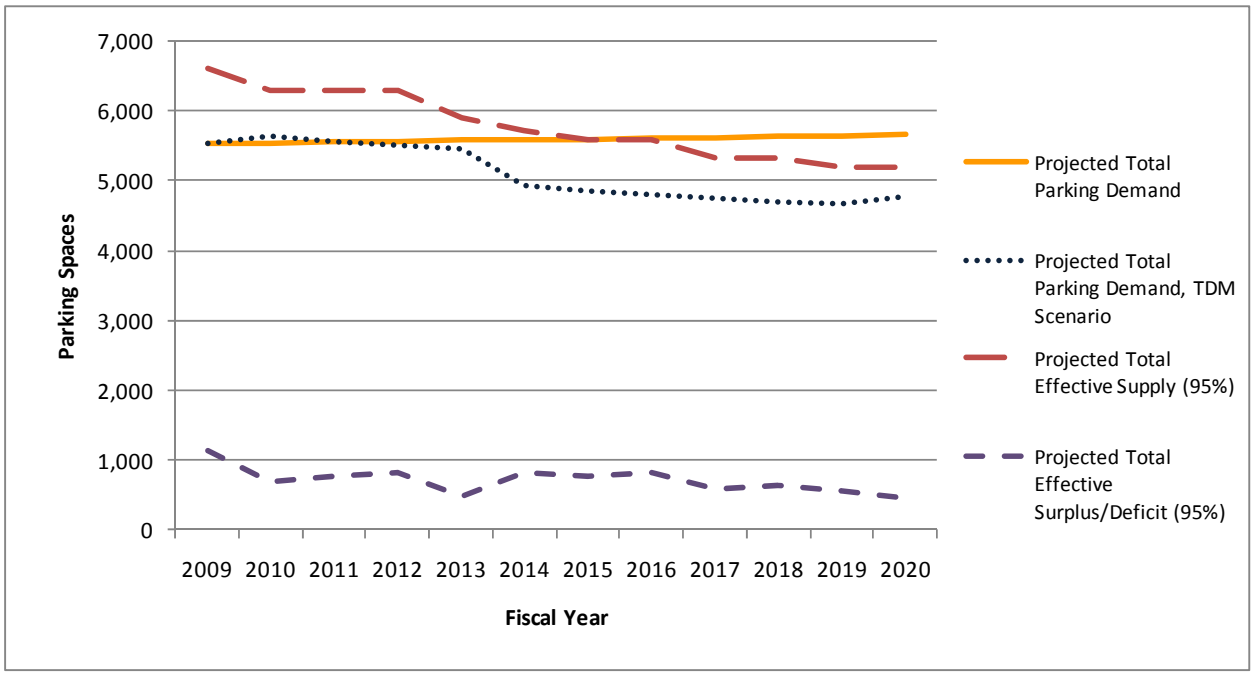
Parking demand for the whole campus is shown in Figure 6 and Table 3 below.

Table 3 TOTAL Campus Parking Demand & Supply Projections "Enhanced TDM Scenario"

	Projected Total Parking Demand, TDM Scenario	Projected Total Supply	Projected Total Effective Supply (95%)	Projected Total Surplus/Deficit	Projected Total Effective Surplus/Deficit (95%)
2009	5,531	6,952	6,604	1421	1130
2010	5,632	6,623	6,292	991	694
2011	5,570	6,623	6,292	1053	760
2012	5,504	6,623	6,292	1119	829
2013	5,444	6,206	5,896	762	475
2014*	4,919	6,008	5,708	1089	830
2015	4,865	5,888	5,594	1023	767
2016	4,809	5,888	5,594	1079	826
2017	4,757	5,593	5,313	836	586
2018	4,706	5,593	5,313	887	640
2019	4,673	5,467	5,194	794	548
2020	4,766	5,467	5,194	701	450

**2014 is the year the TDM program takes effect.*

Figure 6 TOTAL Campus Parking Demand & Supply Projections "Enhanced TDM Scenario"



Financial Projections: For this analysis, parking expense and revenue projections were developed which take into consideration the price adjustments necessary to finance the enhanced TDM package and to manage demand while also ensuring that the Parking and Transportation Department meets its fund balance requirement of 125% of annual debt service. By increasing permit prices on the Main campus as described above, while keeping the Hill Campus prices the same (actually declining in real terms) through 2020, a sufficient account balance is maintained as illustrated below in Figure 7 and Table. The expense information includes costs associated with new TDM programs: Faculty/Staff UPass, Marketing/TDM Coordinator, 200 bike share bikes, and Parking Cash-Out. Cost estimates assume TDM programs are implemented with the following budgets: faculty/staff Bear Pass - $297,700 per year; marketing - $51,000 per year; TDM Coordinator - $120,000 per year; bike sharing - $600,000 one-time fee. These beginning budgets for new TDM programs are budgeted to rise to keep pace with inflation and campus populations.

Figure 7 Financial Projections "Enhanced TDM Scenario"

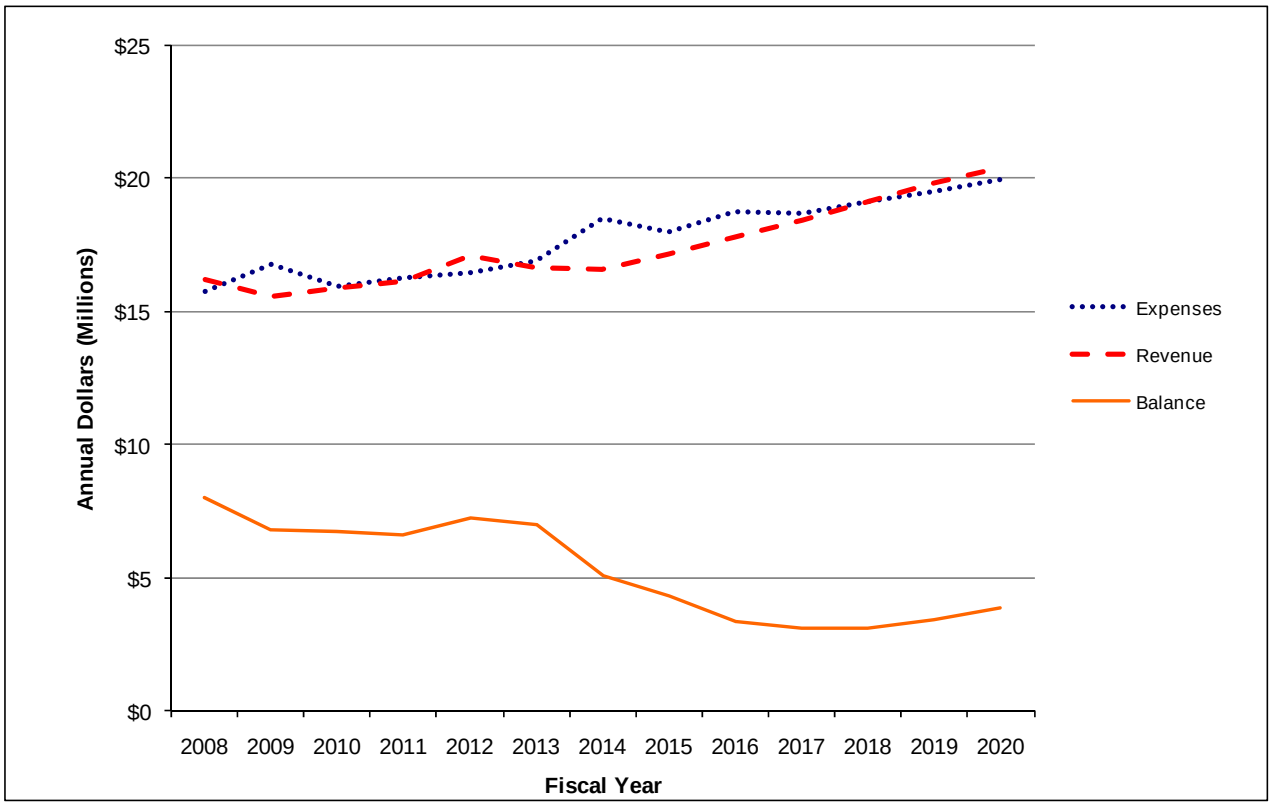


Table 4 Financial Projections Enhanced TDM Scenario

All Expenses (Salaries, Benefits, Previous Debt Service, etc.)	13,417,193	13,173,356	14,705,510	14,951,175	15,421,908	15,594,951	15,912,923	16,331,936	16,925,007	16,884,304	17,274,760	17,620,255	17,972,660
Capital Expenditures	-	2,881,988	366,895	415,769	114,752	296,922	460,971	127,227	253,486	200,835	200,835	200,835	200,835
Admin Reallocation to General Fund	1,900,000	-	-	-	-	-	-	-	-	-	-	-	-
Parking Administrative Full Costing	354,337	584,785	672,044	701,454	756,193	788,218	821,324	855,547	890,927	927,502	965,315	$ 1,003,927	$ 1,044,084
Citation Administrative Full Costing	51,286	94,780	115,760	120,160	125,920	130,560	135,360	140,480	145,680	151,120	156,720	$ 162,989	$ 169,508
Transit Ops Administrative Full Costing	18,187	37,072	40,539	41,958	43,426	44,946	46,519	48,148	49,833	51,577	53,382	$ 55,250	$ 57,184
F/S U-PASS							297,699	297,700	297,700	297,700	297,700	297,700	297,700
Marketing/TDM Coordinator							171,465	171,439	171,414	171,388	171,362	171,337	171,311
Bike Sharing (200 Bikes)							600,000						
Parking Cash Out						0	0	0	0	0	0	0	0
TOTAL	$15,741,002	$16,771,980	$15,900,747	$16,230,516	$16,462,200	$16,855,597	$18,446,260	$17,972,478	$18,734,046	$18,684,426	$19,120,074	$19,512,293	$19,913,283

REVENUES	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Commuter Student Permits	$694,616	$969,732	$986,092	$1,023,593	$1,028,140	$1,067,197	$1,052,394	$1,088,139	$1,093,873	$1,135,451	$1,178,656	$1,220,501	$1,244,289
Resident Student Permits	$212,424	$293,145	$300,675	$313,731	$338,523	$353,221	$350,139	$366,734	$393,809	$410,925	$428,796	$446,278	$460,250
Faculty/Staff Permits - C	$2,191,471	$2,187,360	$2,231,131	$2,329,041	$2,431,270	$2,538,009	$2,384,511	$2,489,239	$2,598,586	$2,712,758	$2,831,965	$2,949,065	$3,004,037
Faculty/Staff Permits - F	$2,467,840	$3,018,600	$3,079,004	$3,214,122	$3,355,200	$3,502,502	$3,290,672	$3,435,198	$3,586,100	$3,743,659	$3,908,168	$4,069,768	$4,145,630
Other Annual Permits	$ 2,782,198	$ 1,005,769	$ 893,336	$ 950,459	$ 933,823	$ 978,107	$ 1,024,414	$ 1,072,845	$ 1,123,569	$ 1,176,494	$ 1,231,819	$ 1,299,569	$ 1,371,046
Daily Permits	$ 817,899	$ 817,899	$ 830,167	$ 859,223	$ 889,296	$ 920,421	$ 952,636	$ 985,978	$ 1,020,487	$ 1,056,204	$ 1,093,171	$ 1,131,433	$ 1,171,033
Lot Machine Parking	$ 1,175,992	$ 1,175,992	$ 1,275,992	$ 1,320,652	$ 1,366,875	$ 1,414,715	$ 1,464,230	$ 1,515,478	$ 1,568,520	$ 1,623,418	$ 1,680,238	$ 1,739,046	$ 1,799,913
Special Event Parking	$ 1,562,136	$ 1,585,568	$ 1,609,352	$ 1,338,603	$ 1,668,311	$ 1,701,677	$ 1,735,710	$ 1,770,425	$ 1,805,833	$ 1,841,950	$ 1,878,789	$ 1,916,365	$ 1,954,692
Campus Bicycle Plan Project	$ 75,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Parking Citation Revenue	$ 1,283,123	$ 1,354,000	$ 1,447,000	$ 1,502,000	$ 1,574,000	$ 1,632,000	$ 1,692,000	$ 1,756,000	$ 1,821,000	$ 1,889,000	$ 1,959,000	$ 2,031,483	$ 2,106,648
Fare Box and Ticket Sales	$ 38,758	$ 40,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Class Pass Revenue (Night Safety)	$ 735,881	$ 882,000	$ 882,000	$ 882,000	$ 1,026,000								
Bear Pass Revenue	$ 415,921	$ 489,600	$ 506,736	$ 524,472	$ 542,829	$ 561,828	$ 581,492	$ 601,844	$ 622,909	$ 644,711	$ 667,276	$ 690,631	$ 714,803
BART Tickets	$ 1,705,872	$ 1,755,342	$ 1,806,247	$ 1,858,628	$ 1,912,528	$ 1,967,991	$ 2,025,063	$ 2,083,790	$ 2,144,220	$ 2,206,402	$ 2,270,388	$ 2,336,229	$ 2,403,980
19900 Driver Funding	$ 46,615	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL REVENUES	$16,205,746	$15,575,007	$15,847,731	$16,116,523	$17,066,794	$16,637,669	$16,553,262	$17,165,670	$17,778,908	$18,440,972	$19,128,267	$19,830,368	$20,376,319
BALANCE	$7,972,947	$6,775,974	$6,722,958	$6,608,965	$7,213,559	$6,995,630	$5,102,631	$4,295,823	$3,340,685	$3,097,230	$3,105,424	$3,423,499	$3,886,535

The revenue projections provided by Parking and Transportation Services only went through 2018. For the purposes of this analysis, Nelson\Nygaard extended the projections two additional years using the same assumptions used by UC, these are highlighted in yellow.

The green highlighted area in Class Pass revenue row highlights the assumption stated at the beginning of the Appendix that UC Parking and Transportation revenue projections assume that the student Class Pass revenue stream is not reaffirmed in 2013.

Build Parking Scenario

Main Campus

Parking Demand: Under the Build Parking Scenario, our analysis projects a parking demand of 4,776 spaces on the Main Campus in 2020, lower than the baseline scenario. The reduction in demand is due exclusively to the demand response from pricing increases necessary to pay for the garage.

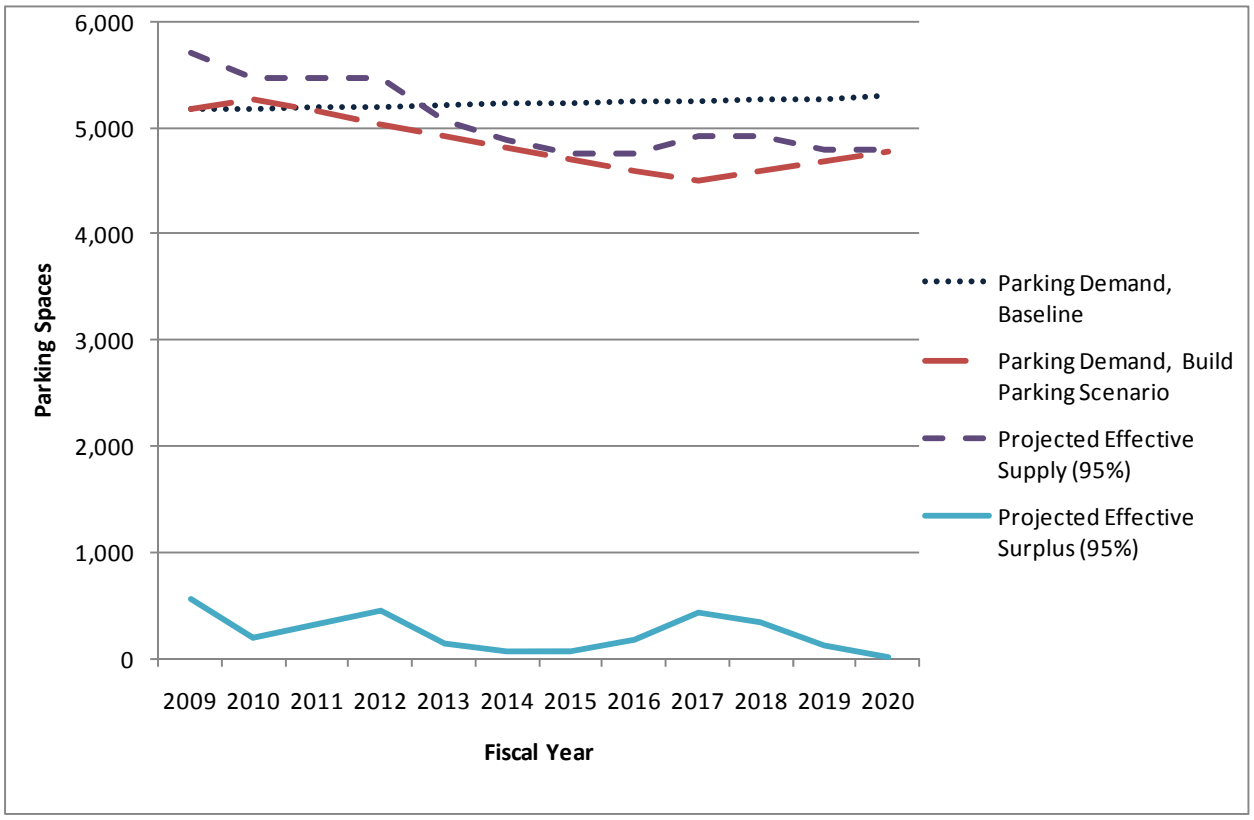
Parking demand is shown in Figure 8 and Table 5 below.

Table 5 Main Campus Parking Demand & Supply Projections "Build Parking Scenario"

	Projected Parking Demand	Projected Supply	Projected Effective Supply (95%)	Projected Surplus/Deficit	Projected Effective Surplus/Deficit (95%)
2009	5,173	6,000	5,700	827	555
2010	5,268	5,751	5,463	483	206
2011	5,151	5,751	5,463	600	329
2012	5,035	5,751	5,463	716	451
2013	4,923	5,334	5,067	411	152
2014	4,814	5,136	4,879	322	69
2015	4,707	5,016	4,765	309	62
2016	4,600	5,016	4,765	416	174
2017*	4,498	5,171	4,912	673	436
2018	4,589	5,171	4,912	582	340
2019	4,682	5,045	4,793	363	117
2020	4,776	5,045	4,793	269	18

*2017 is the year the parking garage opens

Figure 8 Main Campus Parking Demand & Supply Projections "Build Parking Scenario"



Permit Prices: In order to balance parking demand and financial stability, parking permit prices go up 7% per year through 2017. It is worth noting that 3% of this increase is just accounting for inflation. This increase works out to the same ultimate permit prices in 2020 as the TDM scenario. Though the price escalation is slightly faster in this Scenario, it ends one year earlier.

Hill Campus

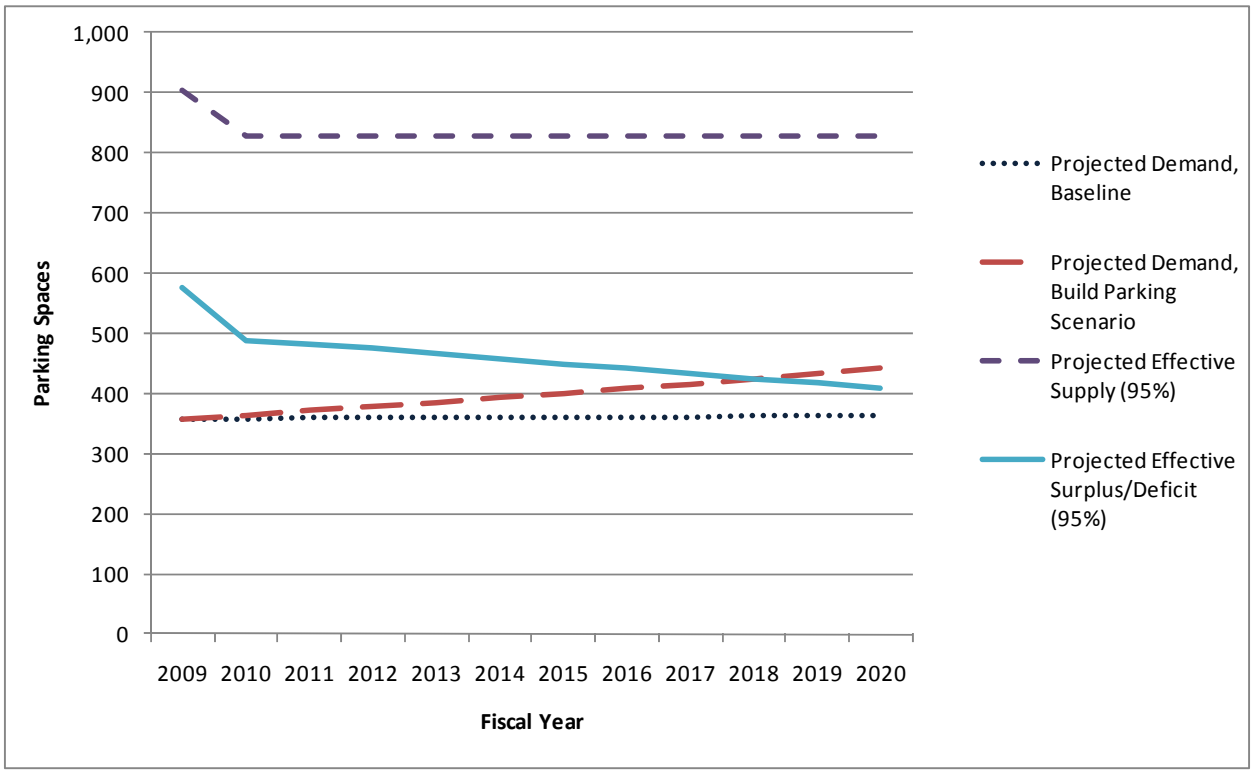
Parking Demand: As in the prior Scenario, there will continue to be ample parking in the Hill Campus through 2020. Our analysis projects a parking demand of 441 spaces on the Hill Campus in 2020 under this Scenario. Parking demand is shown in Table 6 and Figure 9 below.

Table 6 Hill Campus Parking Demand & Supply Projections "Build Parking Scenario"

	Projected Parking Demand	Projected Supply	Projected Effective Supply (95%)	Projected Surplus/Deficit	Projected Effective Surplus/Deficit (95%)
2009	358	952	904	594	575
2010	365	872	828	507	488
2011	372	872	828	500	481
2012	378	872	828	494	474
2013	386	872	828	486	466
2014	393	872	828	479	458
2015	401	872	828	471	450
2016	408	872	828	464	443
2017*	416	872	828	456	434
2018	424	872	828	448	425
2019	433	872	828	439	416
2020	441	872	828	431	407

**2017 is the year the parking garage opens*

Figure 9 Hill Campus Parking Demand & Supply Projections "Build Parking Scenario"



Permit Prices: Hill permit prices in this scenario are identical to the prior Scenario. That is, they are kept unchanged.

Total Campus

Parking Demand: Under the Build Parking Scenario, our analysis projects a parking demand of 5,217 spaces for the campus as a whole in 2020, somewhat lower than the demand in the Baseline Scenario. As stated in the Main Campus section above, the reduction in demand is due exclusively to the demand response from pricing increases necessary to pay for the garage.

Parking demand for the whole campus under the Build Parking Scenario is shown in Figure 10 and Table 7 below.

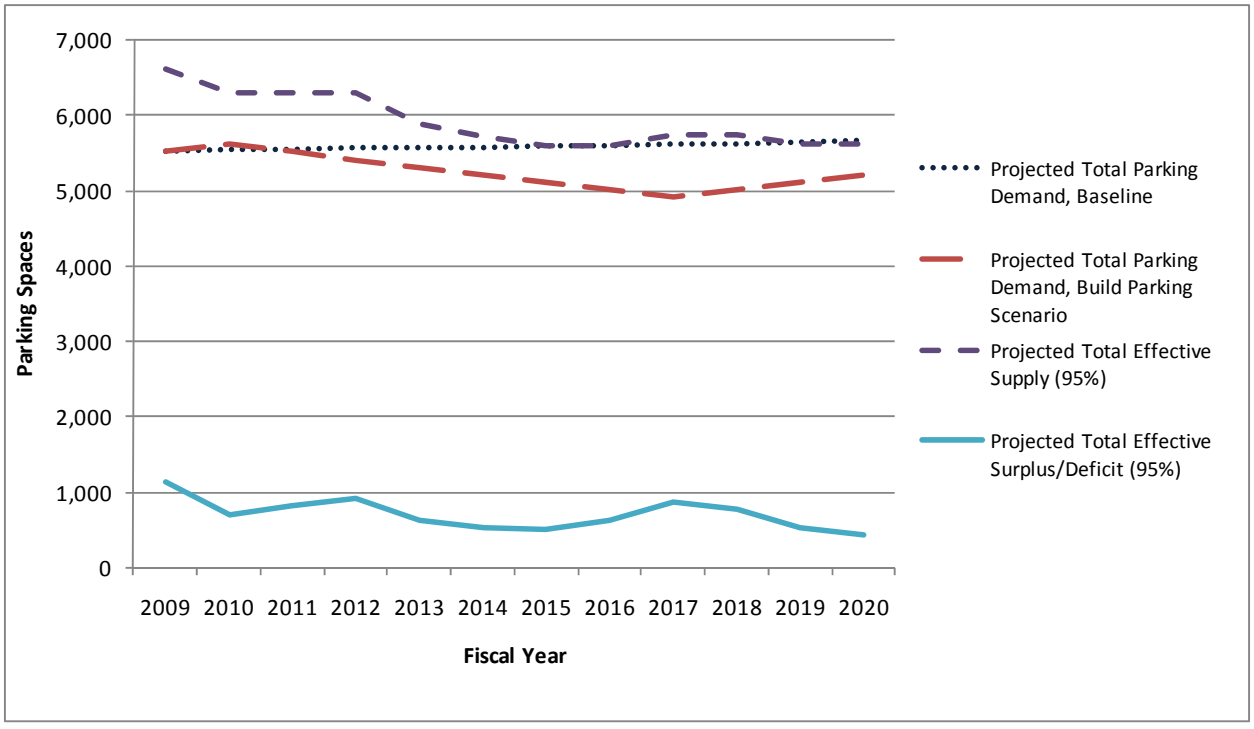
Table 7 Total Campus Parking Demand/Supply Projections "Build Parking Scenario"

	Projected Total Parking Demand, Build Parking Scenario	Projected Total Supply	Projected Total Effective Supply (95%)	Projected Total Surplus/Deficit	Projected Total Effective Surplus/Deficit (95%)
2009	5,531	6,952	6,604	1421	1130
2010	5,632	6,623	6,292	991	694
2011	5,523	6,623	6,292	1100	809
2012	5,413	6,623	6,292	1210	926
2013	5,308	6,206	5,896	898	618
2014	5,207	6,008	5,708	801	527
2015	5,108	5,888	5,594	780	511
2016	5,008	5,888	5,594	880	617
2017*	4,914	6,043	5,741	1129	870
2018	5,013	6,043	5,741	1030	766
2019	5,115	5,917	5,621	802	533
2020	5,217	5,917	5,621	700	425

*

2017 is the year the parking garage opens

Figure 10 Total Campus Parking Demand/Supply Projections "Build Parking Scenario"



Financial Projections: Similar to the analysis done for the other Scenario, parking expense and revenue projections were developed which take into consideration the price adjustments necessary to finance the construction of a parking garage while also ensuring that the parking program meets its fund balance requirement of 125% of the annual debt service. By increasing permit prices on the Main campus as described above, while keeping the Hill Campus prices the same (actually declining in real terms) through 2020, a sufficient account balance is maintained as illustrated in Figure 11 and Table 8 below. The expense information includes costs associated with building the new 450-space parking garage in 2017.

Figure 11 Financial Projections "Build Parking Scenario"

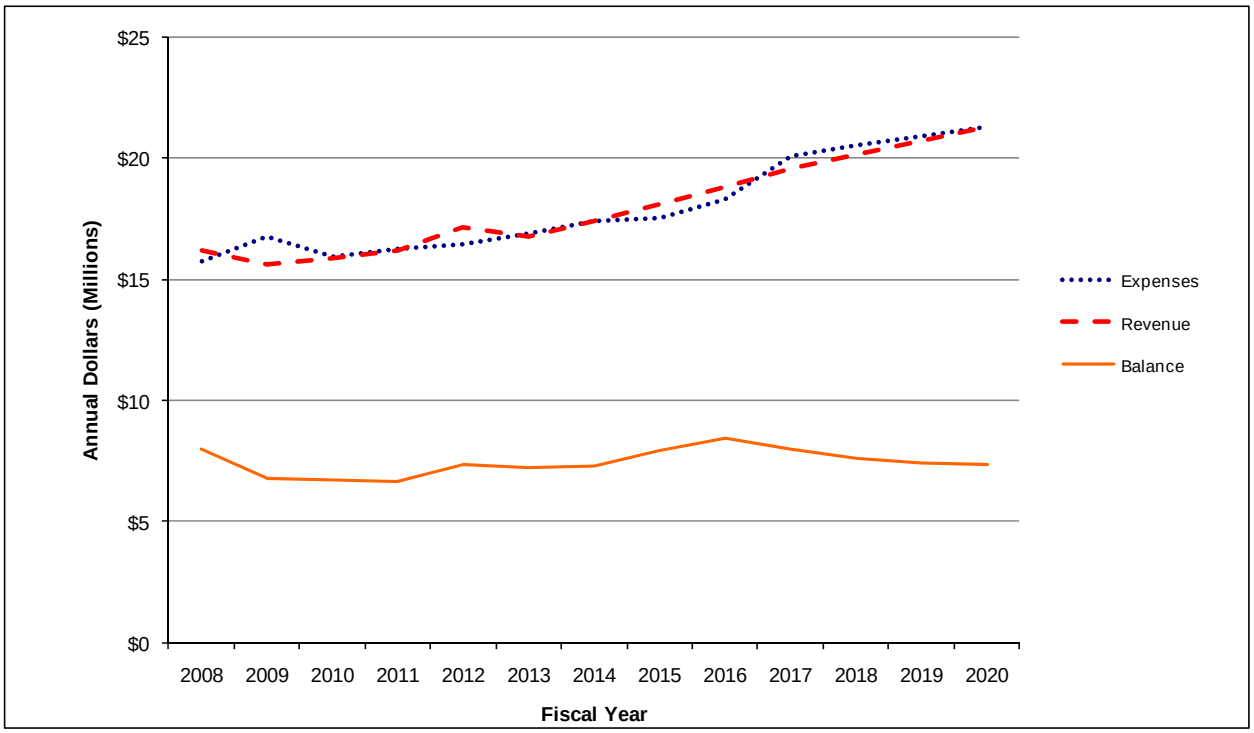


Table 8 Financial Projections "Build Parking Scenario"

Loan Period	35	years (industry standard)
Long-term interest rate:	6.00%	UCB "Rev Exp Projections (12-23-08).xls (University Hall West)
Maintenance cost and ope	$75	Walker Parking Consultants
Maintenance cost and ope	$536	UCB "Rev Exp Projections (12-23-08).xls (University Hall West)

SEE 10 YEAR PLAN PT PARKING EXPENDITURES AND REVENUES.XLSX FOR NUMBER REFERENCES

Construction Cost Index					1.00	1.03	1.06	1.09	1.13	1.16	1.19	1.23	1.27	1.30	1.34	1.38	1.43
	Parking Capital Costs in Current $				Year Built												
	Spaces Built	Cost per Space	Debt Service	Total	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
University Hall	450	$37,500	$2,587	$1,163,934										$1,518,670	$1,518,670	$1,518,670	$1,518,670
Tang	637	$33,250	$2,293	$1,460,884													
Dana Durant	203	$48,750	$3,362	$682,583													
Bancroft	396	$34,375	$2,371	$938,907													
Upper Hearst	135	$34,743	$2,396	$323,508													
SUBTOTAL					$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,518,670	$1,518,670	$1,518,670	$1,518,670
	Parking Operations Costs in Current $																
		Cost per Space															
	Spaces Built	Ops & Maintenance															
University Hall	450	$536												$314,711	$324,153	$333,877	$343,894
Tang	637	$536															
Dana Durant	203	$536															
Bancroft	396	$536															
Upper Hearst	135	$536															
SUBTOTAL					$0	$0	$0	$0	$0	$0	$0	$0	$0	$314,711	$324,153	$333,877	$343,894
All Expenses (Salaries, Benefits, Previous Debt Service, etc.)					13,417,193	13,173,356	14,705,510	14,951,175	15,421,908	15,594,951	15,912,923	16,331,936	16,925,007	16,884,304	17,274,760	17,620,255	17,972,660
Capital Expenditures					-	2,881,988	366,895	415,769	114,752	296,922	460,971	127,227	253,486	200,835	200,835	200,835	200,835
Admin Reallocation to General Fund					1,900,000	-	-	-	-	-	-	-	-	-	-	-	-
Parking Administrative Full Costing					354,337	584,785	672,044	701,454	756,193	788,218	821,324	855,547	890,927	927,502	965,315	$ 1,003,927	$ 1,044,084
Citation Administrative Full Costing					51,286	94,780	115,760	120,160	125,920	130,560	135,360	140,480	145,680	151,120	156,720	$ 162,989	$ 169,508
Transit Ops Administrative Full Costing					18,187	37,072	40,539	41,958	43,426	44,946	46,519	48,148	49,833	51,577	53,382	$ 55,250	$ 57,184
F/S U-PASS																	
Marketing/TDM Coordinator																	
Bike Sharing (200 Bikes)																	
Parking Cash Out		$1															
TOTAL					$15,741,002	$16,771,980	$15,900,747	$16,230,516	$16,462,200	$16,855,597	$17,377,097	$17,503,338	$18,264,933	$20,048,719	$20,493,834	$20,895,803	$21,306,835
REVENUES					2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Commuter Student Permits					$694,616	$969,732	$986,092	$1,029,329	$1,039,714	$1,085,297	$1,132,943	$1,178,068	$1,191,012	$1,243,333	$1,264,081	$1,285,192	$1,310,241
Resident Student Permits					$212,424	$293,145	$300,675	$315,611	$342,592	$354,246	$366,306	$380,211	$404,603	$418,384	$451,405	$483,821	$498,969
Faculty/Staff Permits - C					$2,191,471	$2,187,360	$2,231,131	$2,342,079	$2,458,611	$2,581,010	$2,709,571	$2,844,606	$2,986,441	$3,135,420	$3,205,898	$3,277,897	$3,338,999
Faculty/Staff Permits - F					$2,467,840	$3,018,600	$3,079,004	$3,232,115	$3,392,932	$3,561,845	$3,739,262	$3,925,613	$4,121,348	$4,326,941	$4,424,203	$4,523,563	$4,607,884
Other Annual Permits					$ 2,782,198	$ 1,005,769	$ 893,336	$ 950,459	$ 933,823	$ 978,107	$ 1,024,414	$ 1,072,845	$ 1,123,569	$ 1,176,494	$ 1,231,819	$ 1,299,569	$ 1,371,046
Daily Permits					$ 817,899	$ 817,899	$ 830,167	$ 859,223	$ 889,296	$ 920,421	$ 952,636	$ 985,978	$ 1,020,487	$ 1,056,204	$ 1,093,171	$ 1,131,433	$ 1,171,033
Lot Machine Parking					$ 1,175,992	$ 1,175,992	$ 1,275,992	$ 1,320,652	$ 1,366,875	$ 1,414,715	$ 1,464,230	$ 1,515,478	$ 1,568,520	$ 1,623,418	$ 1,680,238	$ 1,739,046	$ 1,799,913
Special Event Parking					$ 1,562,136	$ 1,585,568	$ 1,609,352	$ 1,338,603	$ 1,668,311	$ 1,701,677	$ 1,735,710	$ 1,770,425	$ 1,805,833	$ 1,841,950	$ 1,878,789	$ 1,916,365	$ 1,954,692
Campus Bicycle Plan Project					$ 75,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Parking Citation Revenue					$ 1,283,123	$ 1,354,000	$ 1,447,000	$ 1,502,000	$ 1,574,000	$ 1,632,000	$ 1,692,000	$ 1,756,000	$ 1,821,000	$ 1,889,000	$ 1,959,000	$ 2,031,483	$ 2,106,648
Fare Box and Ticket Sales					$ 38,758	$ 40,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Class Pass Revenue (Night Safety)					$ 735,881	$ 882,000	$ 882,000	$ 882,000	$ 1,026,000								
Bear Pass Revenue					$ 415,921	$ 489,600	$ 506,736	$ 524,472	$ 542,829	$ 561,828	$ 581,492	$ 601,844	$ 622,909	$ 644,711	$ 667,276	$ 690,631	$ 714,803
BART Tickets					$ 1,705,872	$ 1,755,342	$ 1,806,247	$ 1,858,628	$ 1,912,528	$ 1,967,991	$ 2,025,063	$ 2,083,790	$ 2,144,220	$ 2,206,402	$ 2,270,388	$ 2,336,229	$ 2,403,980
19900 Driver Funding					$ 46,615	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL REVENUES					$16,205,746	$15,575,007	$15,847,731	$16,155,170	$17,147,510	$16,759,137	$17,423,628	$18,114,858	$18,809,943	$19,562,257	$20,126,268	$20,715,230	$21,278,206
BALANCE				$ 7,508,203	$7,972,947	$6,775,974	$6,722,958	$6,647,611	$7,332,921	$7,236,460	$7,282,991	$7,894,511	$8,439,521	$7,953,058	$7,585,492	$7,404,919	$7,376,290