MEMORANDUM

To: Aaron Sage

From: Brian Canepa, Michael Rhodes and Kevin Shively

Date: August 26, 2013

Subject: 2201 Dwight Way

INTRODUCTION

This memo provides data and analysis to aid City staff and officials, and other stakeholders in understanding likely transportation and parking conditions at the proposed Garden Village development at 2201 Dwight Way, consisting of 77 student apartments, including 36 two-bedroom and 41 four-bedroom apartments. The apartment building will replace a 20,000 square foot office building currently occupying the site. The project will provide no off-street parking spaces for private motor vehicles, but it will provide four to ten spaces for shared vehicles, four motorcycle/moped spaces, 154 secured bicycles spaces within apartments, 34 bicycle lockers for residents in the basement, 24 bicycle lockers for visitors installed at grade level, and 8 bicycle racks on the public sidewalk near the building entrance for short-term visitor parking.

The memo reports on a survey of parking and transportation conditions at three existing apartment buildings that are located nearby and have similar characteristics to the proposed development. This memo contains the following sections:

- **Survey Methodology**. This section describes the parking survey of three developments. It includes a discussion of how the sites were chosen, a description of each site, the survey itself, and how it was deployed.
- **Parking Demand Analysis.** This section provides an assessment of parking in two pieces. It offers parking demand estimates based on (1) a conventional methodology provided by the Institute for Transportation Engineers (ITE), and a more tailored URBEMIS analysis that relies on ITE, and (2) findings of the survey.
- **Conclusion.** From the findings of the surveys of comparable sites in Berkeley, analyses utilizing URBEMIS and ITE published rates, and observations about parking regulations and the market for private off-street parking in the vicinity, this memo draws conclusions about the likely minimal impact of the Garden Village project on parking availability in the area.

An Appendix at the end of this document provides all of the data collected through the survey.

EXISTING CONDITIONS & ANALYSIS

Code Requirements

The proposed project is in an area zoned as R-S, or Residential High Density Subarea. A 77-unit residential building of this size in this zone would typically require 63 parking spaces (the applicable parking requirement is 1 space per 1,000 square feet, and the building area is 63,108 square feet). The Garden Village has applied for a "concession" under State density bonus law to waive this requirement; this request is also based on the expectation that this housing, marketed to students and strengthened by robust transportation demand management (TDM) measures, will likely generate far less demand for parking than a typical, market-rate residential development. Residents of the development would also be ineligible for Residential Parking Permits, restricting their access to on-street parking.

Previous traffic study findings

PHA Transportation Consultants conducted a traffic study for the Garden Village, last updated in October, 2012. The study evaluated potential traffic impacts of the project, and assessed the likely demand for on- and off-street parking. At the time of the study, the development proposal included 49 parking spaces. However, it has since been updated to remove all proposed off-street parking (except for shared spaces noted earlier), based on additional development costs not previously identified by the applicant.

- *Traffic:* The study found that the proposed project was expected to generate 43 AM and 51 PM peak-hour vehicle trips, or just eight morning and 17 evening trips in excess of what is currently generated by the existing office building. The study found that, even without accounting for the reduction in trips that would result from eliminating the existing office building, the apartment building would generate no significant traffic impacts. All three intersections studied currently operate at Level of Service (LOS) A or B, and would continue to operate at these levels after project completion and occupancy.[1]
- *Parking:* In order to forecast future parking demand, the study considered likely vehicle ownership rates for residents of the proposed development. It relied on a study of vehicle ownership for students living in university housing near the campus (including those living at 2135 College Avenue and 2311 Le Conte Avenue) that was conducted by University housing staff. That study found an average vehicle ownership rate of "less than 5%." Assuming that the development would have a population of 266 residents (this has since been reduced to 236), the study concludes that a 5% vehicle ownership rate would result in demand for 14 parking spaces. A 10% vehicle ownership rate would result in demand for 27 parking spaces. The study also conducted on-street parking surveys in the project vicinity to determine on-street parking availability (the study area, defined in consultation with City staff, included a 12 block area within approximately 600 feet of the project site). The survey found between 18 and 19 vacant parking spaces in the study area in late evenings between 8 and 11 PM.

The remainder of this memo will reexamine parking conditions and provide additional insight on the likely parking demand from residents of Garden Village, by considering parking demand

[1] LOS is a measure of traffic flows with a range from A to F. Berkeley considers LOS A through D to be acceptable conditions with LOS A representing free-flow conditions.

forecast methodologies based on (1) standard parking generation rates published by the ITE, (2) rates adjusted for location factors such as transit accessibility using the URBEMIS trip generation module, and (3) a survey of other student-oriented apartment buildings in Berkeley.

SURVEY METHODOLOGY

To estimate the parking demand from the proposed development, Nelson\Nygaard conducted a survey of three other existing apartment buildings near the proposed development that are marketed to UC Berkeley students. These apartment buildings are: 2310 Fulton (Stadium Place); 2414 Telegraph Ave; 2119 University (Bachenheimer Building).

Site Selection

Survey sites were selected based on the presence of tenants with travel behavior similar to the proposed development. Each survey site met the following criteria: they are residential buildings with a moderate to high number of units; they are within one mile of both 2201 Dwight and the UC Berkeley campus; they have few or no residential parking permits; and they provide a range of off-street parking ratios from 0.24 to 0.71 parking spaces per unit. Detail on the developments is as follows:

- **2310 Fulton (Stadium Place).** This 75 apartment-unit apartment building is located just a quarter of a mile from 2201 Dwight Way. It is named Stadium Place to signify its proximity to UC Berkeley's Edwards Stadium. It has 18 off-street parking spaces, or 0.24 spaces per unit. Residents of this building are not eligible to participate in Berkeley's Residential Parking Permit program, and City records indicate that there are no active annual permits for individuals living at this address.
- **2414 Telegraph Avenue.** This 40-unit apartment is located one-half mile from 2201 Dwight way. It includes a mix of one- and two-bedroom units. There are 11 parking spaces present on the side of this building, or 0.27 spaces per unit. These parking spaces are not exclusively available to residential tenants (Current advertisements for available apartments at this location note that no off-street parking is available to prospective tenants, while surveyors confirmed that some of the off-street parking spaces are leased to non-tenants). Residents of this building are eligible to participate in Berkeley's Residential Parking Permit program, but City records indicate that there are no active annual permits for individuals living at this address.
- **2119 University (Bachenheimer Building).** This 42-unit apartment building is located just under one mile from 2201 Dwight Way, and two blocks from UC Berkeley's campus. It provides 30 parking spaces, or a ratio of 0.71 spaces per unit. Residents of this building are not eligible to participate in Berkeley's Residential Parking Permit Program, and City records indicate that there are no active annual permits for individuals living at this address.

While these apartment buildings have many similarities to the proposed Garden Village development, none has a comprehensive Transportation Demand Management (TDM) program, which would be expected to further reduce resident parking demand.

Survey Deployment

Residents and visitors of each apartment building were surveyed to gather information on their transportation and parking choices. Two of the sites were surveyed on one weekday and one

weekend day (Thursday, April 4 and Saturday, April 6) between the hours of 6:30 to 9:30 AM and 3:30 to 7:30 PM). 2119 University was surveyed on one weekday and one weekend day (Wednesday, April 10 and Saturday, April 13) between the hours of 6:30 to 9:30 AM and 3:30 to 7:30 PM). All individuals entering and leaving the building through its accessible doorways during this time were approached and asked to participate in the survey. The full list of questions asked, including specific wording, is presented in Appendix B.

This memo focuses on survey responses from building residents, whose travel behavior is most relevant to the issue of future parking demand. As shown in Figure 1, there were 222 resident weekday responses and 146 Saturday responses to the survey. Most of these respondents were surveyed at 2310 Fulton and 2119 University, which each had more than 170 total resident respondents. 2414 Telegraph had 33 total resident responses.

Figure 1 Survey responses by building

	2310 Fulton	2414 Telegraph	2119 University	All Surveyed Buildings
Weekday				
Resident	110	20	92	222
Visitor	19	8	11	38
Saturday				
Resident	62	13	71	146
Visitor	20	1	42	63

PARKING DEMAND ANALYSIS

This section presents modeled and observed data to help assess likely parking demand and transportation behavior for residents and visitors of the Garden Village. It seeks to answer the following key questions:

- How many parking spaces will residents and visitors use each day?
- How many vehicle trips will be made by residents and visitors to the development?
- How many residents will own cars?
- Where might people park near the project site?

To help answer these questions, we draw data from two sources:

The first subsection presents data drawn from the ITE *Parking Generation, 4th Edition* manual, a conventional reference document for forecasting parking demand. While Parking Generation is widely used, the published parking generation rates for specific land uses do not account for the special circumstances of the proposed development, including student population, proximity to transit and services, provision of transit benefits and bicycle parking, and other factors. It is not therefore likely to provide an accurate forecast in this case.

To provide a basis for a more tailored forecast, the subsection that follows presents data from the survey of resident and visitors at the surveyed developments, and draws conclusions for Garden Village.

ITE

Overview

This portion of the parking demand analysis uses ITE's *Parking Generation, 4th Edition* to derive parking demand rates. The ITE parking analysis was conducted using two methods with the project's proposed land use program as it fits within ITE designations:

1. A standard analysis of ITE parking demand based on the peak parking demand for each land use as defined by a peak demand rate (e.g. 1.2 cars per residential unit) without regard to the site's location or transportation characteristics.
2. An enhanced analysis utilizing the URBEMIS software model to quantify the effects of features such as nearby transit service and the built environment on parking demand.

Standard ITE Analysis

Demand Assumptions

The standard ITE analysis is based on average peak period parking demand rates for appropriate matching land uses. For example, the project site's proposed units are considered as Low/Mid-Rise Apartments (ITE Land Use 221) while the current office use is considered an Office Building (ITE Land Use 701). Parking demand rates were selected for both a weekday and Saturday in order to determine the weekly peak demand.

Baseline Results

The standard analysis does not assume any reductions in parking demand as a result of the area's density, mix of uses, multimodal transportation access (transit, bicycle, walking), or lack of available on-site parking. This results in an extremely conservative parking demand estimate and as such, it is **not** recommended that it be used as a foundation for any policy or decision making. Instead, it is intended only to identify the likely maximum weekly peak parking demand, so that further, more detailed analysis can be conducted, as necessary. Figure 2 shows parking demand anticipated to be generated by the new apartments, the parking demand estimated for the current office use, per ITE published rates and the resulting net difference in estimated demand for the Garden Village site.[2]

[2] Weekend office demand was estimated at 10% of weekday demand.

Figure 2 Net New Parking Demand (Standard ITE Analysis)

ITE Land Use Category	Existing and Planned Land Uses at 2201 Dwight Way	Weekday		Weekend	
		ITE Ratio	Estimated Demand (Parking Spaces)	ITE Ratio	Estimated Demand (Parking Spaces)
Planned Use: Low/Mid-Rise Apartments (221)	77 (units)	1.20 occupied parking spaces per unit	92	1.03 occupied parking spaces per unit	79
Existing Use: Office (701)	20 (1000's sf)	2.47 occupied parking spaces per 1000 sf	49	0.25 occupied parking spaces per 1000 sf	5
Net New Demand	-	-	43	-	74

URBEMIS Analysis

Demand Assumptions

URBEMIS is a program developed for the California Air Resources Board to calculate emissions resulting from new developments. This program is an industry standard air emissions calculator for CEQA documents and is also used in calculating trip generation rates by using the ITE *Trip Generation, 8th Edition* manual as a base. It is a more suitable model for estimating parking demand in many areas given that ITE trip and parking generation rates are based largely on observations made at single-use sites in suburban locations with free parking, little or no transit service and no transportation demand management programs. Since trip generation is closely correlated to parking demand, the model has been used as a proxy to calculate the parking demand reductions that can be anticipated from different measures. The model itself accounts for several variables, including:

Mix of Uses. Many references point to the impact of "diversity" or mix of uses on parking behavior. The mix of uses is measured by calculating the jobs-housing balance in the area to gauge the potential for employees to take alternative modes of transportation to work. The jobs-housing balance is derived from employment and housing data from the U.S. Census and measured within a half-mile radius of the project.

Local Retail. The presence of local serving retail (including restaurants and personal/household services) can be expected to further encourage alternative modes. URBEMIS provides a relatively small reduction compared to published research[3] in order to avoid double counting with the Mix of Uses mitigation measure described above.

[3] E.g. Parsons Brinkerhoff (1996); and NTI (2000), both cited in Kuzmyak et. al. (2003).

Transit Service. In examining local transit service, it is important to consider both the amount of service (i.e., frequency and service span), and quality of service (particularly speed), which have a strong relationship with ridership.[4] The index used by URBEMIS places an emphasis on frequency, but gives greater weight to rail service (in view of greater speed and comfort). It considers the quantity of bus service within one-quarter mile, and rail service within one-half mile.[5]

Pedestrian/Bicycle Environment. Research for the Florida Department of Transportation, FHWA and other organizations has shown that there are numerous statistically significant factors that can assess the quality of the bicycle and pedestrian environment. URBEMIS uses three of the most important variables that are identified in the literature[6] to calculate the quality of the bicycle and pedestrian environment - intersection density, (which measures street connectivity), sidewalk completeness, and bike network completeness.

Affordable Housing. Data from the U.S. Census as well as other sources reveal that residents with lower incomes (and those living in rental units) own fewer vehicles.[7] URBEMIS uses the percentage of deed-restricted below-market-rate (BMR) housing as a way to incorporate this effect.

Parking Supply. There is a significant correlation between the quantity of parking provided and resident vehicle ownership and mode split.[8] Generally speaking, the *Parking Generation* rates represent completely unconstrained parking demands (i.e. demands that assume an over-supply of free parking).

In addition to the current physical conditions in and around the project site, it is also important to note the site's proposed traffic and greenhouse gas emission reduction measures. The following measures are currently implemented as part of the program:

Transit Subsidy. Each of the units in the new development will receive two unlimited transit passes at a 90% discounted rate (except for full-time students who already receive such passes).

Secure Bike Parking & Repair Station. The development will provide permanent bicycle storage hooks within each unit for two bicycles, resulting in a total of 162 secured indoor spaces. There will be an additional 24 bicycle lockers installed at grade level along with 16 bicycle racks near the building entrance for short-term visitor parking. Furthermore, an indoor bicycle repair station will be available for residents to maintain their bicycles. Bike parking facilities, for both residents and visitors, have been shown to encourage non-motorized travel.

Carshare/Transportation Information. The development will provide between four to ten onsite carshare vehicles with free membership for all tenants. In addition, electronic transportation

[4] See, for example Kittselson & Associates et. al, (2003); Holtzclaw et. al. (2002) Pratt et. al. (2003); Nelson\Nygaard (2002).

[5] See Lund et. al. (2004) for a discussion of walking distances to transit.

[6] See, for example, Dill (2003); Parsons Brinkerhoff (1993); Kuzmyak et. al, (2003); Ewing & Cervero (2001); and Ewing (1999). Note that network density is inversely related to block size, which is sometimes considered in the research.

[7] See Russo, Ryan (2001), Planning for Residential Parking: A Guide For Housing Developers and Planners. Non-Profit Housing Association of Northern California. Holtzclaw, John; Clear, Robert; Dittmar, Hank; Goldstein, David; and Haas, Peter (2002), "Location Efficiency: Neighborhood and Socio-Economic Characteristics Determine Auto Ownership and Use – Studies in Chicago, Los Angeles and San Francisco", Transportation Planning and Technology, 25 (1): 1-27.

[8] See, for example, Morrall & Bolger, 1996, cited in Kuzmyak et. al., 2003b; Lund et. al., (2004).

information will be available to residents in the building lobby, providing maps, traffic data, transit information, and trip planning to residents.

Additional measures: Building management will provide these additional measures for non-motorized travel:

- A $10 Bike Link locker card to each resident at the time of lease signing. At a rate of $0.02 to $0.03 per hour, a this card will provide up to 200-300 hours of bike parking at self-serve, card-accessible Bike Link lockers located throughout the Bay Area, including selected BART Stations, Amtrak Stations, Ferry Terminals, and public parking structures.
- One grocery trolley will be provided to each unit for resident use.

By providing an option for hauling groceries and other goods while walking, and secure bike parking at key intermodal transfer points throughout the area, these incentives are aimed at removing barriers to biking and walking for common trips originating at Garden Village.

URBEMIS Results

Given the multiple factors mentioned above, estimated parking demand in the URBEMIS analysis varies considerably from the standard ITE analysis. However, as with the standard analysis, it is **not** recommended that the URBEMIS analysis be used as a basis for decision making. Although URBEMIS more accurately accounts for site and area-specific conditions, it remains a model that relies on nationally-derived parking data from ITE. Indeed, ITE itself acknowledges that *Parking Generation*, "may not best reflect local conditions...surveys of comparable local conditions should always be considered as one of the best means to estimate parking demand to account for local factors."[9] As such, it is recommended that local data (see next section below) be used as a primary means of analysis, when available. Based on the URBEMIS analysis, Figure 3 shows parking demand anticipated to be generated by the new apartments, parking demand for the current office use, and the resulting net difference in demand.

Figure 3 Net New Parking Demand (Method 2 – URBEMIS Analysis)

ITE Land Use Category	Existing and Planned Land Uses at 2201 Dwight Way	Weekday		Weekend	
		URBEMIS Ratio	Estimated Demand (Parking Spaces)	URBEMIS Ratio	Estimated Demand (Parking Spaces)
Planned Use: Low/Mid-Rise Apartments (221)	77 (units)	0.33 Occupied Parking Spaces per Unit	25	0.28 Occupied Parking Spaces per Unit	22
Existing Use: Office (701)	20 (1000's sf)	1.73 Occupied Parking Spaces Per 1000 sf	35	0.18 Occupied Parking Spaces Per 1000 sf	4
Net New Demand	-	-	-9	-	18

[9] Institute of Transportation Engineers, *Parking Generation, 4th Edition*, 2010, p. 2.

Survey Data

In contrast to the analysis conducted based on published ITE rates, and the separate URBEMIS analyses, the survey data reflect actual, observed conditions at sites that are comparable to the proposed project. In order to help forecast future travel behavior at 2201 Dwight Way, respondents were asked what travel mode they used, how many vehicles they keep in Berkeley, where these vehicles are stored, the price paid for parking, and whether they use Residential Parking Permits. This section focuses on responses from residents, who made up about 80% of survey respondents, and whose travel behavior is of most relevance to forecasting parking demand for the proposed Garden Village development at 2201 Dwight Way. Visitor information is briefly summarized at the end of this section.

Mode Choice

Figure 4 presents the mode of transportation that surveyed residents reported using for their trip. It shows that, across sites, a large majority of trips were made on foot. Across all survey sites, walking was the mode chosen for 80% of trips by survey respondents on the weekday and 75% of trips on Saturday. Transit (either bus or rail) was the mode of choice for most of the remaining trips: it represented 18% of trips on the weekday and 10% on Saturday. Survey respondents made very few trips by single-occupant vehicle: less than one percent of weekday trips were made by driving alone, while four percent drove alone on Saturday.

The responses to this question do not permit a full accounting of automobile trips to and from the site, or auto mode share for all trips, because residents were only surveyed at the primary pedestrian accessible entrances and exits from each survey site (interviews were not conducted at locations where individuals entered and exited surveyed buildings directly from off-street parking facilities associated with each site). Only one survey respondent had driven for the trip surveyed and stored their car on-site, since most people who park on-site are able to access their building without entering through an exterior door, and thus bypass surveyors.

To account for vehicle trips associated with off-street parking facilities at each site, a separate count of entering and exiting vehicles was conducted at the point of access/egress from the public street during each survey period. Figure 5 reports the number of vehicle trips observed: 34 vehicles entered or exited garages at the survey sites during the weekday survey period, and 16 entered or exited during the Saturday survey period.

Figure 4 Mode of Current Trip, Surveyed Residents (Question 2) #

	2310 Fulton	2414 Telegraph	2119 University	All Surveyed Buildings
Weekday				
Walk	77.3%	85.0%	82.6%	80.2%
Bus	8.2%	5.0%	8.7%	8.1%
Bike	0.9%	5.0%	0.0%	0.9%
BART	10.0%	0.0%	8.7%	8.6%
Drove alone	0.0%	5.0%	0.0%	0.5%
Carpool	1.8%	0.0%	0.0%	0.9%
Other*	1.8%	0.0%	0.0%	0.9%
Saturday				
Walk	74.2%	92.3%	71.8%	74.7%
Bus	3.2%	0.0%	8.5%	5.5%
Bike	4.8%	0.0%	4.2%	4.1%
BART	3.2%	0.0%	7.0%	4.8%
Drove alone	4.8%	0.0%	4.2%	4.1%
Carpool	4.8%	7.7%	2.8%	4.1%
Other*	4.8%	0.0%	1.4%	2.7%

** (Motorcycle, Taxi, Carsharing, Skateboard among "other" options)*

 # Note: Mode shares shown in Figure 4 do not account for all vehicle trips to on-site parking facilities (All such trips are accounted for in Figure 5).

Vehicle Trips

Figure 5 shows the total number of vehicles counted entering and exiting on-site parking facilities during each survey period. For all surveyed buildings combined, 13 vehicle trips were counted during the weekday AM period, and 21 trips during the PM period. The number of trips was even lower on Saturday: three total vehicle trips during the AM period and 13 during the PM period.

The observed number of vehicle trips translates to an AM peak-hour vehicle trip generation rate of .05 trips per dwelling unit (8:30 to 9:30 AM) and a PM peak-hour vehicle trip generation rate of .06 trips per dwelling unit (6 to 7 PM).[10] 2414 Telegraph, which has the highest parking ratio, also had the majority of the weekday vehicle trips (18 of the 34 total vehicle trips). It is important to note, though, that some of the trips recorded for 2414 Telegraph are not associated with building tenants, because some of the building's 11 parking spaces are rented to non-residents.

[10] As a point of reference, the ITE *Trip Generation 9th Edition* manual cites an average AM Peak Hour trip generation rate of 0.35 and a PM rate of 0.44 for Mid-Rise Apartments (Land Use 223).

Figure 5 Vehicles Entering and Exiting On-Site Parking Facilities

	2310 Fulton	2414 Telegraph	2119 University	All Surveyed Buildings
Weekday				
AM Trips	3	8	2	13
PM Trips	6	10	5	21
Saturday				
AM Trips	0	2	1	3
PM Trips	5	3	5	13

Vehicle Availability

Figure 6 shows that 14% of residents surveyed on a weekday reported having a vehicle in Berkeley, and 16% surveyed on a Saturday reported having a vehicle in Berkeley. Of these, just one individual reported having two vehicles in the weekday survey, and one individual reported having two vehicles in the weekend survey (this could have been the same individual since every trip was surveyed). This low rate of vehicle access and availability is consistent across the three apartment buildings, suggesting that it is typical of this market segment.

Although residents were not surveyed when entering or exiting on-site parking facilities by vehicle, the data in Figure 6 should accurately reflect the rate of vehicle access and availability for all residents. It is very likely that the intercept survey captured a representative sample of all residents, including those who regularly park a vehicle on-site, but who may have been intercepted at the start or end of a non-auto trip during the survey period. (Berkeley residents typically make many walking, biking, or transit trips each day (comprising 86% of the surveyed sites' mode share.)

Figure 6 Vehicles available in Berkeley (residents)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
0 vehicles	86%	85%	84%	85%
1 vehicle	13%	15%	16%	14%
2 vehicles	1%	0%	0%	0%
Saturday				
0 vehicles	83%	85%	86%	85%
1 vehicle	15%	15%	14%	15%
2 vehicles	2%	0%	0%	1%

Low rates of vehicle access may be explained, in part, by the fact that many of the residents are students. Figure 7 shows that among respondents affiliated with UC Berkeley, just 12% have a vehicle available somewhere in Berkeley. By contrast, among those not affiliated with the University, 40% have a vehicle in Berkeley.

Figure 7 Vehicle Availability by UC Berkeley affiliation (residents)

	Vehicle Available	No vehicle Available
Affiliated	12%	88%
Not affiliated	40%	60%

Figure 8 shows the mode of travel survey respondents reported using for their current trip, based on their reported vehicle access and availability. Not surprisingly, most of those survey respondents who reported making a driving trip were also among those who reported keeping a private vehicle in Berkeley. The two percent of residents who reported not keeping a private vehicle, but driving for their current trip may have been borrowing a vehicle or using a car sharing service such as Zipcar or City Carshare.

Figure 8 Mode of current trip by vehicle availability (residents)

	Driving Trip	Non-driving Trip
Vehicle available	12%	88%
No vehicle available	2%	98%

Location and Price of Private Vehicle Parking

Figure 9 shows the location that surveyed residents who keep one or more vehicles in Berkeley typically store such vehicles when they are not in use. Of the 30 residents who reported keeping a private vehicle in Berkeley, twelve, or 40%, reported parking their vehicle in an on-site parking facility. Another twelve reported using another off-street parking lot or garage, and six (20%) reported parking on-street.

Figure 9 Location of car in Berkeley (residents)

	2310 Fulton	2414 Telegraph	2119 University	All Surveyed Buildings
Weekday				
On-site garage or lot	7	0	5	12
Other off-street parking	5	1	6	12
On street	3	2	1	6
Saturday				
On-site garage or lot	3	0	2	5
Other off-street parking	1	1	2	4
On street	3	1	5	9

Figure 10 shows the total number of survey respondents at each site who reported paying for parking. Of the 31 respondents who reported having a car available, 20 (or 65%) reported paying for parking, either for a space in their own building, at another garage or lot, or on-street.

Figure 10 Payment for parking for car in Berkeley (residents)

	2310 Fulton	2414 Telegraph	2119 University	All Surveyed Buildings
Weekday				
Paid	10	1	9	20
Did Not Pay	5	2	4	11
Saturday				
Paid	4	2	3	9
Did Not Pay	3	0	6	9

Residential Parking Permits

Like the proposed Garden Village, residents of two of the surveyed sites are not permitted to participate in the City's Residential Parking Program (RPP) program. While residents of the third site (2414 Telegraph Avenue) are permitted to get RPP permits, City data indicate that there no current annual RPP permits issued to residents of any of these developments.

Survey findings demonstrate a slight discrepancy from these records. Three resident respondents from each building report having an RPP permit, for a total of nine respondents from the survey as a whole.

Figure 11 Residential Parking Permits (residents)

	2310 Fulton	2414 Telegraph	2119 University	All Surveyed Buildings
Weekday				
Has RPP	3	3	3	9
Does not have RPP	12	0	10	22
Saturday				
Has RPP	3	1	3	7
Does not have RPP	5	1	5	11

Visitor mode choice and vehicle ownership

One-hundred and one visitors responded to the survey. They made up 15% of all weekday respondents and 30% of all Saturday respondents. Visitors had higher rates of vehicle ownership than residents. In total, 30% of weekday visitors (17 out of 39), reported having cars, while just 12% of weekend visitors reported having a car.

While somewhat more residents than visitors to these apartment buildings have cars of their own, walking is still by far the most common mode of transportation for visitors. Seventy-eight percent of visitor respondents reported walking for their trip to the survey site. Just two percent reported driving alone to get to the survey site, and four percent reported carpooling.

These findings suggest that visitors have very little impact on total parking demand at and around this type of apartment building. On weekdays, each development had, on average, less than two daily visitor drive-alone trips from visitors, and less than two daily carpool trips from visitors. On Saturday, each development had an average of three drive-alone trips and six carpool trips.

CONCLUSIONS

Survey data indicate that most trips from student-oriented apartment buildings near UC Berkeley generate far less vehicle traffic, and far less demand for parking, than typical, market-priced residential developments, which have higher ratios of on-site parking spaces supplied per residential dwelling unit and less diversity of land uses in the surrounding neighborhood. Evidence suggests that providing an ample supply of dedicated residential parking spaces on-site

can increase site-based auto mode share and consequently vehicle trip generation, localized traffic and greenhouse gas emissions[11]. Correspondingly, development with very limited on-site parking, as is proposed for the Garden Village project, is likely to generate fewer daily vehicle trips per dwelling unit, which in turn means less traffic and lower GHG emissions.

Data from both intercept surveys of residents and visitors and vehicle trip counts at on-site parking facility exits/entrances suggest that the vast majority of trips made by residents of these apartment buildings are made by walking, bicycling, or taking transit. By contrast, relatively few trips are made by driving or riding as a passenger in a private vehicle. Survey results also suggest that few visitors travel to or from these apartment buildings by car.

Estimation of Parking Demand for Garden Village Based on Survey Findings

Roughly 15% of residents of the surveyed apartment buildings report having a car in Berkeley[12]. If 15% of the estimated 236 residents of 2201 Dwight Way were to keep a private vehicle in Berkeley residents would own a total of 35 vehicles. (Because not all resident vehicles would be parked at or around the apartment building at all times, the total parking demand would be projected to be less than 35 spaces[13]).

This estimate, however, does not take into account the vehicle ownership impact of the Garden Village's four to ten on-site carshare spaces. According to the Transportation Research Board, "at least five private vehicles are replaced by each shared car" [14] demonstrating that the 35 privately-owned vehicles cited above would likely be reduced to between 0 to 15 vehicles.[15]

Forty percent of survey respondents who have access to a car in Berkeley report storing their vehicles in an off-site parking lot or garage. If, as estimated above, 0 to 15 residents of 2201 Dwight Way were to keep a private vehicle in Berkeley, and a baseline minimum of 40% those residents were to choose to park off-site, consistent with survey findings from comparable sites, that would leave no more than nine resident vehicle users interested in long-term parking nearby, but without access to a space, either on-site (no on-site parking will be provided), or on-street in the vicinity of 2201 Dwight Way (residents of Garden Village will not have access to RPP permits).[16]

We believe these circumstances would lead to the following effects:

- Because no off-street parking and no access to RPP will be provided at this development, the Garden Village will likely attract an even lower ratio of tenants with private vehicles than typical student-oriented private apartment buildings in Berkeley.
- Residents of Garden Village may be expected to be more likely than residents of comparable apartment buildings to pay for off-site parking. This option, chosen by 40% of parkers at surveyed buildings, will be the only available option for those residents of

[11] Weinberger, R (2012). "Death by a Thousand Curb-Cuts: Evidence on the effect of minimum parking requirements on the choice to drive." Transport Policy. Vol. 20, March 2012, p. 93-102 (doi:10.1016/j.tranpol.2011.08.002)

[12] Based on an average of weekday and Saturday responses.

[13] Note that some survey respondents reported parking their vehicles up to one mile away at times (including overnight) to avoid payment of parking/RPP fees.

[14] TCRP (2005) *Car-Sharing: Where and How it Succeeds*, TCRP Report 108. 2005. pg ES-3.

[15] The range of 0 to 15 vehicles exists due to the uncertain number of carshare vehicles present (four to ten).

[16] It should be noted that the baseline 40% figure is very likely low compared to the Garden Village given the presence of on-site parking spaces at the other surveyed sites.

the Garden Village who do choose to keep a vehicle. Off-street parking (both covered and uncovered) is regularly advertised for rent in this part of Berkeley[17]. For example, on April 19, 2013, the online classified site Craigslist advertised 12 off-street parking spaces available for lease within seven blocks of the project site. Asking prices ranged between $70 and $120 per month. Several advertisements noted the proximity of parking to the UC Berkeley campus, suggesting that the use of rented off-street parking is common for people affiliated with the University. [18]

- A small number of residents may choose to park vehicles overnight on-street in areas not covered by RPP zones. The nearest non-RPP area is located approximately 0.4 miles from the site, at Shattuck Avenue and Carleton Street. Although it would require a walk of 10-15 minutes from these locations to reach the project site, some residents may choose to park on-street overnight in these areas. It is generally not feasible for residents who do not have RPP permits to parking in RPP areas, since this requires moving vehicles every two hours during the daytime to avoid tickets.

Given the restrictions in place regarding on-street parking in this part of Berkeley, it is unlikely that a significant number of residents will regularly store vehicles on-street near the Garden Village.

The small number of visitors traveling to the site by car may park on-street for up to two-hours in RPP zones. However, based on the results of this survey, the number of visitors expected to arrive to Garden Village by car is so low that this pattern of use is unlikely to have a significant impact on neighborhood parking availability.

It is also important to consider that the proposed project will have a TDM program, as described in the discussion of the URBEMIS trip generation analysis on pages 6-8, which is likely to reduce vehicle trips and parking demand below the rates surveyed at comparable apartment buildings in Berkeley. Because they exclude any analysis of TDM program effects, the survey-based parking demand forecasts discussed in this concluding section are therefore conservative.

It will be very important for marketing materials and apartment listings for the development to make parking restrictions very clear. Prospective tenants should be clearly notified about the lack of dedicated off-street parking, as well as the restrictions on participating in the RPP program. Such notifications will help make clear that this apartment building is most appropriate for residents who do not plan to keep cars in Berkeley, or those who are able and willing to make arrangements for off-site, off-street parking elsewhere in the city.

[17] No attempt was made in this analysis to investigate or pursue published advertisements for private off-street parking, including Craigslist postings, to determine the ease with which a Garden Village apartment resident might negotiate and finalize terms to lease parking spaces from private individuals or property owners.

[18] The City of Berkeley has three paid parking facilities available: the Center Street Garage, the Telegraph/Channing Garage, the Oxford Garage, and the Berkeley Way Parking lot. While these facilities can provide convenient access to campus, shops, and other destinations in Berkeley, they do not permit overnight parking, and they charge rates that are inconsistent with long-term vehicle storage by students.

APPENDIX A. BERKELEY TRANSPORTATION SURVEY: TABLES OF FINDINGS

Figure 12 Vehicles Entering and Exiting Building Garages, Count

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
AM Trips	3	8	2	13
PM Trips	6	10	5	21
Saturday				
AM Trips	0	2	1	3
PM Trips	5	3	5	13

Figure 13 Resident or Visitor, Count (Question 1)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
Resident	110	20	92	222
Visitor	19	8	11	38
Saturday				
Resident	62	13	71	146
Visitor	20	1	42	63

Figure 14 Resident or Visitor, Percent (Question 1)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
Resident	85%	71%	89%	85%
Visitor	15%	29%	11%	15%
Saturday				
Resident	76%	93%	63%	70%
Visitor	24%	7%	37%	30%

Figure 15 Mode of Current Trip, Count (Question 2)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
Walk	98	24	85	207
Bus	12	1	8	21
Bike	1	2	0	3
Rail	12	0	9	21
Drove alone	2	1	2	5
Carpool	2	0	3	5
Other	2	0	0	2
Saturday				
Walk	86	12	70	168
Bus	5	0	9	14
Bike	7	0	3	10
Rail	5	0	25	30
Drove alone	5	1	3	9
Carpool	9	1	7	17
Other	4	0	1	5

Figure 16 Mode of Current Trip, Percent (Question 2)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
Walk	76%	86%	79%	78%
Bus	9%	4%	7%	8%
Bike	1%	7%	0%	1%
Rail	9%	0%	8%	8%
Drove alone	2%	4%	2%	2%
Carpool	2%	0%	3%	2%
Other	2%	0%	0%	1%
Saturday				
Walk	71%	86%	59%	66%
Bus	4%	0%	8%	6%
Bike	6%	0%	3%	4%
Rail	4%	0%	21%	12%
Drove alone	4%	7%	3%	4%
Carpool	7%	7%	6%	7%
Other	3%	0%	1%	2%

Figure 17 Mode of Current Trip, Count (Question 2) (residents)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
Walk	85	17	76	178
Bus	9	1	8	18
Bike	1	1	0	2
Rail	11	0	8	19
Drove alone	0	1	0	1
Carpool	2	0	0	2
Other	2	0	0	2
Saturday				
Walk	46	12	51	109
Bus	2	0	6	8
Bike	3	0	3	6
Rail	2	0	5	7
Drove alone	3	0	3	6
Carpool	3	1	2	6
Other	3	0	1	4

Figure 18 Mode of Current Trip, Percent (Question 2) (residents)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
Walk	77%	85%	83%	80%
Bus	8%	5%	9%	8%
Bike	1%	5%	0%	1%
Rail	10%	0%	9%	9%
Drove alone	0%	5%	0%	0%
Carpool	2%	0%	0%	1%
Other	2%	0%	0%	1%
Saturday				
Walk	74%	92%	72%	75%
Bus	3%	0%	8%	5%
Bike	5%	0%	4%	4%
Rail	3%	0%	7%	5%
Drove alone	5%	0%	4%	4%
Carpool	5%	8%	3%	4%
Other	5%	0%	1%	3%

Figure 19 Number of vehicles available in Berkeley, Count (Q3)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
0 vehicles	110	25	82	217
1 vehicle	17	3	15	35
2 vehicles	2	0	0	2
Saturday				
0 vehicles	55	11	101	167
1 vehicle	12	3	11	26
2 vehicles	1	0	0	1

Figure 20 Number of vehicles available in Berkeley, Percent (Q3)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
0 vehicles	85%	89%	85%	85%
1 vehicle	13%	11%	15%	14%
2 vehicles	2%	0%	0%	1%
Saturday				
0 vehicles	81%	79%	90%	86%
1 vehicle	18%	21%	10%	13%
2 vehicles	1%	0%	0%	1%

Figure 21 Number of vehicles available in Berkeley, Count (Q3) (residents)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
0 vehicles	95	17	72	184
1 vehicle	14	3	14	31
2 vehicles	1	0	0	1
Saturday				
0 vehicles	40	11	60	111
1 vehicle	7	2	10	19
2 vehicles	1	0	0	1

Figure 22 Number of vehicles available in Berkeley, Percent (Q3) (residents)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
0 vehicles	86%	85%	84%	85%
1 vehicle	13%	15%	16%	14%
2 vehicles	1%	0%	0%	0%
Saturday				
0 vehicles	83%	85%	86%	85%
1 vehicle	15%	15%	14%	15%
2 vehicles	2%	0%	0%	1%

Figure 23 Location of car in Berkeley, Count (Q4)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
On-site garage or lot	7	0	5	12
Other off-street parking	7	1	6	14
On street	5	2	2	9
Saturday				
On-site garage or lot	3	0	2	5
Other off-street parking	3	1	2	6
On street	7	2	5	14

Figure 24 Location of car in Berkeley, Percent (Q4)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
On-site garage or lot	37%	0%	38%	34%
Other off-street parking	37%	33%	46%	40%
On street	26%	67%	15%	26%
Saturday				
On-site garage or lot	23%	0%	22%	20%
Other off-street parking	23%	33%	22%	24%
On street	54%	67%	56%	56%

Figure 25 Location of car in Berkeley, Count (Q4) (residents)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
On-site garage or lot	7	0	5	12
Other off-street parking	5	1	6	12
On street	3	2	1	6
Saturday				
On-site garage or lot	3	0	2	5
Other off-street parking	1	1	2	4
On street	3	1	5	9

Figure 26 Location of car in Berkeley, Percent (Q4) (residents)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
On-site garage or lot	47%	0%	42%	40%
Other off-street parking	33%	33%	50%	40%
On street	20%	67%	8%	20%
Saturday				
On-site garage or lot	43%	0%	22%	28%
Other off-street parking	14%	50%	22%	22%
On street	43%	50%	56%	50%

Figure 27 Payment for parking for car in Berkeley, Count (Q5)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
Paid	12	1	10	23
Did Not Pay	7	2	4	13
Saturday				
Paid	6	2	3	11
Did Not Pay	7	1	6	14

Figure 28 Payment for parking for car in Berkeley, Percent (Q5)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
Paid	63%	33%	71%	64%
Did Not Pay	37%	67%	29%	36%
Saturday				
Paid	46%	67%	33%	44%
Did Not Pay	54%	33%	67%	56%

Figure 29 Payment for parking for car in Berkeley (Q5) (residents)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
Paid	10	1	9	20
Did Not Pay	5	2	4	11
Saturday				
Paid	4	2	3	9
Did Not Pay	3	0	6	9

Figure 30 Payment for parking for car in Berkeley, Percent (Q5) (residents)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
Paid	67%	33%	69%	65%
Did Not Pay	33%	67%	31%	35%
Saturday				
Paid	57%	100%	33%	50%
Did Not Pay	43%	0%	67%	50%

Figure 31 RPP for cars available in Berkeley, Count (Q6)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
Has RPP	3	3	3	9
Does not have RPP	16	0	11	27
Saturday				
Has RPP	3	2	3	8
Does not have RPP	11	1	5	17

Figure 32 RPP for cars available in Berkeley, Percent (Q6)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
Has RPP	16%	100%	21%	25%
Does not have RPP	84%	0%	79%	75%
Saturday				
Has RPP	21%	67%	38%	32%
Does not have RPP	79%	33%	63%	68%

Figure 33 RPP for cars available in Berkeley, Count (Q6) (residents)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
Has RPP	3	3	3	9
Does not have RPP	12	0	10	22
Saturday				
Has RPP	3	1	3	7
Does not have RPP	5	1	5	11

Figure 34 RPP for cars available in Berkeley, Percent (Q6) (residents)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
Has RPP	20%	100%	23%	29%
Does not have RPP	80%	0%	77%	71%
Saturday				
Has RPP	38%	50%	38%	39%
Does not have RPP	63%	50%	63%	61%

Figure 35 UC Berkeley affiliation, Count (Q7)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
Affiliated	117	20	87	224
Not affiliated	11	8	11	30
Saturday				
Affiliated	54	11	72	137
Not affiliated	13	3	41	57

Figure 36 UC Berkeley affiliation, Percent (Q7)

	2310 Fulton	2414 Telegraph	2119 University	All buildings
Weekday				
Affiliated	91%	71%	89%	88%
Not affiliated	9%	29%	11%	12%
Saturday				
Affiliated	81%	79%	64%	71%
Not affiliated	19%	21%	36%	29%

Figure 37 Mode of current trip by number of vehicles available in Berkeley, Count (Q2&3) (residents)

	Driving Trip	Non-driving Trip
Vehicle available	6	46
No vehicle available	7	288

Figure 38 Mode of current trip by number of vehicles available in Berkeley, Percent (Q2&3) (residents)

	Driving Trip	Non-driving Trip
Vehicle available	12%	88%
No vehicle available	2%	98%

Figure 39 Availability of a vehicle in Berkeley by UC Berkeley affiliation, Count (residents)

	Vehicle Available	No vehicle Available
Affiliated	35	266
Not affiliated	17	25

Figure 40 Availability of a vehicle in Berkeley by UC Berkeley affiliation, Percent (residents)

	Vehicle Available	No vehicle Available
Affiliated	12%	88%
Not affiliated	40%	60%

APPENDIX B. BERKELEY TRANSPORTATION SURVEY GUIDE

This document is a guide for members of the Nelson\Nygaard survey team to use to collect relevant information on the travel and parking patterns, vehicle use and UC affiliation of residents, visitors, and employees of selected apartment buildings and mixed-use buildings in Berkeley with residential components. Surveyors will attempt to stop and survey all persons entering and exiting the main residential entrance to the building during the designated survey periods. Verbal responses to all questions will be recorded by the surveyor on a separate data entry sheet.

Introduction: "Hi, we're doing some research on transportation patterns for the City of Berkeley and I have a few quick questions for you…"

1. **Do you live here?**
    a. Yes
    b. No

2. **What primary mode of transportation did you use to get here [if arriving], or will you be using to get to your next destination [if leaving]?**
    a. Walk
    b. Bus
    c. Bike
    d. Rail (BART, Muni Metro, etc.)
    e. Drive-alone
    f. Carpool
    g. Carshare (i.e. Zipcar or City Carshare)
    h. Motorcycle/scooter
    i. Other

3. **How many motor vehicles do you have in Berkeley?**
    a. Specify how many _____
    b. Are any of those motorcycles or scooters?

[If answer to (3) is "0" or "No" vehicles, skip to question (7)]

[If answer to (3) is one or more vehicles, proceed to next question (4)]

4. **Where is/are your vehicle (s) currently parked?**
    a. Parking garage/lot for this building
    b. Other off-street parking garage or lot (Specify location:
        i. _____ corner of [cross streets] _____ and _____

[If not willing to provide cross-streets:]

        ii. Ok – how many blocks away is the lot?
    c. On-Street (Specify location:
        i. ___ side of _____, between _____and _____

[If not willing to provide cross-streets:]

        ii. Ok – how many blocks away is the vehicle parked? _____

5. **Did you pay to park your vehicle(s) there?**
    a. No
    b. Yes.
        i. If "Yes," ask: How much did you pay?
        $_____ per: hour / day / month

[If respondent is not willing to be specific, ask if amount paid was…]

        ii. less than $50 per month
        iii. $50-$99 per month
        iv. $100 or more per month
        v. Less than $5 per day/event
        vi. $6-10 per day/event
        vii. $1.50 or less per hour
        viii. More than $1.50 per hour

6. **Does your vehicle have an annual Residential Parking Permit (RPP) for Berkeley?**
    a. No
    b. Yes (Specify which letter zone _____)

7. **Are you affiliated with UC-Berkeley?**
    a. No
    b. Yes (If "Yes", "are you a/an:
        i. Undergraduate student
        ii. Graduate student
        iii. Member of faculty or staff