PROJECT ENGINEERING CONSULTANTS

June 18, 2009

Matthew Cassel, P.E.
Park City Engineer
445 Marsac Avenue
P.O. Box 1480
Park City, UT 84060-1480

RE: Fifth Addendum to the Treasure Hill Traffic Impact Analysis, July, 2004 Parking Generation Study

Dear Mr. Cassel,

Upon your request, Project Engineering Consultants (PEC) has performed a parking generation study to estimate the demand for parking that the Treasure Hill development in Park City would be expected to create. We have used information provided in the Traffic Impact Analysis completed in July, 2004 (including addendums 1-4), as well as information provided via other submitted development documents.

Forecasts of vehicle parking demand for the proposed development were calculated using the 3rd edition of *Parking Generation*, published by the Institute of Transportation Engineers (ITE). Land use codes that matched the codes in the original traffic impact analysis were used to estimate the trips generated by the facility with the exception of the hotel support commercial. The original traffic impact analysis used land use code 814: Specialty Retail which is not currently available in *Parking Generation*. Land use code 820: Shopping Center was the closest available land use and was used in place of the original land use code. Regression equations were used to determine the parking generation. Details of the land use codes and generation rates used are attached.

Table 1 - Raw Parking Generation

Type of Facility	*# of Units*	*Weekday Parking Generation*	*Weekend Parking Generation*
Hotel	202	168	235
Condominium/Townhouse	103	176	143
Hotel/Resort Support Commercial	19	189	394
Employee Housing	58	57	61
TOTAL		590	833

Details on how each land use was used in this analysis include:

- Land Use 310: Hotel – The data for this land use was fairly limited. Actual parking generation data was only available for the Weekday peak period. However, in the accompanying description of the data, the Parking Generation document noted that Saturday parking demand rates averaged 40 percent higher than the weekday rates. Therefore, calculated weekday rates were increased by 40 percent to reflect estimated weekend rates.
- Land Use 230: Residential Condominium/Townhouse – Similar to the Hotel land use, no data was available for weekend parking generation rates. However, the description of the data stated that in one set of data, the Saturday peak demand was 19 percent lower than the weekday demand. Therefore, calculated weekday rates were reduced by 19 percent to obtain estimates for weekend demand.
- Land Use 820: Shopping Center (used for the hotel support commercial) – This land use had substantial data and included data for weekday (December), weekday (non-December), and separate data for Friday, Saturday, and Sunday for both December and non-December. For the purposes of this analysis, the Mon.-Thurs. (December) data was used to estimate the weekday parking demand and the Sunday (December) data was used to estimate weekend parking demand at the proposed development. An assumption was made that the difference in December vs. non-December parking demand was similar to the difference in ski-day vs. non-ski-day demand at the proposed development.
- Land Use 221: Low/Mid-Rise Apartment (used for employee housing) – This land use was chosen as best representing the parking generation for the employee housing. PEC was informed that approximately 23,000 SF of employee housing will be provided. It was assumed that 400 SF of space (dormitory style) would approximate the parking generation of one urban low/mid-rise apartment, resulting in 58 units for analysis purposes. The weekday urban peak period and Saturday urban peak period from *Parking Generation* were used.

Similar to the original traffic impact analysis, the raw estimated parking demand was calculated assuming no interaction or internal sharing of trips by the different land uses. This is unrealistic considering the mixed use nature of the development and the high probability of shared trips between the different land uses. In the original traffic impact analysis, a reduction was made to the calculated trips to account for the trips that are made internal to the development. In addition, trips were further reduced to account for the addition of on-site employee housing. Similarly, a portion of the parking demand is expected to be shared between the different land uses. This is especially true of the support commercial, where a large portion of visitors to these areas will be patrons of the Hotel, residents of the Condominium/Townhomes, or employees.

However, the reduction in parking demand due to shared demand is not expected to be as great as the reduction in vehicle trips. In some instances, the reduction in vehicle trips does not correlate to a similar reduction in parking demand. Some examples of this could include patrons of the Hotel that access Main Street via the gondola or walking and employees who live on site and walk to work, Main Street, etc. In both of these examples, there is justification for reducing the number of vehicle trips. However, the demand for parking still exists since, in both cases, the patron and employee still have a car parked in the project.

Addendum four of the traffic impact analysis showed a reduction in trips (compared to the raw numbers) of 55% with on-site employee housing. The reduction in trips was applied across the board for the various land uses. Many of the mitigating factors that allow for that reduction also apply to the parking need, but for the reasons stated above, the reduction in parking generation is expected to be somewhat less. The assumed reductions for each of the land uses are as described below:

- Residential Uses (Hotel, Condominium/Townhouse, and Employee Housing) – While vehicle trips for these land uses are greatly reduced by the ability to walk or ride the cabriolet, the reduction in parking demand is expected to be modest. For purposes of this study, a 10% reduction was assumed.
- Hotel/Resort Support Commercial – These facilities are intended for the use of the resort guests only. Therefore no public parking is provided. However, a certain amount of parking will be needed for managers/employees living off-site, service issues, etc. 90% reduction was assumed.

The reduced parking generation is shown in Table 2.

Table 2 – Reduced Parking Generation

Type of Facility	*# of Units*	*Weekday Parking Generation*	*Weekend Parking Generation*
Hotel	202	151	212
Condominium/Townhouse	103	158	129
Hotel/Resort Support Commercial	19	19	39
Employee Housing	58	51	55
TOTAL		379	435

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Based on the information presented in this addendum, PEC recommends that approximately 435 parking spaces be provided to service the expected parking demand at the Treasure Hill development.

After a review of this addendum, if there are any questions or need for further clarifications, please contact me at your earliest convenience.

Respectfully,

Project Engineering Consultants

Gary Horton, P.E.
Principal

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Land Use: 221
Low/Mid-Rise Apartment

Land Use Description

Low/mid-rise apartments are rental dwelling units located within the same building with at least three other dwelling units, for example quadraplexes and all types of apartment buildings. The study sites in this land use have one, two, three, or four levels. High-rise apartment (Land Use 222) is a related use.

Database Description

The database consisted of a mix of suburban and urban sites. Parking demand rates at the suburban sites differed from those at urban sites and therefore the data were analyzed separately.

- Average parking supply ratio: 1.4 parking spaces per dwelling unit (44 study sites). This ratio was the same at both the suburban and urban sites.
- Suburban site data: average size of the dwelling units at suburban study sites was 1.7 bedrooms and the average parking supply ratio was 0.9 parking spaces per bedroom (three study sites).
- Urban site data: average size of the dwelling units was 2.2 bedrooms with an average parking supply ratio of 0.8 spaces per bedroom (eight study sites).

Saturday parking demand data were only provided at two suburban sites. The average Saturday parking demand at these two sites was 1.13 vehicles per dwelling unit.

One urban site with 15 dwelling units was counted on a Sunday during consecutive hours between 1:00 p.m. and 5:00 a.m. Peak parking demand occurred between 12:00 and 5:00 a.m. and was measured at 1.00 vehicle per dwelling unit.

About half of the urban sites were identified as affordable housing.

Several of the suburban study sites provided data regarding the number of bedrooms in the apartment complex. Although these data represented only a subset of the complete database for this land use, they demonstrated a correlation between number of bedrooms and peak parking demand. Study sites with an average of less than 1.5 bedrooms per dwelling unit in the apartment complex reported peak parking demand at 92 percent of the average peak parking demand for all study sites with bedroom data. Study sites with less than 2.0 but greater than or equal to 1.5 bedrooms per dwelling unit reported peak parking demand at 98 percent of the average. Study sites with an average of 2.0 or greater bedrooms per dwelling unit reported peak parking demand at 13 percent greater than the average.

Land Use: 221
Low/Mid-Rise Apartment

For the urban study sites, the parking demand data consisted of single or discontinuous hourly counts and therefore a time-of-day distribution was not produced. The following table presents a time-of-day distribution of parking demand at the suburban study sites.

Based on Vehicles per Dwelling Unit (Suburban)	*Weekday Data*	
Hour Beginning	Percent of Peak Period	Number of Data Points*
12:00–4:00 a.m.	100	19
5:00 a.m.	96	15
6:00 a.m.	92	22
7:00 a.m.	74	15
8:00 a.m.	64	2
9:00 a.m.	–	0
10:00 a.m.	–	0
11:00 a.m.	–	0
12:00 p.m.	–	0
1:00 p.m.	–	0
2:00 p.m.	–	0
3:00 p.m.	–	0
4:00 p.m.	44	1
5:00 p.m.	59	1
6:00 p.m.	69	1
7:00 p.m.	66	10
8:00 p.m.	75	9
9:00 p.m.	77	11
10:00 p.m.	92	26
11:00 p.m.	94	11

* Subset of database

Parking studies of apartments should attempt to obtain information on occupancy rate and on the mix of apartment sizes (in other words, number of bedrooms per apartment and number of units in the complex). Future parking studies should also indicate the number of levels contained in the apartment building.

Additional Data

- Apartment occupancy can affect parking demand ratio. In the United States, successful apartment complexes commonly have a vacancy rate between 5 and 8 percent.[2]
- While auto ownership has increased over time, based on the limited data sample, the parking demand ratios for the provided data set did not vary significantly with age. There is a wide range of data from the 1960s to 2000s (primarily from the 1980s to 2000s) in the database. In fact, a series of surveys conducted in 1961 and 1963 found a peak parking demand ratio very similar to the data collected in *Parking Generation*. The study conducted in Hayward, CA[3] surveyed 53 apartment complexes with a total of 1,759 dwelling units between the hours of 3:00 and 5:00 a.m. on seven consecutive days in both years. The study found an average of 1.26 parked vehicles per dwelling unit.

[2] Rental and Homeowner Vacancy Rates for the United States: 1960 to 2001, U.S. Census Bureau. www.census.gov/hhes/www/housing/hvs/q401tab1.html

[3] Crommelin, Robert. *Planning for Parking: Residential Requirements*, Proceedings of the 16th California Street and Highway Conference. UC Berkeley: Institute of Transportation Studies, January 30, 1964.

Land Use: 221
Low/Mid-Rise Apartment

- Additional research was conducted in the Portland, OR region using 2000 U.S. Census data[4] to relate rental households to the availability of vehicles. These data provided trends in the ratio of vehicles owned per rental household. While it was recognized that area type was not the only factor affecting vehicle ownership (household income was a very significant factor), this general assessment provided a means of comparison to the survey data submitted to ITE. The following table summarizes the number of vehicles owned per household, based on year 2000 Census data. Note that these data do not include visitor parking demand.

Area Type	Vehicles Owned per Household
Suburban (within urban growth boundary)	1.4
Central City, Not Downtown	1.2
Central Business District (CBD)	0.7
Areas within 1/3 mile of a light rail station and more than 10 miles from CBD	1.0–1.3
Areas within 1/3 mile of a light rail station and less than 10 miles from CBD	0.8–1.2

SOURCE: DKS Associates. Portland, OR, 2002 (based upon 2000 Census block data).

Study Sites/Years

Suburban:
Skokie, IL (1964); Glendale, CA (1978); Irvine, CA (1981); Newport Beach, CA (1981); Dallas, TX (1982); Farmers Branch, TX (1982); Euless, TX (1983, 1984); Baytown, TX (1984); Syracuse, NY (1987); Devon, PA (2001); Marina del Rey, CA (2001); Milburn, NJ (2001); Parsippany, NJ (2001); Springfield, NJ (2001); Westfield, NJ (2001); Beaverton, OR (2002); Hillsboro, OR (2002); Portland, OR (2002); Vancouver, WA (2002)

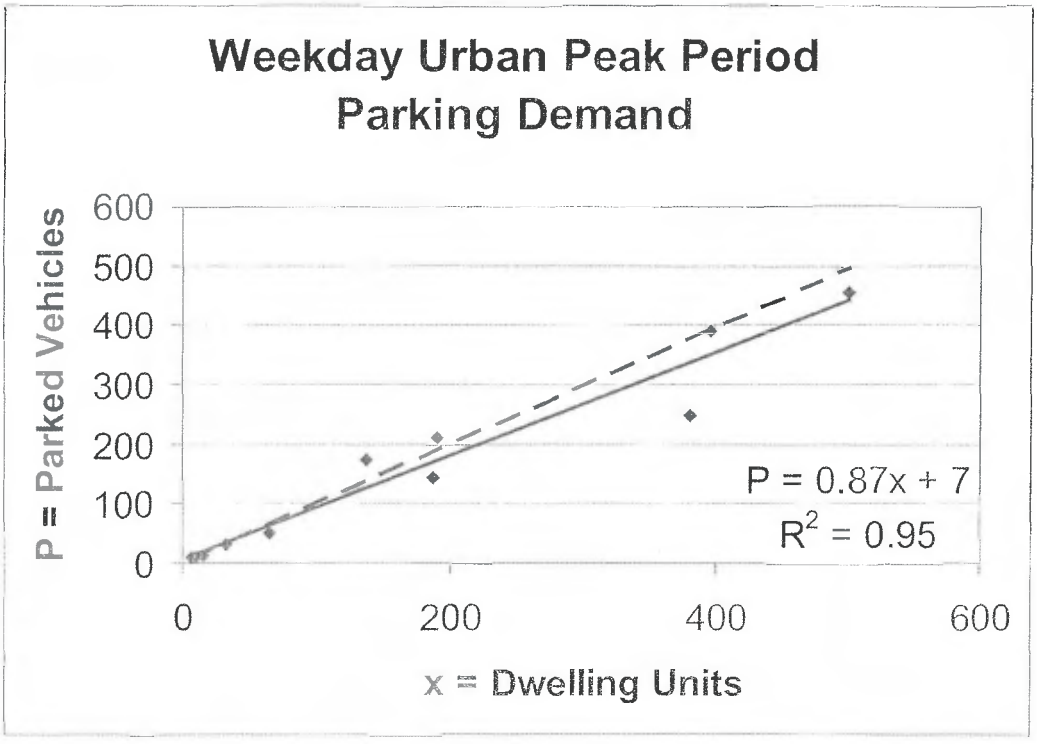
Urban:
Dallas, TX (1982, 1983); San Francisco, CA (1982); Syracuse, NY (1984, 1987); Santa Barbara, CA (1994); Long Beach, CA (2000); Santa Monica, CA (2001); San Diego, CA (2001)

[4] Census 2000, U.S. Census Bureau, 2002, Table H44.

Land Use: 221
Low/Mid-Rise Apartment

Average Peak Period Parking Demand vs: Dwelling Units
On a: Weekday
Location: Urban

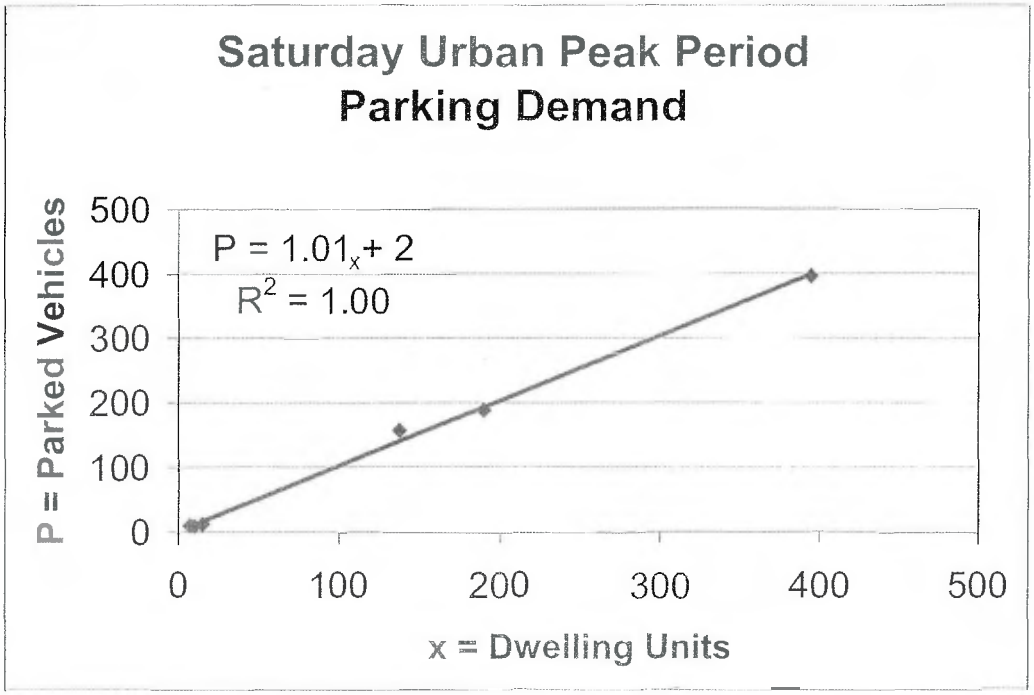
Statistic	Peak Period Demand
Peak Period	9:00 p.m.–5:00 a.m.
Number of Study Sites	12
Average Size of Study Sites	165 dwelling units
Average Peak Period Parking Demand	1.00 vehicles per dwelling unit
Standard Deviation	0.22
Coefficient of Variation	22%
Range	0.66–1.43 vehicles per dwelling unit
85th Percentile	1.17 vehicles per dwelling unit
33rd Percentile	0.92 vehicles per dwelling unit



Land Use: 221
Low/Mid-Rise Apartment

Average Peak Period Parking Demand vs: Dwelling Units
On a: Saturday
Location: Urban

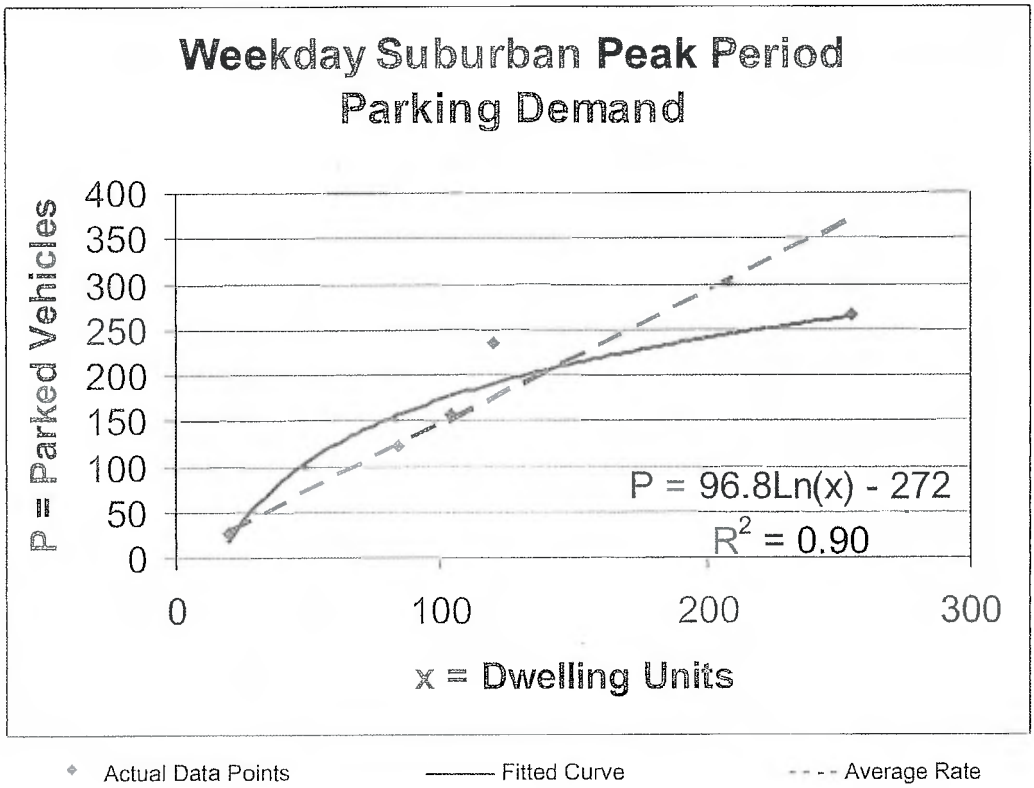
Statistic	Peak Period Demand
Peak Period	9:00 p.m.–7:00 a.m.
Number of Study Sites	7
Average Size of Study Sites	110 dwelling units
Average Peak Period Parking Demand	1.02 vehicles per dwelling unit
Standard Deviation	0.21
Coefficient of Variation	20%
Range	0.80–1.43 vehicles per dwelling unit
85th Percentile	1.17 vehicles per dwelling unit
33rd Percentile	0.90 vehicles per dwelling unit



Land Use Group: 230
Residential Condominium/Townhouse

Average Peak Period Parking Demand vs: Dwelling Units
On a: Weekday
Location: Suburban

Statistic	Peak Period Demand
Peak Period	5:00–6:00 a.m.
Number of Study Sites	5
Average Size of Study Sites	120 dwelling units
Average Peak Period Parking Demand	1.46 vehicles per dwelling unit
Standard Deviation	0.33
Coefficient of Variation	23%
Range	1.04–1.96 vehicles per dwelling unit
85th Percentile	1.68 vehicles per dwelling unit
33rd Percentile	1.38 vehicles per dwelling unit



Land Use: 310
Hotel

Land Use Description

Hotels are places of lodging that provide sleeping accommodations and supporting facilities such as restaurants, cocktail lounges, meeting and banquet rooms or convention facilities, limited recreational facilities (pool, fitness room) and/or other retail and service shops. All suites hotel (Land Use 311), business hotel (Land Use 312), motel (Land Use 320) and resort hotel (Land Use 330) are related uses.

Database Description

- Average parking supply ratio: 1.3 spaces per room (nine study sites).

Some of the submitted studies provided information on the size of the supporting facilities. For example, seven of the study sites reported the presence of convention facilities and two of these seven sites reported meeting or banquet rooms with capacities of 1,300 and 4,100 seats. As another example, five of the study sites reported the presence of a restaurant with an average capacity of 300 seats. However, none of the studies indicated the level of activity at these supporting facilities during observations (such as, full, empty, partially active, number of people attending a meeting/banquet).

Although the weekend database was limited, it indicated that Saturday peak parking demand was higher than on weekdays. Three study sites provided both Saturday and weekday parking demand data; Saturday parking demand rates averaged 40 percent higher than the weekday rates. It should be noted that all three sites included significant supporting facilities (restaurants, lounges, meeting space), which may be more active on weekends.

The following table presents a time-of-day distribution of parking demand for four study sites.

Based on Vehicles per Room	*Weekday*	
Hour Beginning	Percent of Peak Period	Number of Data Points*
12:00–4:00 a.m.	–	0
5:00 a.m.	–	0
6:00 a.m.	100	3
7:00 a.m.	95	3
8:00 a.m.	91	3
9:00 a.m.	87	2
10:00 a.m.	82	2
11:00 a.m.	100	3
12:00 p.m.	98	4
1:00 p.m.	90	4
2:00 p.m.	82	4
3:00 p.m.	70	3
4:00 p.m.	70	4
5:00 p.m.	66	4
6:00 p.m.	73	4
7:00 p.m.	81	4
8:00 p.m.	79	3
9:00 p.m.	80	3
10:00 p.m.	80	3
11:00 p.m.	–	0

*Subset of database

Land Use: 310
Hotel

Parking demand at a hotel may be related to the presence of supporting facilities, such as convention facilities, restaurants, meeting/banquet space and retail facilities. Future data submissions should specify the presence of these amenities.

For all lodging uses, it is important to collect data on occupied rooms as well as total rooms in order to accurately estimate parking generation characteristics for the site.

Additional Data

During the course of a year most hotels maintain at least an overall average occupancy ratio of 60 to 70 percent. Peak (above 90 percent) occupancy is common, but generally occurs for limited times throughout the year. Analysts are encouraged to consider the month and day activity/occupancy trend of hotels. Supplementary information on seasonal and daily variation in hotel room occupancy is presented below from Smith Travel Research for all hotels in North America. Its direct applicability to this land use code is limited because the occupancy data averages all regions and hotel types, including resort, business, convention and all-suites hotels. More parking survey data is needed to better understand these peak and non-peak trends.

Month	Average Hotel Occupancy (%)
January	51
February	61
March	66
April	65
May	67
June	72
July	72
August	71
September	67
October	67
November	59
December	48

Day of Week	Average Hotel Occupancy (%)
Sunday	51
Monday	62
Tuesday	67
Wednesday	69
Thursday	66
Friday	69
Saturday	72

SOURCE: Smith Travel Research, average data from North American hotels from 2000. www.wwstar.com

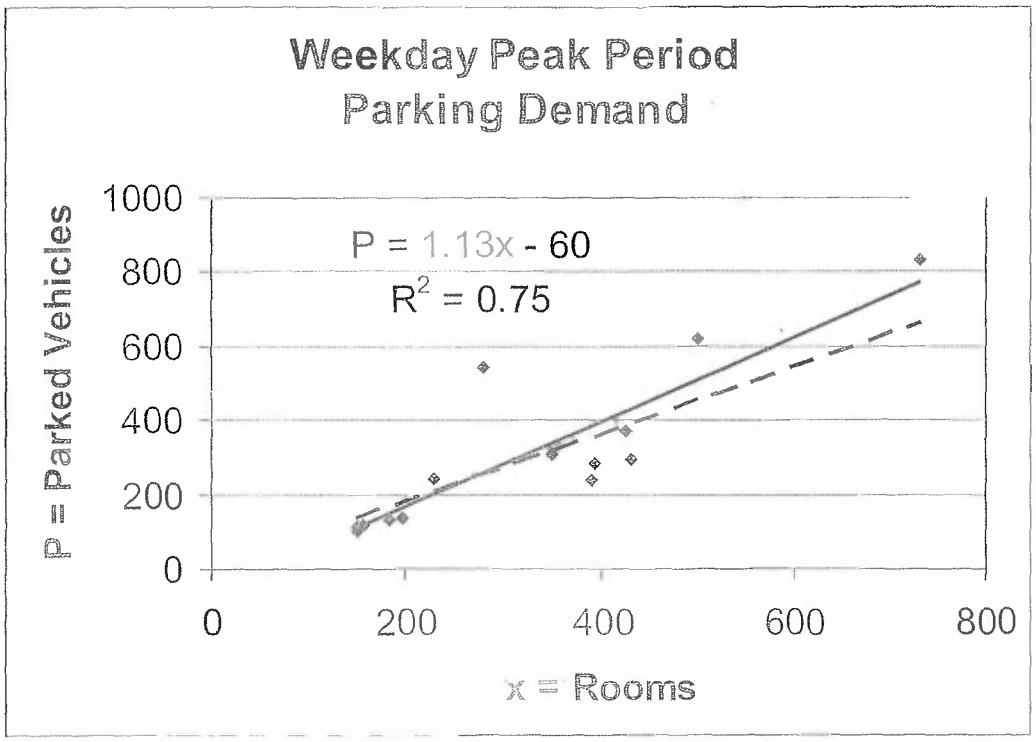
Study Sites/Years

Rosemont, IL (1969); Chicago, IL (1973); Newport Beach, CA (1981); Boca Raton, FL (1983); Scottsdale, AZ (1983); Concord, CA (1985); Orlando, FL (1988); Cypress, CA (1989); La Palma, CA (1989); Burlingame, CA (2001); Millbrae, CA (2001); Milpitas, CA (2001); San Mateo, CA (2001)

Land Use: 310
Hotel

Average Peak Period Parking Demand vs: Rooms
On a: Weekday

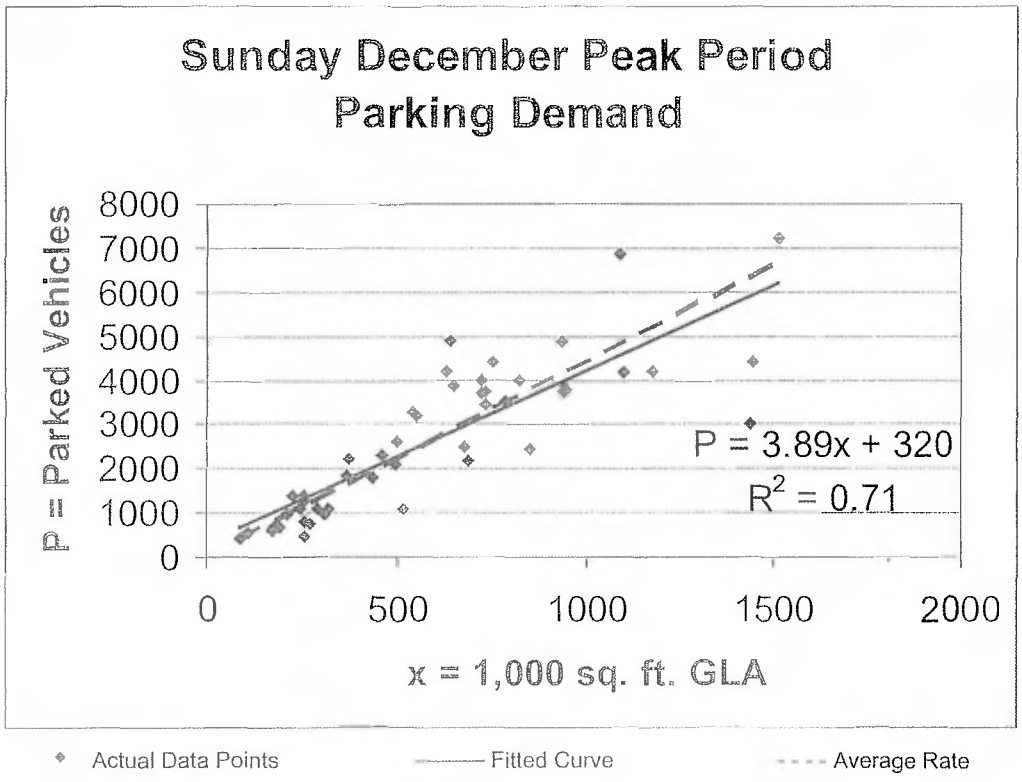
Statistic	Peak Period Demand
Peak Period	12:00–1:00 p.m.; 7:00–10:00 p.m.; 11:00 p.m.–5:00 a.m.
Number of Study Sites	14
Average Size of Study Sites	340 rooms
Average Peak Period Parking Demand	0.91 vehicles per room
Standard Deviation	0.35
Coefficient of Variation	39%
Range	0.61–1.94 vehicles per room
85th Percentile	1.14 vehicles per room
33rd Percentile	0.72 vehicles per room



Land Use: 820
Shopping Center

Average Peak Period Parking Demand vs: 1,000 sq. ft. GLA
On a: Sunday (December)

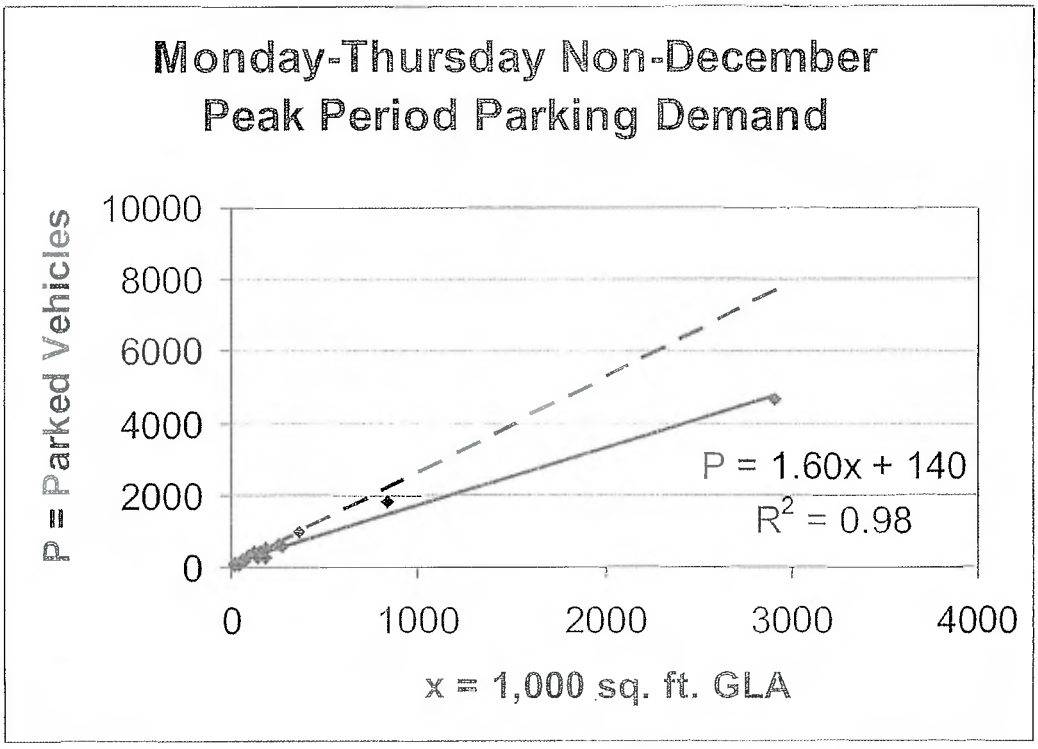
Statistic	Peak Period Demand
Peak Period	1:00–4:00 p.m.
Number of Study Sites	47
Average Size of Study Sites	593,000 sq. ft. GLA
Average Peak Period Parking Demand	4.45 vehicles per 1,000 sq. ft. GLA
Standard Deviation	1.28
Coefficient of Variation	29%
95% Confidence Interval	4.09–4.81 vehicles per 1,000 sq. ft. GLA
Range	1.79–7.67 vehicles per 1,000 sq. ft. GLA
85th Percentile	5.85 vehicles per 1,000 sq. ft. GLA
33rd Percentile	3.83 vehicles per 1,000 sq. ft. GLA



Land Use: 820
Shopping Center

Average Peak Period Parking Demand vs: 1,000 sq. ft. GLA
On a: Monday through Thursday (Non-December)

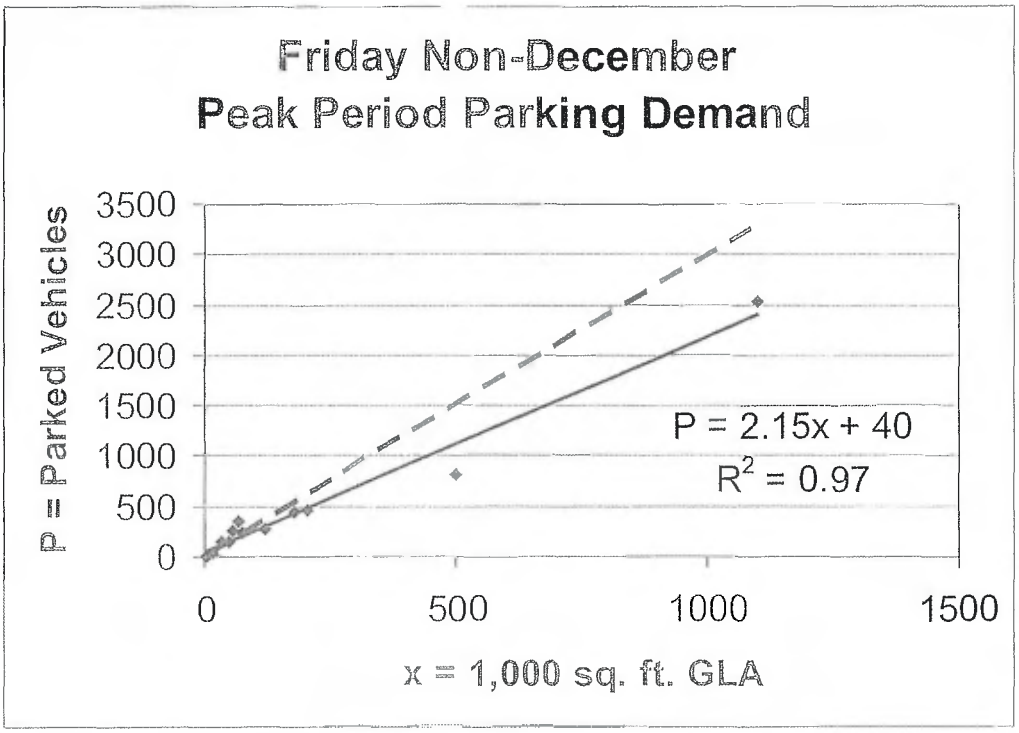
Statistic	Peak Period Demand
Peak Period	11:00–3:00 p.m.; 6:00–7:00 p.m.
Number of Study Sites	19
Average Size of Study Sites	331,000 sq. ft. GLA
Average Peak Period Parking Demand	2.65 vehicles per 1,000 sq. ft. GLA
Standard Deviation	0.98
Coefficient of Variation	37%
Range	1.33–5.58 vehicles per 1,000 sq. ft. GLA
85th Percentile	3.35 vehicles per 1,000 sq. ft. GLA
33rd Percentile	2.26 vehicles per 1,000 sq. ft. GLA



Land Use: 820
Shopping Center

Average Peak Period Parking Demand vs: 1,000 sq. ft. GLA
On a: Friday (Non-December)

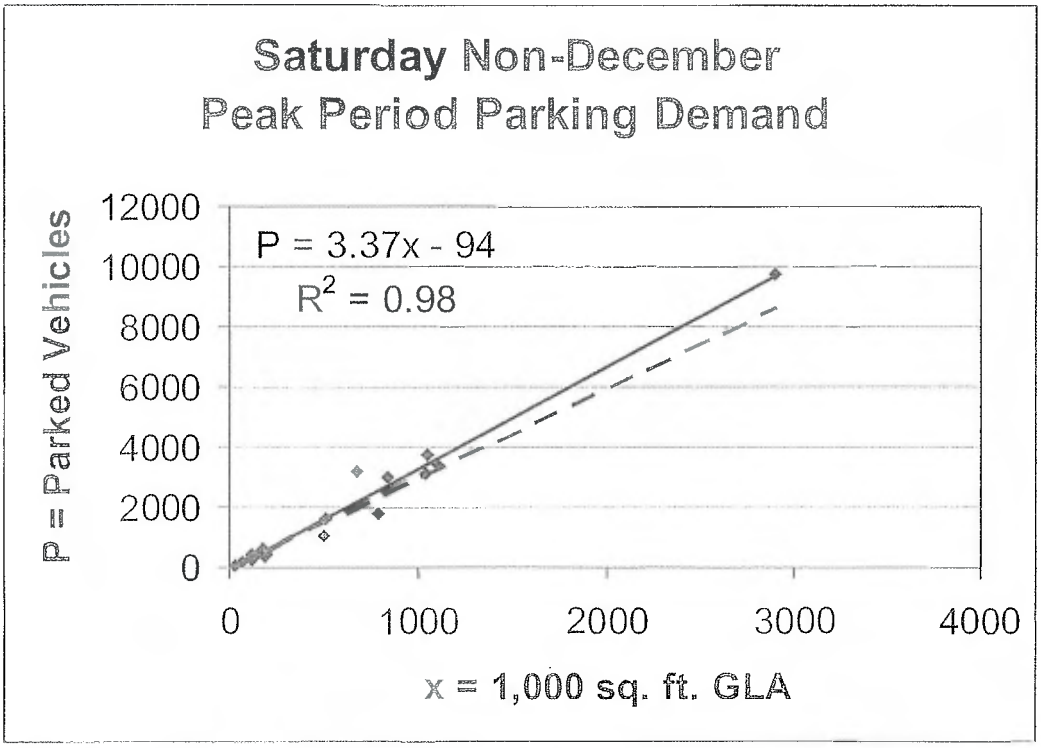
Statistic	Peak Period Demand
Peak Period	12:00 p.m.–1:00 p.m.
Number of Study Sites	14
Average Size of Study Sites	172,000 sq. ft. GLA
Average Peak Period Parking Demand	3.02 vehicles per 1,000 sq. ft. GLA
Standard Deviation	1.12
Coefficient of Variation	37%
Range	1.62–5.25 vehicles per 1,000 sq. ft. GLA
85th Percentile	4.36 vehicles per 1,000 sq. ft. GLA
33rd Percentile	2.30 vehicles per 1,000 sq. ft. GLA



Land Use: 820
Shopping Center

Average Peak Period Parking Demand vs: 1,000 sq. ft. GLA
On a: Saturday (Non-December)

Statistic	Peak Period Demand
Peak Period	1:00–2:00 p.m.
Number of Study Sites	20
Average Size of Study Sites	549,000 sq. ft. GLA
Average Peak Period Parking Demand	2.97 vehicles per 1,000 sq. ft. GLA
Standard Deviation	0.71
Coefficient of Variation	24%
95% Confidence Interval	2.66–3.28 vehicles per 1,000 sq. ft. GLA
Range	1.85–4.82 vehicles per 1,000 sq. ft. GLA
85th Percentile	3.56 vehicles per 1,000 sq. ft. GLA
33rd Percentile	2.65 vehicles per 1,000 sq. ft. GLA



Land Use: 820
Shopping Center

Average Peak Period Parking Demand vs: 1,000 sq. ft. GLA
On a: Sunday (Non-December)

Statistic	Peak Period Demand
Peak Period	12:00–3:00 p.m.
Number of Study Sites	5
Average Size of Study Sites	306,000 sq. ft. GLA
Average Peak Period Parking Demand	2.04 vehicles per 1,000 sq. ft. GLA
Standard Deviation	0.48
Coefficient of Variation	23%
Range	1.47–2.75 vehicles per 1,000 sq. ft. GLA
85th Percentile	2.39 vehicles per 1,000 sq. ft. GLA
33rd Percentile	1.86 vehicles per 1,000 sq. ft. GLA