Parking Utilization at Work Sites in King and South Snohomish Counties, Washington

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To help local jurisdictions review their parking policies as mandated by Washington State's new commute trip reduction legislation, the Municipality of Metropolitan Seattle conducted a parking utilization study in 1991 to assess the demand for parking, compared with supply, at employment sites throughout King and south Snohomish counties. A total of 36 employment sites in suburban, noncentral business district areas were included in the study. The sites represented two land uses: (*a*) professional office and (*b*) industrial sites (both light industrial and manufacturing). Results showed that the average parking supply was 30 percent greater than the average parking demand. The average number of parking spaces per 1,000 gross ft^2 (GSF) was 3.15, compared with a demand of 2.54 (a 24 percent excess). If projected employment and demand figures are used, a 13.5 percent excess parking supply still exists, in relation to spaces per 1,000 GSF. On the basis of the results of this study, it is recommended that local jurisdictions consider reducing their parking requirements, at least for professional office uses. The reduction of parking requirements in local codes will apply only to new or expanding developments; therefore local jurisdictions are encouraged to establish an administrative review process so that property owners of existing work sites, on behalf of employers, may request reductions in parking supply.

The oversupply of parking at suburban office sites has been well documented in previous research (*1–3*). The purpose of this study was to determine how well the results of these earlier studies compared with those of suburban work sites in King and south Snohomish counties.

Washington's commute trip reduction law mandates that each affected jurisdiction's commute trip reduction plan "shall include . . . a review of local parking policies and ordinances as they relate to employers and major worksites" [RCW 70.94.527(4.e)]. The Municipality of Metropolitan Seattle (Metro) conducted the parking utilization study to assess the demand for parking, compared with that of supply, at employment sites throughout King and south Snohomish counties. A total of 36 employment sites were included in the study. The sites, which were all in noncentral business districts, represented two land use types: (*a*) professional office sites and (*b*) industrial sites (combination of light industrial/manufacturing).

The parking utilization study had the following objectives:

- To assess the demand for parking, compared with supply, focusing on sites with 100 or more full-time employees arriving between 6 and 9 a.m.;
- To expand the geographic distribution of sites from previous parking studies;
- To collect data relating to long-term versus short-term parking behavior;
- To identify the level of spillover parking;
- To provide data and recommendations relating to parking standards for new development in local jurisdictions;
- To conduct the study within ITE standards so as to provide reliable and consistent findings; and
- To provide a procedural model for parking demand studies.

A parking utilization study advisory committee (including local jurisdiction staff, developers, academic researchers, and a representative from the local chapter of ITE) was formed to assist with the methodology, scope of work, site selection criteria, and data analysis.

METHODOLOGY

This was a pilot study. However, the methodology may be viewed as a model for future parking demand studies. The following criteria were used for selecting sites:

- All sites were located outside central business districts.
- Each site needed to have 100 or more full-time employees arriving between 6 and 9 a.m.
- The parking lot for each site was distinct (that is, parking was not shared with neighboring sites).
- All sites had surface-level parking areas.
- Pay (commercial) parking was not available within three blocks.
- Cooperation of the building manager or site contact person was necessary.

Single-tenant sites were preferred to multitenant sites. An even mixture of "ample" and "tight" parking situations was sought. Telephone contact was made with each site's contact person to determine each site's parking situation (i.e., ample or tight). This provided for the ability to choose an even mixture of both parking situations. An attempt was also made to include only sites that were as free as possible from unique characteristics that would make parking counts and analysis more difficult than necessary, as well as less accurate. Snohomish County sites were suggested by Community Transit staff. Local jurisdiction planners suggested particular work sites of interest to them.

The parking lots in this study were counted in the morning and afternoon of two different days, not of the same week, during hours

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having the greatest occupancy (generally from 9 to 11 a.m., and again from 1 to 3 p.m.) as determined by Metro or each site's building managers. Data from the four visits were compared, and any sites for which counts varied between visits by more than 10 percent were revisited and recounted. The counts were conducted during October and November 1991 (excluding the week of Thanksgiving and all Mondays). Two sites were counted during the first 2 weeks of December.

Phone contact was made with each site's building manager or contact person to explain the scope of the study. If approval was granted to perform the supply and demand counts, questions relating to each site's parking characteristics were asked. These questions related to the following: the peak parking times, the peak parking days, whether spillover parking occurred, and whether the site shared parking with other sites. These questions were asked to ensure that each site was "pure" in that parking would not be shared with other sites. This also assisted in collecting data relating to the best times of day and days of the week to perform the counts at each site.

Data collection was performed using two methods. The first method consisted of mailing a site profile to the contact person for each site. The site profile was used to collect data relating to the age of the building, square footage, number of employees (both current and projected) and other site characteristics. The other method of data collection was the actual supply and demand counts performed at each site. Hand-held computers were selected to collect the data. Paperwork, time, and margin for error were greatly reduced since the hand-held computers eliminated data transfer from paper to personal computer. The hand-held computers were programmed with fields for entering parking space supply and demand data for each type of parking space.

Six types of parking spaces were examined for the purposes of this study.

1. Visitor,
2. Disabled,
3. Carpool/vanpool,
4. Reserved,
5. Other (general), and
6. Spillover (a definition of this parking type is given later in the paper).

Each site's counts were entered into a data base broken down by visit number, parking space type, and time of day the count was conducted. Information from each site that returned a site profile was used to perform calculations regarding spaces per 1,000 gross ft^2 (GSF) and spaces per employee. The same calculations were also performed using projected number of employees and projected parking demand. An attempt was made to arrange the sites into groups. Three groups were created:

1. Professional office sites (not including medical sites),
2. Light industrial and manufacturing sites, and
3. Combination professional office/light industrial and manufacturing sites.

Because the groupings reduced the number of light industrial and combination professional office/light industrial sites into such small segments, no attempt was made to analyze them in detail. Table 1 provides supply and demand figures relating to spaces per 1,000 GSF and spaces per employee for the 33 sites that returned site profiles. The demand figures used in Table 1 were the highest demand figures at each site, not the average demand.

In addition to the supply and demand data, the hand-held computers were programmed with fields for entering license plate numbers of all vehicles at each site. This was intended to provide information relating to long-term versus short-term parking behavior. Unfortunately, because of employees' security concerns, license plate data were collected at only six sites.

RESULTS

The results summarized next are based on the long-term commuter parking supply and demand data collected at the 36 employment sites. For calculations of supply and demand for spaces per 1,000 GSF and spaces per employee, a base of 33 is used. This was because 33 of the 36 sites (91.6 percent) returned their site profile containing the data necessary for the calculations. For purposes of this study, supply is defined as the sum of all types of parking with the exception of spillover. Demand is equal to the sum of all types of parking, including spillover.

Analysis was also performed with regard to spaces per 1,000 GSF and spaces per employee using projected numbers for employees and parking demand. Of the 33 sites that returned site profiles, 24 answered the section about the projected number of employees at full occupancy (72.7 percent). Of the 24 responses, 14 sites projected numbers higher than the current number of employees, whereas the other 10 sites indicated that they were at peak occupancy. The projected parking demand was recalculated using current employee to demand ratios. These are projected numbers using the assumption that parking demand will remain at the same proportion as that at current levels. In addition, no attempt was made to adjust parking supply figures, among other variables.

Each site was contacted for permission to use company names in the report. Five sites requested to remain anonymous. These sites are referred to as Sites A through E.

Overall Averages

The average supply of parking spaces exceeded the average demand for spaces by 29.9 percent. Of the 36 sites in the study, the average parking supply was 374 total spaces with an average parking demand of 208 spaces (see Figure 1). For office sites the average parking supply was 370 spaces with an average parking demand of 272 spaces. This represents an average excess supply of 36 percent (see Figure 2).

Occupancy Rates

The average parking lot occupancy rate (all parking space types except spillover) was 74.6 percent. For office sites the average parking lot occupancy rate was 71.9 percent.

Supply Versus Demand: Profiled Sites

Parking supply and demand figures were also calculated in relation to spaces per 1,000 GSF and spaces per employee. These figures were calculated using data obtained from each site's profile and the

TABLE 1 Parking Supply and Demand, All Sites: Spaces per 1,000 gsf and Spaces per Employee

All Sites	Gross Sq Ft Leased	Full-Time Employees	Parking Spaces	Parking Demand	Employee Density emp./1000 gsf	Parking Supply		Parking Demand		Parking Excess	
						Sp/1000gsf	Sp/Emp	Sp/1000 gsf	Sp/Emp	Sp/1000 gsf	Sp/Emp
Advanced Tech Labs	285,024	1,266	1,027	1,053	4.44	3.60	0.81	3.69	0.83	- 2.44%	- 2.41%
Site A	175,947	685	769	556	3.89	4.37	1.12	3.16	0.81	38.29%	38.27%
AMI Building	62,500	350	290	252	5.60	4.64	0.83	4.03	0.72	15.14%	15.28%
Attachmate	32,697	161	111	117	4.92	3.39	0.69	3.58	0.73	- 5.31%	- 5.48%
Blue Cross Hdqrtrs	93,991	300	378	295	3.19	4.02	1.26	3.14	0.98	28.03%	28.57%
Boeing Material Div	300,000	1,500	1,349	1,078	5.00	4.50	0.90	3.59	0.72	25.35%	25.00%
Coca-Cola	190,286	195	223	157	1.02	1.17	1.14	0.83	0.81	40.96%	40.74%
Container Corp	120,000	100	130	93	0.83	1.08	1.30	0.78	0.93	38.46%	39.78%
Site B	82,027	104	112	95	1.27	1.37	1.08	1.16	0.91	18.10%	18.68%
Eddie Bauer - OLE	28,649	150	159	178	5.24	5.55	1.06	6.21	1.19	-10.63%	-10.92%
Eddie Bauer - OLW	41,176	187	116	137	4.54	2.82	0.62	3.33	0.73	-15.32%	-15.07%
Eldec	194,000	636	818	555	3.28	4.22	1.29	2.86	0.87	47.55%	48.28%
First Interstate Bank	60,000	217	236	178	3.62	3.93	1.09	2.97	0.82	32.32%	32.93%
Site D	28,800	60	118	68	2.08	4.10	1.97	2.36	1.13	73.73%	74.34%
Harbor Marina Corp Center	106,477	290	290	190	2.72	2.72	1.00	1.78	0.66	52.81%	51.52%
John H. Harland Co	41,451	100	180	127	2.41	4.34	1.80	3.06	1.27	41.83%	41.73%
Kirkland City Hall	39,000	160	136	105	4.10	3.49	0.85	2.69	0.66	29.74%	28.79%
Modern Manufacturing	100,000	142	151	92	1.42	1.51	1.06	0.92	0.65	64.13%	63.08%
Northgate Meridian Building	37,000	96	116	70	2.59	3.14	1.21	1.89	0.73	66.14%	65.75%
Opportunity Building	82,258	330	380	222	4.01	4.62	1.15	2.70	0.67	71.11%	71.64%
Site E	75,000	256	265	210	3.41	3.53	1.04	2.80	0.82	26.07%	26.83%
Physio Control	254,131	678	742	678	2.67	2.92	1.09	2.67	1.00	9.36%	9.00%
Puget Power	73,087	190	161	135	2.60	2.20	0.85	1.85	0.71	18.92%	19.72%
Safeway Dist Center	1,221,990	630	750	672	0.52	0.61	1.19	0.55	1.07	10.91%	11.21%
Sierra Building	50,000	220	173	161	4.40	3.46	0.79	3.22	0.73	7.45%	8.22%
Sun Sportswear	226,242	180	325	229	0.80	1.44	1.81	1.01	1.27	42.57%	42.52%
Two/Three Renton Place	275,876	1,250	1,238	938	4.53	4.49	0.99	3.40	0.75	32.06%	32.00%
Unigard Insurance	120,000	500	427	392	4.17	3.56	0.85	3.27	0.78	8.87%	8.97%
USAA Insurance	39,835	160	175	127	4.02	4.39	1.09	3.19	0.79	37.62%	37.97%
U.S. Food & Drug Adm	54,000	127	121	136	2.35	2.24	0.95	2.52	1.07	-11.11%	-11.21%
West Coast Paper	198,000	117	67	81	0.59	0.34	0.57	0.41	0.69	-17.07%	-17.39%
Weyerhaeuser-Corp HQ	356,000	775	1,123	572	2.18	3.15	1.45	1.61	0.74	95.65%	95.95%
Weyerhaeuser-W. Campus	117,500	350	376	295	2.98	3.20	1.07	2.51	0.84	27.49%	27.38%
Mean	156,453	378	395	310	3.07	3.15	1.09	2.54	0.85	24.02%	28.24%

parking supply and demand counts. Only sites that returned their site profile were included in this analysis (33 of 36 sites using current numbers, 24 of 36 sites using projected numbers). Calculations were performed using averages for all sites, as well as breaking them down into groups of professional office sites, light industrial sites, and those sites that were a mix of professional office and industrial. The parking demand figures used in the spaces per 1,000 GSF and spaces per employee were the highest demand figures of the two visits, not the average demand.

Spaces Per 1,000 GSF

There was an average 24 percent parking supply excess over parking demand, in relation to parking spaces per 1,000 GSF. The average number of parking spaces per 1,000 GSF was 3.15. These figures ranged from a low of 0.34 spaces per 1,000 GSF to a high of 5.55 spaces. The average parking demand was 2.54 spaces per 1,000 GSF, ranging from a low of 0.41 to a high of 6.21.

For office sites the average number of parking spaces per 1,000 GSF was 3.78. The average parking demand was 3.05 spaces per 1,000 GSF. This represents an average excess supply of 23.9 percent in relation to parking spaces per 1,000 GSF.

Using the projected number of employees and projected parking demand numbers still produced a 13.5 percent excess of parking supply over demand, in relation to parking spaces per 1,000 GSF. The average number of parking spaces per 1,000 GSF was 3.19, and the average demand was 2.81.

Zoning Requirements Versus Parking Supply and Demand

Local jurisdiction zoning requirements for spaces per 1,000 GSF at each site were compared with each site's parking supply and demand per 1,000 GSF. Of the 33 sites that returned site profiles, zoning requirements for off-street parking were obtained for 31. The average zoning requirement for spaces per 1,000 GSF was close to the average supply. The average requirement was 3.0 spaces per 1,000 GSF, whereas the average supply was 3.3 spaces per 1,000 GSF. The average demand was 2.6 spaces per 1,000 GSF, representing an excess supply of 15.4 percent over the average supply requirement.

Spaces per Employee

There was an average 28.2 percent excess of parking supply over parking demand, in relation to parking spaces per employee. The average number of parking spaces per employee was 1.09. These figures ranged from a low of 0.57 to a high of 1.97. The average

parking demand was 0.85 spaces per employee, ranging from a low of 0.65 to a high of 1.27.

For office sites the average number of spaces per employee was 1.03. The average parking demand was 0.84 spaces per employee. This represents an average 22.6 percent excess of parking supply over parking demand.

Using projected number of employees at full occupancy and projected parking demand at full occupancy still produced a 16.5 percent excess of parking supply over demand, in relation to parking spaces per employee.

Employee Density: Employees per 1,000 GSF

The average number of employees per 1,000 GSF was 3.1. This ranged from a low of 0.5 to a high of 5.6. Using projected number of employees at full building occupancy resulted in an average of 3.6 employees per 1,000 GSF. This ranged from a low of 0.63 to a high of 6.0.

Long-Term Versus Short-Term Parking (License Plate Matching)

In addition to parking space supply and demand counts, the researchers had intended to examine long-term versus short-term parking behavior. The approach was to record the license plate numbers of all vehicles at each site. Because of concerns about security by employees at several sites, this portion of the study was conducted at only six sites.

Although only six sites were observed, the high percentage of license plates matching indicates that the counts measured peak occupancy reasonably well. That is, there was little variation between a.m. and p.m. counts, and the average total percentage of license plates matching was fairly high.

LESSONS LEARNED

The parking utilization study endured many challenges and changes during inception, data collection, and analysis. Parking behaviors varied from site to site. Because this was a pilot study, the lessons learned during the course of this project may prove useful for future studies.

Site Selection Criteria

Although costly and time consuming, the ability to personally inspect a site's parking characteristics, perhaps with the assistance of the site's contact person, would assist in maximizing the number of "pure" sites. More in-depth phone contacts to ensure distinct parking between sites would help minimize this problem.

Although the actual site selection criteria assisted in selecting sites with "pure" parking situations, additional measures need to be implemented to ensure that this happens. During and after site data collection, some sites were found to share parking with or lease parking from other sites. This was not a major concern, however, because the instances of shared parking were small.

To assist those performing the supply and demand counts, a site map was drawn for each site before it was counted. Although this map helped find problems with a few sites that were thought to be "pure," other methods could also be of assistance.

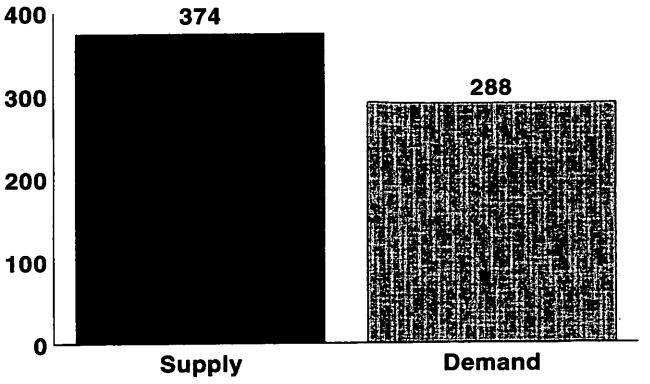

FIGURE 1 Average supply versus demand (all sites). Excess is 29.9 percent.

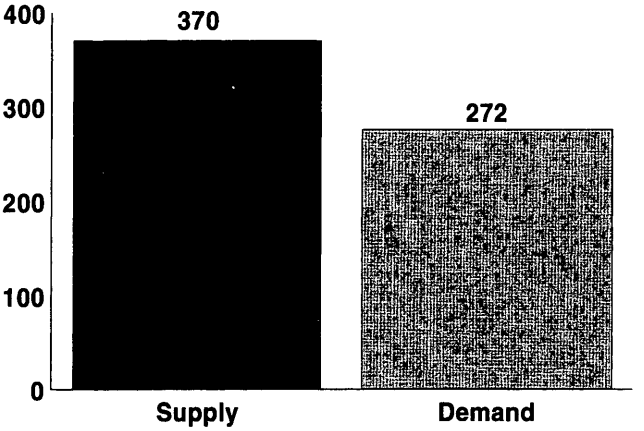

FIGURE 2 Average supply versus demand (office sites). Excess is 36 percent.

Spillover Parking

Spillover parking is a complex parking type. Both on-site and off-site spillover parking need to be documented.

For purposes of this study spillover was categorized in one of two ways: (*a*) on-site spillover or (*b*) off-site spillover. On-site spillover occurs in the confines of a site's parking lot. This may happen for many reasons, but the two most common reasons seem to be either parking along curbs or "no parking" areas because all other spaces were occupied, or parking for convenience. That is, it was found that some people park in areas not designated for parking because these areas may be closer than is a designated parking space to a person's destination. Off-site spillover parking, on the other hand, occurs outside the confines of a site's parking lot. The two reasons for spillover mentioned above also apply to off-site spillover. In addition, a site may lease parking from another site. For the purposes of this study this was also considered spillover.

Although it is difficult to count supply for spillover (unless a site has a designated number of spaces capable of "counting"), in many instances it was done. Two main reasons stand out. The first reason is that a supply and demand figure had to be entered because of the hand-held computers' programming. Therefore, although a site may have had no specific or discernable parking spaces relating to

spillover parking, a supply number had to be entered to, in turn, enter a demand number. Second, in some instances an actual number could be deciphered. Spillover parking is an area deserving further research and review.

Site Profile

Two separate site profile forms, one for those who owned their building and a second for those who leased space, might have worked better.

In some instances site contacts got confused and did not answer questions because they thought the questions did not apply to them. Revisions to the site profile to include both situations or the use of two distinct profile forms would help to ensure better response rates.

Precount Confirmation

Ensure that all affected parties at each site are aware of when the counts are to be conducted.

Initially, there were problems at a few sites when employees protested the recording of their license plate numbers. In addition, because of past instances of theft and car break-ins, a few employees did not care for people "wandering" through their parking lot.

Accuracy of Counts

Take steps to strive for greater consistency between counts.

It was difficult to accomplish completely consistent counts of the parking lot sites. These counts were logged at the site into preprogrammed minicomputers. The difficulty with the use of computer entry is that there is no way to check one's work at the site. It is all too easy to lose track of whether a spot has just been counted or was just about to be. The firm contracted to perform the counts offered the following suggestions:

- Supply field workers with chalk on a long string, and mark each parking space (not the vehicle) after counting.
- Reprogram the computers to allow subtotals to be called up while still in the field. Alternatively, if there is space on the computer, the last entry could be displayed. The feasibility of these two steps would have to be checked with the computer supplier; these steps are also not likely to be helpful in very large lots.
- Program computers to beep at the end of each entry. (Again, feasibility would have to be confirmed with the computer suppliers.)
- Conduct counts on paper, or have a paper count as a backup to the computer count. The advantage of a paper copy is that the field worker has a readable record of work at the time of the entry. The disadvantage is that paper counts are fraught with their own difficulties.
- Expand the amount of time put into mapping the location so that the number of slots available, labeled per type, is provided on each map.

CONCLUSIONS

The parking utilization study has indicated that there is an excess supply of employee parking provided at the majority of sites counted. An average excess parking supply of nearly 30 percent exists for the 36 sites studied. An average excess supply of 24 percent in relation to spaces per 1,000 GSF and 28.2 percent in relation to parking spaces per employee was found. Even using a conservative approach (using projected employee numbers at full occupancy and projected parking demand at full occupancy), parking supply excesses of 13.5 and 16.5 percent were estimated for spaces per 1,000 GSF and spaces per employee, respectively.

This excess parking supply makes a case for local jurisdictions to consider reducing their parking requirements, at least for professional office uses. Local jurisdiction parking requirements closely matched the actual parking supply. This may be because, to request a variance below the minimum, the developers must pursue a lengthy administrative process, which causes most of them to provide parking at minimum levels or above.

Reduction of local parking requirements will apply only to new or expanding developments. The commute trip reduction law, on the other hand, applies to existing employment sites; therefore it is recommended that local jurisdictions establish an administrative review process so that property owners of existing work sites, on behalf of employers, may request reductions in parking supply.

FUTURE RESEARCH

This project focused on finding trends and developing a methodology that could be used by local jurisdictions in conducting their own parking demand studies. During this study, additional research needs on several aspects of parking demand emerged, including the following:

- Parking supply/demand at office sites of 100 or more, with a larger sample size;
- Parking supply/demand focusing on industrial sites;
- Parking supply/demand at business parks;
- Parking supply/demand focusing on suburban central business districts;
- Parking requirements based on access to transit;
- The impact of work site transportation demand management programs on parking demand (based on implementation of the commute trip reduction law); and
- Spillover parking.

Parking utilization study data are being used to help develop guidelines for commuter parking policies in King County, including recommendations for constraining the supply of commuter/employee parking.

ACKNOWLEDGMENT

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