Travel Demand Management

Spack Consulting
The Traffic Study Company
3268 Xenwood Avenue
St. Louis Park, Minnesota 55416
952-378-5017
www.SpackConsulting.com
www.MikeOnTraffic.com

An analysis of the effectiveness of TDM plans in reducing traffic and parking in the Minneapolis-St. Paul metropolitan area.

By
Mike Spack, PE
Mike Bultman, EIT
Kirk Pettis, EIT
Jenni Thompson, RLA, AICP, LEED AP
Joe Collins, RLA

January 22, 2010

Introduction

The goal of a Travel Demand Management (TDM) Plan is to encourage the reduction of single occupancy vehicle use during rush hours. These plans potentially have many benefits for all stakeholders in an office complex including:

- Improve the Developer's bottom line by reducing the number of parking stalls required and increasing building square footage capacity on the site.
- Decrease Property Owners/Managers maintenance costs by reducing parking lot surface area.
- Create more commuting choices for Tenants and their employees.
- Reduce the runoff impact on water quality by reducing the impervious surface area.
- Delay the need for new road construction by reducing traffic congestion.
- Create potential points for LEED® certification.

TDM is not a new concept. It was first proposed in the U.S. during the 1970's oil crisis. In the 1990's, the City of Minneapolis, Minnesota began requiring formal TDM Plans from developers. Since then many cities have adopted comprehensive transportation plans with new requirements or encouragement for TDM Plans.

Has TDM been scientifically proven to reduce traffic & parking? By how much?

In theory, TDM Plans sound like a good idea. However, their effectiveness has been minimally studied. Do TDM Plans really reduce the amount of traffic generated by an office building? Do they then require fewer parking stalls? Several positive case studies were found online, but no data on mediocre or non-effective TDM plans was found. Is it possible TDM may not in fact provide all of the claimed benefits?

The purpose of this study is to objectively study the traffic and parking characteristics of office buildings in the Minneapolis Metropolitan Area who are actively implementing TDM Plans. Our study objectives are to:

1. Determine the effectiveness of TDM Plans at reducing rush hour traffic by measuring vehicle use generated by an office building with a TDM Plan versus an equivalent office building without one.
2. Quantify actual parking needs of office buildings with active TDM Plans to determine if less available parking would be sufficient versus the current mandated capacity.
3. Identify best practices to help make future TDM Plans more effective.

What is a TDM Plan?

It is a binding agreement outlining the efforts the owner/tenants will make to reduce their traffic impact. The developer enters into the agreement with the city which extends to future owners/tenants. The TDM Plan lists strategies to be implemented over time with the goal of reducing the amount of traffic generated by the office complex.

TDM Plans also have concrete goals. Typically, their stated goal is to reduce parking demand and traffic generation by 10 to 20% as compared to typical demand as documented in the Institute of Transportation Engineers' *Parking Generation* and *Trip Generation* reports. An important part of the TDM Plan is to have mechanisms in place for measuring effectiveness over time.

What are common TDM Plan Strategies?

The most effective TDM strategies affect the pocketbook. People make decisions about their commute options based on cost. The more expensive it is to drive to work by yourself, the more likely you are to implement a personal TDM Plan. Case in point - carpooling and transit ridership grew significantly when gas prices were at $4 a gallon.

There are four main strategies people use to avoid the expense of the solo drive to work:

- Carpool - Carpools can be set up informally by individuals or by using existing carpool services (i.e. Rideshare).
- Vanpool – Sponsored by the employer or the Metropolitan Council, the typical vanpool works by having one driver pick up a number of other riders.
- Public Transit – This includes city buses and LRT.
- Biking/Walking – This includes providing robust sidewalk and trail connections between office buildings and neighborhoods.

Governmental agencies can encourage alternate ride options by including bike lanes and walking/bike trails as part of their transportation plan. Developers can encourage tenant use of alternate ride options by designing new sites with consideration for safe and comfortable pedestrian and bicyclist building access. This includes emphasis on well-lit sidewalks and convenient access to bike trails.

But the biggest impact can be made by the employer. Some ideas to support employee's use of alternate ride options include:

- Encourage use of existing carpool services (i.e. Rideshare).
- Sponsor employee van-pools.
- Work with transit providers to ensure transit routes are convenient and schedules are timely for their employees work hours.
- Provide access to secure bike storage and showers (with showers provided either on-site or through arrangements with a local health club).
- Charge employees for on-site parking – free parking makes the solo drive to work less expensive.
- Pay employees not to park on-site (providing incentive to use other options).
- Provide free or subsidized parking for car/van pools.
- Allow flexible work hours to facilitate the setup of ride-sharing and/or non-rush hour commuting.
- Provide a "Guaranteed Ride Home" program for ride-sharing participants in case of emergency.

Planning is important, but it is the follow through that leads to successful Travel Demand Management. The building and site should have been built to encourage pedestrian activity. After that, success comes down to marketing and promotion. Key to implementation is having a designated Transportation Coordinator inside the company.

Most TDM Plans require a Transportation Coordinator staff person within each company. The Coordinator position is usually approximately one-eighth of a full time equivalent, but is somewhat dependent on the size of the company. The Coordinator should:

- Market and promote ideas and incentives available to employees for alternate commuting options. The company's incentives should be well publicized in their new hire packet, on their intranet, and on posters throughout the office complex.
- Provide continuing updates and reminders to encourage employee participation.
- Work with various alternate ride providers to give employees the most options.
- Coordinate annual performance surveys (typically required in TDM Plans).
- Keep up on the latest trends in alternate commuting options.

Companies should participate in the Bike/Walk/Bus/Carpool Week held in mid-May every year as an easy way to promote their TDM programs. Applying for Metro Transit's Commuter Choice Awards program and the U.S. Environmental Protection Agency's Best Workplaces for Commuters designation are both great ways to promote the company's TDM benefits. Holding an annual meeting to promote and discuss the company's TDM Plan is a good way to get feedback.

Methodology

The project team began by locating office buildings with existing TDM programs which also had stand-alone facilities to allow accurate data collection. Local transportation management personnel were very helpful in providing lists of employers with TDM plans. Aerial photos were then used to determine sites where traffic entering/exiting the site could be observed by four or less people. No downtown sites met this initial criterion because employees could park in multiple parking ramps.

A site visit was then conducted of the top ten candidates to confirm the site entrances could be viewed by four or less people. The team determined that a minimum of six sites were needed for comparison to produce a relevant conclusion. All sites needed to contain on-site parking, have known employee numbers, and have TDM strategies in place at the time of observation. Interviews with each property or transportation manager were conducted discussing statistical information about the company and all available information on the TDM plan.

Trip generation and parking counts were collected on Tuesdays, Wednesdays, and Thursdays of non-holiday weeks to ensure the data was collected during normal weekday conditions. The data was collected from 7:00 – 9:00 a.m., 11:00 a.m. – 1:00 p.m., and 4:00 – 6:00 p.m. to cover the peak traffic and parking periods. All of the data was collected during the Fall of 2009. Phone and email interviews were conducted during the Fall of 2009 to ensure the site and TDM data corresponded to the traffic and parking data.

Description of Sites

This section contains a description of the six sites surveyed. Figure 1 at the end of this section contains a matrix identifying which TDM strategies each site utilized at the time the data was collected along with demographic information about each employer.

Site A
No. of Stalls: 341
No. of Employees: 300
Occupancy: 100%
Building Size: 166,000 sf
Location: Suburban

Site A is an energy company in a 2nd tier suburb of the northwest metro. The company is located in a high density, heavily traveled shopping area. The site required two project participants to count the access points. The traffic and parking data was collected on October 13th, 2009. The weather was cold and there was snow/sleet during the prior night causing difficult travel conditions for the morning peak. This site is a LEED® certified building. LEED® points were earned in the area of alternative transportation through its close proximity to a regional mass transit station and incentives for car sharing, carpooling, and vanpooling.

The entire parking area contains 341 stalls and has two access points. The primary access point is on the south side at a signalized intersection with a left-in turn lane provided for traffic accessing the site. The collector road used to enter the parking lot is a four lane road used primarily by retail customers of this area. A secondary, gate controlled, access point is located on the west side of the site. This driveway leads to the parking lot of a shopping center. The gate will open automatically for westbound traffic wishing to go into the shopping center parking lot, but a scanner card is required for the gate to allow traffic to go eastbound from the shopping center lot into the energy company lot. Only a small number of employees have these cards, although the specific number was not available. It should be noted that during the data collection there were at least three employees who chose to park outside the company parking lot and instead parked in the retail parking adjacent to the site.

Site B
No. of Stalls: 270
No. of Employees: 297
Occupancy: 100%
Building Size: 181,000 sf
Location: Urban

Site B is a privately owned medical device manufacturer occupying a newly constructed LEED® certified multi-story office building. Because the site is located on the corner of a frontage road to a river and a secondary road, only one person was required to collect traffic and parking data for all of the on-site parking areas. This site is categorized as being urban in close proximity to the newly revitalized warehouse business district (high-density mixed-use buildings) and newly constructed Twins baseball stadium near downtown Minneapolis.

The data was collected on November 3, 2009. The weather was fair and mostly sunny, a high of 62 Degrees, with moderate winds throughout the day. This site provides high incentives for utilizing local transit services, the effects of which were observed during the data collection as employees were frequently seen using the buses at a nearby bus shelter.

The site contains two surface parking areas. The primary traffic within this site was generated by employees, visitors, deliveries/pick-ups, and company owned vehicles (Trucks). A description of each parking area is as follows:

1. Parking Area #1 contains 19 parking spaces with two access points. One access point exits onto a divided roadway with a median, forcing the exiting vehicle onto a one-way road. This parking area is located directly at the front entrance to the building and primarily used by visitors or drop-offs.
2. Parking Area #2 contains 251 spaces and is a fenced in area with two "card controlled" sliding-fence gates. During the observation, both of the gates were open during normal business hours. This area is primarily used by employees and delivery vehicles.

Site C
No. of Stalls: 1,263
No. of Employees: 1,314
Occupancy: 100%
Building Size: 292,000 sf
Location: Suburban

Site C is occupied by four manufacturing buildings, which are all part of the same company. There are five total parking areas for the campus. This site required four project participants to count trip generation and parking lot usage. This site is suburban, located outside of the downtown area. The traffic and parking data was collected on November 11, 2009. The weather was dry, 50 degrees with moderate winds throughout the day. During peak period observations, the number of employees taking advantage of the bus service was relatively low, presumably due to the site being suburban and transfers likely needed to reach the destination. This site also provides high incentives for car-pooling and van-pooling. The preferential car-pooling designated stalls were full throughout the peak periods.

The two main parking areas and three small parking areas were included in the study. They contain 1,263 employee-based parking spaces. It should be noted that a small visitor lot containing approximately 30 stalls was not included in the calculations because data was not collected at this lot. A description of each parking area is as follows:

1. Parking Area #1 contains 680 stalls with two access points and is used by Building #1 and Building #2.
2. Parking Area #2 contains 510 stalls with three access points and is used by Building #3.
3. Parking Area #3 contains 50 stalls with one access point and is used by Building #4. It was noted that parking demand in this lot exceeded stall capacity with some vehicles parking in non-parking areas.
4. Parking Area #4 contains 14 stalls with two access points and is used by Building #1.
5. Parking Area #5 contains 9 stalls with one access point and is used by Building #1.

Site D
No. of Stalls: 1,546
No. of Employees: 1,400
Occupancy: unknown
Building Size: 418,064 sf
Location: Suburban

Site D is occupied by a pharmaceutical company with two buildings. One building uses a parking ramp for employees and the other building uses two surface lots. This site required three project participants to count trip generation and parking lot usage. This site is suburban, located outside of the downtown area. The traffic and parking data was collected on October 20, 2009. The weather was overcast with light rain, a high of 51 Degrees with moderate winds throughout the day. During peak period observations, a shuttle service could be seen picking up employees multiple times each hour. This site also provides high incentives for car-pooling and it could be seen that the car-pooling designated stalls were full throughout the peak periods.

The site contains 1,546 employee based parking spaces. A description of each parking area is as follows:

1. Parking Area #1 consists of a parking ramp that contains 1,256 stalls with two access points and is used primarily by Building #1. There were very few cars parked on the top ramp during the study periods.
2. Parking Area #2 consists of a surface lot with 272 stalls with two access points and is used primarily by Building #2. Some of the parking stalls were occupied by visitors.
3. Parking Area #3 consists of a small surface lot near the parking ramp that contains 18 stalls with two access points. Most of these stalls were used for visitor parking going to Building #2.

Site E
No. of Stalls: 1,646
No. of Employees: 2,303
Occupancy: 93%
Building Size: 573,116 sf
Location: Urban

Site E is occupied by three Minnesota government agencies. Each agency occupies a separate multi-story building but all three agencies share open surface parking areas. This site required four project participants to count trip generation and parking lot usage. This site is urban in close proximity to downtown St. Paul (high density mixed-use buildings). The traffic and parking data was collected on October 21, 2009. On the day data was collected, the weather was steady to heavy rain, a high of 46 Degrees, with moderate winds throughout the day. This site provides high incentives for utilizing local transit services and rideshare programs. It was noted during the observation; three local bus routes provided frequent service. Most car-pooling designated stalls were full throughout the peak periods.

Four surface parking areas were observed for this study, providing 1,646 employee based parking spaces. It should be noted that a small visitor lot containing approximately 20 stalls was not included in the calculations because data was not collected at this lot. A description of each parking area is as follows:

1. Parking Area #1 contains 186 parking spaces with two access points. This area is used by one agency.
2. Parking Area #2 contains 107 spaces with a single access "card controlled" gate. This area is shared by two agencies.
3. Parking Area #3 contains 18 spaces adjacent to one agency.
4. Parking Area #4 contains 1,335 spaces with three "card controlled" gates. This area is shared by all agencies. This parking area encompasses landscape islands to separate parking for each agency, but does allow full connection throughout the entire lot.

Site F
No. of Stalls: 2,361
No. of Employees: 2,304
Occupancy: 69%
Building Size: 712,868 sf
Location: Suburban

Site F occupies two separate multi-storied suburban office buildings and is the world headquarters of an insurance company. Both buildings share a multiple level garage and a surface parking lot. The main building has a front parking lot mainly for visitor parking with 32 stalls. The parking garage permits entry with security card clearance; having a capacity of 2,130 stalls. The shared surface lot with 199 parking stalls has visitor parking yet is primarily used by employees. Vehicle trips were counted by watching all three entrances from one location. The garage vehicle occupancy data was provided by the company. Vehicle trips were counted on November 10, 2009, in sunny conditions with a high temperature of 50 degrees. This site has a bus stop in front of the building along the adjacent street.

Figure 1 – Site Characteristics with TDM Strategies

		A	B	C	D	E	F
Site Data	Sq. Footage	166,000	181,000	292,000	418,064	573,116	712,868
	Employees	300	297	1,314	1,400	2,303	2,304
	Occupancy	100%	100%	100%	unknown	93%	69%
	Location	Suburb	Urban	Suburb	Suburb	Urban	Suburb
	Parking Stalls	341	270	1,263	1,546	1,646	2,361
Traffic Data	AM Peak Hour Volume	179	96	365	481	564	683
	PM Peak Hour Volume	116	90	386	425	630	697
	Maximum Stalls Parked	276	217	941	1,067	1,404	1,617
Transit Services	Bus Stop	⊗	⊗	⊗	⊗	⊗	⊗
	Distance (Blocks)	1	2	1	2	1	1
	Enhanced Bus Amenities		⊗	⊗			
	Shuttle Services	⊗		⊗	⊗	⊗	
Parking Management	Paid						
	HOV Preferential	⊗	⊗	⊗	⊗	⊗	
	Pedestrian Accessibility	⊗	⊗	⊗			
Incentive Programs	Free Transit						
	Discounted Transit			⊗	⊗	⊗	
	Cash						
	Non-money Rewards					⊗	⊗
	Tax Subsidies					⊗	
Rideshare Programs	Carpool / Vanpool	⊗	⊗	⊗ 1	⊗	⊗ 2	⊗
	Car sharing	⊗				⊗	
	Bike Sharing					⊗	⊗
	Guaranteed Ride Home	⊗		⊗		⊗	
	Rideshare Matching			⊗		⊗	
Alternate Schedule	Telework		⊗	⊗		⊗ 3	⊗
	Flextime		⊗	⊗		⊗	⊗
	Compressed weeks		⊗			⊗	
Bicycle Infrastructure	Racks	⊗	⊗	⊗	⊗	⊗	⊗
	Showers	⊗	⊗	⊗	⊗	⊗	⊗
	Lockers		⊗	⊗		⊗	
	Cycling Improvements						
	Walking / Cycling			⊗ 4		⊗ 5	⊗
Advertising/ Communication	Posters / Kiosks			⊗		⊗	
	Newsletters			⊗		⊗	⊗
	Internet			⊗		⊗	⊗
	Transportation Coordinators			⊗		⊗	⊗

Notes: (1) 140 employee carpool, (2) 17% carpool/vanpool, (3) 334 employees, (4) 5 employees bike, (5) 16 employees bike

Results

This section presents the parking and traffic generation data collected at the six sites. The traffic generation data shows the a.m. and p.m. peak hour rates. The noon time peak hour at all six sites was less than the a.m. and p.m. peak hour rates, so they are not relevant to this study. The peak parking occupancy occurred at each site during either the a.m. study period or noontime study period.

Traffic Generation

Figure 2 shows the amount of total traffic (entering the site plus exiting the site) generated per 1,000 square feet of building at each site during the morning rush hour (the busiest 60 minute period between 7:00 and 9:00 a.m.). The highest rate observed in the morning rush hour was 1.25 trips per 1,000 square feet while the lowest was 0.53 trips per 1,000 square feet. The average trip rate was 0.99 trips per 1,000 square feet, which is a 36% reduction in trips compared to the industry average rate of 1.55 documented in the Institute of Transportation Engineers' *Trip Generation, 8th Edition.* All six sites have a rate lower than industry average.

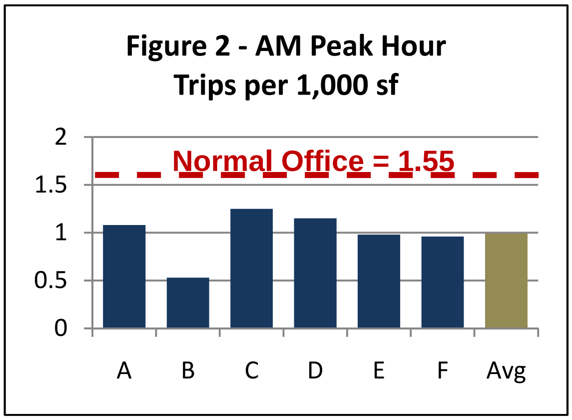
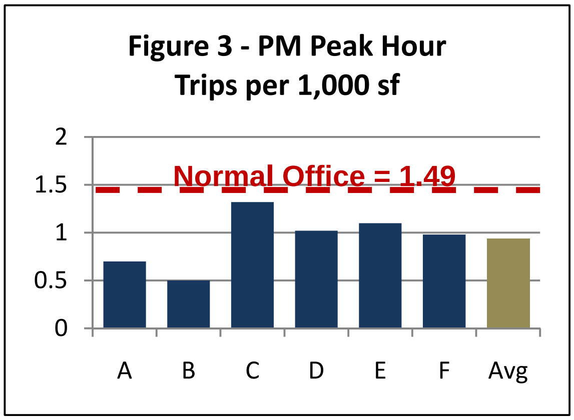
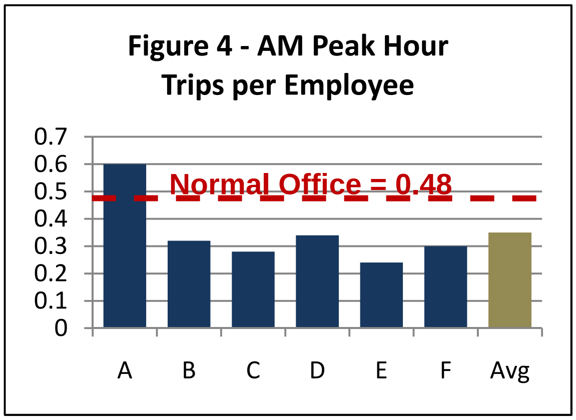


Figure 3 shows the amount of total traffic (entering the site plus exiting the site) generated per 1,000 square feet of building at each site during the evening rush hour (the busiest 60 minute period between 4:00 and 6:00 p.m.). The highest rate observed in the evening rush hour was 1.32 trips per 1,000 square feet while the lowest was 0.50 trips per 1,000 square feet. The average trip rate was 0.94 trips per 1,000 square feet, which is also a 37% reduction in trips compared to the industry average rate of 1.49 documented in the Institute of Transportation Engineers' *Trip Generation, 8th Edition.* All six sites have a rate lower than industry average.



The economy was performing poorly during the fall of 2009 when the data was collected. It is possible that the reported occupancy rates were incorrect or employees were given larger than normal working spaces. A more consistent way of comparing traffic generation is to compare the amount of traffic generated by employee, since the employee variable is more independent from the condition of the economy.

Figure 4 shows the amount of total traffic (entering the site plus exiting the site) generated per employee at each site during the morning rush hour (the busiest 60 minute period between 7:00 and 9:00 a.m.). The highest rate observed in the morning rush hour was 0.60 trips per employee while the lowest was 0.24 trips per employee. The average trip rate was 0.35 trips per employee, which is a 27% reduction in trips compared to the industry average rate of 0.48 documented in the Institute of Transportation Engineers' *Trip Generation, 8th Edition.* Five of the six sites have a rate lower than industry average. The 0.60 trips per employee at Site A is an unexplained anomaly in the data. The building is a LEED® certified headquarters building for an energy company. It is possible they had a meeting with field staff the morning the data was collected or they were giving a tour of the building, which they regularly do. The building manager has not corroborated either of these theories.



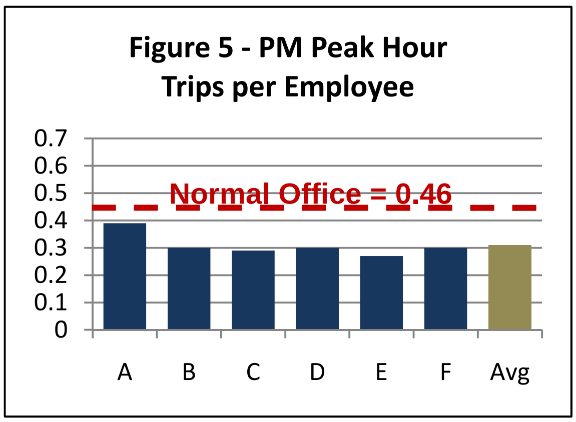
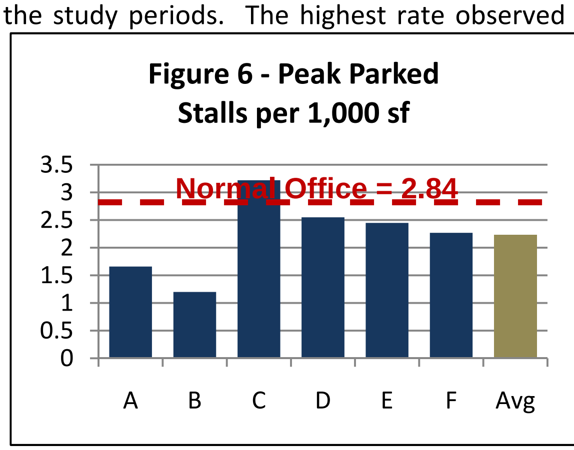


Figure 5 shows the amount of total traffic (entering the site plus exiting the site) generated per employee at each site during the evening rush hour (the busiest 60 minute period between 4:00 and 6:00 p.m.). The highest rate observed in the evening rush hour was 0.39 trips per employee while the lowest was 0.27 trips per employee. The average trip rate was 0.31 trips per employee, which is also a 33% reduction in trips compared to the industry average rate of 0.46 documented in the Institute of Transportation Engineers' *Trip Generation, 8th Edition.* All six sites have a rate lower than industry average.

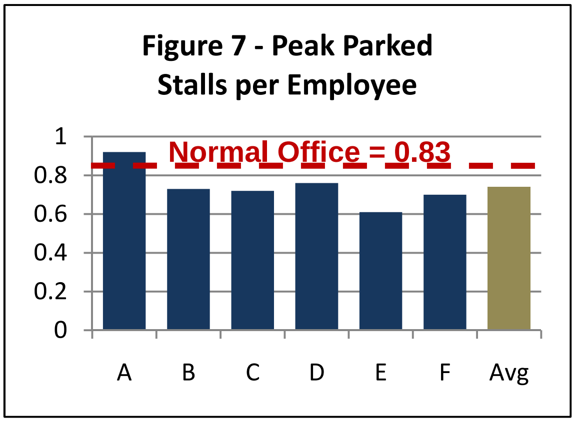
Parking Generation

Figure 6 shows the peak number of parking stalls filled per 1,000 square feet of building during the study periods. The highest rate observed was 3.22 stalls per 1,000 square feet while the lowest was 1.20 stalls per 1,000 square feet of building. The average peak occupied stall rate was 2.23 stalls per 1,000 square feet, which is a 21% reduction in stalls compared to the industry average rate of 2.84 documented in the Institute of Transportation Engineers' *Parking Generation, 3rd Edition.* Five of the six sites have a rate lower than industry average. We do not have a hypothesis for why the peak rate at Site C was slightly higher than the industry standard average. Note – the rate



from *Parking Generation* is the peak rate for the day and encompasses suburban office buildings.

Figure 7 shows the peak number of parking stalls filled per employee at each site during the study periods. The highest rate observed was 0.92 stalls per employee while the lowest was 0.61 stalls per employee. The average peak occupied stall rate was 0.74 stalls per employee, which is an 11% reduction in stalls compared to the industry average rate of 0.83 documented in the Institute of Transportation Engineers' *Parking Generation, 3rd Edition.* The higher than average parking rate for Site A in Figure 7 may have been caused by a field staff meeting or facility tour the morning the data was collected. The building manager has not corroborated either of these theories. Note – the rate from *Parking Generation* is the peak rate for the day and does not distinguish between urban and suburban locations.



Conclusions

Overall, TDM plans do appear to have a positive effect on traffic generation and parking numbers in buildings with TDM plans in place when compared to the Institute of Transportation Engineers published standards. Based on the analysis performed for this study, on average, TDM plans reduce traffic generation rates by 27% to 37% and parking generation from 11% to 21% depending on the time of day and other variables.

If office buildings implement a thorough TDM plan, they will generate less peak hour traffic and require fewer parking stalls. We recommend practitioners use a 30% reduction in traffic generation (compared with the Institute of Transportation Engineers' standard rates) when assessing the traffic impacts of a proposed office building that will implement a TDM plan. We recommend practitioners use a 10% reduction in parking stall requirements (compared with the Institute of Transportation Engineers' standard rates) for office building that will implement a TDM plan.

Findings Related to Office Buildings with TDM:

- **30% Reduction in Traffic Generation**
- **10% Reduction in Required Parking Stalls**

These are significant findings. The reduction in traffic generation could often be the difference between needing to install a traffic signal or not, typically a $200,000 expenditure. In Minnesota, a surface parking stall costs between $3,000 and $4,000 to build while a stall in a parking ramp costs between $15,000 and $20,000. This means the 181,000 square foot office labeled Site B could have built 245 parking stalls instead of 270 stalls, saving $75,000 to $100,000 in construction costs. This does not factor in lower maintenance costs, lower environmental impacts, or the higher employee satisfaction benefits Travel Demand Management provides.

Next Steps

This study analyzed the effectiveness of TDM strategies at six sites in Minnesota. Our findings are encouraging, but much more data should be collected around the United States. Due to the limited dataset, we were not able to determine TDM "best practices" which could be identified with a larger dataset. The universality of our findings could also be corroborated with data from different regions of the country.

Acknowledgements

Thank you to Marc Culver, Mike Anderson, Melissa Madison, Randy Newton, Damien Goebel, and Cathy Moeger who were very helpful in assisting us in selecting sites for our study. Huge thanks also goes to the Minnesota Pollution Control Agency-Department of Natural Resources-Human Services complex and Coloplast for their assistance. We respect the wishes of the other companies who wish to remain anonymous, but we greatly appreciate their assistance as well.

About the Authors

During the period of July, 2009-January, 2010 a group of professionals (civil engineers, landscape architects, and urban planners) took part in an apprenticeship under the tutelage of Mike Spack, president and founder of Spack Consulting. The apprentices were Mike Bultman, Joe Collins, Kirk Pettis, and Jenni Thompson. This Travel Demand Management study was prepared as part of the apprenticeship program.