Downtown Bozeman Parking Study

A Project Completed for the City of Bozeman Parking Commission

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EXECUTIVE SUMMARY

On behalf of the City of Bozeman Parking Commission and the Downtown Bozeman Partnership, the Western Transportation Institute at Montana State University (WTI) conducted parking occupancy rate studies in the downtown Bozeman area between July and September/October of 2012. The purpose of this project was to understand how parking spaces near Main Street were being utilized. Occupancy rates, a measure of the level of utilization of a parking area for a specific period of time, were observed on several dates during the study period. Study dates included Tuesday, July 17; Saturday, July 28; Wednesday, August 8; Saturday, August 18; Thursday, September 6; Saturday, September 29 (no MSU football game); and Saturday, October 6 (no MSU football game, Carnegie lot only). Data collection activities ran between 9:00 a.m. and 8:00 p.m. on each of these respective dates. Once per hour, data collectors recorded the number of vehicles parked in the specific lots/areas of interest, and this data was then used to compute hourly occupancy rates.

When examined, occupancy rates shared a similar trend between all block groups, both on weekdays and weekends in general. Occupancy steadily increased throughout the morning and reached its peak for the day during the noon hour. This coincided with the lunch hour when downtown restaurants were likely to be heavily frequented. Following the midday peak, occupancy rates for most blocks fell throughout the afternoon before rising again to a second, evening peak. This second peak was typically lower than the one observed at midday. On-street parking occupancy rates were generally high, typically exceeding 60 to 70 percent throughout the day. In many cases, 80 to 90 percent occupancy rates were observed, and at some points, parking on certain block faces was 100 percent occupied.

High occupancy rates typically were not observed for off-street parking lots, with the exception of the Armory lot and the Willson lot across Mendenhall Street, where high occupancy was the norm throughout the day (generally above 60 percent for both lots). In the Armory lot, 100 percent occupancy was observed at several times, while the Willson lot also had high occupancy, reaching 90 percent several times. Conversely, the Carnegie lot and the Rouse lot both had lower occupancies throughout the day. The Carnegie lot never exceeded an occupancy of 75 percent and generally remained below 60 percent occupancy, even on weekends. This lot is neighbored by the city parking garage, which accounts for the lower occupancies observed in this lot. The Rouse lot never exceeded 65 percent, and typically it remained below 50 percent occupancy. These observations may be indicative of two points. First, the Armory lot and the Willson lot are the preferred off-street parking location for many downtown patrons, particularly given their close proximity to many Main Street businesses. Second, outlying lots (particularly the Rouse lot), even with their proximity to downtown businesses, appear to be a secondary location of choice for parking following other on-street and Armory lot options.

Comparisons of occupancy rates from the Armory lot between 2010 and 2012, showed the same trend of occupancy climbing throughout the morning, peaking at 12:00 p.m., tapering off in the afternoon and then climbing once again was observed for all dates. For the one comparison performed between 2010 and 2012 for the Willson lot, a significant difference in occupancy rates occurred during the afternoon and evening. Comparisons of parking garage data for a weekday and weekend showed no significant difference between trends between 2010 and 2012. While the general trend of rates climbing throughout the afternoon and evening matched for each year, 2012 occupancies were much lower than those of 2010 during these hours.

1 INTRODUCTION

The City of Bozeman Parking Commission (Commission) and the Downtown Bozeman Partnership (Partnership) have an ongoing interest in monitoring the availability and usage of parking in the downtown Bozeman area. On behalf of the Commission and the Partnership, the Western Transportation Institute at Montana State University (WTI) conducted parking occupancy rate studies in the downtown area between July and September of 2012. This report presents the results from these studies, which focused on the utilization of parking spaces on a series of streets. To understand how parking spaces were being utilized, researchers observed occupancy rates for selected on-street and city-owned off-street parking areas.

Occupancy rate is a measure of the level of utilization of a parking area for a specific period of time. This metric will help the Parking Commission understand how parking is presently being used in the downtown area. Previous work completed during the summer of 2010 established initial occupancy rates for two off-street lots in the study area, but did not address on-street parking along specific streets (1). However, the results of the work discussed in this report still allow some comparisons of changes that have occurred in occupancy trends since that initial study.

1.1 Study Approach

WTI researchers followed a straightforward approach for completing the study. It consisted of observational data collection activities that occurred on six dates selected in consultation with the City of Bozeman Parking Commission:

- Tuesday, July 17;
- Saturday, July 28;
- Wednesday, August 8:
- Saturday, August 18;
- Thursday, September 6; and
- Saturday, September 29 (no MSU football game).

Data collection activities ran between 9:00 a.m. and 8:00 p.m. on each of these respective dates. The study area established by the Parking Commission is presented in Figure 1-1.

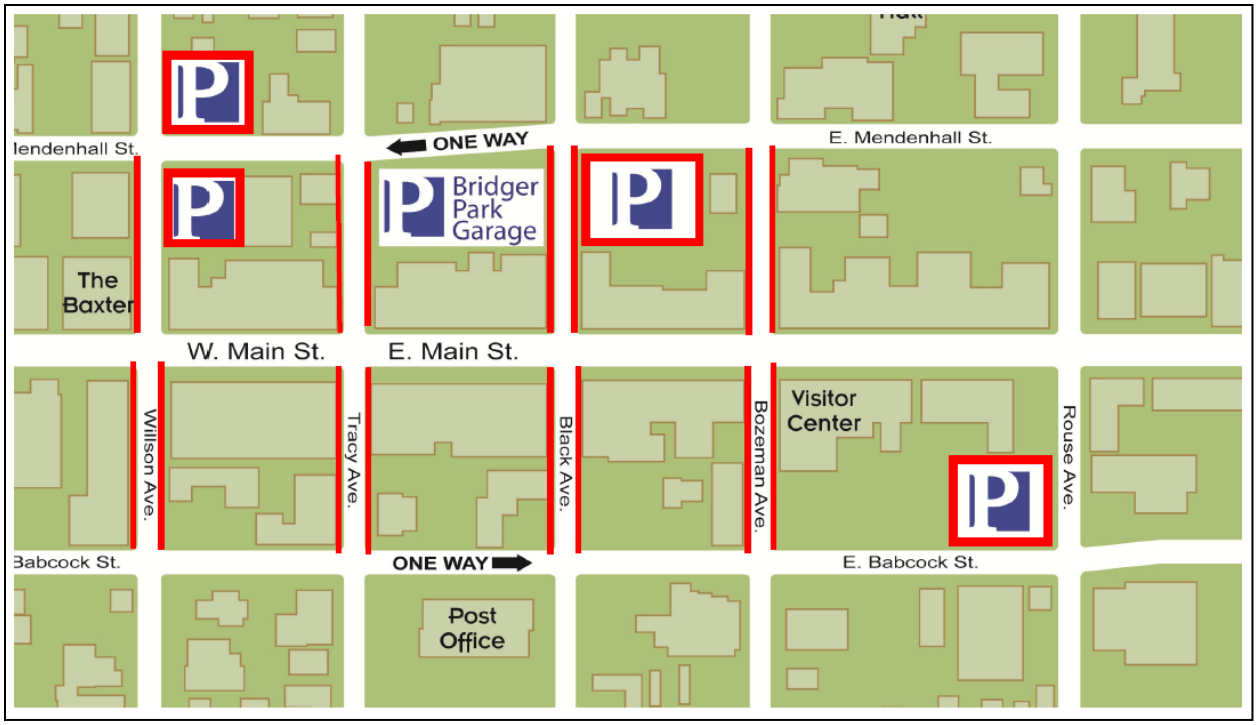


Figure 1-1: Downtown study area (Note: red lines indicate areas included in study)

The specific blocks/streets included in the study are as follows:

Surface lots

- 100 block N. Willson (Willson lot)
- Unit block N. Willson (Armory lot)
- Carnegie lot
- Rouse lot (Rouse and Babcock)

Block faces

- Unit block N. Tracy (Both sides)
- Unit block S. Tracy (Both sides)
- Unit block N. Black (Both sides)
- Unit block S. Black (Both sides)
- Unit block S. Willson (Both sides)
- Unit block N. Willson (West side only)
- Unit block S. Bozeman (Both sides)
- Unit block N. Bozeman (Both sides)

To collect the data necessary to measure occupancy rates, Montana State University civil engineering students canvassed the downtown study area, recording (once per hour) the number of vehicles observed to be parked in the specific lots/areas highlighted in Figure **1-1**.

Upon completion of the field data collection effort, the data was analyzed to compute occupancy rates. They help in understanding how parking demand fluctuates during the course of a day for a particular block or parking lot. Using the hourly observations of parked vehicles collected in the field, occupancy rates were computed as:

—

Where:

OR = Occupancy rate, spaces/hour

N_T = total number of parked vehicles observed

P_S = total number of legal parking stalls

Researchers previously documented the total number of parking stalls on a block face or off-street lot during the 2010 study (1). This information was used in the formula above to complete each occupancy rate calculation.

1.2 Organization of the Report

The results of the occupancy rate studies conducted on the different study dates are presented in the following chapter. The document concludes with a summary of the findings from the work.

2 RESULTS

This chapter presents the results of the analysis of occupancy rates, based on data collected on Tuesday, July 17; Saturday, July 28; Wednesday, August 8; Saturday, August 18; Thursday, September 6; and Saturday, September 29. The results are separated by the two types of parking studied: on-street stalls and off-street city-owned parking lots. When possible, comparisons between 2010 and 2012 data are provided. Based on the data available, these comparisons primarily address off-street parking lots.

2.1 Block Face Occupancy Rates

The Bozeman Parking Commission has an interest in documenting occupancy rates for on-street parking on key streets that run perpendicular to Main Street in the downtown district. This included on-street parking (block faces) on the east and west side of North Tracy Avenue, South Tracy Avenue, North Black Avenue, South Black Avenue, South Willson Avenue, South Bozeman Avenue and North Bozeman Avenue (note the dividing line of Main Street runs east and west across these roads, hence the North and South distinction). In addition, the west side of North Willson Avenue was examined. The following sections will discuss the occupancy rate findings for each block face. Note that the findings for each block include combined data from both the east side and west side of the street (except for North Willson Avenue).

2.1.1 North Bozeman Ave

North Bozeman Avenue has approximately 22 on-street parking stalls. Table 2-1 presents both the number of vehicles parked during each observation period, as well as the resulting occupancy rate for the block. As the results indicate, the block saw a general increase in occupancy rates on each collection date as the day progressed, with an initial peak around 12:00 p.m. and a second peak occurring in the early evening. This is further illustrated in Figure 2-1. The peak observed rate was approximately 82 percent occupancy at 1:00 p.m. on Wednesday, August 8, 2012 and at noon on Saturday, September 29, 2012. On average, occupancy rates were much lower than this peak throughout the day. The general trend observed for this block on each date was an increase in occupancy rates throughout the morning, tapering off in the afternoon, and rising again in the early evening hours. This suggests that more vehicles are parking for downtown trip purposes, such as lunch and evening dining.

Table 2-1: North Bozeman Ave. parking observations and occupancy rates

Tuesday, July 17, 2012			Saturday, July 28, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	6	27.3%	9:00 AM	6	27.3%
10:00 AM	9	40.9%	10:00 AM	10	45.5%
11:00 AM	14	63.6%	11:00 AM	9	40.9%
12:00 PM	15	68.2%	12:00 PM	14	63.6%
1:00 PM	12	54.5%	1:00 PM	12	54.5%
2:00 PM	11	50.0%	2:00 PM	10	45.5%
3:00 PM	7	31.8%	3:00 PM	13	59.1%
4:00 PM	10	45.5%	4:00 PM	13	59.1%
5:00 PM	11	50.0%	5:00 PM	9	40.9%
6:00 PM	16	72.7%	6:00 PM	11	50.0%
7:00 PM	17	77.3%	7:00 PM	17	77.3%
8:00 PM	13	59.1%	8:00 PM	16	72.7%

Wednesday August 8, 2012			Saturday, August 18, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	3	13.6%	9:00 AM	6	27.3%
10:00 AM	5	22.7%	10:00 AM	8	36.4%
11:00 AM	5	22.7%	11:00 AM	7	31.8%
12:00 PM	8	36.4%	12:00 PM	14	63.6%
1:00 PM	18	81.8%	1:00 PM	15	68.2%
2:00 PM	11	50.0%	2:00 PM	11	50.0%
3:00 PM	7	31.8%	3:00 PM	8	36.4%
4:00 PM	6	27.3%	4:00 PM	7	31.8%
5:00 PM	14	63.6%	5:00 PM	14	63.6%
6:00 PM	13	59.1%	6:00 PM	15	68.2%
7:00 PM	16	72.7%	7:00 PM	16	72.7%
8:00 PM	11	50.0%	8:00 PM	15	68.2%

Thursday, September 06, 2012			Saturday, September 29, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	1	4.5%	9:00 AM	3	13.6%
10:00 AM	7	31.8%	10:00 AM	3	13.6%
11:00 AM	7	31.8%	11:00 AM	9	40.9%
12:00 PM	10	45.5%	12:00 PM	5	22.7%
1:00 PM	13	59.1%	1:00 PM	9	40.9%
2:00 PM	8	36.4%	2:00 PM	14	63.6%
3:00 PM	7	31.8%	3:00 PM	10	45.5%
4:00 PM	12	54.5%	4:00 PM	15	68.2%
5:00 PM	11	50.0%	5:00 PM	11	50.0%
6:00 PM	13	59.1%	6:00 PM	16	72.7%
7:00 PM	17	77.3%	7:00 PM	18	81.8%
8:00 PM	14	63.6%	8:00 PM	18	81.8%

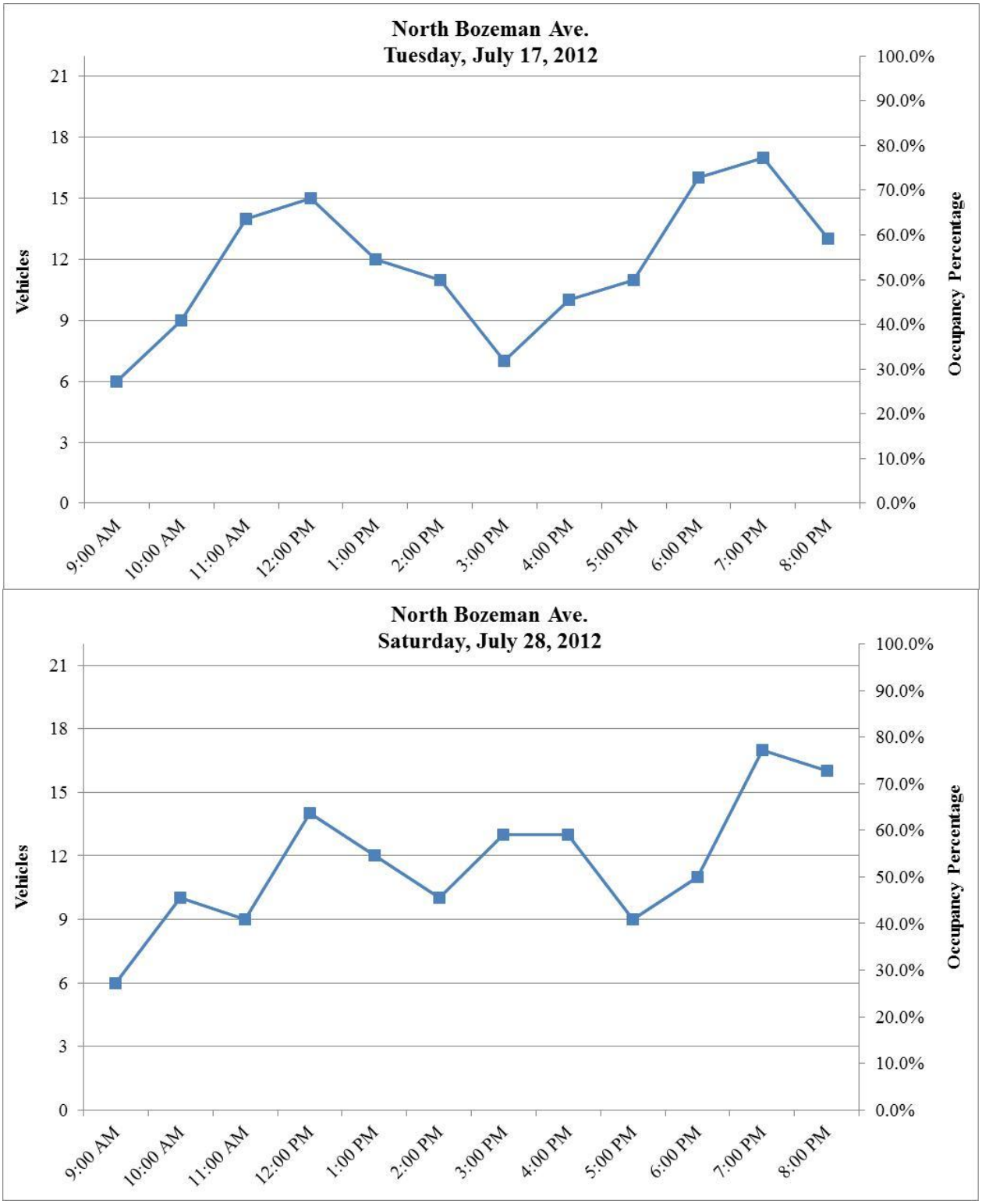


Figure 2-1: North Bozeman Ave. vehicle observations versus occupancy rates

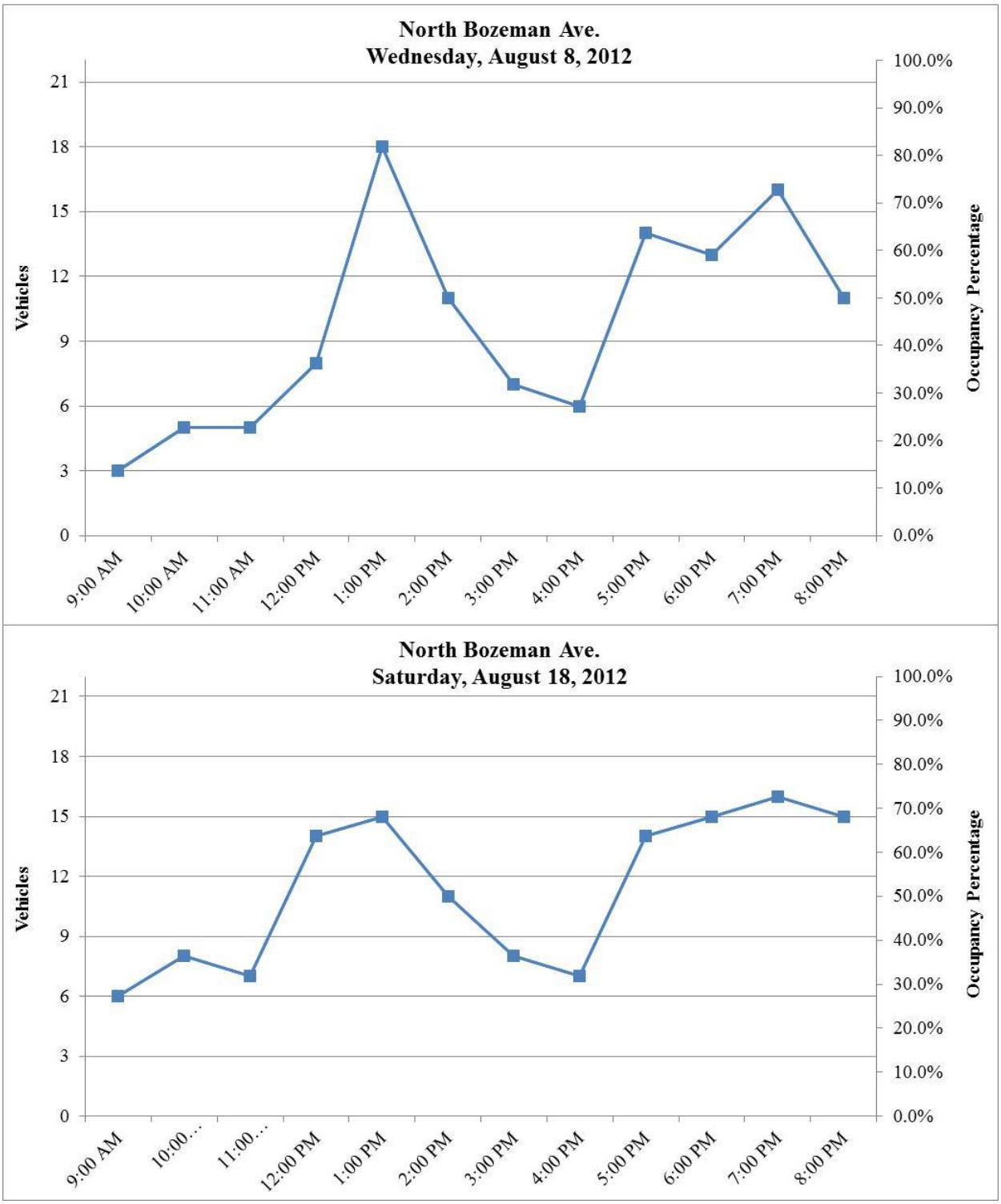


Figure 2-1 cont'd: North Bozeman Ave. vehicle observations versus occupancy rates

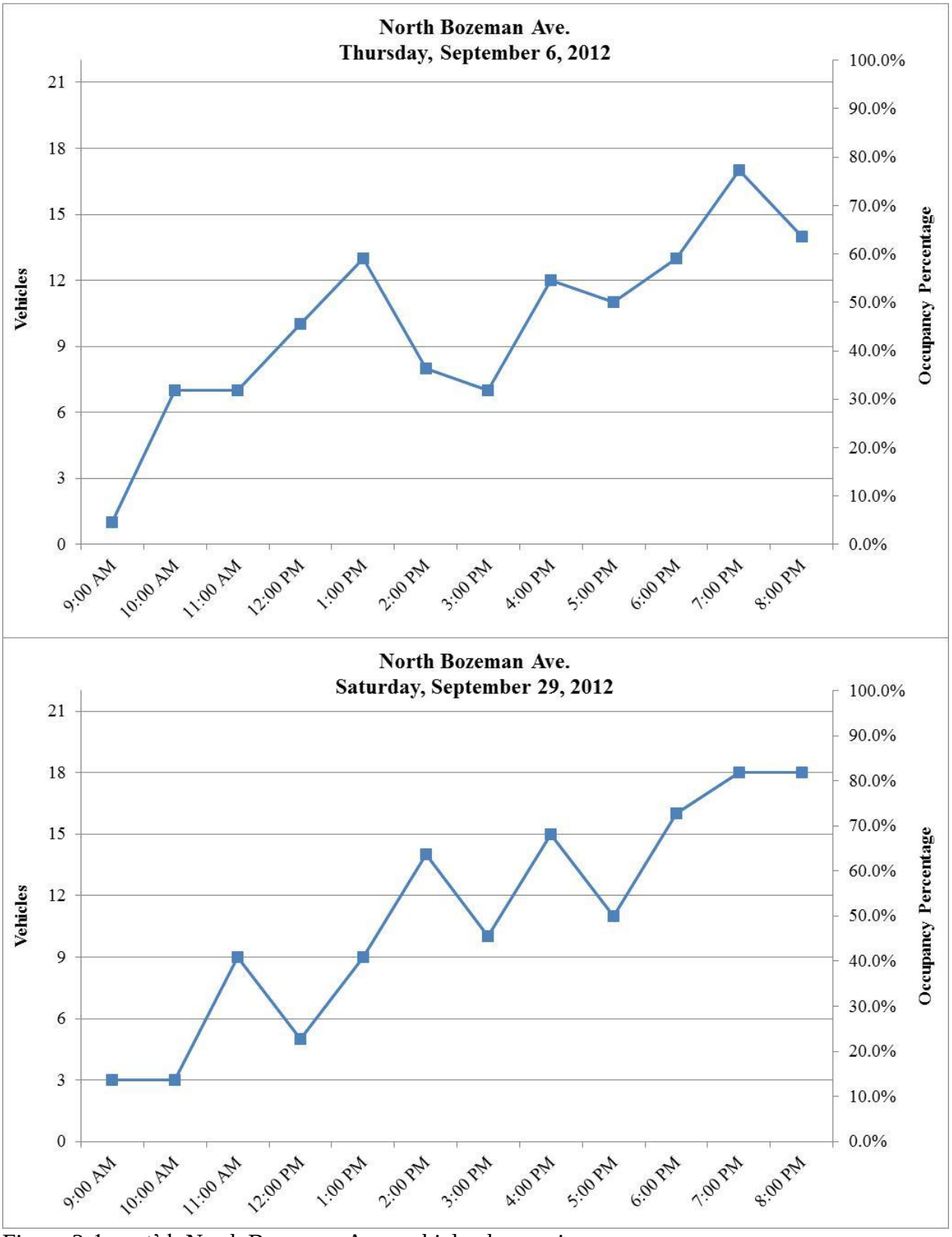


Figure 2-1 cont'd: North Bozeman Ave. vehicle observations versus occupancy rates

2.1.2 South Bozeman Ave

South Bozeman Avenue has approximately 18 on-street parking stalls. Table 2-2 presents both the number of vehicles parked during each observation period, as well as the resulting occupancy rate for the block. This block exhibited no obvious trend in general, with occupancy fluctuating throughout the day on many occasions. On some days, a noontime peak followed by an early afternoon drop occurred, while on other days, occupancy rates continued to climb throughout the afternoon, peaking in the early evening. These trends are further illustrated in Figure 2-2: South Bozeman Ave. vehicle observations versus occupancy ratesFigure 2-2. The peak observed rate was approximately 95 percent occupancy at 12:00 p.m. on Tuesday, July 17 and Thursday, September 12, 2012 and at 6:00 p.m. on Wednesday, August 8, 2012. On average, occupancy rates were much lower than this peak throughout the day. July and August occupancy rates were somewhat higher on weekdays, while September occupancy rates were higher on the weekend.

Table 2-2: South Bozeman Ave. parking observations and occupancy rates

Tuesday, July 17, 2012			Saturday, July 28, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	10	55.6%	9:00 AM	6	33.3%
10:00 AM	9	50.0%	10:00 AM	8	44.4%
11:00 AM	10	55.6%	11:00 AM	12	66.7%
12:00 PM	17	94.4%	12:00 PM	13	72.2%
1:00 PM	5	27.8%	1:00 PM	11	61.1%
2:00 PM	11	61.1%	2:00 PM	9	50.0%
3:00 PM	12	66.7%	3:00 PM	11	61.1%
4:00 PM	8	44.4%	4:00 PM	9	50.0%
5:00 PM	13	72.2%	5:00 PM	12	66.7%
6:00 PM	16	88.9%	6:00 PM	14	77.8%
7:00 PM	14	77.8%	7:00 PM	16	88.9%
8:00 PM	15	83.3%	8:00 PM	17	94.4%

Wednesday August 8, 2012			Saturday, August 18, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	9	50.0%	9:00 AM	5	27.8%
10:00 AM	13	72.2%	10:00 AM	10	55.6%
11:00 AM	11	61.1%	11:00 AM	8	44.4%
12:00 PM	13	72.2%	12:00 PM	13	72.2%
1:00 PM	13	72.2%	1:00 PM	14	77.8%
2:00 PM	12	66.7%	2:00 PM	13	72.2%
3:00 PM	12	66.7%	3:00 PM	11	61.1%
4:00 PM	8	44.4%	4:00 PM	11	61.1%
5:00 PM	15	83.3%	5:00 PM	6	33.3%
6:00 PM	17	94.4%	6:00 PM	7	38.9%
7:00 PM	12	66.7%	7:00 PM	10	55.6%
8:00 PM	12	66.7%	8:00 PM	11	61.1%

Thursday, September 06, 2012			Saturday, September 29, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	14	77.8%	9:00 AM	6	33.3%
10:00 AM	9	50.0%	10:00 AM	10	55.6%
11:00 AM	9	50.0%	11:00 AM	13	72.2%
12:00 PM	17	94.4%	12:00 PM	15	83.3%
1:00 PM	14	77.8%	1:00 PM	13	72.2%
2:00 PM	12	66.7%	2:00 PM	14	77.8%
3:00 PM	5	27.8%	3:00 PM	16	88.9%
4:00 PM	11	61.1%	4:00 PM	10	55.6%
5:00 PM	5	27.8%	5:00 PM	8	44.4%
6:00 PM	6	33.3%	6:00 PM	12	66.7%
7:00 PM	16	88.9%	7:00 PM	17	94.4%
8:00 PM	10	55.6%	8:00 PM	15	83.3%

Figure 2-2: South Bozeman Ave. vehicle observations versus occupancy rates

Figure 2-2 cont'd: South Bozeman Ave. vehicle observations versus occupancy rates

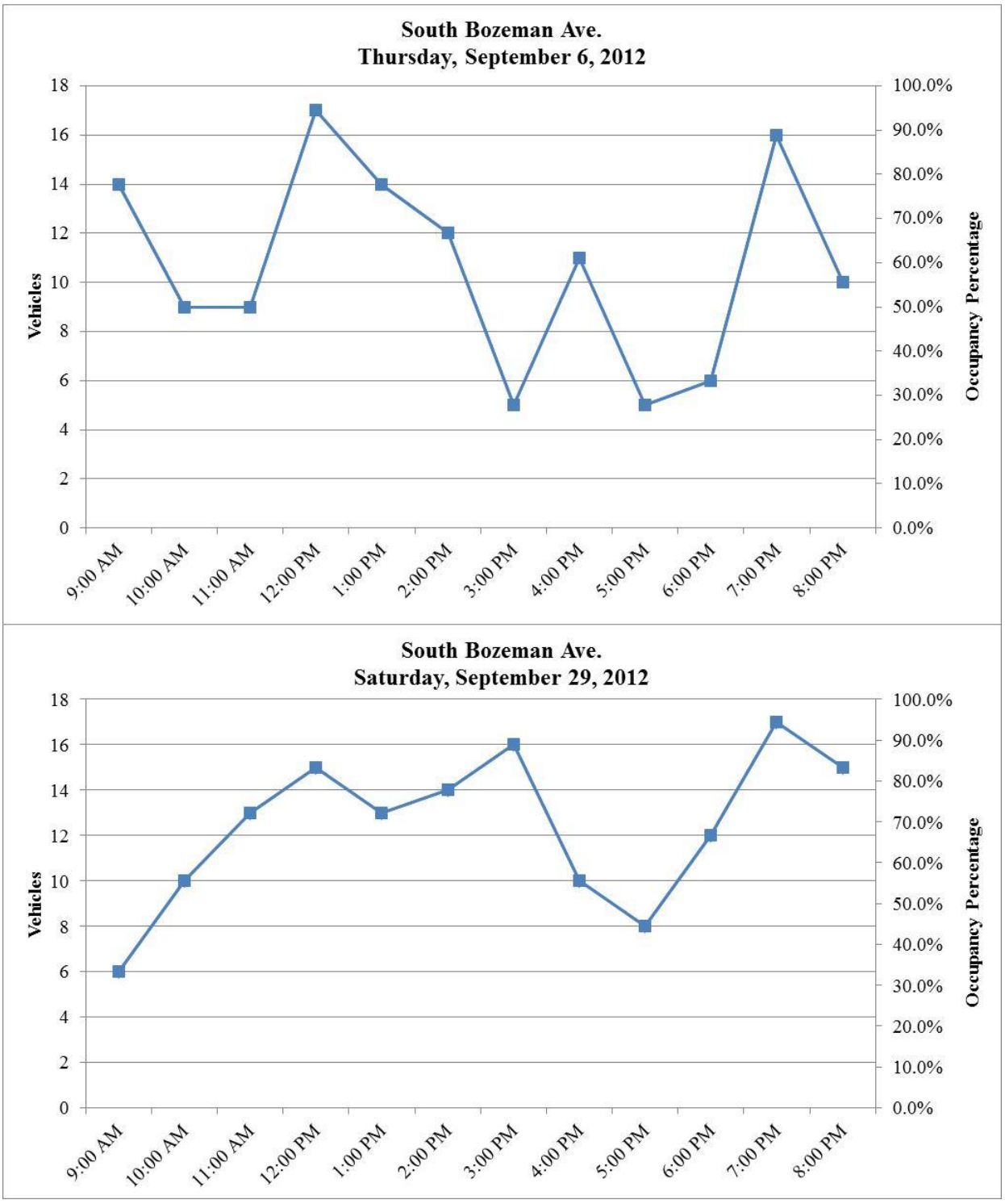


Figure 2-2 cont'd: South Bozeman Ave. vehicle observations versus occupancy rates

2.1.3 North Black Ave

North Black Avenue has approximately 18 on-street parking stalls. Table 2-3 presents both the number of vehicles parked during each observation period, as well as the resulting occupancy rate for the block. On weekdays, this block exhibited a peak around 12:00 p.m., with a drop in occupancy throughout the afternoon before a secondary peak occurred in the evening. On weekends, more random fluctuations in occupancy were observed throughout the day, generally leading to a peak in the evening. One item of note is that on September 6, 2012, a construction waste dumpster occupied one space on the west side of the street. This space was included in the occupancy calculations, as it represented a use of the existing inventory of spaces available for parking. The occupancy trends for this block are further illustrated in Figure 2-2: South Bozeman Ave. vehicle observations versus occupancy ratesFigure 2-2. The peak observed rate was approximately 95 percent occupancy at 12:00 p.m. on Tuesday, July 17; 12:00 p.m. and 1:00 p.m. on Wednesday, August 8; and at 8:00 p.m. on Saturday, August 18, 2012. On average, occupancy rates were much lower than this peak throughout the day. Occupancy rates were below 50 percent throughout the day on Thursday, September 6th, due to construction activities closing off spaces on the east block face throughout the day.

Table 2-3: North Black Ave. parking observations and occupancy rates

Tuesday, July 17, 2012			Saturday, July 28, 2012		
Time	**Parked Vehicles**	**Occupancy Rate**	**Time**	**Parked Vehicles**	**Occupancy Rate**
9:00 AM	12	66.7%	9:00 AM	9	50.0%
10:00 AM	10	55.6%	10:00 AM	13	72.2%
11:00 AM	13	72.2%	11:00 AM	17	94.4%
12:00 PM	17	94.4%	12:00 PM	15	83.3%
1:00 PM	11	61.1%	1:00 PM	15	83.3%
2:00 PM	11	61.1%	2:00 PM	10	55.6%
3:00 PM	13	72.2%	3:00 PM	12	66.7%
4:00 PM	11	61.1%	4:00 PM	9	50.0%
5:00 PM	14	77.8%	5:00 PM	8	44.4%
6:00 PM	15	83.3%	6:00 PM	8	44.4%
7:00 PM	16	88.9%	7:00 PM	14	77.8%
8:00 PM	10	55.6%	8:00 PM	16	88.9%

Wednesday August 8, 2012			Saturday, August 18, 2012		
Time	**Parked Vehicles**	**Occupancy Rate**	**Time**	**Parked Vehicles**	**Occupancy Rate**
9:00 AM	11	61.1%	9:00 AM	10	55.6%
10:00 AM	11	61.1%	10:00 AM	13	72.2%
11:00 AM	14	77.8%	11:00 AM	11	61.1%
12:00 PM	17	94.4%	12:00 PM	12	66.7%
1:00 PM	17	94.4%	1:00 PM	11	61.1%
2:00 PM	10	55.6%	2:00 PM	10	55.6%
3:00 PM	12	66.7%	3:00 PM	10	55.6%
4:00 PM	13	72.2%	4:00 PM	11	61.1%
5:00 PM	13	72.2%	5:00 PM	9	50.0%
6:00 PM	14	77.8%	6:00 PM	10	55.6%
7:00 PM	12	66.7%	7:00 PM	11	61.1%
8:00 PM	13	72.2%	8:00 PM	17	94.4%

Thursday, September 06, 2012			Saturday, September 29, 2012		
Time	**Parked Vehicles**	**Occupancy Rate**	**Time**	**Parked Vehicles**	**Occupancy Rate**
9:00 AM	6	33.3%	9:00 AM	10	55.6%
10:00 AM	7	38.9%	10:00 AM	14	77.8%
11:00 AM	6	33.3%	11:00 AM	15	83.3%
12:00 PM	6	33.3%	12:00 PM	15	83.3%
1:00 PM	8	44.4%	1:00 PM	14	77.8%
2:00 PM	4	22.2%	2:00 PM	16	88.9%
3:00 PM	6	33.3%	3:00 PM	8	44.4%
4:00 PM	7	38.9%	4:00 PM	15	83.3%
5:00 PM	6	33.3%	5:00 PM	12	66.7%
6:00 PM	7	38.9%	6:00 PM	13	72.2%
7:00 PM	6	33.3%	7:00 PM	16	88.9%
8:00 PM	8	44.4%	8:00 PM	13	72.2%

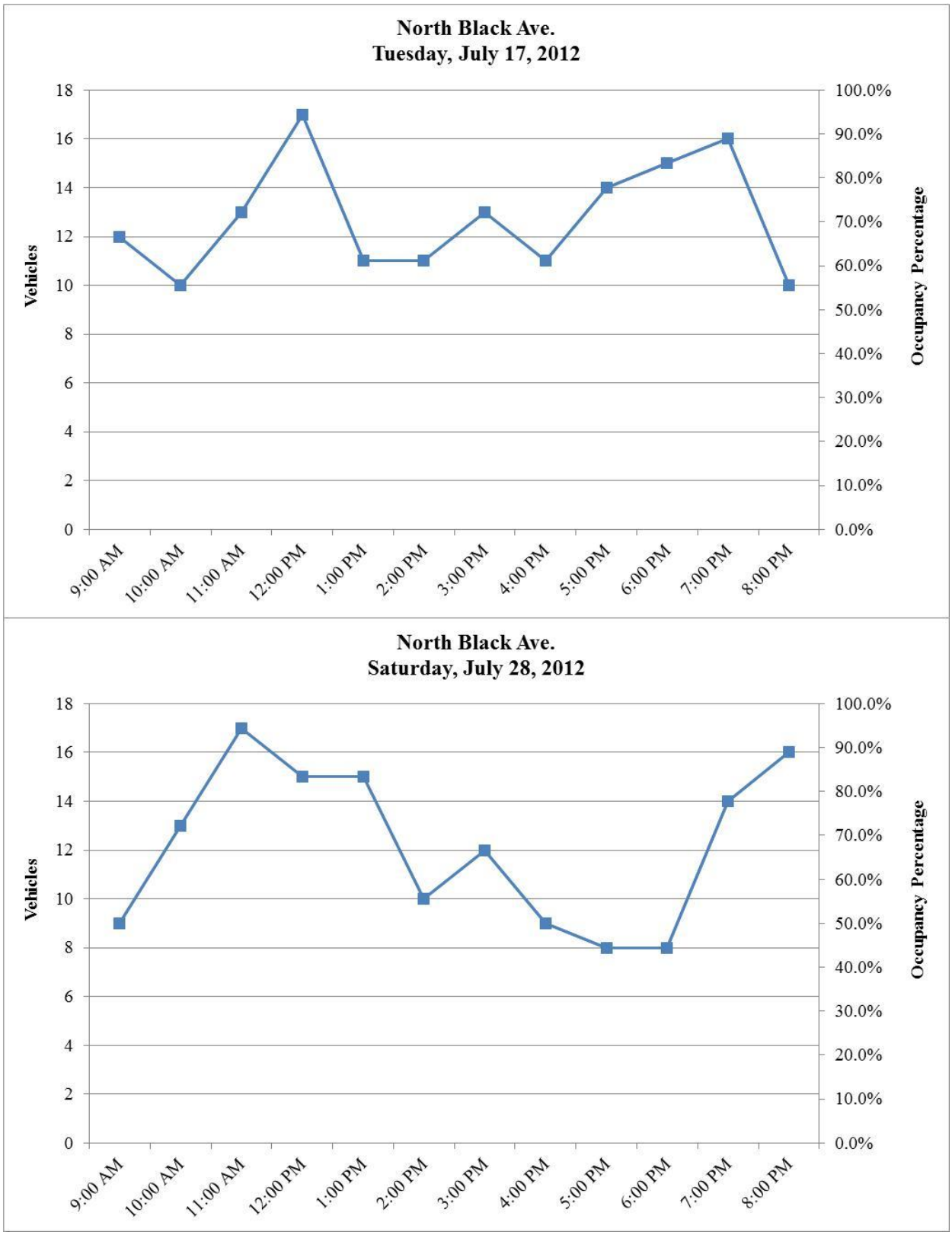
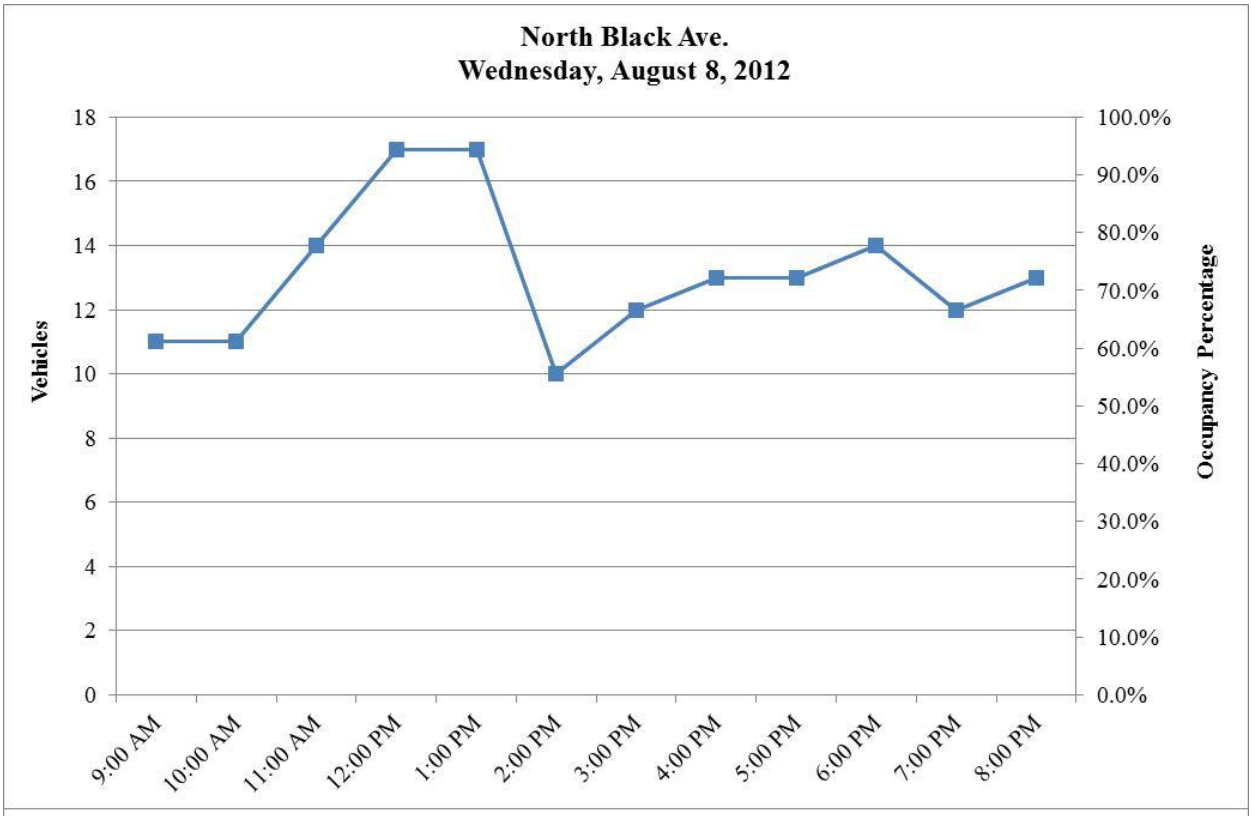


Figure 2-3: North Black Ave. vehicle observations versus occupancy rates



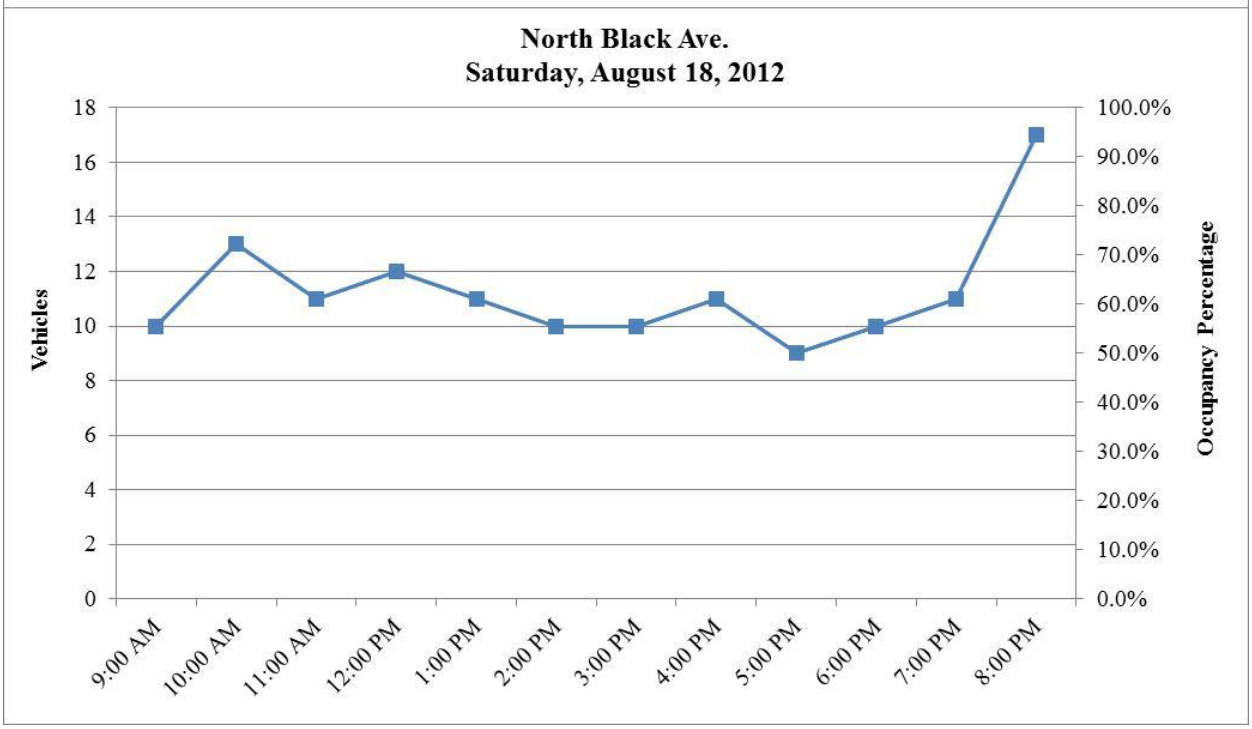


Figure 2-3 cont'd: North Black Ave. vehicle observations versus occupancy rates

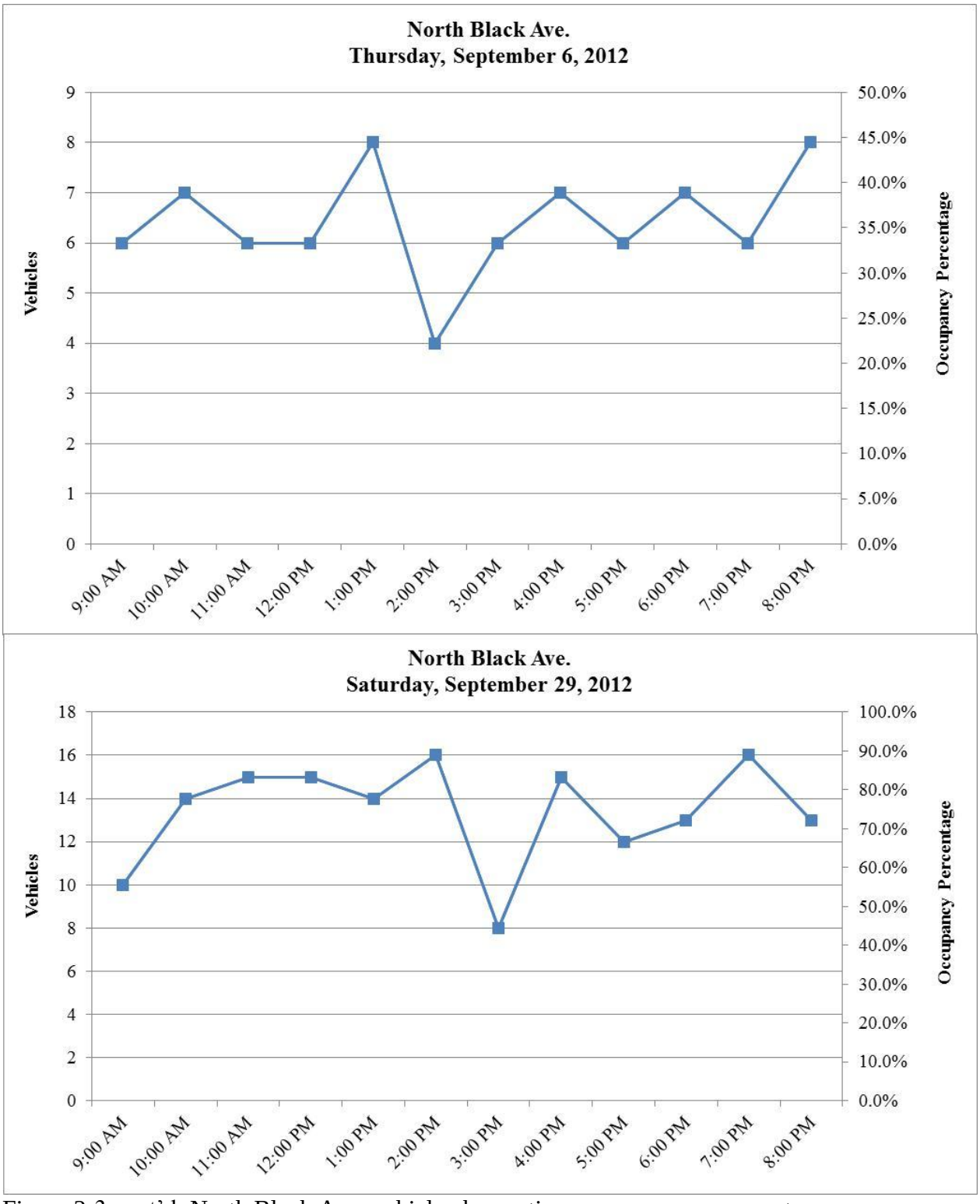


Figure 2-3 cont'd: North Black Ave. vehicle observations versus occupancy rates

2.1.4 South Black Ave

South Black Avenue has approximately 15 on-street parking stalls. Table 2-4 presents both the number of vehicles parked during each observation period, as well as the resulting occupancy rate for the block. The general trend observed on both weekdays and weekends was for occupancy rates to increase until 12:00 p.m., where they peaked. This was followed by a general drop in occupancy during the afternoon, before a secondary peak occurred in the evening. However, on some dates, occupancy remained moderately high throughout the afternoon in comparison to the evening hours. The occupancy trends for this block are further illustrated in Figure 2-2: South Bozeman Ave. vehicle observations versus occupancy ratesFigure 2-4. The peak observed rate was approximately 100 percent occupancy at 12:00 p.m. on Tuesday, July 17. On average, occupancy rates were much lower than this peak throughout the day, typically falling in a range between 60 and 80 percent. Occupancy rates were generally at or below 50 percent throughout the day on Thursday, September 6th, although there is no clear reason why this was the case.

Table 2-4: South Black Ave. parking observations and occupancy rates

Tuesday, July 17, 2012			Saturday, July 28, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	12	80.0%	9:00 AM	5	33.3%
10:00 AM	12	80.0%	10:00 AM	10	66.7%
11:00 AM	10	66.7%	11:00 AM	14	93.3%
12:00 PM	15	100.0%	12:00 PM	13	86.7%
1:00 PM	13	86.7%	1:00 PM	9	60.0%
2:00 PM	10	66.7%	2:00 PM	11	73.3%
3:00 PM	9	60.0%	3:00 PM	10	66.7%
4:00 PM	9	60.0%	4:00 PM	9	60.0%
5:00 PM	10	66.7%	5:00 PM	8	53.3%
6:00 PM	13	86.7%	6:00 PM	10	66.7%
7:00 PM	9	60.0%	7:00 PM	10	66.7%
8:00 PM	5	33.3%	8:00 PM	12	80.0%

Wednesday August 8, 2012			Saturday, August 18, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	10	66.7%	9:00 AM	7	46.7%
10:00 AM	10	66.7%	10:00 AM	10	66.7%
11:00 AM	10	66.7%	11:00 AM	11	73.3%
12:00 PM	14	93.3%	12:00 PM	13	86.7%
1:00 PM	8	53.3%	1:00 PM	12	80.0%
2:00 PM	12	80.0%	2:00 PM	13	86.7%
3:00 PM	9	60.0%	3:00 PM	13	86.7%
4:00 PM	8	53.3%	4:00 PM	9	60.0%
5:00 PM	11	73.3%	5:00 PM	11	73.3%
6:00 PM	9	60.0%	6:00 PM	8	53.3%
7:00 PM	9	60.0%	7:00 PM	10	66.7%
8:00 PM	8	53.3%	8:00 PM	8	53.3%

Thursday, September 06, 2012			Saturday, September 29, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	6	40.0%	9:00 AM	5	33.3%
10:00 AM	6	40.0%	10:00 AM	10	66.7%
11:00 AM	5	33.3%	11:00 AM	14	93.3%
12:00 PM	7	46.7%	12:00 PM	12	80.0%
1:00 PM	7	46.7%	1:00 PM	10	66.7%
2:00 PM	7	46.7%	2:00 PM	13	86.7%
3:00 PM	7	46.7%	3:00 PM	10	66.7%
4:00 PM	8	53.3%	4:00 PM	8	53.3%
5:00 PM	6	40.0%	5:00 PM	7	46.7%
6:00 PM	6	40.0%	6:00 PM	8	53.3%
7:00 PM	8	53.3%	7:00 PM	11	73.3%
8:00 PM	8	53.3%	8:00 PM	7	46.7%

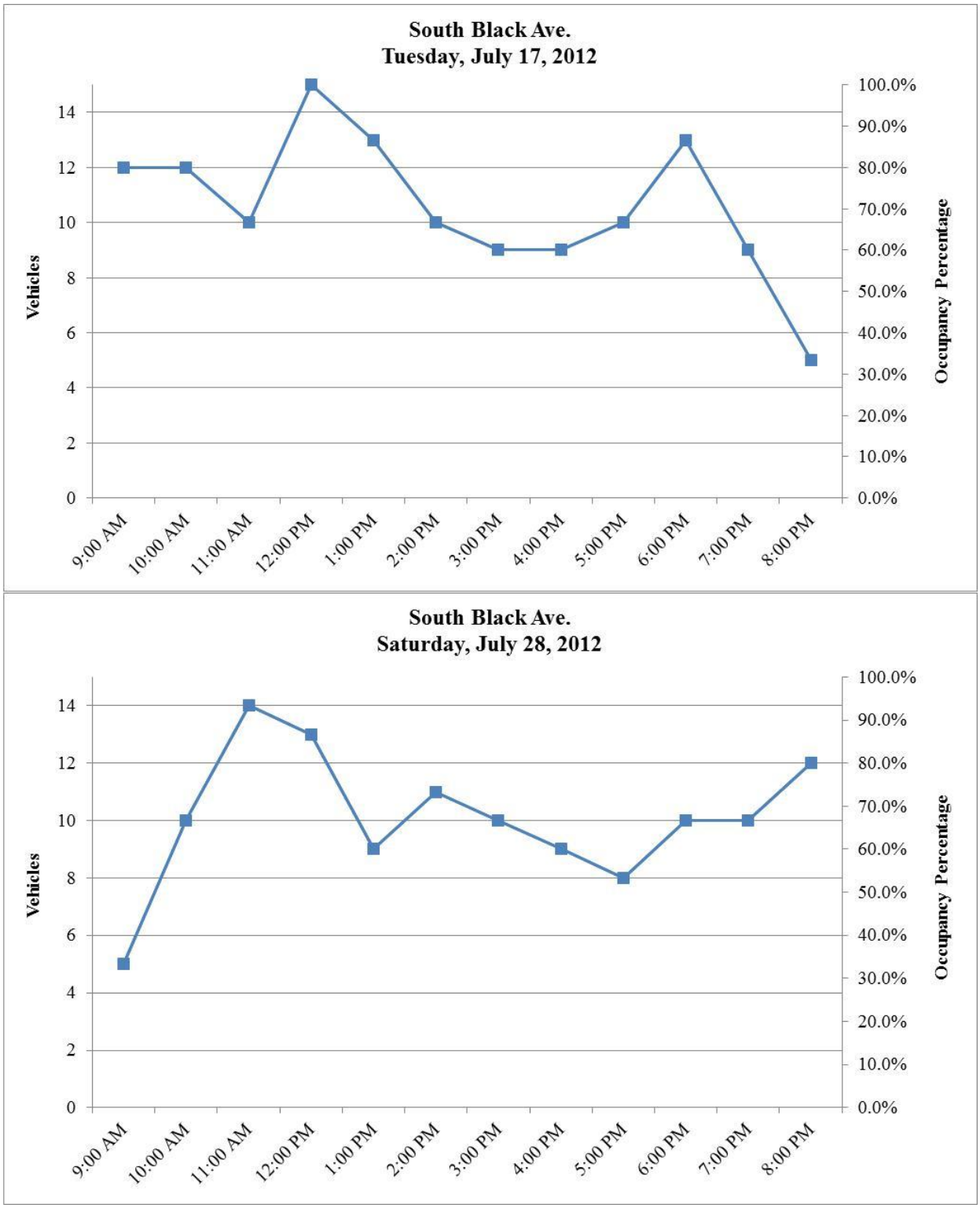


Figure 2-4: South Black Ave. vehicle observations versus occupancy rates

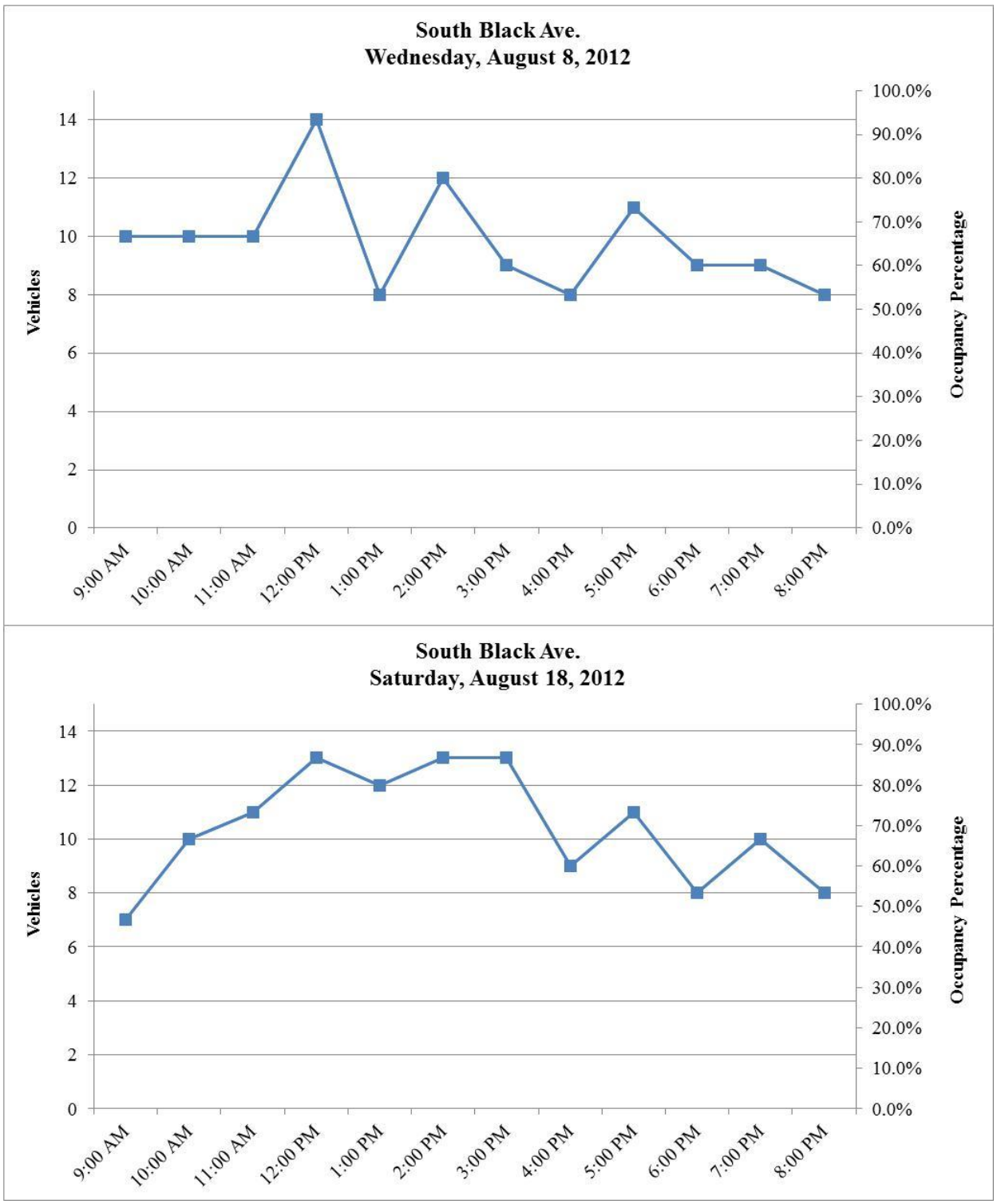


Figure 2-4 cont'd: South Black Ave. vehicle observations versus occupancy rates

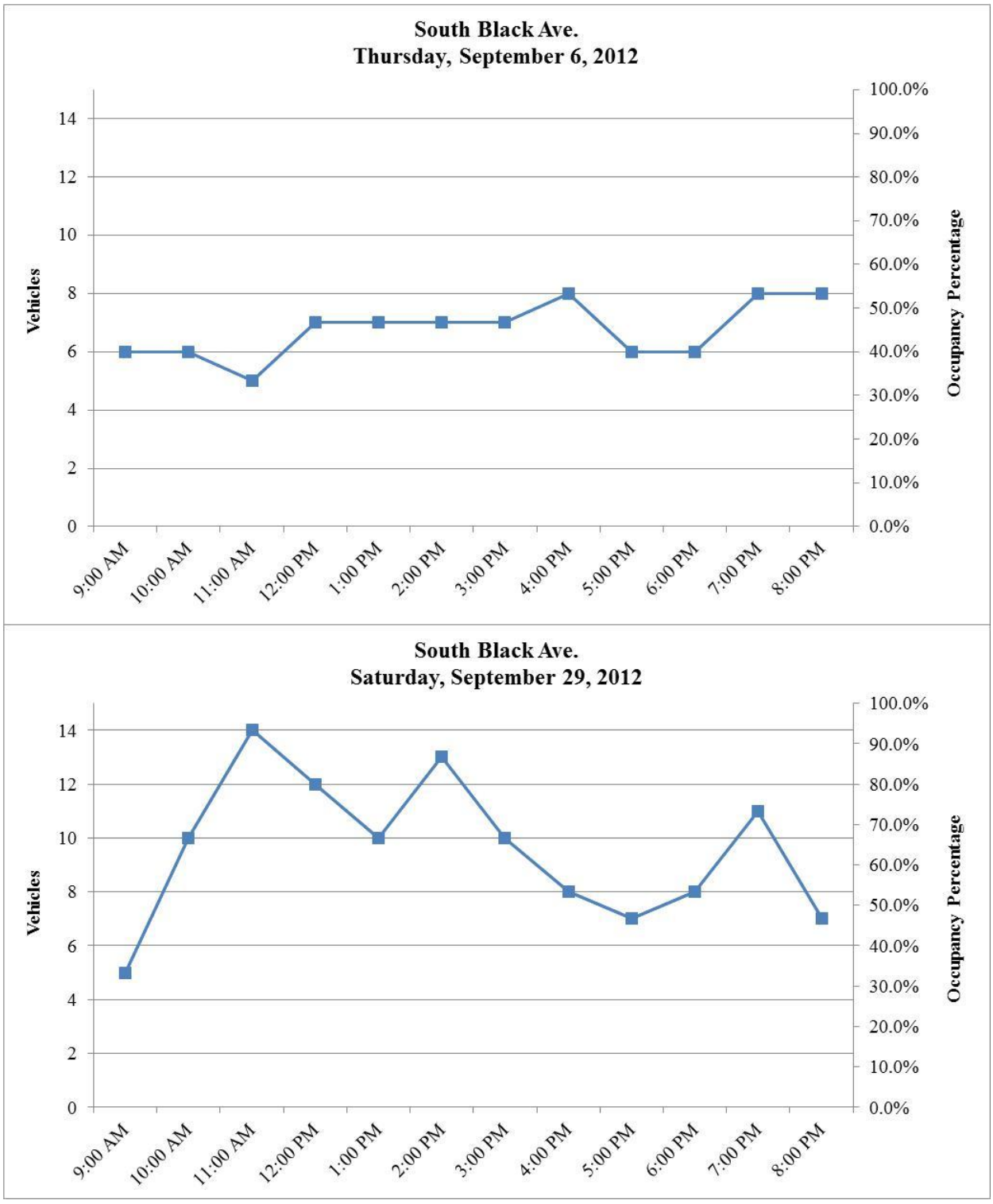


Figure 2-4 cont'd: South Black Ave. vehicle observations versus occupancy rates

2.1.5 North Tracy Ave

North Tracy Avenue has approximately 17 on-street parking stalls. Table 2-5 presents both the number of vehicles parked during each observation period, as well as the resulting occupancy rate for the block. The observed trend on all days was for occupancy to fluctuate throughout the day, peaking in the time frame of 12:00 p.m. to 1:00 p.m. on many days, with a second peak in the evening equal to or greater than the initial occupancy peak. The occupancy trends for this block are further illustrated in Figure 2-2: South Bozeman Ave. vehicle observations versus occupancy ratesFigure 2-5. The peak observed rate was approximately 95 percent occupancy at 8:00 p.m. on Saturday, July 28. On average, occupancy rates were much lower than this peak throughout the day, typically falling in a range between 60 and 80 percent. Given its proximity to the downtown core, the higher observed occupancy trends throughout the day were expected.

Table 2-5: North Tracy Ave. parking observations and occupancy rates

Tuesday, July 17, 2012			Saturday, July 28, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	14	82.4%	9:00 AM	13	76.5%
10:00 AM	12	70.6%	10:00 AM	13	76.5%
11:00 AM	12	70.6%	11:00 AM	13	76.5%
12:00 PM	12	70.6%	12:00 PM	11	64.7%
1:00 PM	10	58.8%	1:00 PM	14	82.4%
2:00 PM	8	47.1%	2:00 PM	12	70.6%
3:00 PM	10	58.8%	3:00 PM	9	52.9%
4:00 PM	10	58.8%	4:00 PM	6	35.3%
5:00 PM	14	82.4%	5:00 PM	8	47.1%
6:00 PM	14	82.4%	6:00 PM	14	82.4%
7:00 PM	12	70.6%	7:00 PM	15	88.2%
8:00 PM	13	76.5%	8:00 PM	16	94.1%

Wednesday August 8, 2012			Saturday, August 18, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	12	70.6%	9:00 AM	10	58.8%
10:00 AM	14	82.4%	10:00 AM	13	76.5%
11:00 AM	12	70.6%	11:00 AM	14	82.4%
12:00 PM	12	70.6%	12:00 PM	15	88.2%
1:00 PM	12	70.6%	1:00 PM	15	88.2%
2:00 PM	10	58.8%	2:00 PM	14	82.4%
3:00 PM	8	47.1%	3:00 PM	10	58.8%
4:00 PM	10	58.8%	4:00 PM	7	41.2%
5:00 PM	13	76.5%	5:00 PM	11	64.7%
6:00 PM	15	88.2%	6:00 PM	10	58.8%
7:00 PM	13	76.5%	7:00 PM	13	76.5%
8:00 PM	9	52.9%	8:00 PM	13	76.5%

Thursday, September 06, 2012			Saturday, September 29, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	12	70.6%	9:00 AM	10	58.8%
10:00 AM	11	64.7%	10:00 AM	12	70.6%
11:00 AM	13	76.5%	11:00 AM	15	88.2%
12:00 PM	13	76.5%	12:00 PM	15	88.2%
1:00 PM	14	82.4%	1:00 PM	14	82.4%
2:00 PM	12	70.6%	2:00 PM	12	70.6%
3:00 PM	13	76.5%	3:00 PM	8	47.1%
4:00 PM	8	47.1%	4:00 PM	12	70.6%
5:00 PM	10	58.8%	5:00 PM	9	52.9%
6:00 PM	13	76.5%	6:00 PM	8	47.1%
7:00 PM	14	82.4%	7:00 PM	12	70.6%
8:00 PM	11	64.7%	8:00 PM	9	52.9%

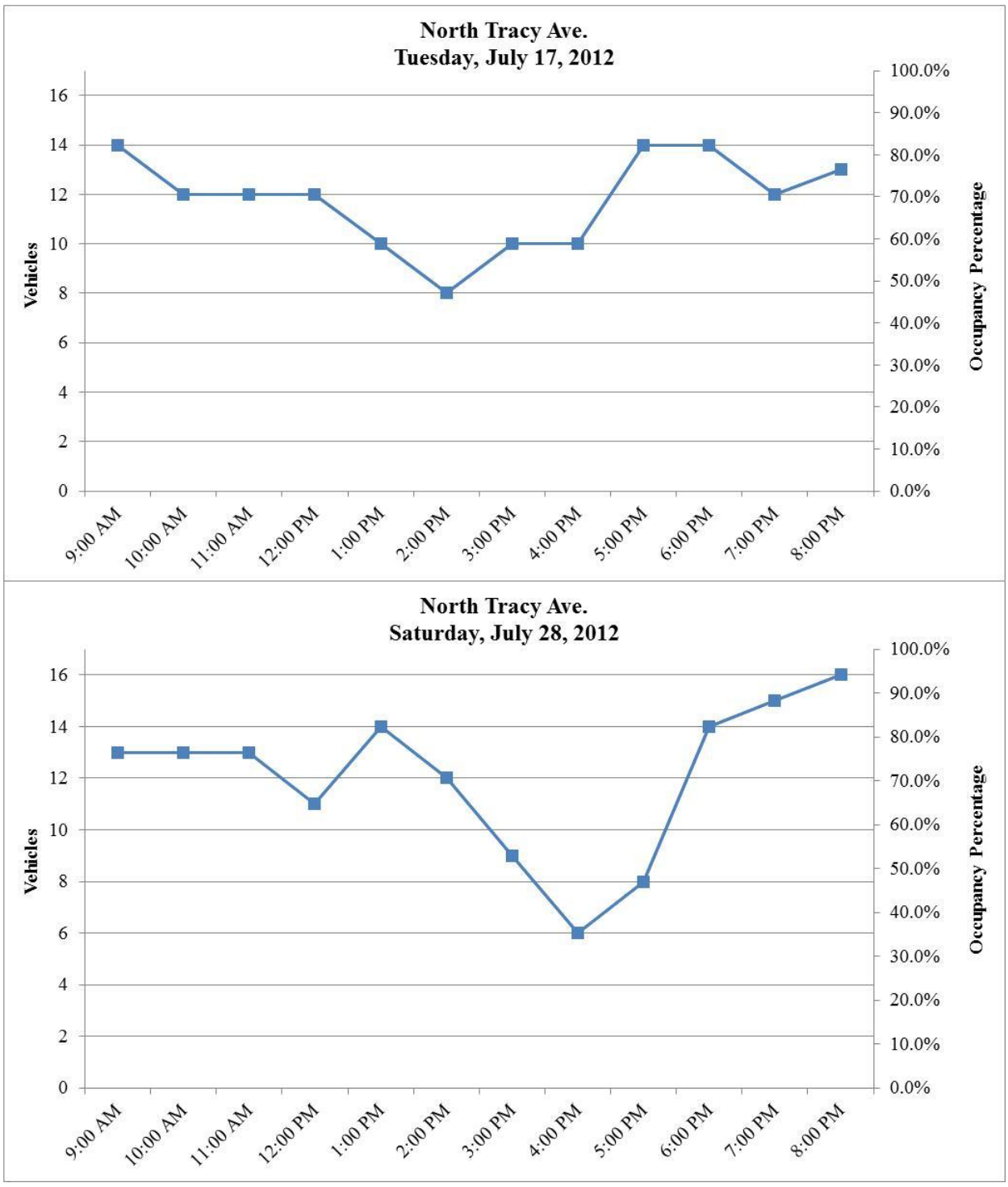


Figure 2-5: North Tracy Ave. vehicle observations versus occupancy rates

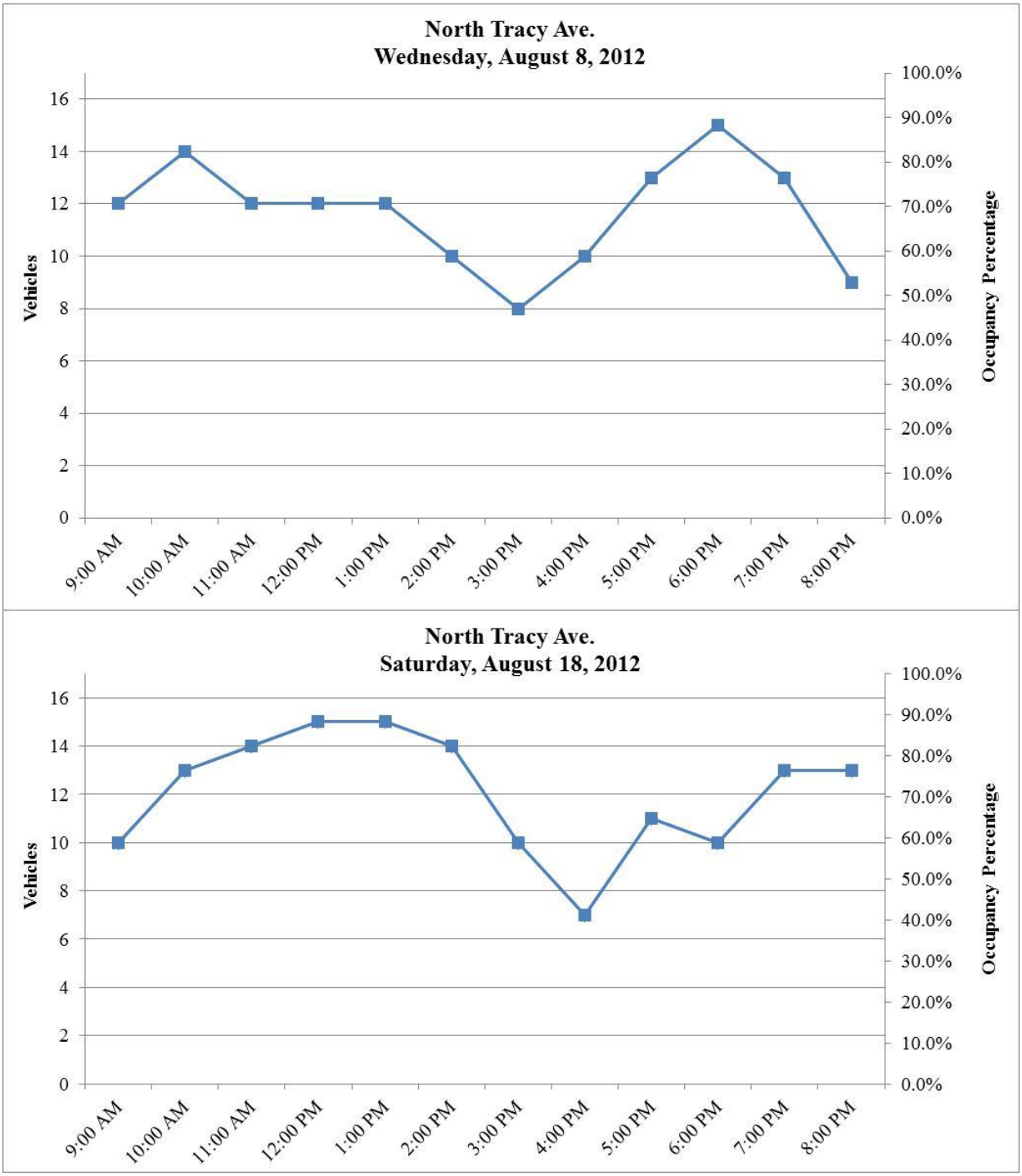


Figure 2-5 cont'd: North Tracy Ave. vehicle observations versus occupancy rates

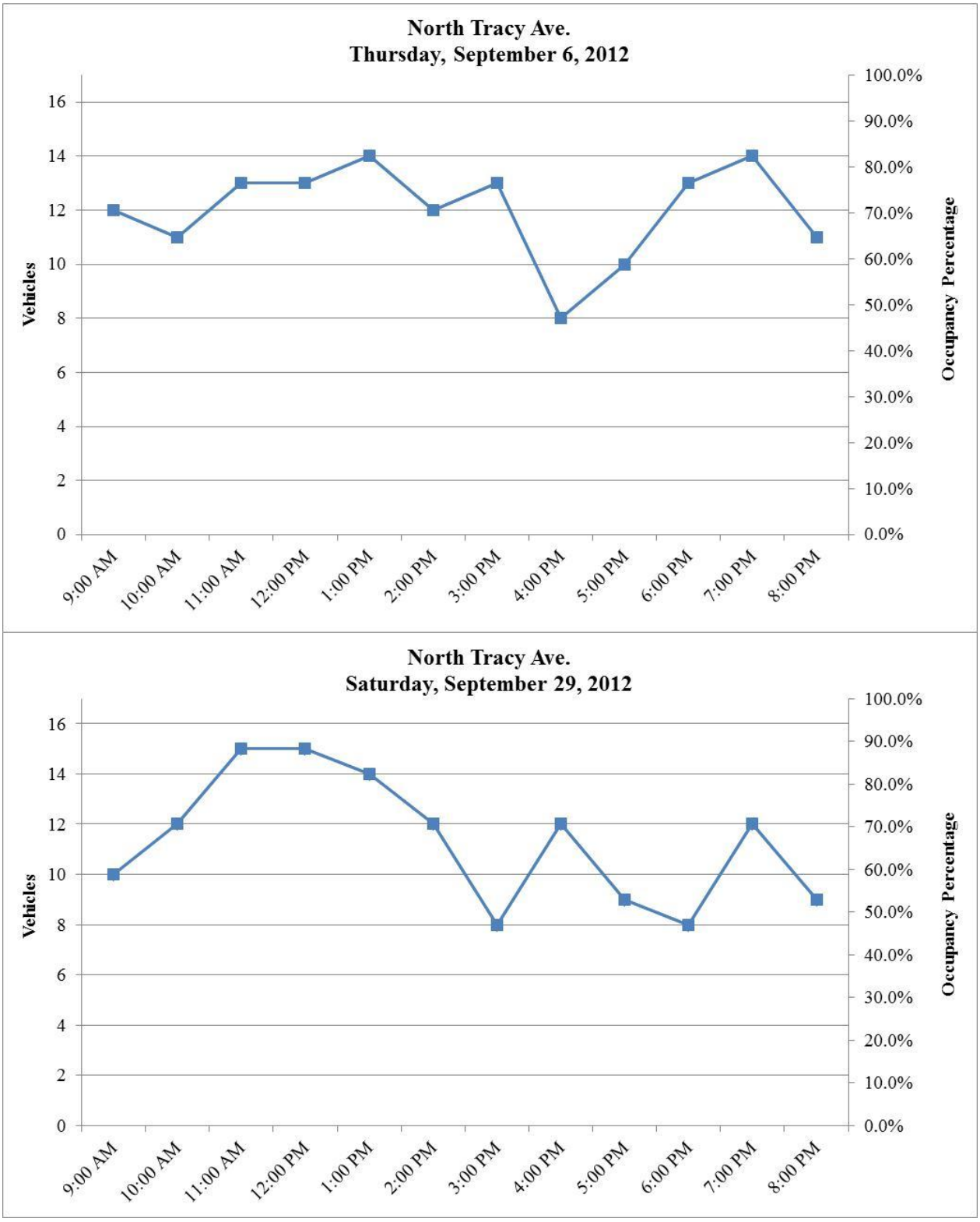


Figure 2-5 cont'd: North Tracy Ave. vehicle observations versus occupancy rates

2.1.6 South Tracy Ave

South Tracy Avenue has approximately 20 on-street parking stalls. Table 2-6 presents both the number of vehicles parked during each observation period, as well as the resulting occupancy rate for the block. The general trend was for occupancy to peak between 12:00 p.m. and 1:00 p.m. on most days and then fluctuate throughout the afternoon. One notable exception to this was Wednesday, August 8th, where occupancy peaked at 3:00 p.m. and then fell into the evening. No clear explanation for this trend was identified. The occupancy trends for this block are further illustrated in Figure 2-2: South Bozeman Ave. vehicle observations versus occupancy ratesFigure 2-6. The peak observed rate was approximately 100 percent occupancy at 1:00 p.m. on Thursday, September 6th. On average, occupancy rates were much lower than this peak throughout the day, typically falling in a range between 60 and 80 percent, similar to that observed on the North Tracy Avenue block.

Table 2-6: South Tracy Ave. parking observations and occupancy rates

Tuesday, July 17, 2012			Saturday, July 28, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	14	70.0%	9:00 AM	14	70.0%
10:00 AM	13	65.0%	10:00 AM	15	75.0%
11:00 AM	16	80.0%	11:00 AM	13	65.0%
12:00 PM	18	90.0%	12:00 PM	15	75.0%
1:00 PM	16	80.0%	1:00 PM	12	60.0%
2:00 PM	10	50.0%	2:00 PM	14	70.0%
3:00 PM	12	60.0%	3:00 PM	7	35.0%
4:00 PM	14	70.0%	4:00 PM	10	50.0%
5:00 PM	15	75.0%	5:00 PM	12	60.0%
6:00 PM	12	60.0%	6:00 PM	8	40.0%
7:00 PM	11	55.0%	7:00 PM	11	55.0%
8:00 PM	10	50.0%	8:00 PM	17	85.0%

Wednesday August 8, 2012			Saturday, August 18, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	13	65.0%	9:00 AM	8	40.0%
10:00 AM	15	75.0%	10:00 AM	13	65.0%
11:00 AM	12	60.0%	11:00 AM	15	75.0%
12:00 PM	15	75.0%	12:00 PM	15	75.0%
1:00 PM	15	75.0%	1:00 PM	19	95.0%
2:00 PM	13	65.0%	2:00 PM	16	80.0%
3:00 PM	17	85.0%	3:00 PM	13	65.0%
4:00 PM	16	80.0%	4:00 PM	12	60.0%
5:00 PM	9	45.0%	5:00 PM	6	30.0%
6:00 PM	6	30.0%	6:00 PM	11	55.0%
7:00 PM	9	45.0%	7:00 PM	18	90.0%
8:00 PM	8	40.0%	8:00 PM	13	65.0%

Thursday, September 06, 2012			Saturday, September 29, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	11	55.0%	9:00 AM	11	55.0%
10:00 AM	16	80.0%	10:00 AM	14	70.0%
11:00 AM	13	65.0%	11:00 AM	15	75.0%
12:00 PM	15	75.0%	12:00 PM	13	65.0%
1:00 PM	20	100.0%	1:00 PM	17	85.0%
2:00 PM	16	80.0%	2:00 PM	15	75.0%
3:00 PM	15	75.0%	3:00 PM	9	45.0%
4:00 PM	17	85.0%	4:00 PM	12	60.0%
5:00 PM	14	70.0%	5:00 PM	10	50.0%
6:00 PM	13	65.0%	6:00 PM	10	50.0%
7:00 PM	16	80.0%	7:00 PM	9	45.0%
8:00 PM	15	75.0%	8:00 PM	7	35.0%

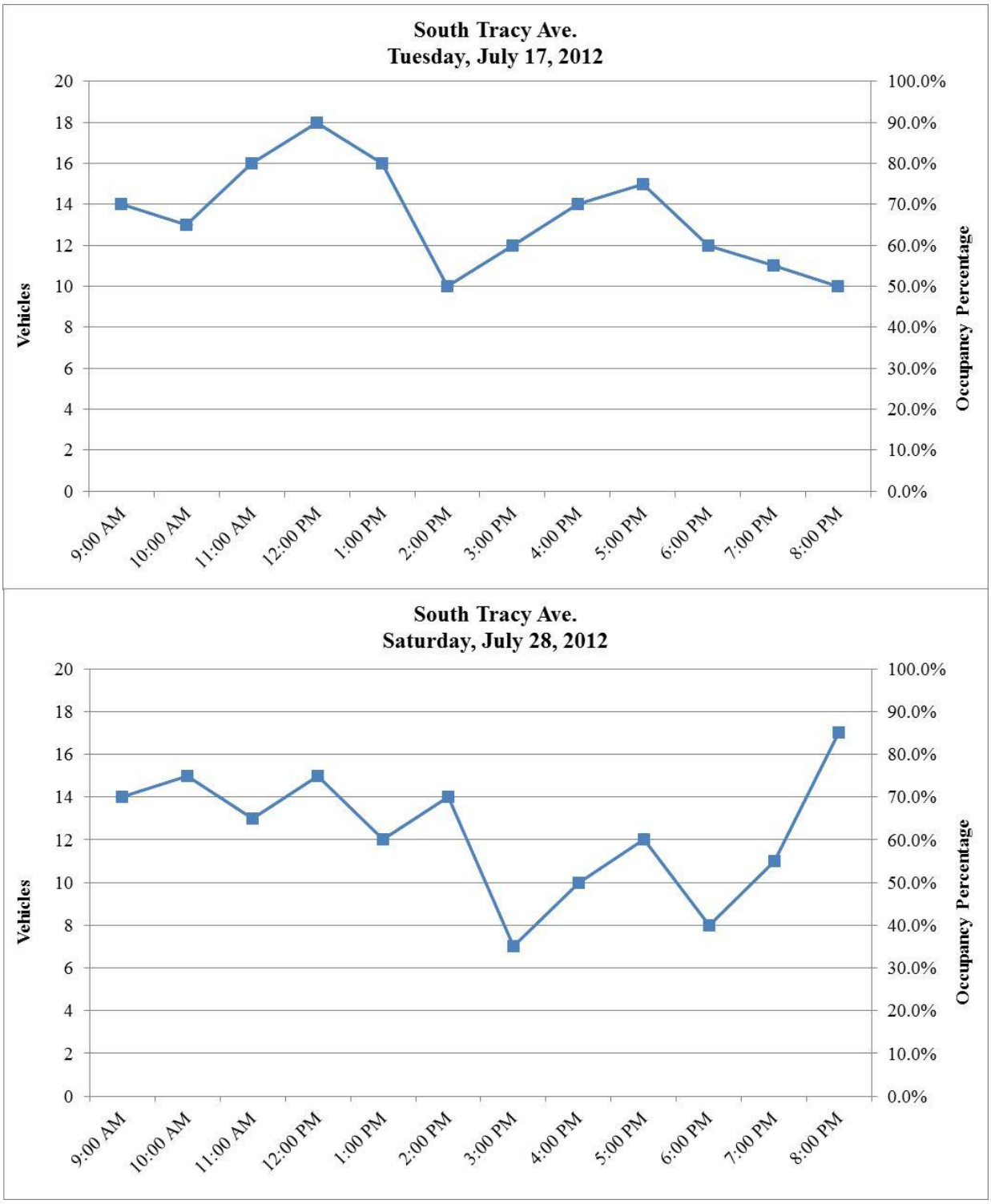


Figure 2-6: South Tracy Ave. vehicle observations versus occupancy rates

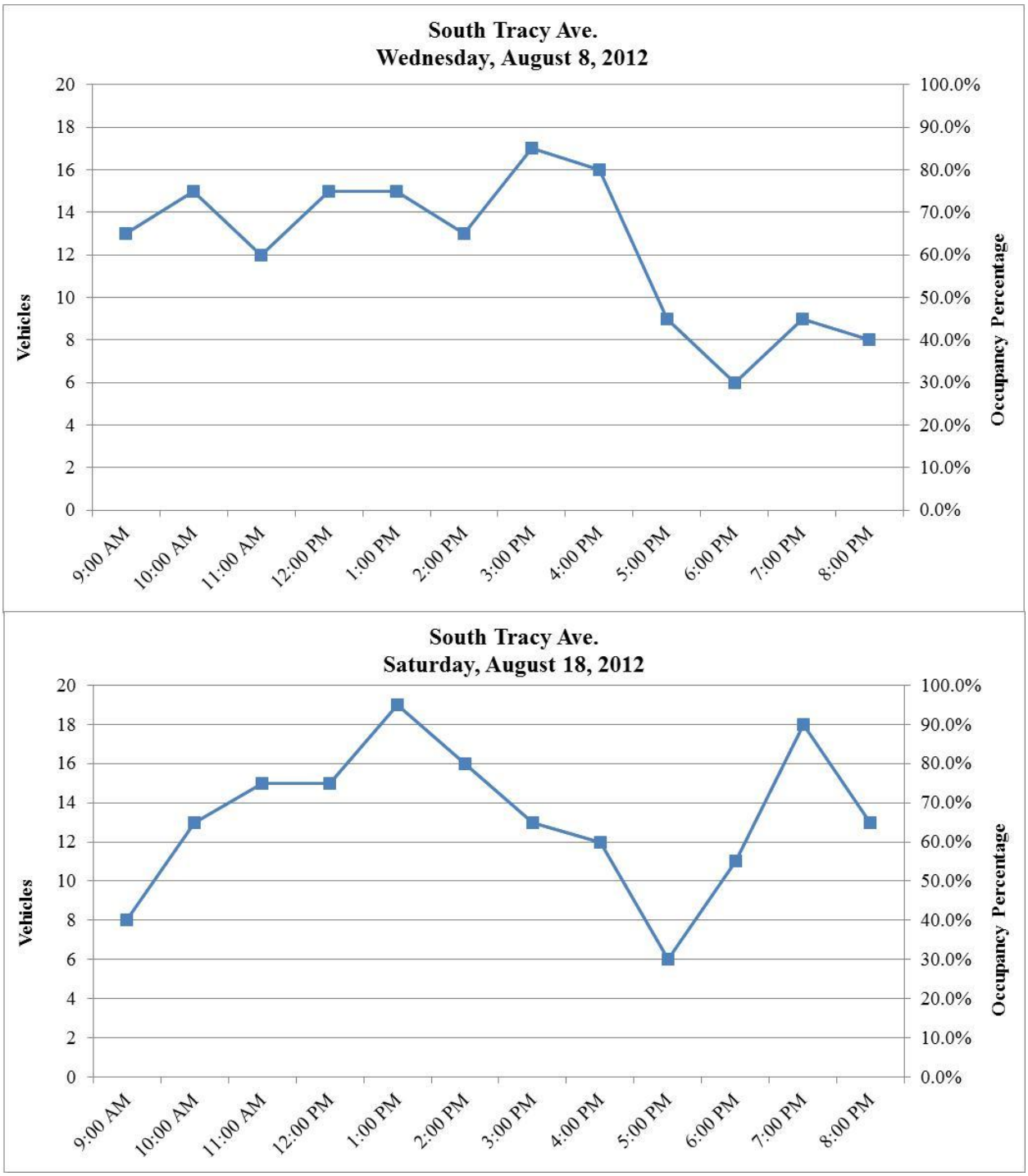


Figure 2-6 cont'd: South Tracy Ave. vehicle observations versus occupancy rates

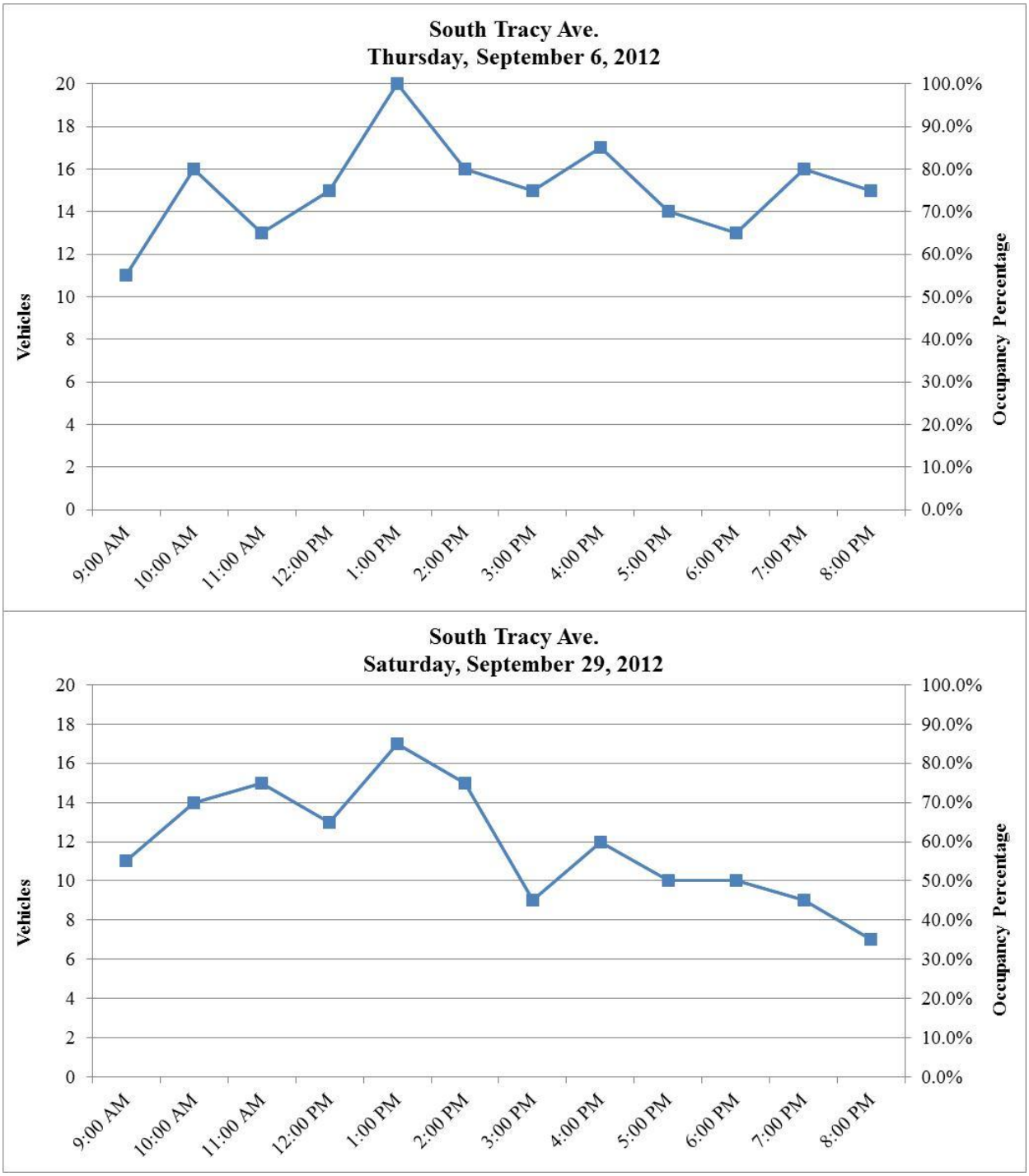


Figure 2-6 cont'd: South Tracy Ave. vehicle observations versus occupancy rates

2.1.7 North Willson Ave

North Willson Avenue has approximately 9 on-street parking stalls. As requested by the Parking Commission, only the west side of this block face was observed. This modification accounts for the lower number of on-street stalls compared to other blocks. Table 2-7 presents both the number of vehicles parked during each observation period, as well as the resulting occupancy rate for the block. The general trend for this block was for occupancy to peak during the evening, typically between 5:00 p.m. and 7:00 p.m. In many cases, this peak was 100 percent occupancy and spanned several hours. Similar to other blocks, a peak was also observed between 12:00 p.m. and 1:00 p.m., but this peak was often lower than those observed during the evening. The occupancy trends for this block are further illustrated in Figure 2-2: South Bozeman Ave. vehicle observations versus occupancy ratesFigure 2-7. On average, occupancy rates were typically above 70 percent, which was expected given the proximity of the block to the downtown core.

Table 2-7: North Willson Ave. parking observations and occupancy rates

Tuesday, July 17, 2012			Saturday, July 28, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	4	44.4%	9:00 AM	4	44.4%
10:00 AM	2	22.2%	10:00 AM	1	11.1%
11:00 AM	4	44.4%	11:00 AM	8	88.9%
12:00 PM	9	100.0%	12:00 PM	8	88.9%
1:00 PM	8	88.9%	1:00 PM	8	88.9%
2:00 PM	8	88.9%	2:00 PM	5	55.6%
3:00 PM	8	88.9%	3:00 PM	7	77.8%
4:00 PM	5	55.6%	4:00 PM	4	44.4%
5:00 PM	8	88.9%	5:00 PM	7	77.8%
6:00 PM	9	100.0%	6:00 PM	7	77.8%
7:00 PM	9	100.0%	7:00 PM	9	100.0%
8:00 PM	8	88.9%	8:00 PM	9	100.0%

Wednesday August 8, 2012			Saturday, August 18, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	5	55.6%	9:00 AM	7	77.8%
10:00 AM	7	77.8%	10:00 AM	9	100.0%
11:00 AM	5	55.6%	11:00 AM	8	88.9%
12:00 PM	8	88.9%	12:00 PM	8	88.9%
1:00 PM	6	66.7%	1:00 PM	9	100.0%
2:00 PM	6	66.7%	2:00 PM	7	77.8%
3:00 PM	5	55.6%	3:00 PM	5	55.6%
4:00 PM	7	77.8%	4:00 PM	3	33.3%
5:00 PM	9	100.0%	5:00 PM	8	88.9%
6:00 PM	9	100.0%	6:00 PM	7	77.8%
7:00 PM	9	100.0%	7:00 PM	9	100.0%
8:00 PM	8	88.9%	8:00 PM	7	77.8%

Thursday, September 06, 2012			Saturday, September 29, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	7	77.8%	9:00 AM	7	77.8%
10:00 AM	4	44.4%	10:00 AM	2	22.2%
11:00 AM	7	77.8%	11:00 AM	7	77.8%
12:00 PM	5	55.6%	12:00 PM	2	22.2%
1:00 PM	8	88.9%	1:00 PM	6	66.7%
2:00 PM	8	88.9%	2:00 PM	6	66.7%
3:00 PM	6	66.7%	3:00 PM	6	66.7%
4:00 PM	7	77.8%	4:00 PM	8	88.9%
5:00 PM	9	100.0%	5:00 PM	8	88.9%
6:00 PM	9	100.0%	6:00 PM	9	100.0%
7:00 PM	9	100.0%	7:00 PM	9	100.0%
8:00 PM	9	100.0%	8:00 PM	8	88.9%

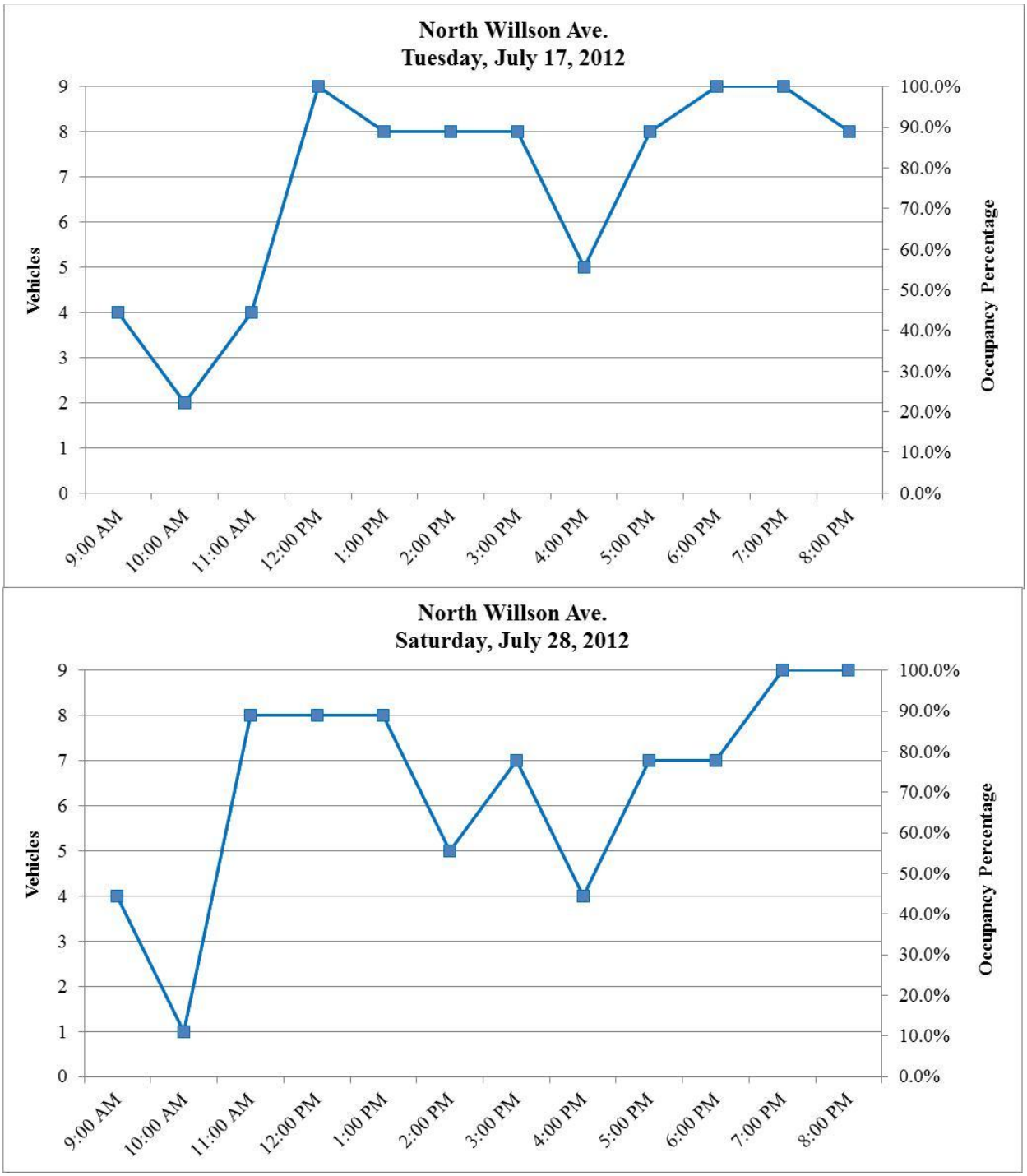


Figure 2-7: North Willson Ave. vehicle observations versus occupancy rates

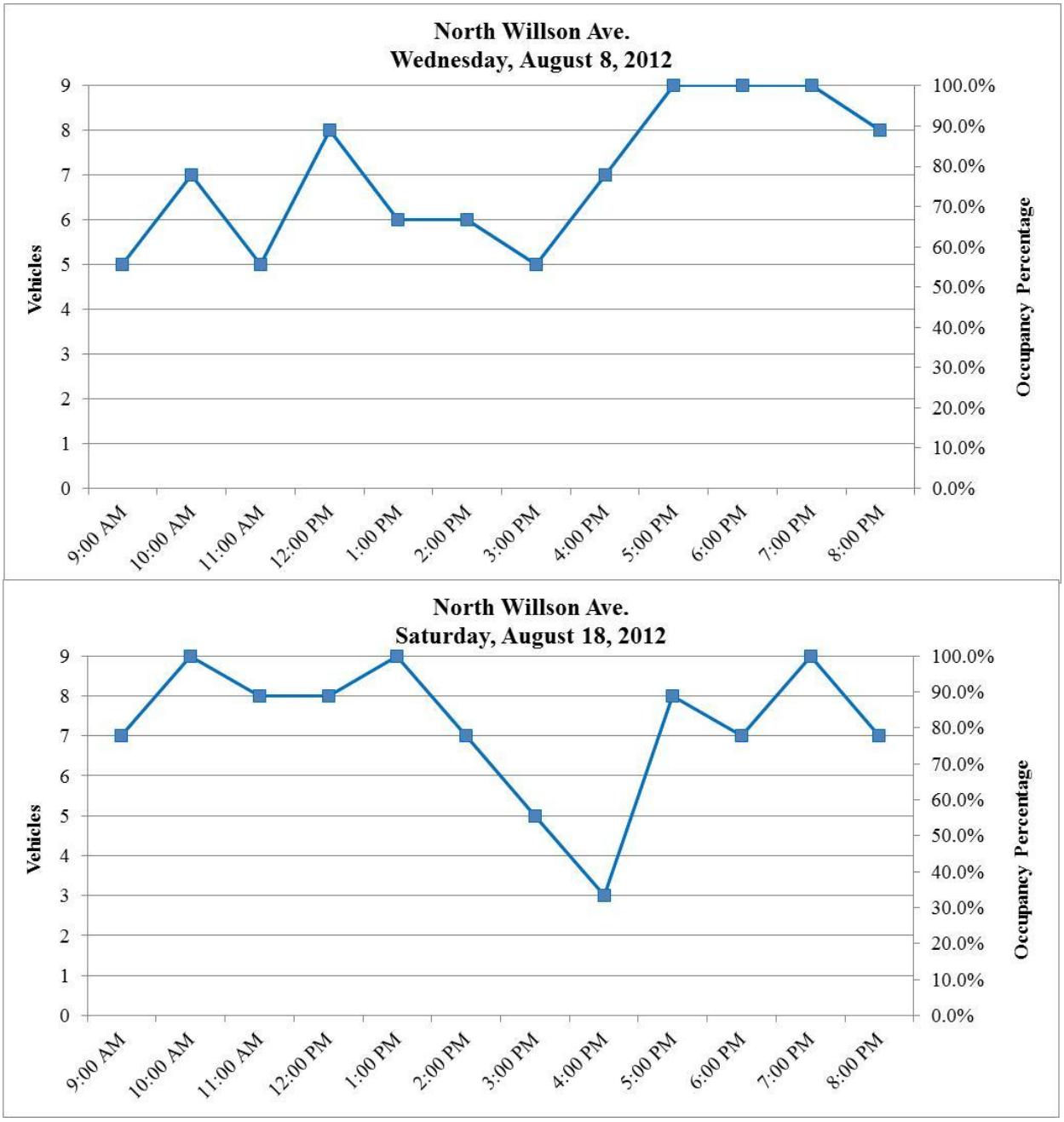


Figure 2-7 cont'd: North Willson Ave. vehicle observations versus occupancy rates

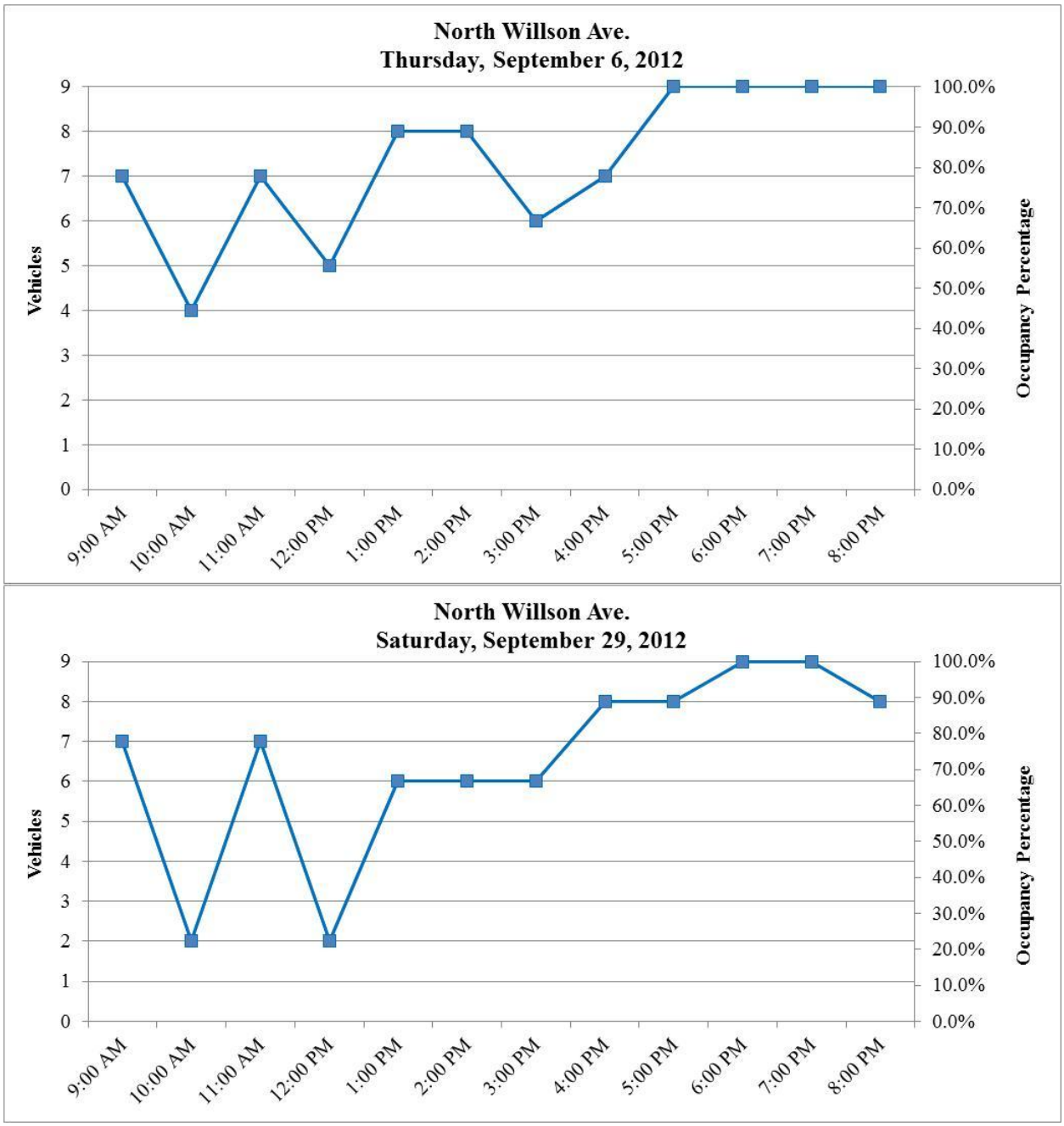


Figure 2-7 cont'd: North Willson Ave. vehicle observations versus occupancy rates

2.1.8 South Willson Ave

South Willson Avenue has approximately 20 on-street parking stalls. Table 2-8 presents both the number of vehicles parked during each observation period, as well as the resulting occupancy rate for the block. Similar to other blocks, an initial peak occupancy was observed between 12:00 p.m. and 1:00 p.m. each day, followed by a second, typically higher peak in the evening between 6:00 p.m. and 7:00 p.m. The exception to this higher evening peak was on Tuesday, July 17th, when the second peak (which was lower than the 12:00 p.m. peak that day) occurred at 5:00 p.m. The occupancy trends for this block are further illustrated in Figure 2-2: South Bozeman Ave. vehicle observations versus occupancy ratesFigure 2-8. On average, occupancy rates were typically above 60 percent, with a peak occupancy of 100 percent observed on Tuesday, July 17th at 12:00 p.m. and Wednesday, August 7th at 7:00 p.m.

Table 2-8: South Willson Ave. parking observations and occupancy rates

Tuesday, July 17, 2012			Saturday, July 28, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	10	50.0%	9:00 AM	9	45.0%
10:00 AM	10	50.0%	10:00 AM	10	50.0%
11:00 AM	13	65.0%	11:00 AM	11	55.0%
12:00 PM	20	100.0%	12:00 PM	17	85.0%
1:00 PM	18	90.0%	1:00 PM	17	85.0%
2:00 PM	13	65.0%	2:00 PM	10	50.0%
3:00 PM	11	55.0%	3:00 PM	16	80.0%
4:00 PM	14	70.0%	4:00 PM	14	70.0%
5:00 PM	17	85.0%	5:00 PM	13	65.0%
6:00 PM	16	80.0%	6:00 PM	12	60.0%
7:00 PM	14	70.0%	7:00 PM	18	90.0%
8:00 PM	12	60.0%	8:00 PM	17	85.0%

Wednesday August 8, 2012			Saturday, August 18, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	4	20.0%	9:00 AM	10	50.0%
10:00 AM	10	50.0%	10:00 AM	13	65.0%
11:00 AM	9	45.0%	11:00 AM	16	80.0%
12:00 PM	16	80.0%	12:00 PM	15	75.0%
1:00 PM	16	80.0%	1:00 PM	16	80.0%
2:00 PM	15	75.0%	2:00 PM	14	70.0%
3:00 PM	15	75.0%	3:00 PM	11	55.0%
4:00 PM	14	70.0%	4:00 PM	11	55.0%
5:00 PM	14	70.0%	5:00 PM	14	70.0%
6:00 PM	19	95.0%	6:00 PM	18	90.0%
7:00 PM	19	95.0%	7:00 PM	20	100.0%
8:00 PM	12	60.0%	8:00 PM	18	90.0%

Thursday, September 06, 2012			Saturday, September 29, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	9	45.0%	9:00 AM	3	15.0%
10:00 AM	13	65.0%	10:00 AM	1	5.0%
11:00 AM	13	65.0%	11:00 AM	16	80.0%
12:00 PM	14	70.0%	12:00 PM	16	80.0%
1:00 PM	18	90.0%	1:00 PM	18	90.0%
2:00 PM	11	55.0%	2:00 PM	16	80.0%
3:00 PM	13	65.0%	3:00 PM	13	65.0%
4:00 PM	17	85.0%	4:00 PM	16	80.0%
5:00 PM	14	70.0%	5:00 PM	16	80.0%
6:00 PM	15	75.0%	6:00 PM	19	95.0%
7:00 PM	19	95.0%	7:00 PM	18	90.0%
8:00 PM	17	85.0%	8:00 PM	19	95.0%

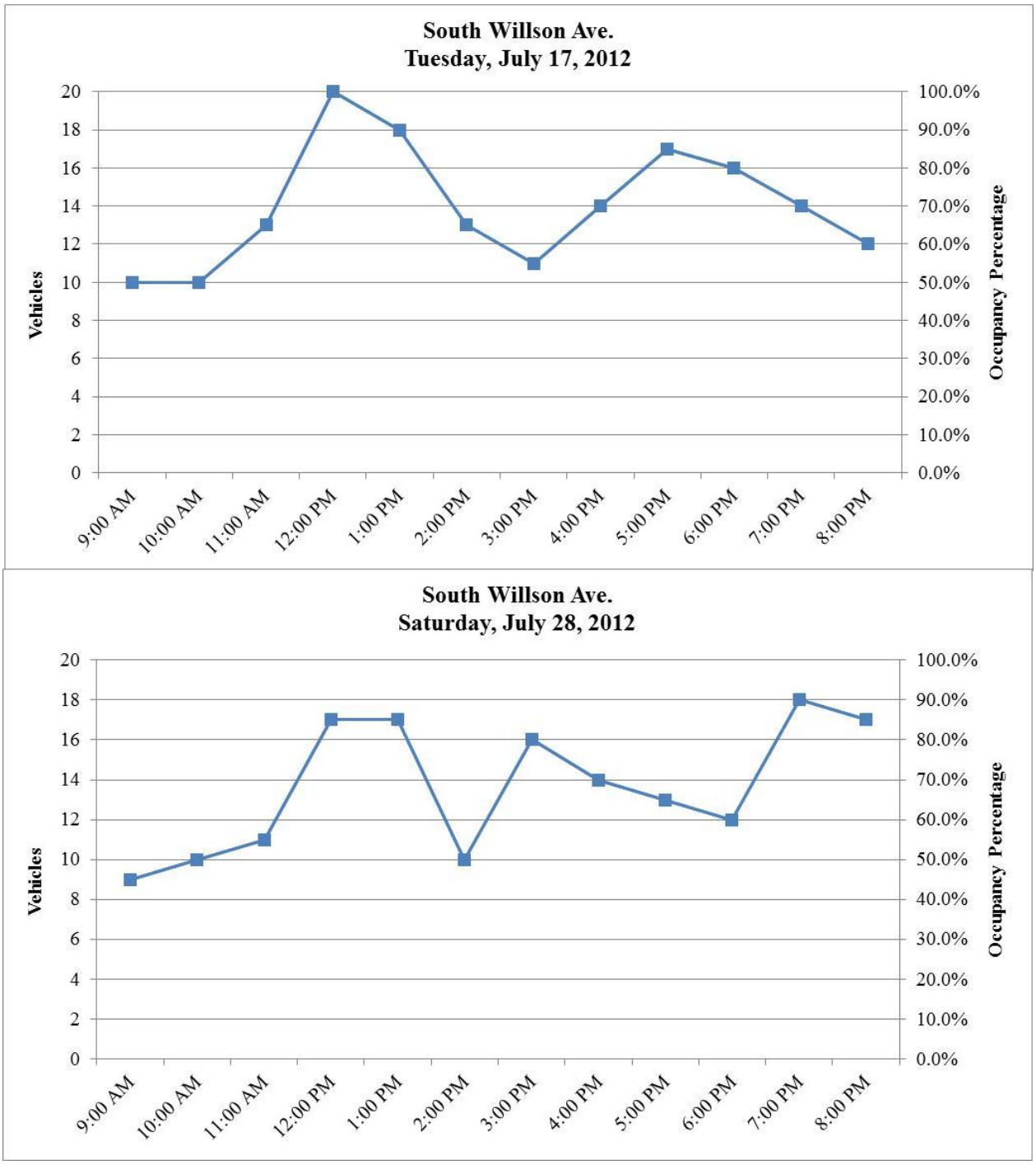
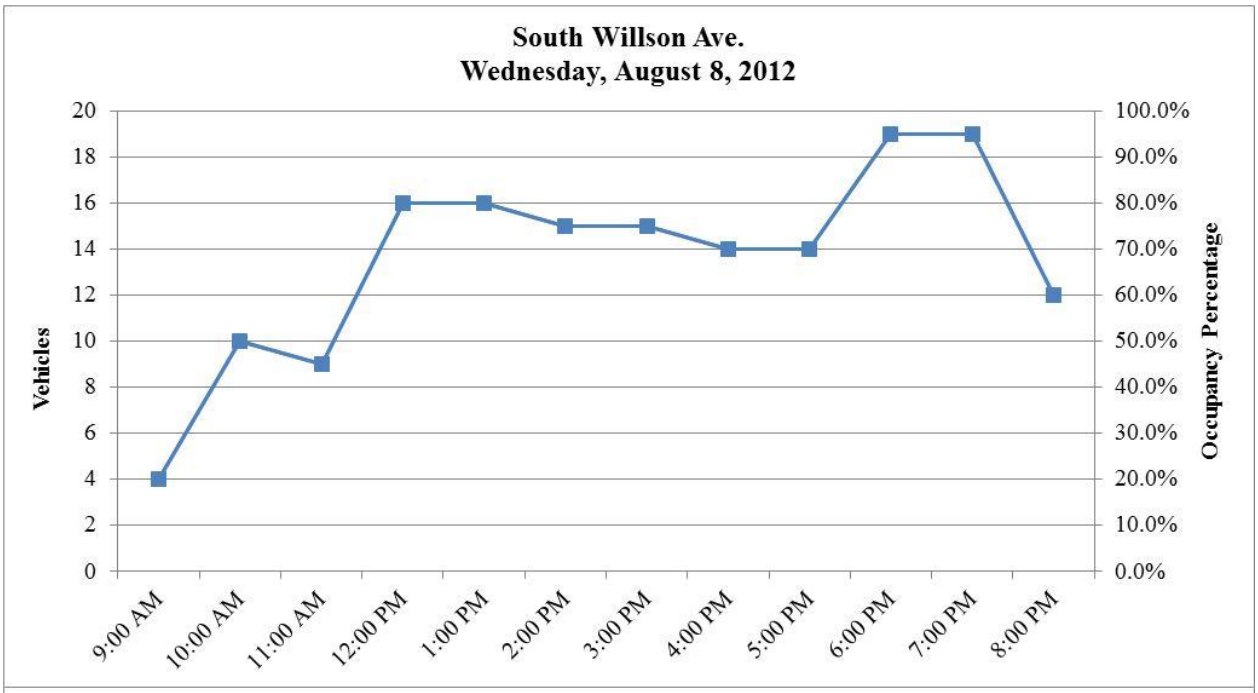


Figure 2-8: South Willson Ave. vehicle observations versus occupancy rates



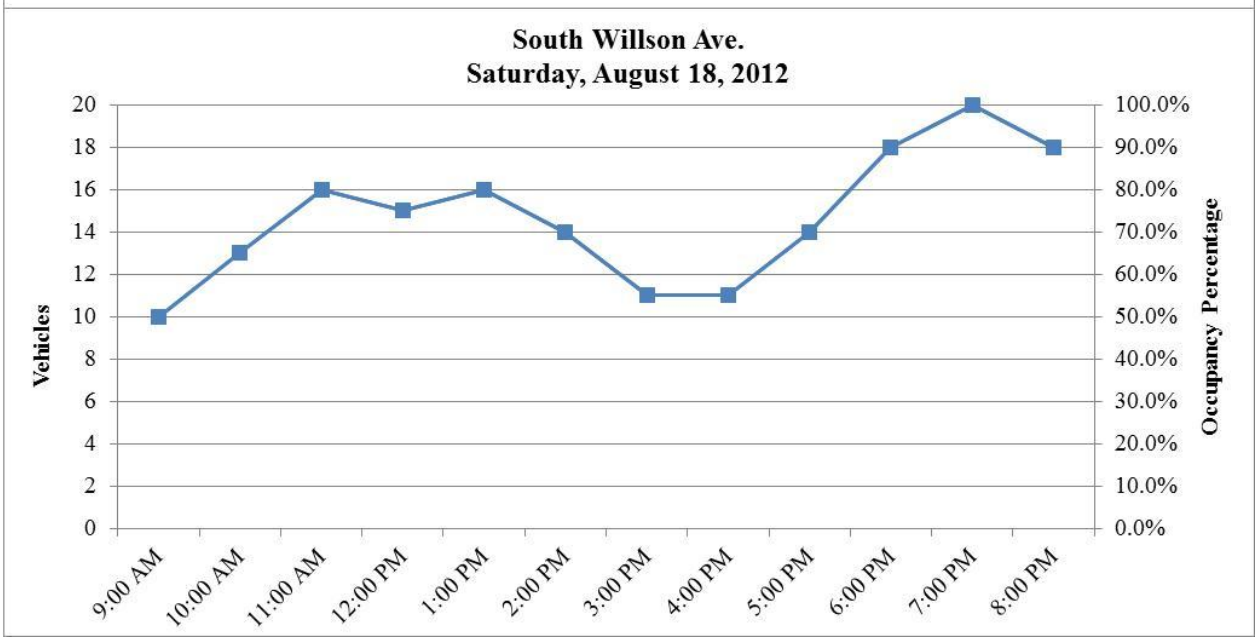
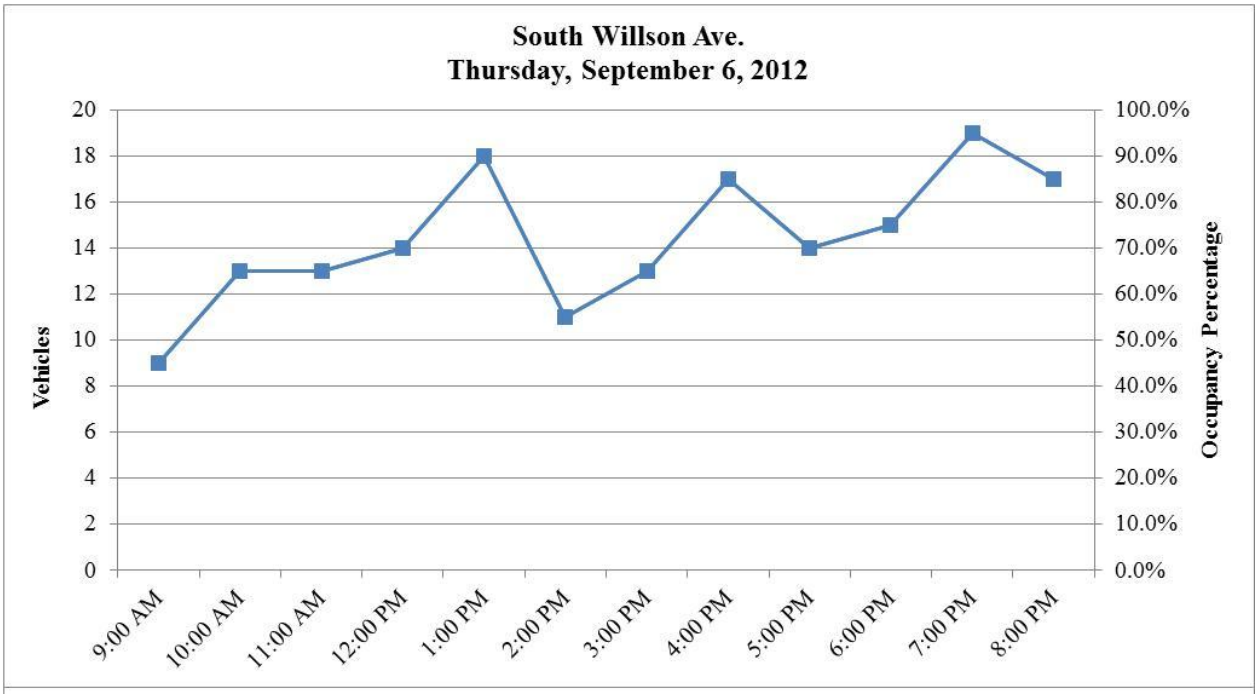


Figure 2-8 cont'd: South Willson Ave. vehicle observations versus occupancy rates



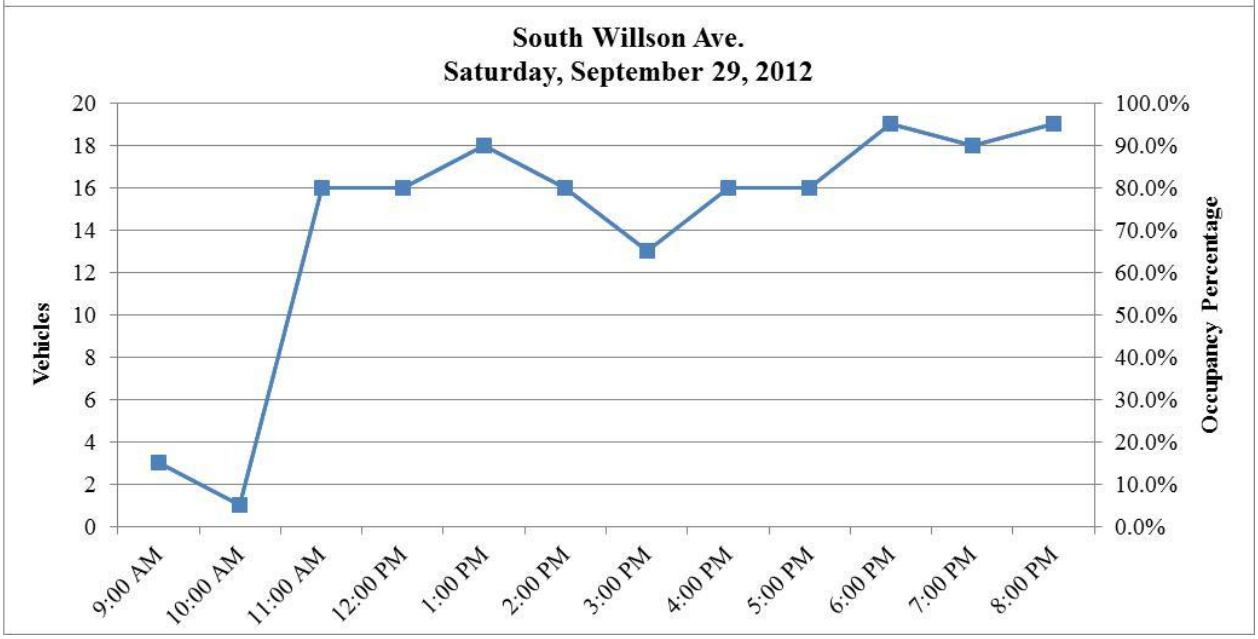


Figure 2-8 cont'd: South Willson Ave. vehicle observations versus occupancy rates

2.2 Lot-Specific Occupancy Rates

In addition to examining block-level occupancy rates, the Bozeman Parking Commission was also interested in the individual occupancy rates of four specific city-owned lots. These were the two lots located at the northeast and southeast corners of the Mendenhall Street and North Willson Avenue intersection (Willson and Armory lots, respectively); the Carnegie lot, located at the southeast corner of Mendenhall Street and Black Avenue; and the Rouse lot, located at the northwest corner of Babcock Street and Rouse Avenue. The following sections discuss the results of the occupancy rate analysis conducted for each of these specific parking lots.

2.2.1 Armory Lot

This off-street lot, located at the southeast corner of Mendenhall Street and North Willson Avenue, has a total of 28 stalls. Table 2-9 presents both the number of vehicles parked during each observation period, as well as the resulting occupancy rate for the lot. This lot showed a pattern of occupancy rising throughout the morning, peaking during the 12:00 p.m. hour, and then fluctuating throughout the afternoon before peaking once again in the evening. At many times throughout the day on each study date, the lot had high occupancy, exceeding 80 percent. This was not surprising given its proximity to the downtown core. The occupancy trends for this lot are further illustrated in Figure 2-2: South Bozeman Ave. vehicle observations versus occupancy ratesFigure 2-9. The trends observed in this lot matched those from the 2010 study, which also saw high occupancies throughout the day and two peaks during the noon and early evening hours. Comparisons between 2010 and 2012 figures will be discussed in a later section of this chapter.

Table 2-9: Armory lot parking observations and occupancy rates

Tuesday, July 17, 2012			Saturday, July 28, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	2	7.1%	9:00 AM	11	39.3%
10:00 AM	4	14.3%	10:00 AM	15	53.6%
11:00 AM	21	75.0%	11:00 AM	17	60.7%
12:00 PM	24	85.7%	12:00 PM	26	92.9%
1:00 PM	26	92.9%	1:00 PM	23	82.1%
2:00 PM	24	85.7%	2:00 PM	20	71.4%
3:00 PM	17	60.7%	3:00 PM	14	50.0%
4:00 PM	16	57.1%	4:00 PM	14	50.0%
5:00 PM	20	71.4%	5:00 PM	18	64.3%
6:00 PM	25	89.3%	6:00 PM	23	82.1%
7:00 PM	25	89.3%	7:00 PM	27	96.4%
8:00 PM	22	78.6%	8:00 PM	27	96.4%

Wednesday August 8, 2012			Saturday, August 18, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	8	28.6%	9:00 AM	18	64.3%
10:00 AM	13	46.4%	10:00 AM	22	78.6%
11:00 AM	11	39.3%	11:00 AM	24	85.7%
12:00 PM	25	89.3%	12:00 PM	25	89.3%
1:00 PM	23	82.1%	1:00 PM	23	82.1%
2:00 PM	22	78.6%	2:00 PM	19	67.9%
3:00 PM	19	67.9%	3:00 PM	15	53.6%
4:00 PM	22	78.6%	4:00 PM	10	35.7%
5:00 PM	24	85.7%	5:00 PM	23	82.1%
6:00 PM	25	89.3%	6:00 PM	27	96.4%
7:00 PM	27	96.4%	7:00 PM	27	96.4%
8:00 PM	27	96.4%	8:00 PM	26	92.9%

Thursday, September 06, 2012			Saturday, September 29, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	8	28.6%	9:00 AM	11	39.3%
10:00 AM	12	42.9%	10:00 AM	4	14.3%
11:00 AM	16	57.1%	11:00 AM	26	92.9%
12:00 PM	25	89.3%	12:00 PM	14	50.0%
1:00 PM	22	78.6%	1:00 PM	27	96.4%
2:00 PM	21	75.0%	2:00 PM	26	92.9%
3:00 PM	17	60.7%	3:00 PM	21	75.0%
4:00 PM	17	60.7%	4:00 PM	23	82.1%
5:00 PM	24	85.7%	5:00 PM	22	78.6%
6:00 PM	25	89.3%	6:00 PM	26	92.9%
7:00 PM	28	100.0%	7:00 PM	25	89.3%
8:00 PM	27	96.4%	8:00 PM	24	85.7%

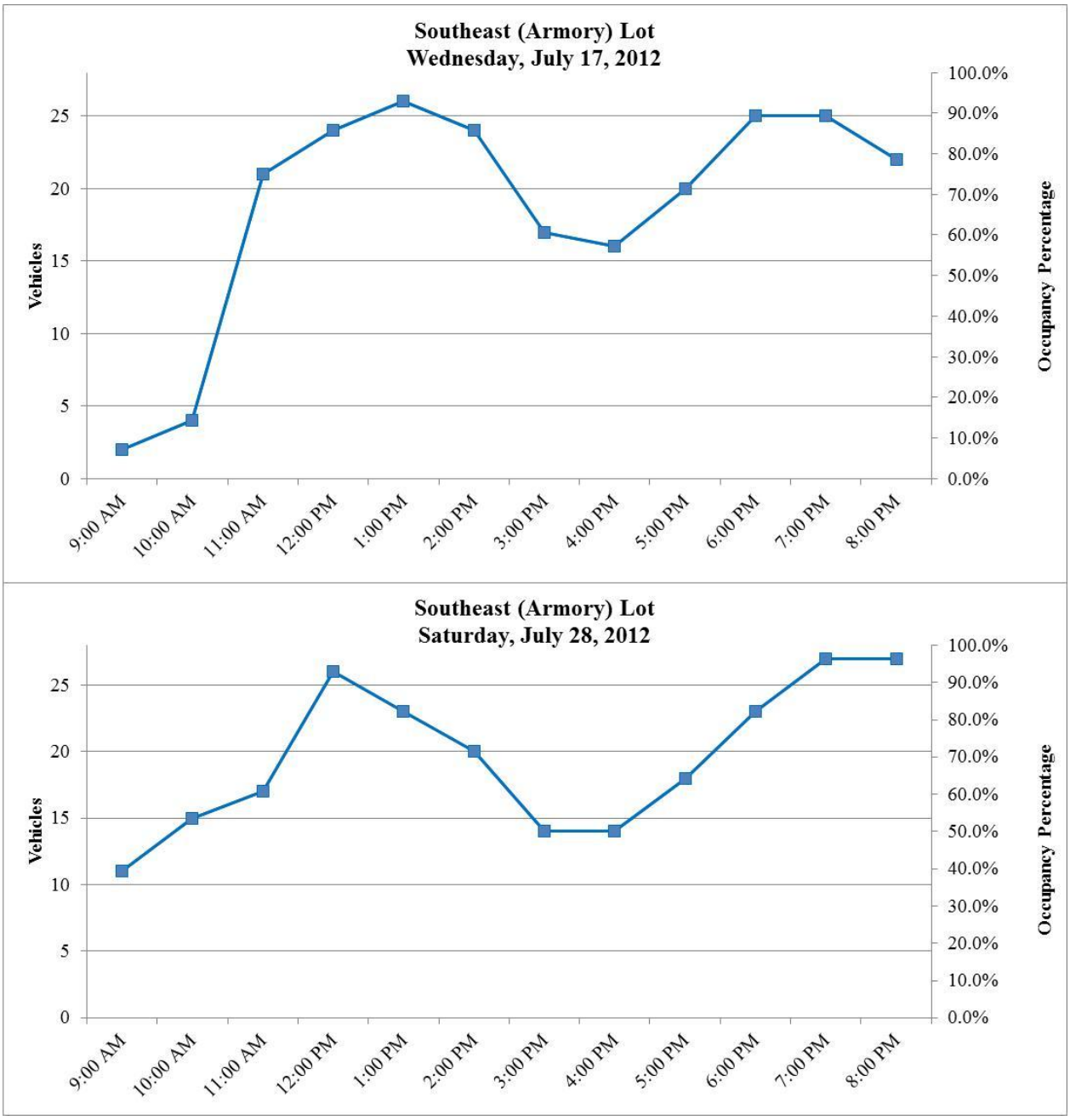


Figure 2-9: Armory lot vehicle observations versus occupancy rates

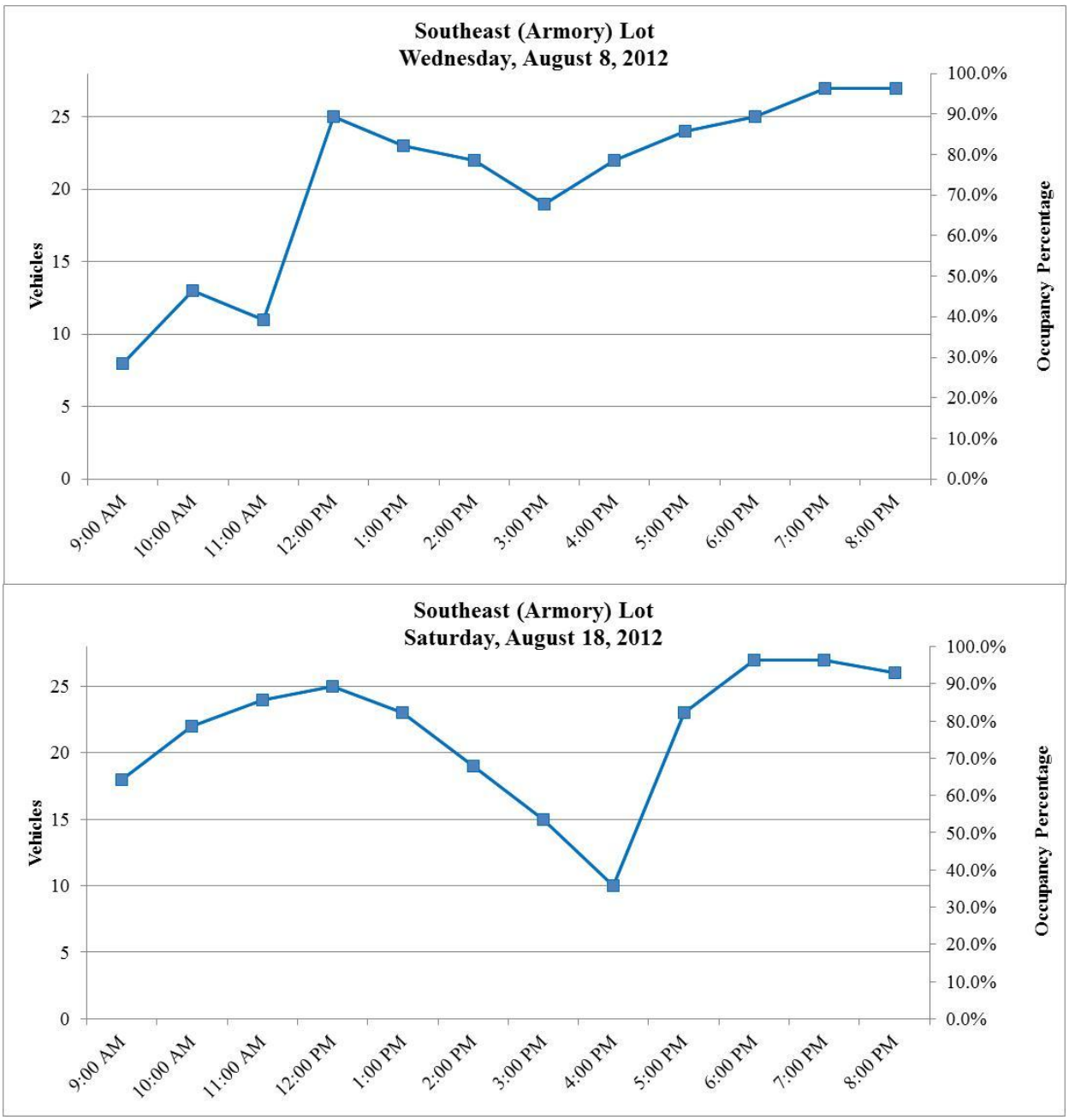


Figure 2-9 cont'd: Armory lot vehicle observations versus occupancy rates

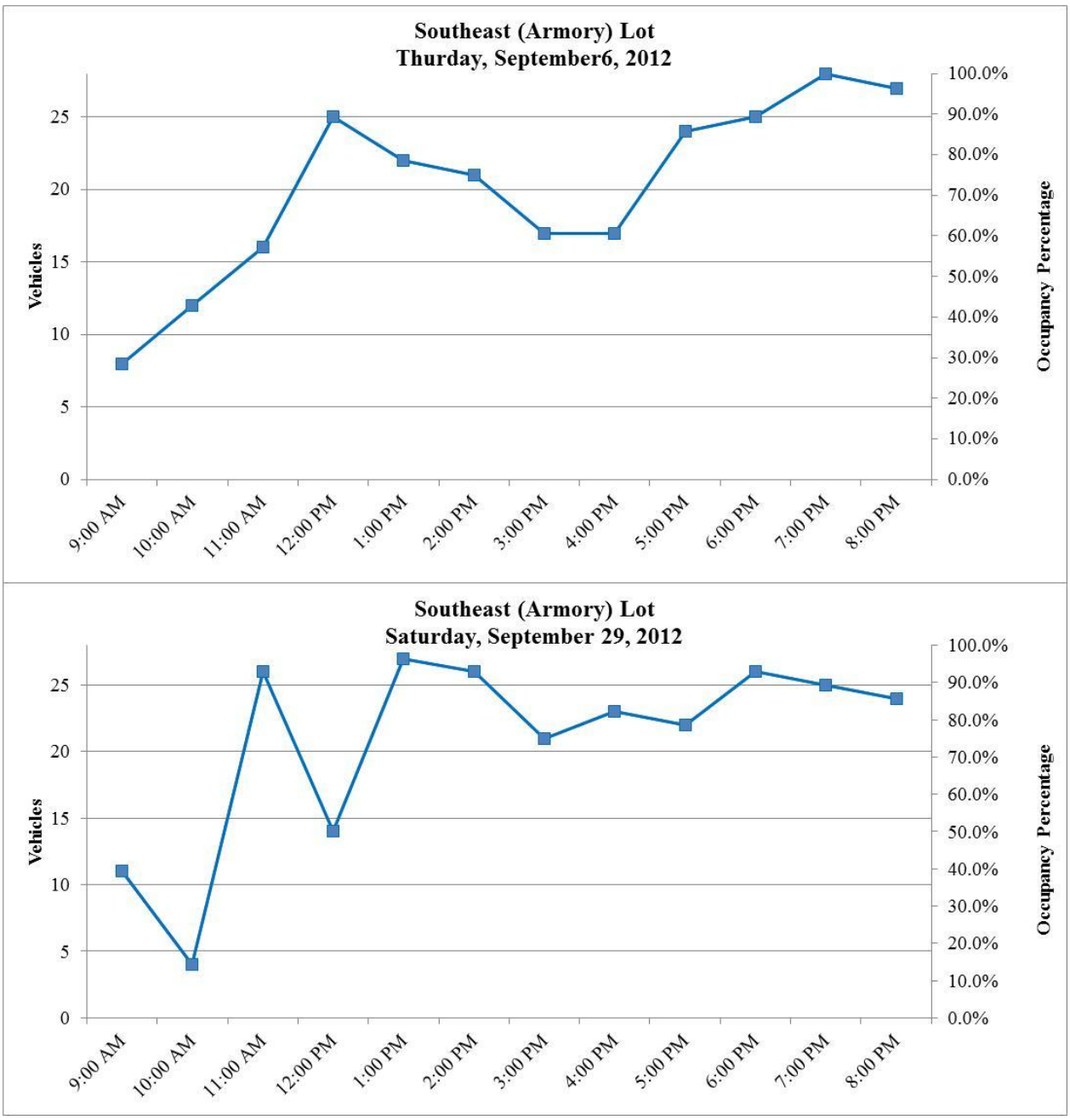


Figure 2-9 cont'd: Armory lot vehicle observations versus occupancy rates

2.2.2 Willson Lot

This off-street lot, located on the northeast corner of Mendenhall Street and North Willson Avenue, has a total of 44 stalls. Table 2-10 presents both the number of vehicles parked during each observation period, as well as the resulting occupancy rate for the lot. This lot showed a pattern of occupancy rising throughout the morning, peaking during the 12:00 p.m. hour, and then dropping off throughout the afternoon, before peaking once again in the evening. Generally, the 12:00 p.m. peak was higher than the evening peak, with the exception of Thursday, September 6th, when the evening peak was higher. On most days, occupancy rates topped out at 90 percent, although in some cases the lot reached 95 percent occupancy. These trends were expected given the proximity of the lot to downtown. The occupancy trends for this lot are further illustrated in Figure 2-2: South Bozeman Ave. vehicle observations versus occupancy ratesFigure 2-10. The trends observed in this lot matched the one date of observation from September 2010, which also saw high occupancies throughout the day and two peaks during the noon and early evening hours. However, in 2010, the evening peak topped out at only around 56 percent occupancy, whereas all evening peaks from 2012 exceeded 80 percent occupancy. Additionally, the 12:00 p.m. peak in 2010 was 81 percent occupancy, while the 2012 peaks for this time were generally around 90 percent, with the exception of approximately 80 percent on Thursday, September 6th. Comparisons between 2010 and 2012 figures will be discussed in a later section of this chapter.

Table 2-10: Willson lot parking observations and occupancy rates

Tuesday, July 17, 2012			Saturday, July 28, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	6	13.6%	9:00 AM	4	9.1%
10:00 AM	11	25.0%	10:00 AM	4	9.1%
11:00 AM	15	34.1%	11:00 AM	8	18.2%
12:00 PM	39	88.6%	12:00 PM	30	68.2%
1:00 PM	34	77.3%	1:00 PM	38	86.4%
2:00 PM	14	31.8%	2:00 PM	23	52.3%
3:00 PM	16	36.4%	3:00 PM	8	18.2%
4:00 PM	17	38.6%	4:00 PM	6	13.6%
5:00 PM	28	63.6%	5:00 PM	6	13.6%
6:00 PM	31	70.5%	6:00 PM	28	63.6%
7:00 PM	38	86.4%	7:00 PM	35	79.5%
8:00 PM	35	79.5%	8:00 PM	34	77.3%

Wednesday August 8, 2012			Saturday, August 18, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	7	15.9%	9:00 AM	15	34.1%
10:00 AM	8	18.2%	10:00 AM	19	43.2%
11:00 AM	10	22.7%	11:00 AM	30	68.2%
12:00 PM	42	95.5%	12:00 PM	39	88.6%
1:00 PM	30	68.2%	1:00 PM	40	90.9%
2:00 PM	21	47.7%	2:00 PM	25	56.8%
3:00 PM	13	29.5%	3:00 PM	11	25.0%
4:00 PM	12	27.3%	4:00 PM	9	20.5%
5:00 PM	27	61.4%	5:00 PM	14	31.8%
6:00 PM	42	95.5%	6:00 PM	23	52.3%
7:00 PM	42	95.5%	7:00 PM	40	90.9%
8:00 PM	36	81.8%	8:00 PM	38	86.4%

Thursday, September 06, 2012			Saturday, September 29, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	10	22.7%	9:00 AM	6	13.6%
10:00 AM	12	27.3%	10:00 AM	7	15.9%
11:00 AM	8	18.2%	11:00 AM	25	56.8%
12:00 PM	26	59.1%	12:00 PM	15	34.1%
1:00 PM	36	81.8%	1:00 PM	39	88.6%
2:00 PM	27	61.4%	2:00 PM	38	86.4%
3:00 PM	20	45.5%	3:00 PM	18	40.9%
4:00 PM	19	43.2%	4:00 PM	15	34.1%
5:00 PM	20	45.5%	5:00 PM	21	47.7%
6:00 PM	28	63.6%	6:00 PM	25	56.8%
7:00 PM	40	90.9%	7:00 PM	35	79.5%
8:00 PM	40	90.9%	8:00 PM	36	81.8%

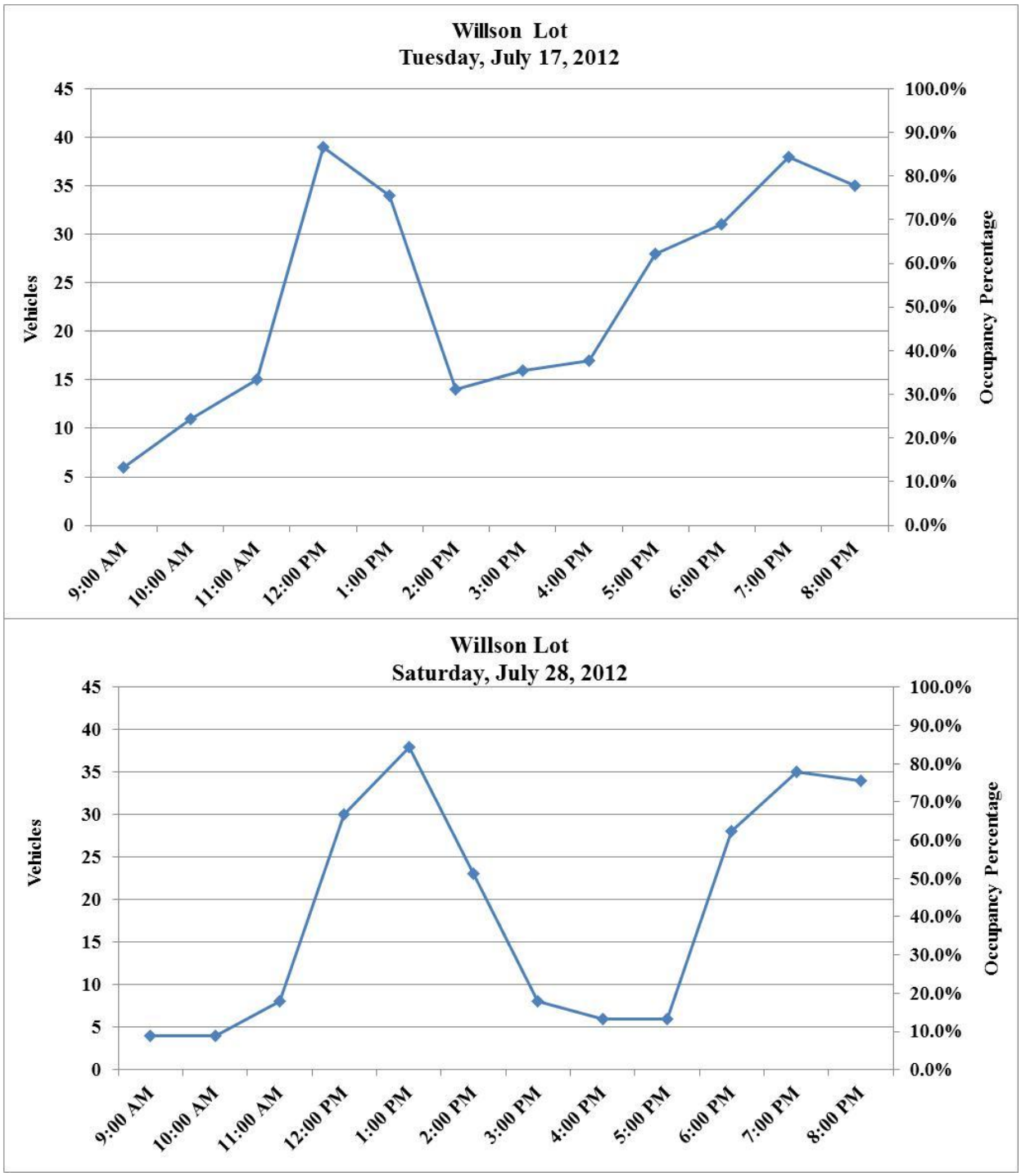


Figure 2-10: Willson lot vehicle observations versus occupancy rates

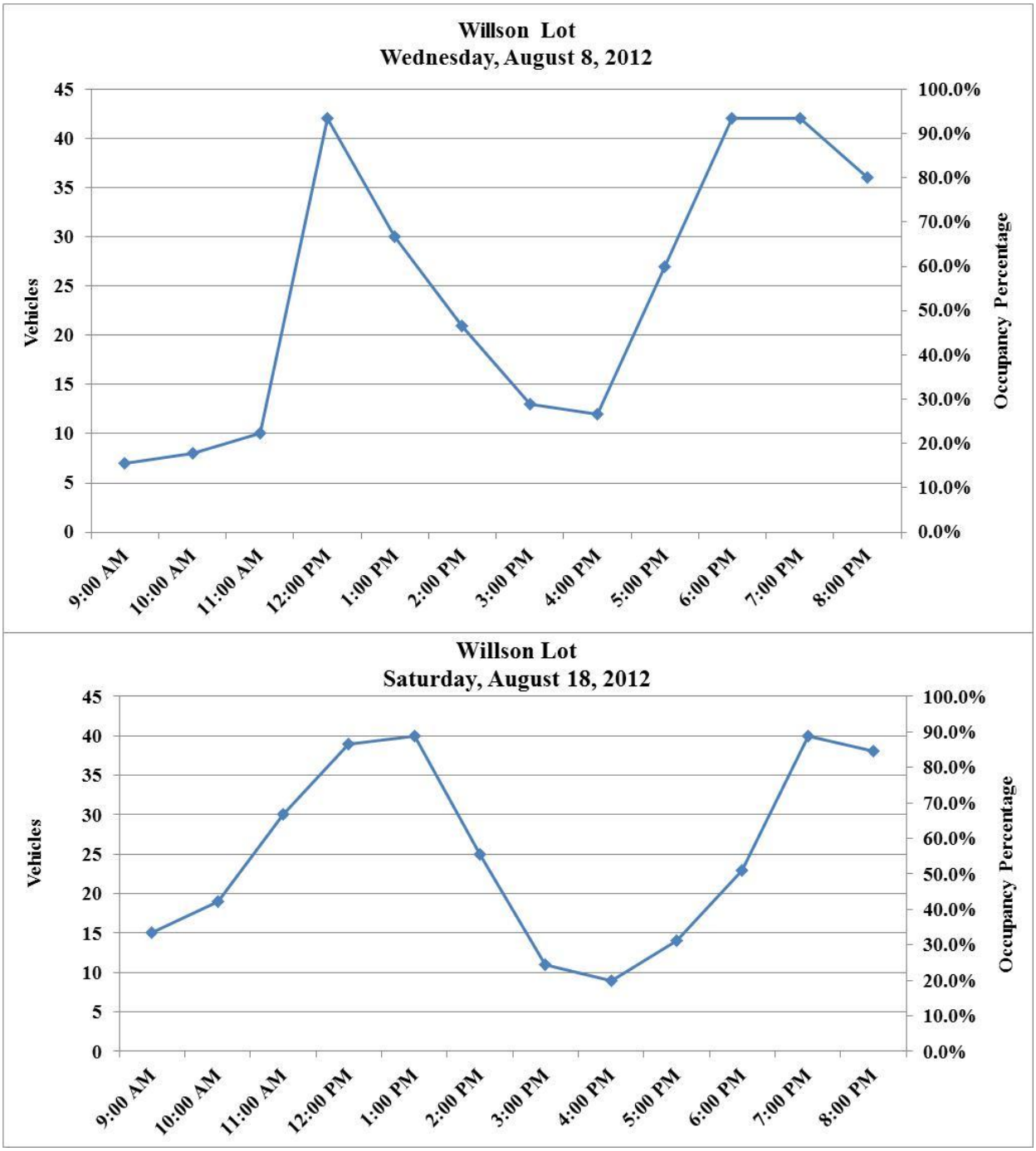


Figure 2-10 cont'd: Willson lot vehicle observations versus occupancy rates

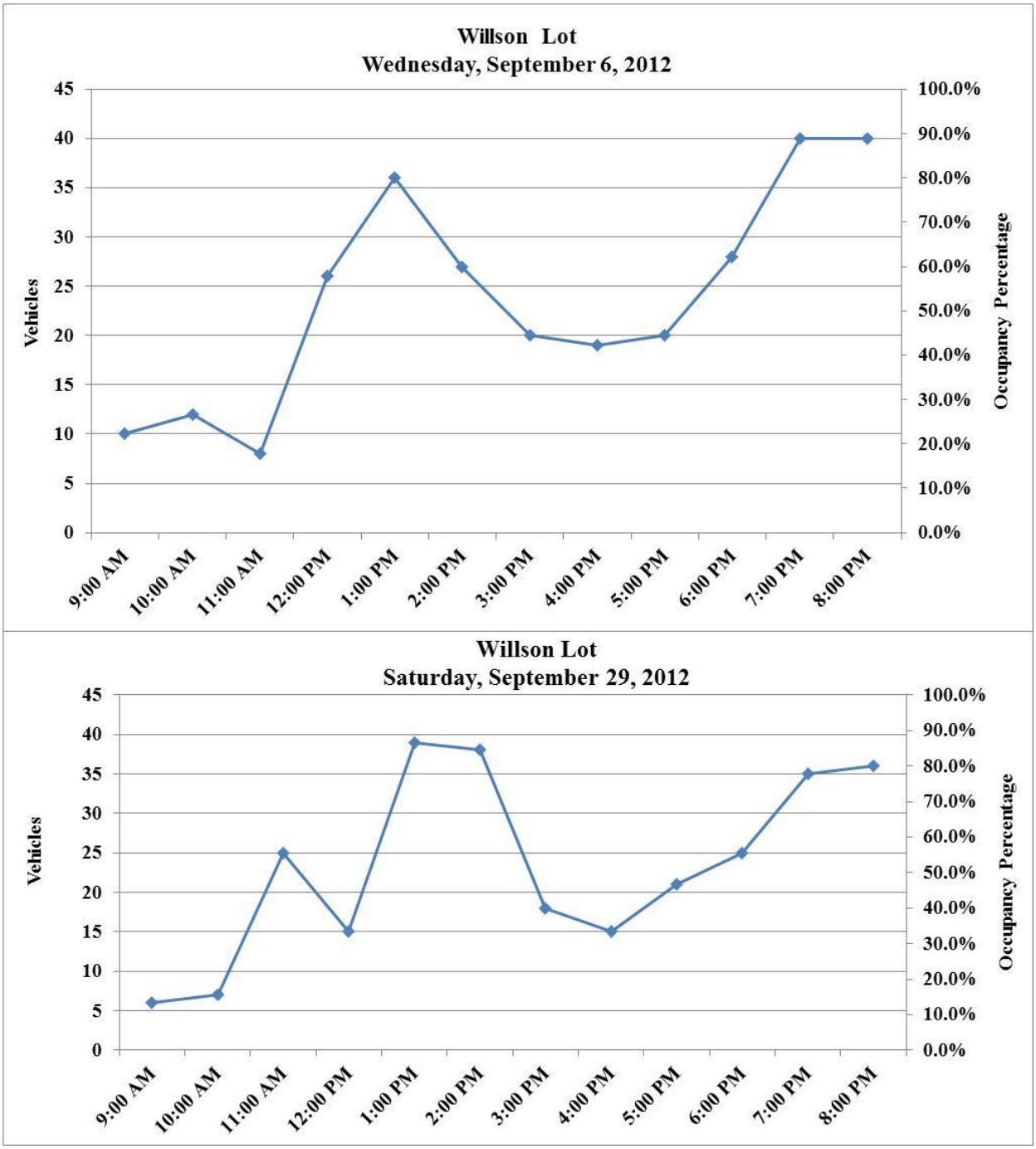


Figure 2-10 cont'd: Willson lot vehicle observations versus occupancy rates

2.2.3 Carnegie Lot

This off-street lot, located on the southeast corner of Mendenhall Street and North Black Avenue, has a total of 71 stalls. Table 2-11 presents both the number of vehicles parked during each observation period, as well as the resulting occupancy rate for the lot. Note that the final data collection occurred on Saturday, October 6, rather than the previous weekend. This was due to a sealcoating project that had closed the lot on Saturday, September 29th. This lot exhibited different occupancy trends, depending on the specific observation date. Weekdays exhibited a pattern of occupancy rising throughout the morning and peaking at 12:00 p.m. This was followed by a drop in occupancy during the afternoon, before rising again to a second peak in the evening (generally lower than midday) occurring between 6:00 p.m. and 8:00 p.m. On weekends, occupancy rates generally remained low throughout the day, with lower peaks than those of weekdays observed during the later morning or early afternoon. On weekdays, occupancy topped out in a range between 70 and 80 percent; while on weekends, occupancy never exceeded 76 percent. It would appear that in part, the nearby city parking structure has had an impact on freeing up additional spaces in this lot both during the week and on weekends. The occupancy trends for this lot are further illustrated in Figure 2-2: South Bozeman Ave. vehicle observations versus occupancy ratesFigure 2-11. Occupancy rates for this lot were not collected during the 2010 study, so no direct comparison of trends can be made with the 2012 data.

Table 2-11: Carnegie lot parking observations and occupancy rates

Tuesday, July 17, 2012			Saturday, July 28, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	28	39.4%	9:00 AM	25	35.2%
10:00 AM	19	26.8%	10:00 AM	32	45.1%
11:00 AM	26	36.6%	11:00 AM	30	42.3%
12:00 PM	40	56.3%	12:00 PM	37	52.1%
1:00 PM	40	56.3%	1:00 PM	33	46.5%
2:00 PM	32	45.1%	2:00 PM	28	39.4%
3:00 PM	27	38.0%	3:00 PM	19	26.8%
4:00 PM	28	39.4%	4:00 PM	10	14.1%
5:00 PM	39	54.9%	5:00 PM	14	19.7%
6:00 PM	50	70.4%	6:00 PM	18	25.4%
7:00 PM	55	77.5%	7:00 PM	26	36.6%
8:00 PM	51	71.8%	8:00 PM	34	47.9%

Wednesday August 8, 2012			Saturday, August 18, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	15	21.1%	9:00 AM	20	28.2%
10:00 AM	13	18.3%	10:00 AM	31	43.7%
11:00 AM	13	18.3%	11:00 AM	25	35.2%
12:00 PM	49	69.0%	12:00 PM	24	33.8%
1:00 PM	33	46.5%	1:00 PM	26	36.6%
2:00 PM	21	29.6%	2:00 PM	20	28.2%
3:00 PM	20	28.2%	3:00 PM	14	19.7%
4:00 PM	23	32.4%	4:00 PM	14	19.7%
5:00 PM	40	56.3%	5:00 PM	17	23.9%
6:00 PM	49	69.0%	6:00 PM	20	28.2%
7:00 PM	48	67.6%	7:00 PM	23	32.4%
8:00 PM	40	56.3%	8:00 PM	28	39.4%

Thursday, September 06, 2012			Saturday, October 06, 2012		
Time	Parked Vehicles	Occupancy Rate	Time	Parked Vehicles	Occupancy Rate
9:00 AM	37	52.1%	9:00 AM	26	36.6%
10:00 AM	26	36.6%	10:00 AM	33	46.5%
11:00 AM	36	50.7%	11:00 AM	54	76.1%
12:00 PM	46	64.8%	12:00 PM	41	57.7%
1:00 PM	37	52.1%	1:00 PM	39	54.9%
2:00 PM	27	38.0%	2:00 PM	35	49.3%
3:00 PM	15	21.1%	3:00 PM	27	38.0%
4:00 PM	28	39.4%	4:00 PM	26	36.6%
5:00 PM	35	49.3%	5:00 PM	29	40.8%
6:00 PM	47	66.2%	6:00 PM	28	39.4%
7:00 PM	38	53.5%	7:00 PM	38	53.5%
8:00 PM	51	71.8%	8:00 PM	46	64.8%

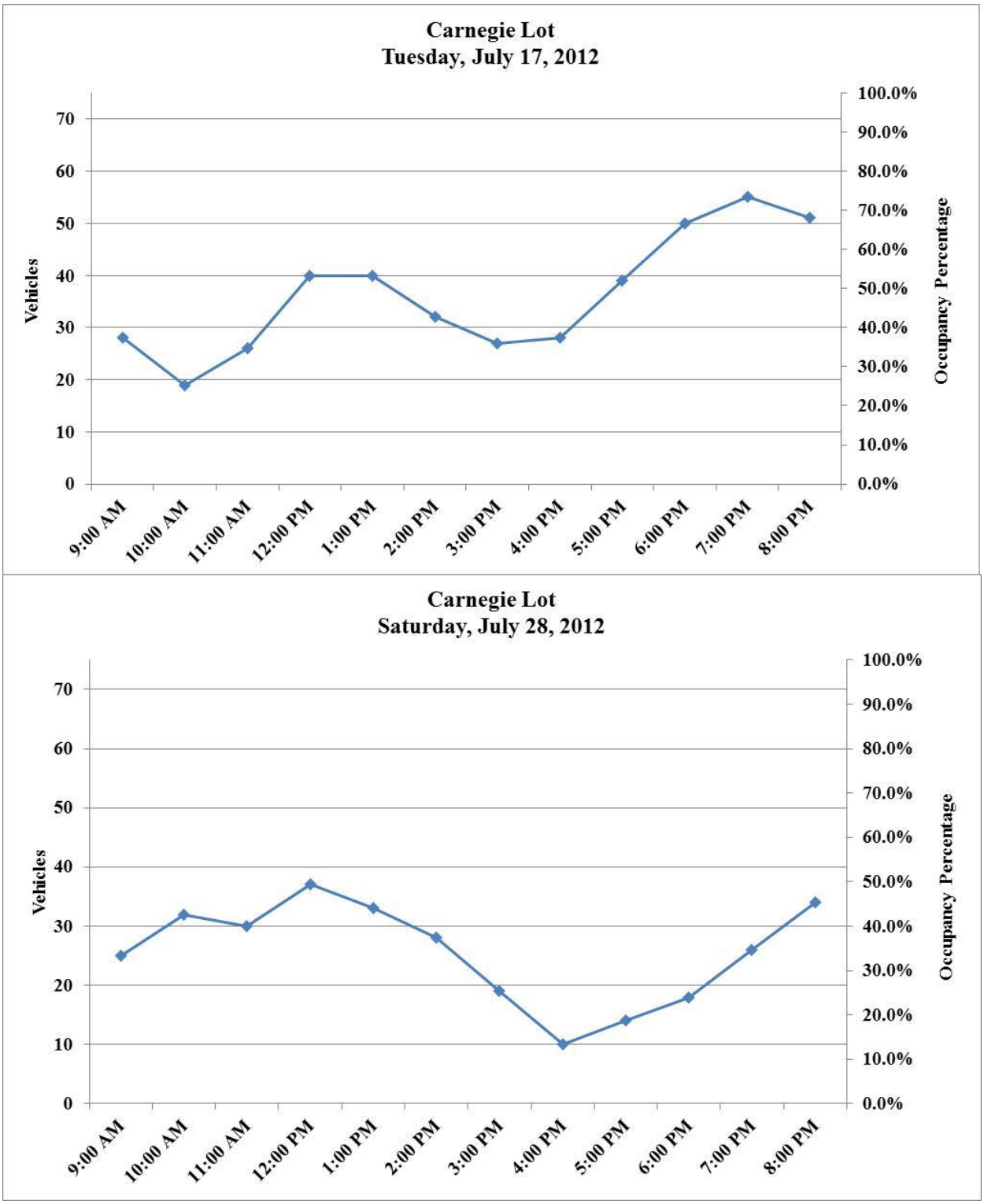


Figure 2-11: Carnegie lot vehicle observations versus occupancy rates

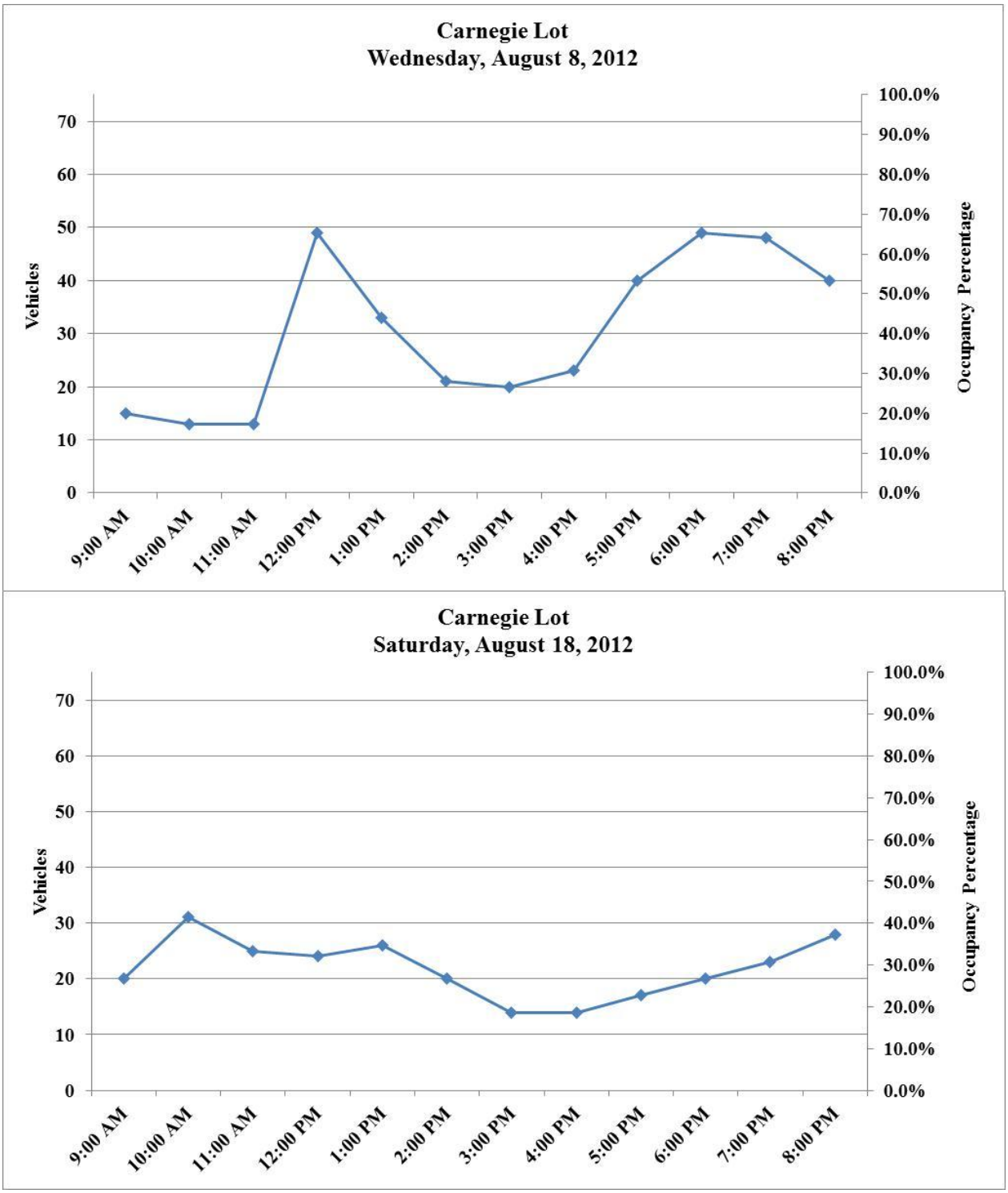
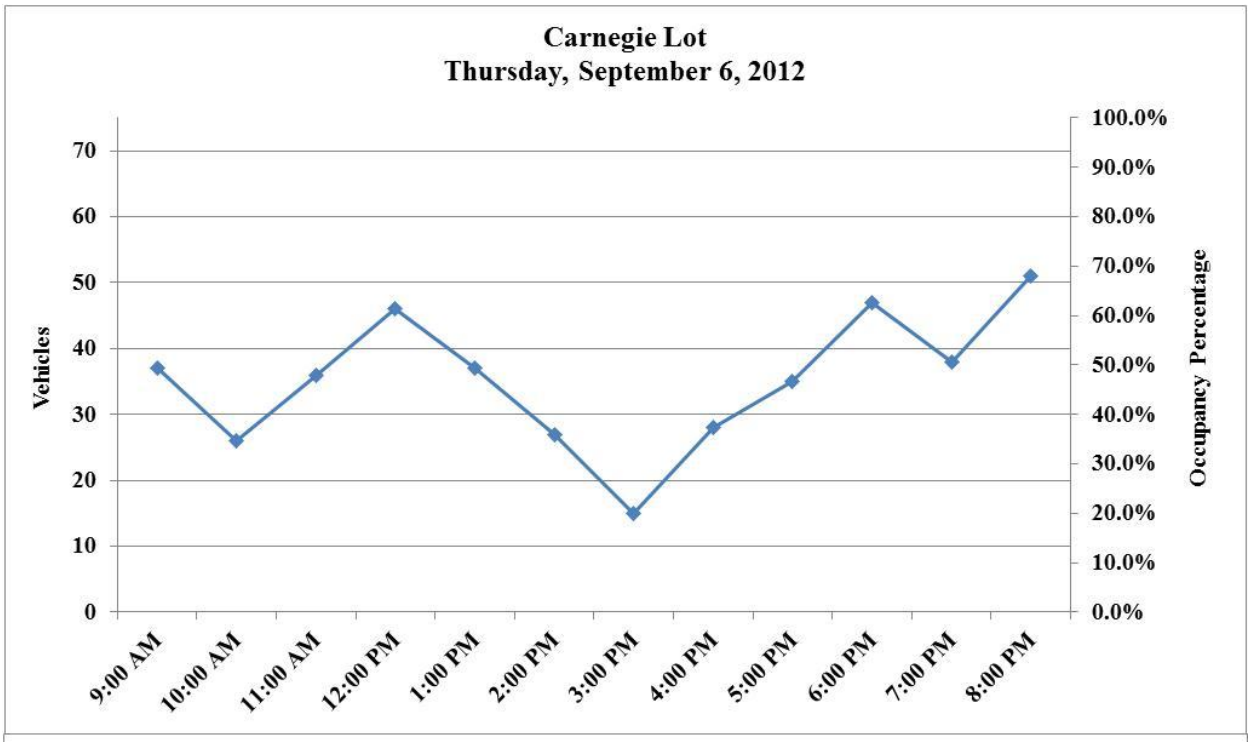


Figure 2-11 cont'd: Carnegie lot vehicle observations versus occupancy rates



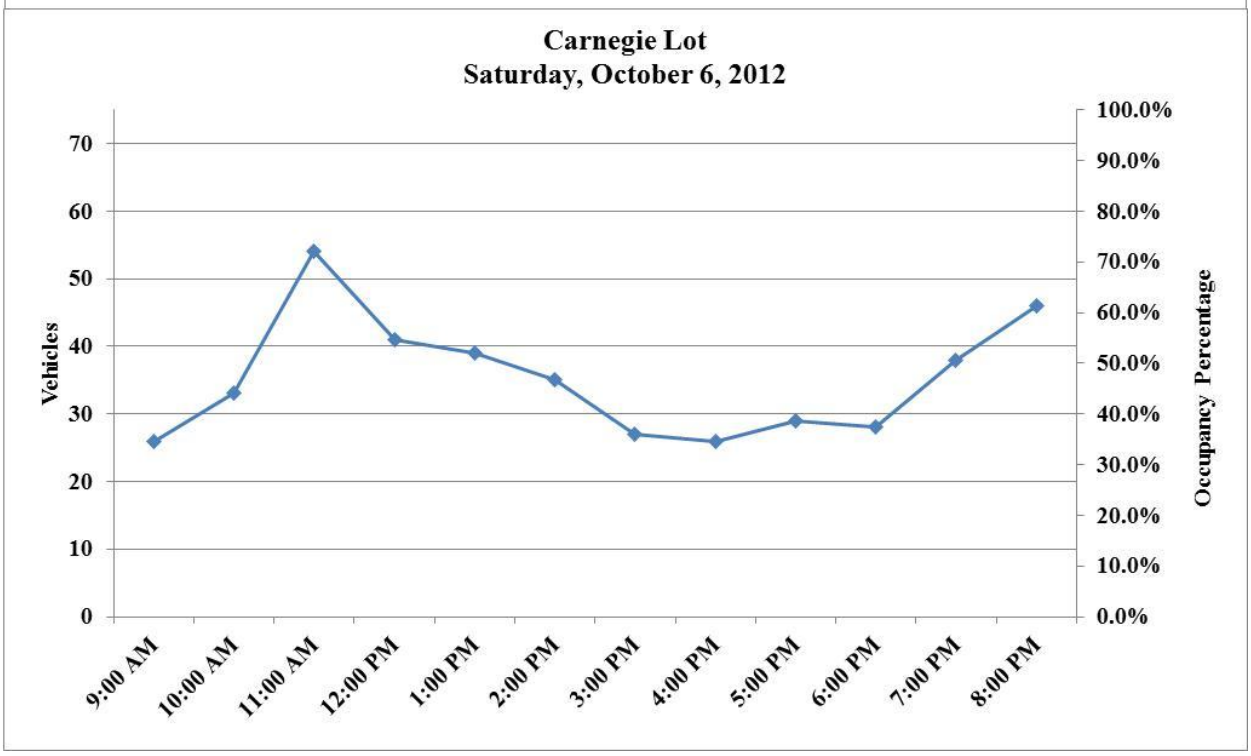


Figure 2-11 cont'd: Carnegie lot vehicle observations versus occupancy rates

2.2.4 Rouse Lot

This off-street lot, located on the northwest corner of Babcock Street and South Rouse Avenue, has a total of 46 stalls. Table 2-12 presents both the number of vehicles parked during each observation period, as well as the resulting occupancy rate for the lot. Weekday occupancy peaks occurred in the morning between 11:00 a.m. and 12:00 p.m. This was followed by a drop in occupancy during the afternoon, before slight increases occurred in the evening. However, the midday peaks were the highest occupancies observed on weekdays. On weekends, occupancies fluctuated throughout the day, with peaks occurring at different times. The general trend was for occupancy to be markedly lower in the evening than during other times of the day. Both weekday and weekend peaks were approximately 65 percent, although most of the time, weekday occupancy rates were below 60 percent and weekend rates were below 50 percent. The occupancy trends for this lot are further illustrated in Figure 2-2: South Bozeman Ave. vehicle observations versus occupancy ratesFigure 2-12. Occupancy rates for this lot were not collected during the 2010 study, so no direct comparison of trends can be made with the 2012 data.

Table 2-12: Rouse lot parking observations and occupancy rates

Tuesday, July 17, 2012			Saturday, July 28, 2012		
Time	**Parked Vehicles**	**Occupancy Rate**	**Time**	**Parked Vehicles**	**Occupancy Rate**
9:00 AM	16	34.8%	9:00 AM	14	30.4%
10:00 AM	17	37.0%	10:00 AM	17	37.0%
11:00 AM	24	52.2%	11:00 AM	10	21.7%
12:00 PM	30	65.2%	12:00 PM	14	30.4%
1:00 PM	25	54.3%	1:00 PM	11	23.9%
2:00 PM	27	58.7%	2:00 PM	11	23.9%
3:00 PM	17	37.0%	3:00 PM	7	15.2%
4:00 PM	17	37.0%	4:00 PM	7	15.2%
5:00 PM	13	28.3%	5:00 PM	6	13.0%
6:00 PM	27	58.7%	6:00 PM	3	6.5%
7:00 PM	27	58.7%	7:00 PM	3	6.5%
8:00 PM	23	50.0%	8:00 PM	5	10.9%

Wednesday August 8, 2012			Saturday, August 18, 2012		
Time	**Parked Vehicles**	**Occupancy Rate**	**Time**	**Parked Vehicles**	**Occupancy Rate**
9:00 AM	22	47.8%	9:00 AM	8	17.4%
10:00 AM	26	56.5%	10:00 AM	16	34.8%
11:00 AM	28	60.9%	11:00 AM	18	39.1%
12:00 PM	26	56.5%	12:00 PM	21	45.7%
1:00 PM	26	56.5%	1:00 PM	18	39.1%
2:00 PM	21	45.7%	2:00 PM	17	37.0%
3:00 PM	11	23.9%	3:00 PM	20	43.5%
4:00 PM	8	17.4%	4:00 PM	10	21.7%
5:00 PM	18	39.1%	5:00 PM	3	6.5%
6:00 PM	22	47.8%	6:00 PM	5	10.9%
7:00 PM	22	47.8%	7:00 PM	4	8.7%
8:00 PM	23	50.0%	8:00 PM	5	10.9%

Thursday, September 06, 2012			Saturday, September 29, 2012		
Time	**Parked Vehicles**	**Occupancy Rate**	**Time**	**Parked Vehicles**	**Occupancy Rate**
9:00 AM	16	34.8%	9:00 AM	5	10.9%
10:00 AM	18	39.1%	10:00 AM	12	26.1%
11:00 AM	16	34.8%	11:00 AM	27	58.7%
12:00 PM	23	50.0%	12:00 PM	19	41.3%
1:00 PM	15	32.6%	1:00 PM	30	65.2%
2:00 PM	15	32.6%	2:00 PM	13	28.3%
3:00 PM	11	23.9%	3:00 PM	10	21.7%
4:00 PM	13	28.3%	4:00 PM	4	8.7%
5:00 PM	10	21.7%	5:00 PM	2	4.3%
6:00 PM	11	23.9%	6:00 PM	4	8.7%
7:00 PM	12	26.1%	7:00 PM	7	15.2%
8:00 PM	14	30.4%	8:00 PM	10	21.7%

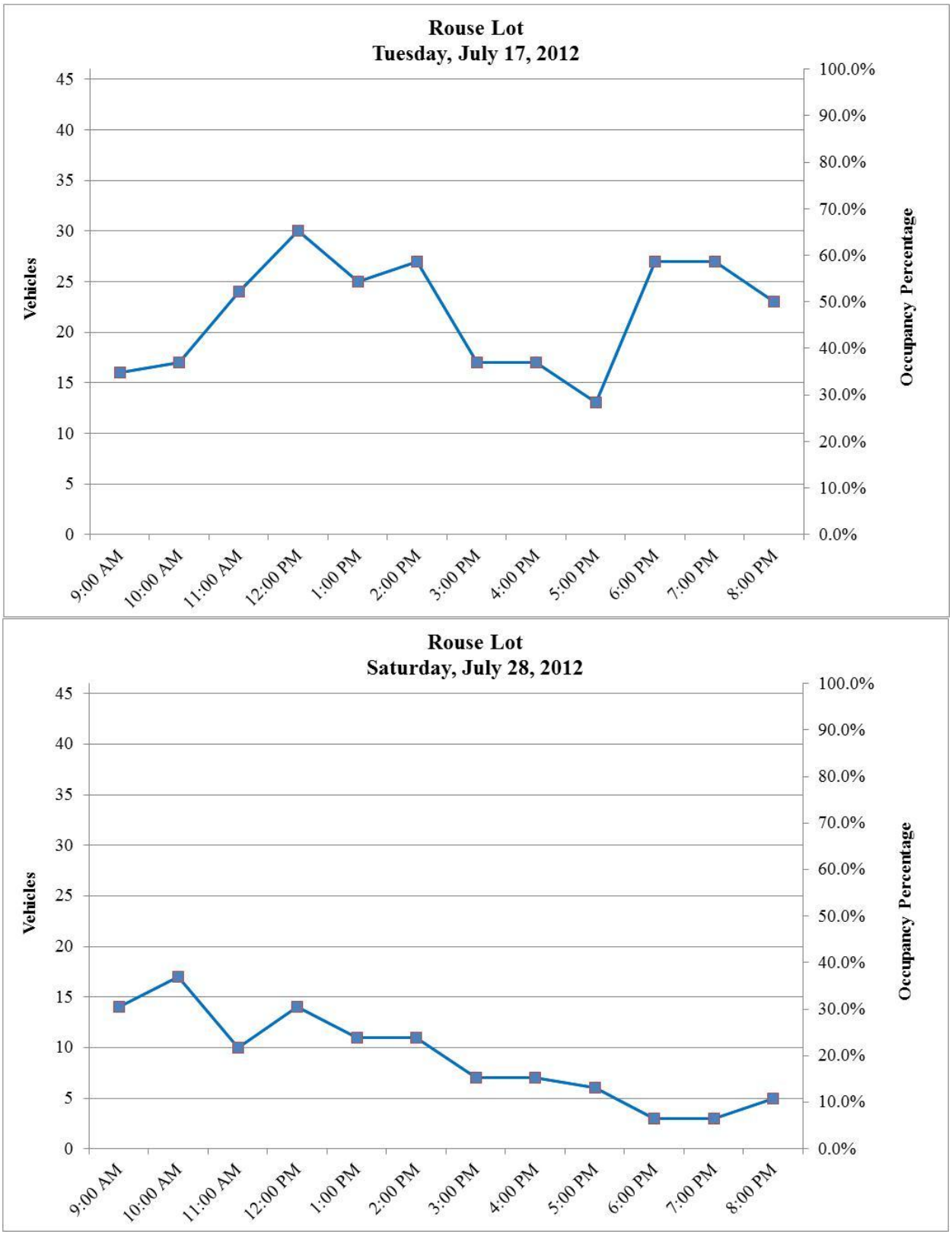


Figure 2-12: Rouse lot vehicle observations versus occupancy rates

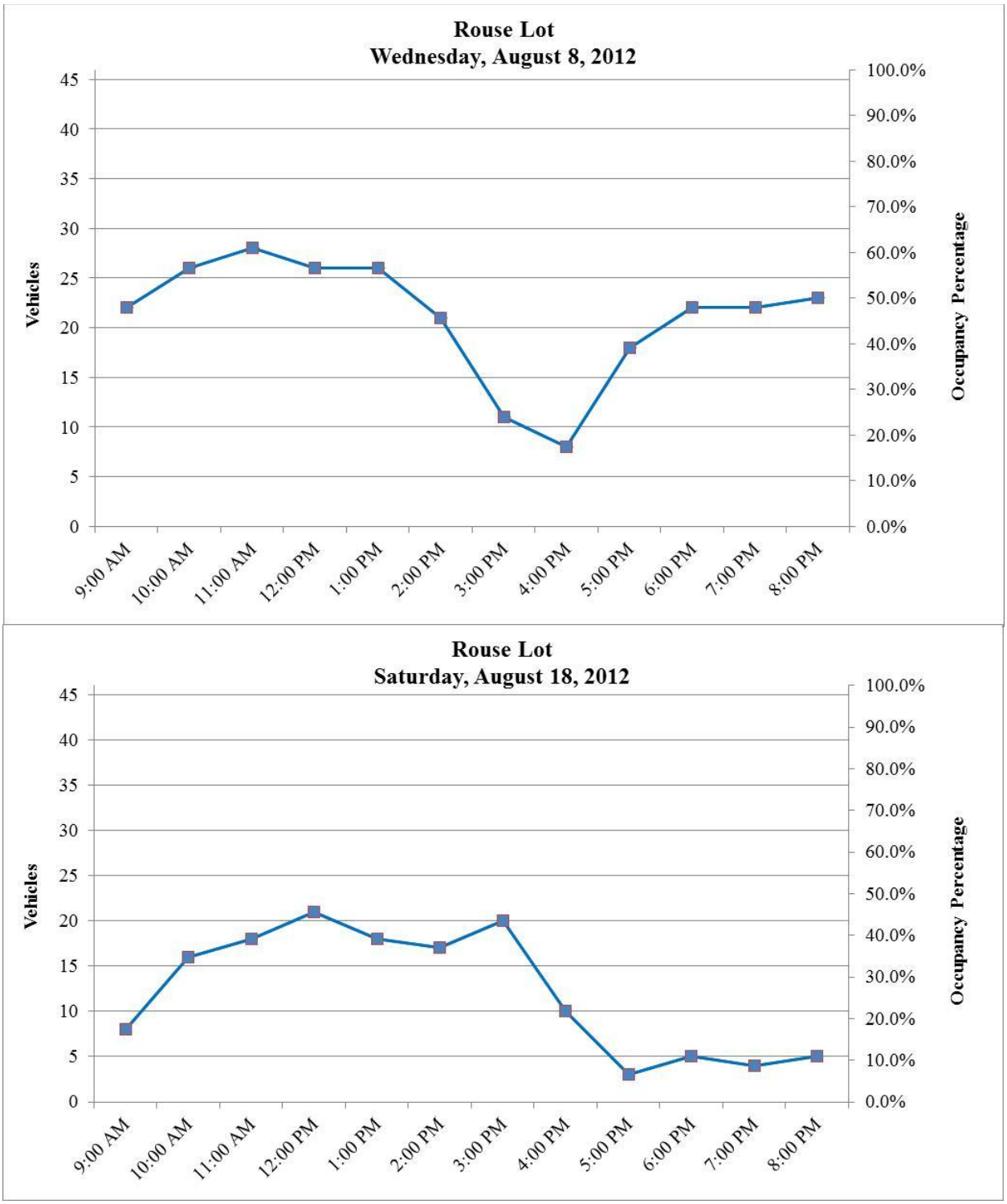


Figure 2-12 cont'd: Rouse lot vehicle observations versus occupancy rates

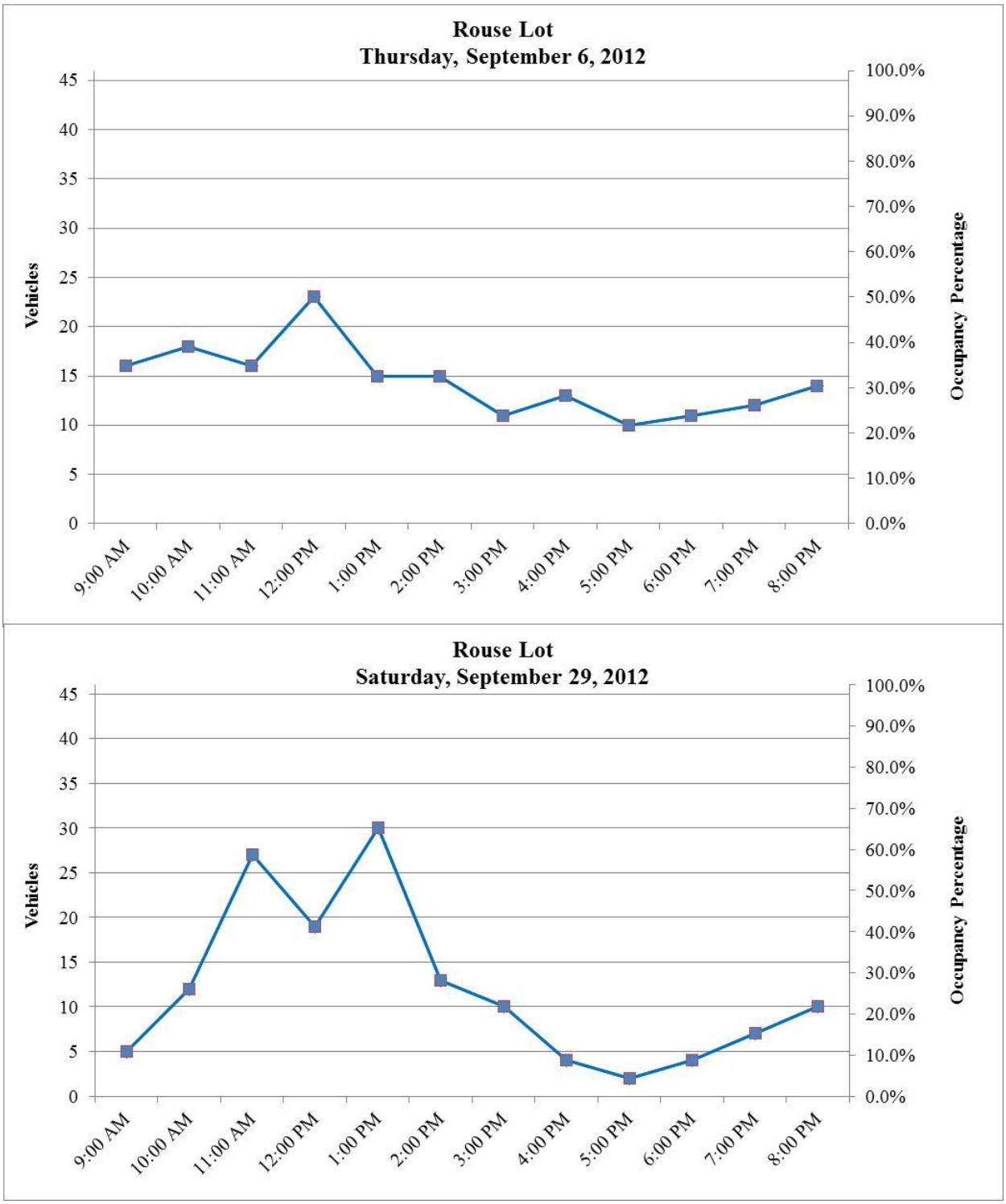


Figure 2-12 cont'd: Rouse lot vehicle observations versus occupancy rates

2.3 Comparison of 2010 and 2012 Occupancy Rates

Occupancy data collected during a previous study in 2010 allowed for comparisons to be made with the 2012 data of this report. Data from 2010 was compared to the closest date from the 2012 study. For example, Wednesday, August 11, 2010 data was compared to Wednesday, August 8, 2012 data. It was believed that this approach provided the closest comparisons between similar days of the week for a given month. The following sections present the results of comparisons between occupancy rates for the Armory lot, the Willson Lot and the downtown parking garage.

2.3.1 Armory Lot Comparison

Data collection in 2010 focused on three dates. The first date of data 2010 available was from Wednesday, August 11, 2010. Consequently, a direct comparison was made between this data and data collected on Wednesday, August 8, 2012. The comparison of this data is presented in Figure 2-13. The figure shows that in general, the same occupancy trends were observed in 2010 as 2012. Notably, the trend for occupancy to initially peak at approximately 12:00 p.m., taper off in the early afternoon, and then rise again into the evening. Following the 12:00 p.m. peak, occupancy generally remained above 70 percent during the afternoon and above 80 percent past 6:00 p.m. While occupancies were slightly higher in 2012, in general, these differences were the result of differences in 1 to 2 parked vehicles observed at comparable collection times between the years.

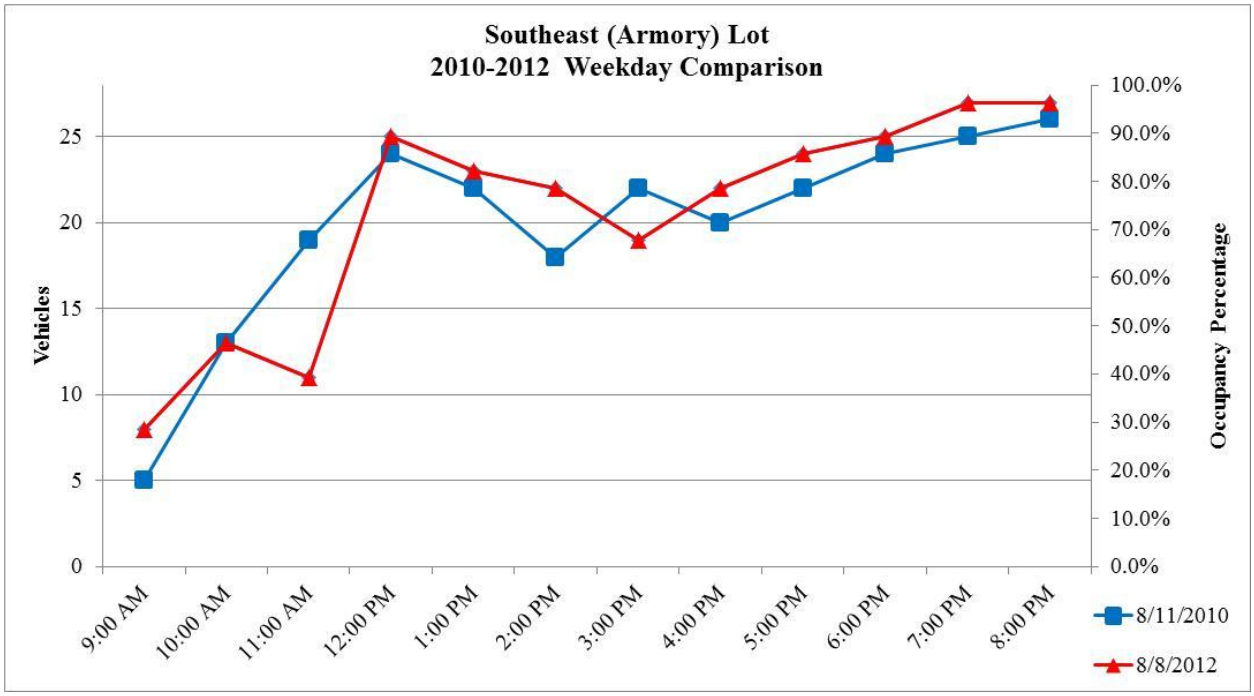


Figure 2-13: Comparison of Armory lot occupancy rates Wednesday, August 11, 2010 versus Wednesday, August 8, 2012

The second data of 2010 data that was available for comparison was Thursday, September 16, 2010. Consequently, a direct comparison was made between this data and data collected on Thursday, September 6, 2012. The comparison of this data is presented in Figure 2-14. Once

again, the trends observed for this lot indicated the same occupancy trends occurred in 2010 and 2012. Notably, the trend for occupancy to initially peak at approximately 12:00 p.m., taper off in the early afternoon, and then rise again into the evening. Following the 12:00 p.m. peak, occupancy generally remained above 50 percent during the afternoon and above 90 percent past 6:00 p.m. Also similar to the trends observed in August was the tendency for occupancy to approach 100 percent in the evening in both 2010 and 2012. This is not surprising given the proximity of this lot to many downtown businesses.

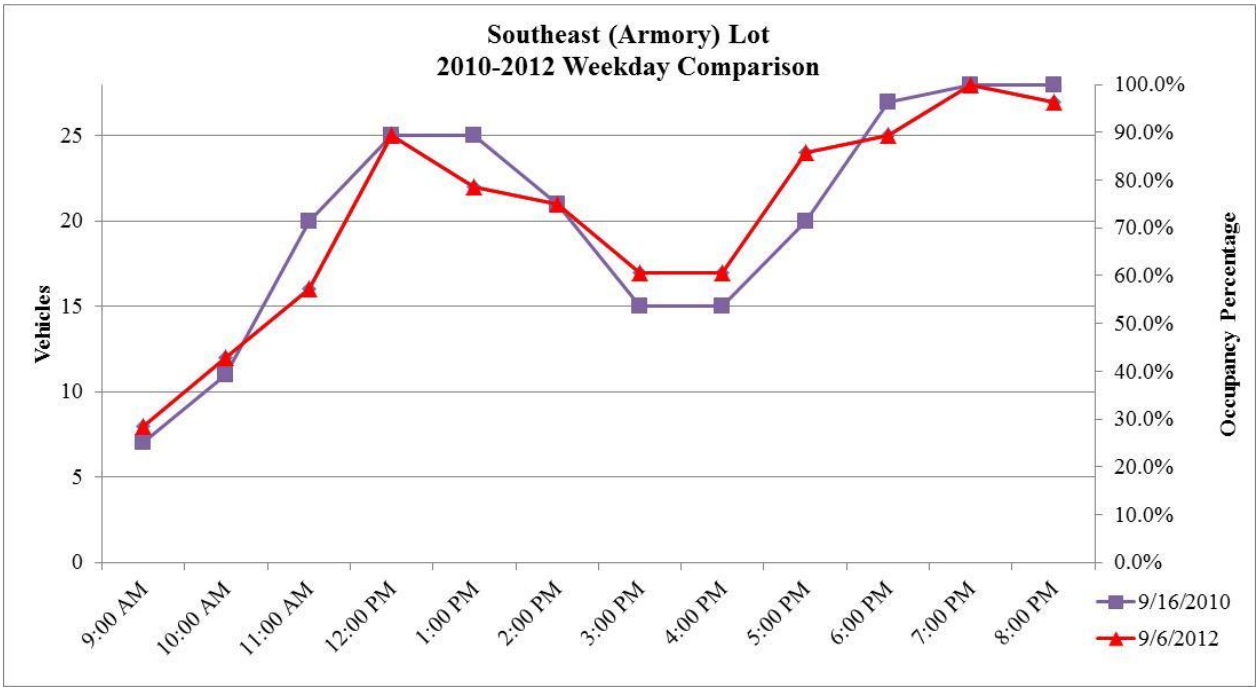


Figure 2-14: Comparison of Armory lot occupancy rates Thursday, September 16, 2010 versus Thursday, September 6, 2012

The final data of 2010 data that was available for comparison was Saturday, September 11, 2010. Consequently, a direct comparison was made between this data and data collected on Saturday, September 29, 2012. The comparison of this data is presented in Figure 2-14. The trends observed for this lot indicated that both 2010 and 2012 occupancies climbed throughout the morning and initially peaked at 12:00 p.m. Both lots exhibited drops in occupancy during the afternoon, although at different times. This was followed by a rise in occupancy after 4:00 p.m. Evening occupancies in 2010 were lower than those of 2012, never exceeding 90 percent. Evening occupancies in 2012 peaked at 100 percent. Of course, the weekend trends exhibited during both of these dates indicate that evening trips to downtown businesses result in high lot occupancies.

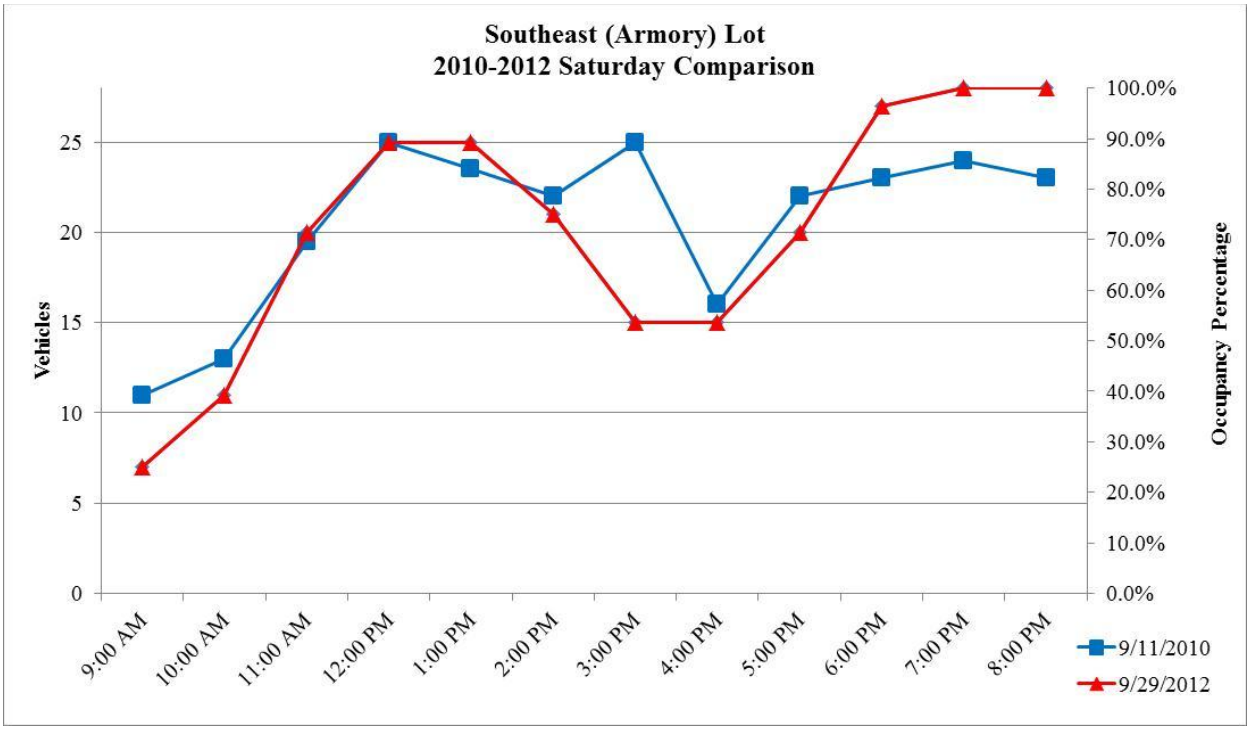


Figure 2-15: Comparison of Armory lot occupancy rates Saturday, September 11, 2010 versus Saturday, September 29, 2012

2.3.2 Willson Lot Comparison

Data collection in 2010 focused on only one date. The date was Thursday, September 16, 2010. Consequently, a direct comparison was made between this data and data collected on Thursday, September 6, 2012. The comparison of this data is presented in Figure 2-16. The figure shows that the same occupancy trends were observed in 2010 as 2012 from 9:00 a.m. through approximately 3:00 p.m. After this point, higher occupancy rates were observed during the 2012 data collection, with occupancy climbing throughout the early evening before reaching a plateau of 90 percent. In 2010, a similar climb in occupancy was observed, but this started from a bottom of 20 percent before reaching a peak of approximately 55 percent at 8:00 p.m. While the general patterns of occupancy largely mimic one another between the two years, the significant increase in occupancy during the midafternoon of 2012 resulted in a distinct difference compared to 2010. The cause of the increase in 2012 is not immediately clear however.

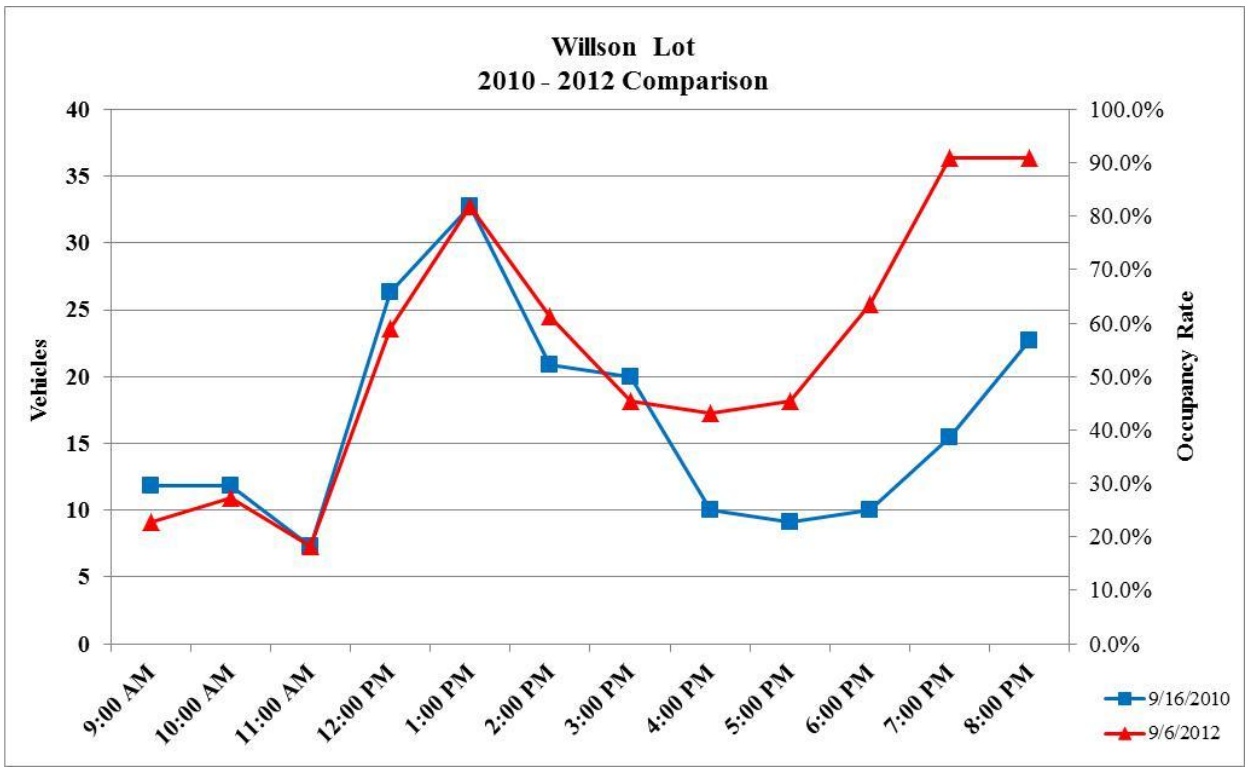


Figure 2-16: Comparison of Willson lot occupancy rates Thursday, September 16, 2010 versus Thursday, September 6, 2012

2.3.3 Parking Garage Comparison

Data collection in the downtown parking garage in 2010 was completed on two dates. The first date was Wednesday, August 11, 2010 and the second date was Saturday, September 11, 2010. Direct comparisons were made between this data and data collected on Wednesday, August 8, 2012 and Saturday, September 8, 2012. The 2012 data was obtained via the parking garage's electronic records rather than manual observation. A comparison of data for weekdays is presented in Figure 2-17. The figure shows that the same occupancy trends were observed in 2010 as 2012 throughout the day for a weekday. Parking occupancy climbs throughout the morning, peaks at approximately 1:00 p.m. and then tapers off through the evening. The general trends observed follows that of the workday, where workers arrive in the morning and leave in the early evening. Occupancy was slightly higher throughout the midday period in 2012, which suggests that more vehicles are selecting the parking garage when visiting the downtown area. During both 2010 and 2012, the peak occupancy observed did not exceed 40 percent of the parking garage's capacity. Consequently, there is still ample parking in reserve to meet future parking growth in the downtown area on weekdays.

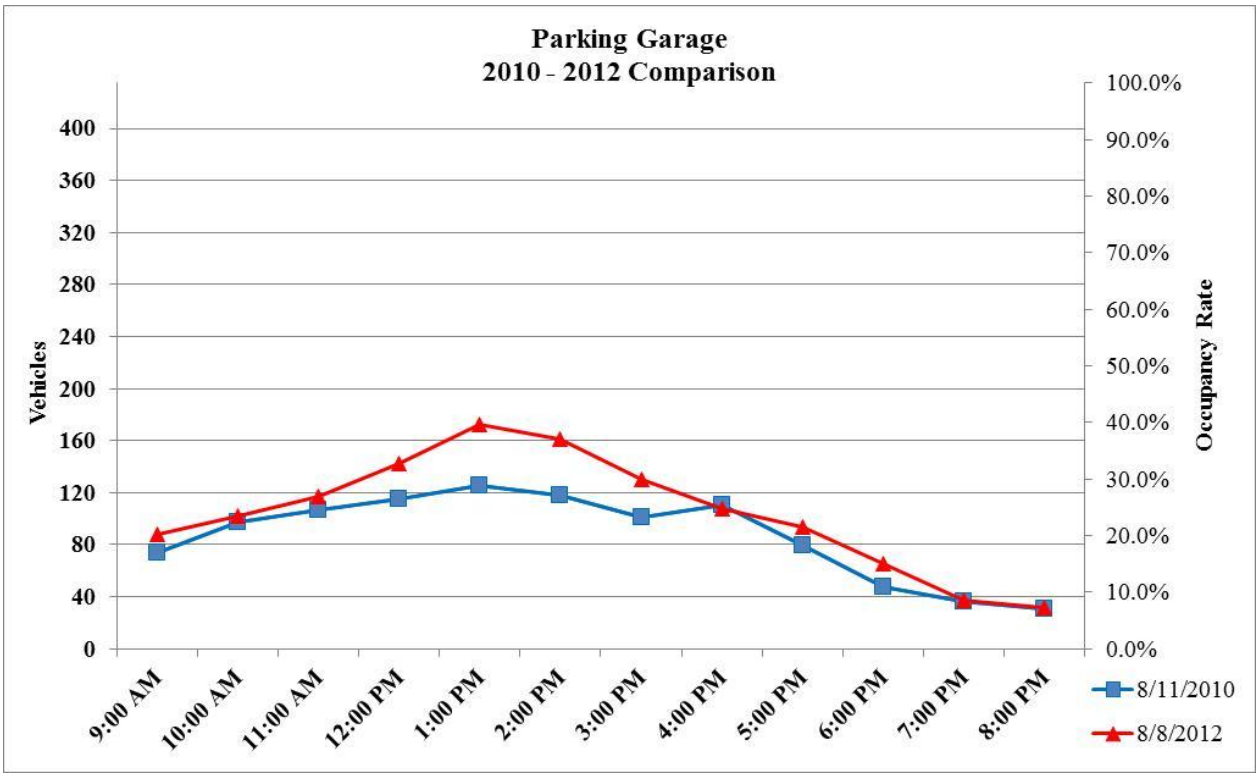


Figure 2-17: Comparison of parking garage lot occupancy rates Wednesday, August 11, 2010 versus Wednesday, August 8, 2012

On weekends, a nearly identical trend, both in pattern and vehicles, was observed as indicated in Figure 2-18. Once again, parking climbed throughout the morning and peaked at approximately 1:00 p.m. on both dates. From that peak, occupancies fell throughout the early afternoon but evening remained stable in the evening. At no point did the occupancies observed on either date exceed 20 percent, once again indicating that there is ample parking availability to handle future growth. It is interesting to note that during both years, there was no increase in occupancy observed in the evening, when one would expect downtown visitors to restaurants and bars to potentially use the parking garage in greater numbers. However, as the figures from the Armory lot indicated, it would appear that many vehicles park in this lot before seeking parking in other locations, which may explain the trends observed here.

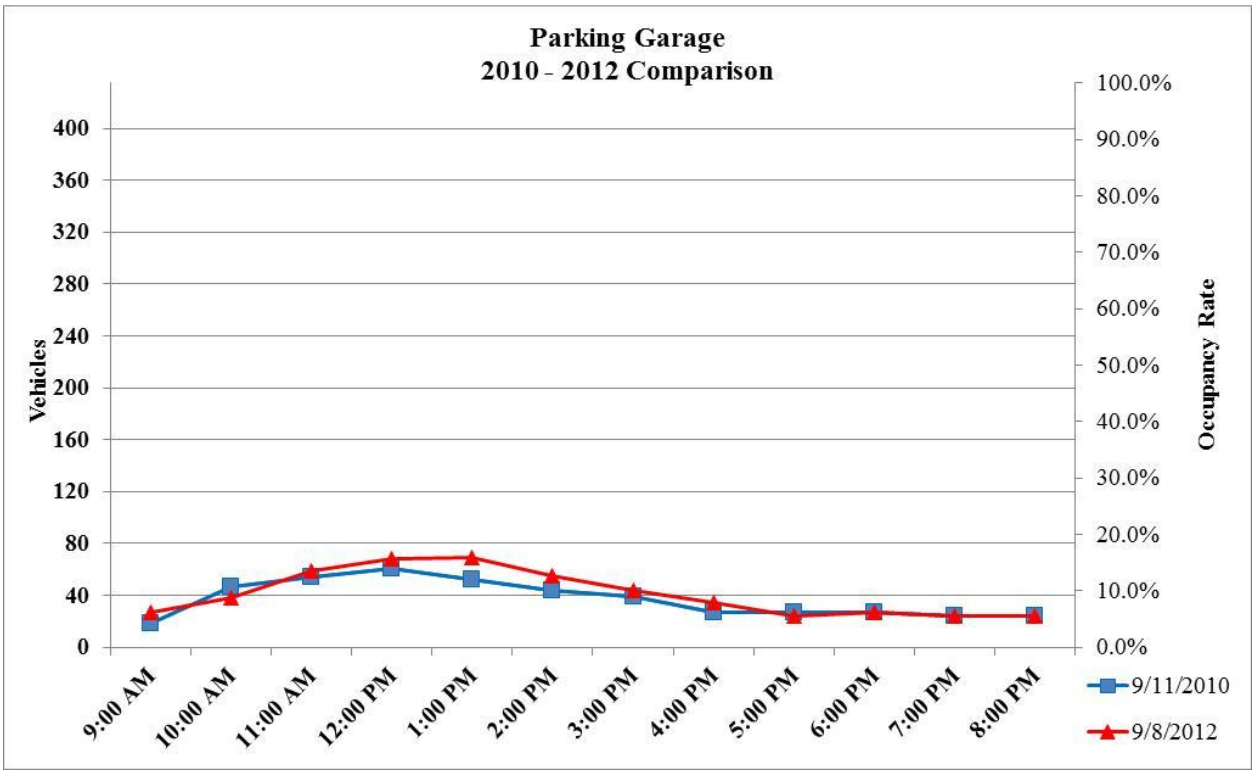


Figure 2-18: Comparison of parking garage lot occupancy rates Saturday, September 11, 2010 versus Saturday, September 8, 2012

2.4 Summary of Results

In general, a similar trend in occupancy rates was observed between all of the on-street and off-street parking examined, both on weekdays and weekends. Occupancy would increase throughout the morning and reach a peak during the noon hour. This was not surprising, as it coincided with the lunch hour when downtown restaurants were likely to be heavily frequented. Following this midday peak, occupancy rates for most parking locations would fall throughout the afternoon, before rising again to a second peak for the day during the evening hours. This second peak was typically lower than the initial peak occurring earlier in the day.

On-street parking occupancy rates were generally high, typically exceeding 60 to 70 percent throughout the day. In many cases, 80 to 90 percent occupancy rates were observed; at some points, parking on certain block faces was 100 percent occupied. This trend was not typically observed for off-street parking lots, with the exception of the Armory lot and the Willson lot across Mendenhall Street, where high occupancy was the norm throughout the day (generally above 60 percent for both lots). In the Armory lot, 100 percent occupancy was observed at several times, while the Willson lot also had high occupancy, reaching 90 percent several times. Conversely, the Carnegie lot and the Rouse lot both had lower occupancies throughout the day. The Carnegie lot never exceeded an occupancy rate of 75 percent and generally remained below 60 percent occupancy. The Rouse lot never exceeded 65 percent, and typically it remained below 50 percent occupancy. These observations may be indicative of two points. First, the Armory lot and the Willson lot are the preferred off-street parking location for many downtown patrons, particularly given their close proximity to many Main Street businesses. Second,

outlying lots, even with their proximity to downtown businesses, appear to be a secondary location of choice for parking, following other on-street and Armory lot options.

Based on data collected in 2010 for the Armory and Willson lots, comparisons between occupancy rates for different dates were made. When comparing occupancy rates from the Armory lot, all dates showed similar trends. In general, the same trend of occupancy climbing throughout the morning, peaking at 12:00 p.m., tapering off in the afternoon and then climbing once again was observed for all dates. The specific occupancies differed by small amounts depending on the year, further illustrating that this lot has been and continues to be highly utilized by visitors to the downtown area. For the one comparison performed between 2010 and 2012 for the Willson lot, a significant difference in occupancy rates occurred during the afternoon and evening. While the general trend of rates climbing throughout the afternoon and evening matched for each year, 2012 occupancies were much lower than those of 2010 during these hours. The reason for this drop in occupancy is not immediately clear.

3 CONCLUSIONS

The purpose of this work was to conduct parking occupancy rate studies in the downtown Bozeman area between July and September of 2012. This was done in order to understand how parking spaces were being utilized. Occupancy rates, a measure of the level of utilization of a parking area for a specific period of time, were observed on several dates during the study period for selected on-street and city-owned off-street parking areas.

Study dates included Tuesday, July 17; Saturday, July 28; Wednesday, August 8; Saturday, August 18; Thursday, September 6; Saturday, September 29 (no MSU football game); and Saturday, October 6 (no MSU football game, Carnegie lot only). Data collection activities ran between 9:00 a.m. and 8:00 p.m. on each of these respective dates. To collect the data, Montana State University civil engineering students canvassed the downtown study area, recording the number of vehicles observed to be parked in the specific lots/areas highlighted of interest once per hour. The resulting data were then used to compute hourly occupancy rates.

When examined, occupancy rates shared a similar trend between all block groups, both on weekdays and weekends in general. Occupancy steadily increased throughout the morning and reached its peak for the day during the noon hour. This coincided with the lunch hour when downtown restaurants were likely to be heavily frequented. Following the midday peak, occupancy rates for most blocks fell throughout the afternoon, before rising again to a second, evening peak. This second peak was typically lower than the one observed at midday.

On-street parking occupancy rates were generally high, typically exceeding 60 to 70 percent throughout the day. In many cases, 80 to 90 percent occupancy rates were observed and at some points, parking on certain block faces was 100 percent occupied. One must keep in mind that these rates essentially represent 100 percent occupancy, as specific stalls are not laid out with pavement markings on the bloc faces. As a result, drivers who parallel park on these block faces typically leave wasted space between vehicles, resulting in slightly lower observed occupancy than what is theoretically available.

High occupancy rates typically were not observed for off-street parking lots, with the exception of the Armory lot and the Willson lot across Mendenhall Street, where high occupancy was the norm throughout the day (generally above 60 percent for both lots). In the Armory lot, 100 percent occupancy was observed at several times, while the Willson lot also had high occupancy, reaching 90 percent several times. Conversely, the Carnegie lot and the Rouse lot both had lower occupancies throughout the day. The Carnegie lot never exceeded an occupancy of 75 percent and generally remained below 60 percent occupancy, even on weekends. This lot is neighbored by the city parking garage, which accounts for the lower occupancies observed in this lot. The Rouse lot never exceeded 65 percent, and typically it remained below 50 percent occupancy. These observations may be indicative of two points. First, the Armory lot and the Willson lot are the preferred off-street parking location for many downtown patrons, particularly given their close proximity to many Main Street businesses. Second, outlying lots, even with their proximity to downtown businesses, appear to be a secondary location of choice for parking following other on-street and Armory lot options. This may particularly be the case for the Rouse lot, which is further away from the higher concentration of downtown businesses.

When comparing occupancy rates from the Armory lot between 2010 and 2012, all dates showed similar trends. In general, the same trend of occupancy climbing throughout the morning,

peaking at 12:00 p.m., tapering off in the afternoon and then climbing once again was observed for all dates. For the one comparison performed between 2010 and 2012 for the Willson lot, a significant difference in occupancy rates occurred during the afternoon and evening. While the general trend of rates climbing throughout the afternoon and evening matched for each year, 2012 occupancies were much lower than those of 2010 during these hours.

In the 2010 study, one of the best practices for parking management established a guideline that at least 50 percent of available public parking be occupied throughout the day (1). This metric was certainly fulfilled by on-street parking on all block faces a majority of the time. It was also true of three of the four off-street lots to varying extents. The Rouse lot had occupancy rates below 50 percent on average, falling below this metric. Consequently, this lot may be considered underutilized at present when the 50 percent threshold is employed.

While the results of the occupancy rate analysis did not indicate any problems at present, it is possible that issues may arise in the future. This is particularly true if growth in tourism traffic visiting downtown occurs. As the analysis indicated, some on-street block faces and off-street lots in the downtown area saw significant increases in occupancy near lunch and dinner hours. While adequate parking capacity exists in the downtown area to absorb these peaks at present, occupancy rates (and possibly dwell times) may need to be monitored in the future. One way to gauge whether future analysis will be needed might be through the observations of enforcement personnel. Given that they observe parking on a frequent basis, it should be possible to determine, over time, whether parking occupancies have changed in a significant way.

4 REFERENCES

1 Al-Kaisy, Ahmed and David Veneziano. "Downtown Bozeman Parking Study, Final Report." Western Transportation Institute, February, 2011.