Carrboro Parking: An Exploratory Study

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Executive Summary

In light of the concern expressed by citizens of Carrboro regarding the impact that proposed and approved mixed use developments in the central business district (CBD) of Carrboro will have on parking supply and demand, as well as the recommendation of policy document *Vision2020*, the Town of Carrboro (hereinafter called the "Town") requested that a comprehensive study of downtown parking be conducted. To this end, in the spring of 2008, a team of master's students from DCRP (hereinafter called the "Team") worked with the Town to carry out four major tasks:

1. administration and analysis of a parking survey of downtown business owners.
2. data collection and analysis of the supply of parking within the Carrboro CBD;
3. data collection and analysis of the demand for parking at varying times of day and days of the week; and
4. analysis of how future approved and proposed development could affect parking supply and demand.

In order to capture the business owner perceptions of downtown parking as well as anecdotal data, the Team conducted a parking survey of downtown business owners. The survey was designed to also capture parking data on employees and customers of each business. Additionally, employers expressed concern over the future parking supply in Carrboro. In the survey, the majority of business owners opposed enforcement or metering of spaces and believe the Town should provide additional spaces downtown.

To capture current parking supply in Carrboro's CBD, the Team conducted a hand count of parking spaces in the Main CBD lots, as determined by meetings between the Team and the Town. With the Town's assistance, the team aggregated the number of spaces in each lot into three distinct Parking Analysis Zones. The most central zone and the study's primary area of interest was further divided in to three Sub-Zones for analysis purposes.

In addition to parking supply, the Team collected measured parking demand. The Team collected demand data in three different ways:

1. hand counts were conducted in public and private lots at varying times of day (9:00 am, 12:00 pm, 3:00 pm, 6:00 pm, and 9:00 pm) and days of week (Saturday, Sunday, Tuesday, and Thursday) to determine occupancy,
2. cars in public lots were marked with chalk several times a day to assess vehicular turnover, and
3. traffic counts were carried out at specific lots to add to hand count data and to determine occupancy at Carr Mill Mall, (hand counts were not permitted by the owners of this private lot).

This data was used to determine two aspects of parking demand: occupancy and turnover. With respect to occupancy, or how full lots and zones are, the Team used the 85% occupancy standard employed by traffic engineers to determine whether there is an over-demand or under-supply at current prices in parking lots and zones. The central zone experienced the highest occupancy (peaking at 80%), with each component sub-zone peaking at different times. The turnover analysis revealed that on average 80% of cars park for fewer than 3 hours at a time in public lots. Therefore, twenty percent exceed the posted 2-hour limit for municipal lots by at least 1 hour.

Finally, the Team related current land use patterns to parking demand, summarized by the number of parking spaces required per 1,000 square feet. This analysis reveals the probable parking effects of future approved and proposed developments.

Preface

Students in the Masters of City and Regional Planning Program at the University of North Carolina at Chapel Hill are required to participate in a problem-solving, client-based project designed to give students experience in applying planning techniques and tools learned during their studies. Municipalities, public agencies, and private firms are typical clients. This report is the result of one of such capstone projects. It was developed under the guidance of City and Regional Planning Professors Daniel A. Rodriguez and Noreen McDonald. The content of the report does not necessarily reflect the views of the University of North Carolina or the client. No official endorsement should be inferred.

The authors are grateful to the Department of City and Regional Planning at the University of North Carolina at Chapel Hill, Mayor Mark Chilton and the Carrboro Board of Aldermen, Adena Messinger, Transportation Planner for the Town of Carrboro, James R. Harris, Economic and Community Development Director for the Town of Carrboro, and everyone else who assisted on this project.

The period of greatest parking demand, Tuesday, Early Evening, served as the base case for analysis. Parking generation rates in the zones and sub-zones ranged from 0.3 to 1.9 parking spaces per 1,000 square feet of occupied building space. The analysis found that despite additional development, parking demand will not exceed recommended occupancy in most areas of the downtown since projected occupancy ranges from 20% to 80%. However, shortages could exist in the area around 300 East Main Street under approved and proposed development scenarios. After approved developments are built, this area will have a projected occupancy rate of 92%. If proposed developments are constructed without modification, this area will have a projected occupancy rate of 105%.

Altogether, the Team's analysis revealed several key findings and recommendations:

- In general, parking demand does not exceed ideal (85%) occupancy. Data does not indicate that current demand is outpacing supply for the CBD.
- Parking demand does exceed recommended occupancy at specific sites at certain times and this situation may be exacerbated by future demand.
- Parking spaces in the CBD experience high turnover.
- There is a 20% violation of the 2-hour limit in public lots.
- Most CBD visitors want to park in lots adjacent to the businesses they are visiting.
- The prevalent perception among business owners and others is that there is a parking shortage in the CBD.
- Although there is not a parking shortage now, there will likely be a shortage in around 300 East Main Street after the addition of approved and future developments.

Based on these findings, the Team recommends a comprehensive suite of solutions to better manage the existing supply of parking, expand the supply of parking, encourage travel by other modes of transport, promote parking at the periphery of the CBD and change perceptions about parking the CDB. These suggestions include:

- Education/Signage
- Stricter Enforcement
- New Restrictions
- Joint Use
- Parking Cash-outs
- Developer Impact Fees
- Pedestrian Amenities
- Park-and-Ride
- Parking Deck

The team conducted a cost benefit analysis comparing the purchase of a tier of a parking deck in partnership with a private developer, a park-and-ride employee shuttle, and the improvement of pedestrian amenities throughout the heart of downtown. The analysis reveals that given the costs for each option, improving pedestrian amenities such as sidewalks and lighting may have the greatest ability at the most reasonable cost to reduce parking demand at critical areas.

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Vision 2020 seeks to promote downtown vitality and pedestrian activity

(Unless otherwise indicated all photos taken by Reed Huegerich, 2008)

A Note on Pricing:

Although expanding parking supply is one solution to a parking concern, decreasing demand through pricing is another potential solution. Carrboro has distinguished itself from neighboring areas for not wanting to charge for parking, and our analysis assumed that this priority would remain unchanged.

Introduction

The Town of Carrboro (hereinafter called the "Town") has expressed an interest in examining parking supply and demand in downtown Carrboro. The Town put forward the *Vision2020* policy document, which provides essential insights regarding Carrboro's parking and transportation goals as well as the Town's current parking situation. The Town also held a public hearing on the Roberson Square development which indicated that citizens are concerned about parking supply and demand as well as pedestrian amenities, walkability, lighting and multi-modal access to the Town's Central Business District (CBD).

To help address these questions and concerns, the Town proposed a parking study of the CBD as a workshop project to the Department of City and Regional Planning (DCRP) at the University of North Carolina at Chapel Hill. To this end, in the spring of 2008, a team of master's students from the UNC Department of City and Regional Planning (hereinafter called the "Team") worked with the Town to study current and future downtown parking supply and demand.

Part I: Existing Town Regulations and Previous Parking Studies

A. Existing Town Policies and Regulations

Before gathering new data, the Team reviewed the Town's current parking policies and regulations.

Policies

In 2000, the Town put forward a policy-making document called *Vision2020* for the Town's CBD that reflected the input of over 100 Carrboro citizens. The *Vision2020* is designed to guide the Town in preserving the Town's character in an atmosphere of desirable growth. Various sections of this document refer to increasing the Town's vitality through parking mitigation as well as facilitating safety and walkability throughout the CBD. For example, Policy 3.21 states a goal for the Town to "improve the downtown infrastructure (e.g. parking facilities, sidewalks, lighting, shading) to meet the needs of the community." Policy 3.24 states "frequent, accessible public transit is necessary for a thriving downtown. Multi-modal access to downtown should be provided. As traffic increases, Carrboro should consider perimeter parking lots served by shuttles to bring people downtown." Finally, the *Vision2020* document includes Policy 3.25, in which the Town encourages downtown and pedestrian safety. The document advises the Town to improve lighting and shading, and create auto barriers.

Regulations

At present, Carrboro restricts public parking through time limits. Signed on-street and municipal lot parking within the CBD is restricted either to one- or two-hour time limits. See Table 1: Existing Town Time Restrictions on Streets and Lots Assessed by this Study, for a list of current Town parking restrictions. As explained in interviews with Town staff, however, time-limited parking in public parking lots is not strictly enforced.

Table 1: Existing Town Time Restrictions on Streets and Lots Assessed by this Study		
Lot/Street Name, as described in the Code	**Time Limit**	**Town Code Reference**
Beginning at a point approximately 220 feet east of the intersection of the centerlines of Weaver Street and North Greensboro Street and running east for approximately 45 feet	One-hour parking only from 7:00 am to 5:30 pm	6-19(b)(3)(a)
Municipal parking lot located at 106 / 108 / 110 East Main Street (except for nine designated spaces in the lot that are reserved from 8:30 am to 5:30 pm for owners and tenants of 106 / 108 / 110 East Main St)	Two hours from 7:00 am to 5:30 pm	6-19(b)(4)(a)
Municipal parking lot located at the southeast corner of the intersection of Roberson Street and Main Street	Two hours from 7:00 am to 5:30 pm	6-19(b)(4)(c)
Municipal parking lot located at 303 West Weaver Street	Two hours from 7:00 am to 5:30 pm	6-19(b)(4)(d)
Municipal parking lot located at the northwest corner of the intersection of Rosemary Street and Sunset Drive. (only in effect Monday through Friday)	Two hours from 7:00 am to 5:30 pm	6-19(b)(4)(c)
Municipal parking lot located at the southwest corner of the intersection of Greensboro Street and Weaver Street is (Ten spaces are reserved for Carrboro Police Department vehicles from 8:30 a.m. to 5:30 pm and one space is for 30-minute parking only)	Reserved for visitors and staff of the Carrboro Century Center	6-19(b)(8)
Municipal parking lot located on the east side of the Carrboro Century Center	Reserved for Town of Carrboro vehicles only	6-19(b)(9)
Municipal parking lot located at Carrboro Town Hall and the Carrboro Town Commons	Four designated spaces are reserved for 2-hour visitor parking, eight designated spaces are reserved for Town vehicles, and one designated space is reserved for loading	6-19(b)(10)

Parking has long been a perceived problem, both in terms of location and availability

B. Previous Parking Studies

2002 Parking Task Force

In 2002, the Mayor of Carrboro and the Board of Aldermen created a parking task force to investigate public parking and shared parking, and to provide monthly status reports. The long-term recommendation of the task force was for the Town to dedicate a revenue stream for parking structures in the downtown area, which would require an overhaul of the Town's parking ordinance. The task force also advised the town to fix short-term supply through enforcement of time limits, engage property owners in joint use of parking, increase the walkability of the downtown and develop park-and-ride alternatives.

2001 Charrette

In 2001, the Town hired consultants to conduct a charrette that found that downtown Carrboro's casual and random parking consumes valuable space. Although parking is a perceived "problem," it is more likely that the parking is just poorly located rather than the Town lacks parking supply. The consultants found that "although people will walk as far as 1200 feet to access shops in a large mall, there is an expectation of curbside parking in downtown areas."

1989 Parking Study

To date, Carrboro has had only one previous study of the Town's parking supply and demand. This survey was conducted in an undetermined year prior to 1989 by a group of UNC students in the masters' program for Public Administration. They relied mostly on survey responses and observed data. The CBD was divided into 5 sections:

1. "Businesses between Main Street, Hill Street, Greensboro Street, and the Southern Railroad Crossing";
2. "Block between Weaver & Main west of Greensboro St.; Triangular block by Laurel, Main, & Jones Ferry; the north side of Weaver from Greensboro W; Main from Weaver to Poplar";
3. "Eastern Carrboro": the area extending east of the railroad tracks (at Weaver Street) to Merritt Mill Road. This area also includes Rosemary Street until Merritt Mill Road, and Merritt Mill Road south until the train tracks. Approx 32 businesses;
4. "Northeast Carrboro": the area including the north side of Rosemary and Main Street from Sunset Drive to the railroad tracks (including Lloyd, Cobb, and Broad streets);
5. "South of Main Street between the PTA Thrift Shop and the railroad lines"

The students also surveyed businesses within those sections to gather information about the location of parking and parking perceptions. The students summarized present parking supply and demand, projected needs, and public opinions of parking in each of the five sections of the CBD. The Carr Mill Mall parking lot was not listed as a "trouble area" by the previous study. Instead, the following lots were designated as potential "problem" areas:

- The Arts Center/Cat's Cradle lot and the triangular block bordered by Main, Rosemary, and Merritt Mill (the Carrburritos/ church block);
- The large gravel lot between the West Main block of buildings between the railroad and Greensboro Street, cited for being an inefficient use of space, due to the unmarked gravel surface;

- The small triangular block between Weaver Street, West Main, and Greensboro, cited because tenants had very few dedicated parking spaces.

To determine future needs, the previous parking study worked on a business-by-business basis. In Appendix B (page 90) of the report is a summary report naming each business and providing information on existing spaces, peak hours (probably self-reported), the number of spaces used at customer peak (also probably self-reported), and the projected number of spaces needed over the next five years.

The report identifies two anecdotal perceptions. First, local residents thought that lots in Carrboro were being used as a "park-and-ride" for university employees and students taking the bus to campus. Second, similar to what was found through the Town's CBD visioning charrette, customers only thought there was a parking "problem" because they were unable to park directly in front of a business and instead had to park several blocks away and walk. The previous study notes, as this report shows, that while some lots were completely full, some were underutilized. The previous report also found that the Town lacks adequate signs to direct people to municipal parking.

To remedy this situation, the previous study suggests that the Town enforce parking time restrictions, increase signage for municipal lots, and increase public awareness of available parking. The study finds that existing spaces are under-utilized, and that enforcing parking time restrictions will increase parking turnover and reduce "park-and-ride" abuses.

Part II: Spring 2008 Business Parking Survey

At the beginning of the study, the Team developed and administered a survey to businesses located in downtown Carrboro in order to determine the location of owner, employee, and customer parking for individual businesses and to gather perceptions of parking in the downtown area among the local business community. This business survey (reprinted in **Appendix B**) was designed to capture and quantify some of the anecdotal reports about parking that the Town had received in recent years from downtown business owners.

Methodology

The survey questions are based on the survey given to Carrboro businesses in the previous town parking analysis, prior to 1989. The survey has a quantitative (multiple-choice) and a qualitative (open-ended response) section. The quantitative section seeks to determine a business's location within Carrboro's downtown by asking respondents to select the location on a map divided into a 48-square grid. See Figure 1. Other quantitative questions determine the operating hours of the business, the number of employees, the type of business, and the length of a transaction at the business. The survey then asks if employees and/or customers are provided with private parking, and, if not, asks respondents to make educated guesses about where employees and/or customers park. To identify reported or perceived parking shortages, the respondents are asked to report when they have noted or been informed of parking shortages. Finally, the survey asks respondents to state their opinions regarding parking enforcement, rental parking, and potential parking solutions for the downtown. The Town of Carrboro administered the survey

Figure 1: Business Location

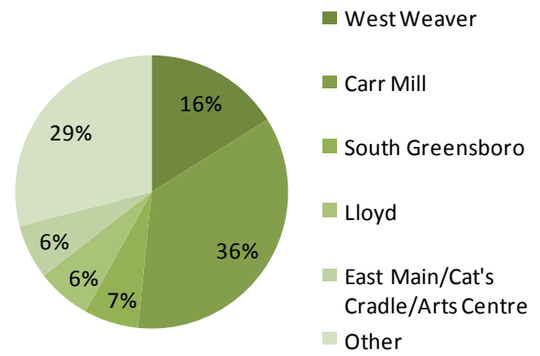


Figure 2: Business Type

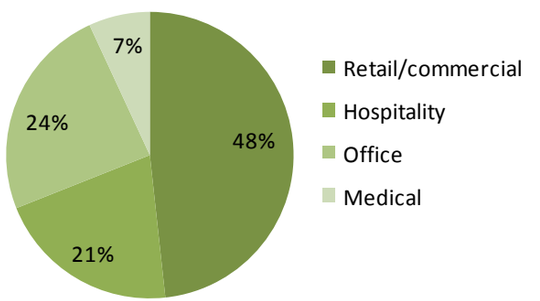


Figure 3: Business Hours of Operation, Weekday and Weekend

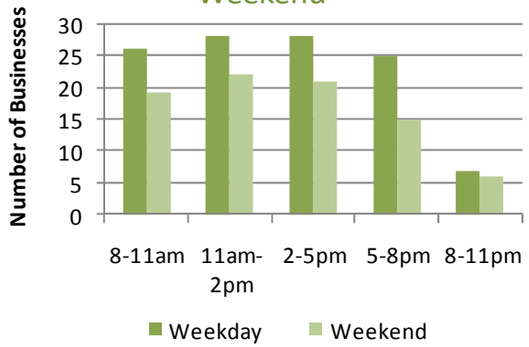
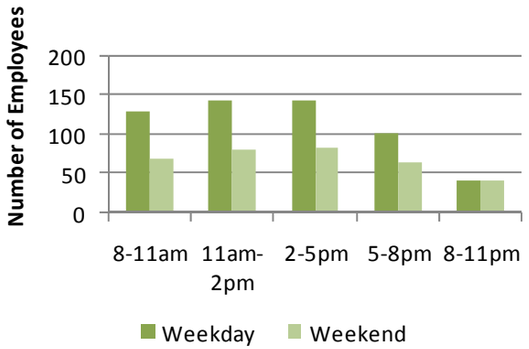


Figure 4: Number of Employees, Weekdays and Weekends



and made the data available to the Team for analysis. The Town distributed the survey to 90 businesses their business listserv and made it available to businesses at a Carrboro Business Association meeting in March 2008.

Limitations

One significant limitation is the possibility of response bias – that is, that only business owners who feel strongly about parking issues took the time to answer the survey. In addition, as the survey was designed for and distributed to businesses only, the survey does not capture Carrboro residents who currently do not visit the downtown.

Results

In total, 29 respondents completed the business survey either online or in paper form, resulting in a response rate of 31% (assuming all 90 businesses on the Carrboro Business Association listserv were contacted). The responses from each paper survey were entered online by the Team. The survey respondents were distributed throughout the downtown area, with just under half (48%) located in the vicinity of Carr Mill Mall and/or the Century Center. The complete survey results can be found in Appendix B. The largest segment of the businesses that responded was retail/commercial (48%), followed by office (24%), hospitality (21%), and medical (7%). Twenty-eight out of 29 businesses operated between 11:00 am and 5:00 pm on weekdays, and 21 out of 23 businesses operated between 11:00 am and 5:00 pm on weekends. The businesses that responded employ a total of 341 employees, mostly concentrated between the hours of 11:00 am and 5:00 pm on weekdays (45%), 8:00 am and 11:00 am on weekdays (38%), 5:00 pm and 8:00 pm on weekdays (30%), and 11:00 am and 5:00 pm on weekends (25%). See Figure 4. These employee numbers do not specifically correlate to the parking peak as observed in the demand analysis, indicating that employees may not be a significant portion of parking demand during their working hours.

All 29 employers reported that some of their employees drove alone to work, 12 employers reported that some of their employees walked to work, 11 employers reported that some of their employees biked to work, and 6 employers reported that some of their employees carpooled, and 7 employers reported that some of their employees took the bus. These results suggest that most employees are parking single-occupancy vehicles somewhere in the downtown. Several employers mentioned that their employees, or the employees of other businesses, parked in the Carr Mill Mall lot on Greensboro Street, rather than in the employee lot on Sweet Bay and Roberson. These comments correspond to anecdotal comments from Carr Mill employees, who were unaware of the employee parking for Carr Mill.

Seventy-two percent of employers reported providing employees and customers with private parking, with the majority of the employee parking concentrated in the Carr Mill employee lot and south of Main Street within a half-block radius of Greensboro Street. This statistic was somewhat influenced by the survey respondents (Tylers' Taproom and Open Eye Cafe among them), but it does indicate that employees are parking where the demand analysis reports high occupancy rates (see Part VI, Recommendations). If employees are not provided with private parking, business owners reported that they park in another private lot (the Carr Mill Greensboro Street lot was cited specifically), public lots, and a small minority in on-street parking. Business owners re

ported that customers who could not take advantage of a private lot at the business they patronized were more likely than employees to park in a public lot or on-street, perhaps due to the fact that employees remain downtown for longer than the time limits allowed on public or on-street parking. See Figure 5.

The majority of respondents saw parking as a growing issue of concern for the town. The specific observations and recommendations from respondents as to parking are further addressed in the Conclusions section. Respondents were also not in favor of metering or enforcing parking, as only 29% of respondents were in favor of metered parking and only 17% believed that the enforcement of parking would make a difference in the parking supply.

In addition to asking business owners their opinions on the availability of parking, the survey also asked owners about the parking demand generated by their customers. The survey collected data on the length of time it takes to make a transaction at the various businesses, and on the origin of the customers of the businesses. Owners reported that the average time to make a transaction at their businesses ranged between 15 minutes to 2 hours or more, with 1-2 hours being the most-reported transaction length (31%), followed by 30-15 minutes (21%), 30-45 and 45-60 minutes (17%), and under 15 minutes or 2 hours or more (7%). See Figure 6. The wide variety of responses for transaction times may explain both the rapid turnover and the two-hour limit violations found in the demand analysis. More likely, however, the range of transaction times reflects the low response rate of the survey and wide variety of business types in Carrboro.

When asked which area they believed the majority of their customers were coming from, business owners reported a variety of areas. All respondents reported that some of their customers come from Carrboro or Chapel Hill, which indicates that at least some customers can use other modes of transportation to access these businesses. 14 out of 29 business owners (48%) reported that some of their customers came from Hillsboro or Orange County, with 12 out of 29 business owners (41%) reporting that some customers came from Durham or Durham County. Business owners also reported customers arriving from Chatham County (28%), Raleigh and Wake County (31%), and from outside of the Triangle (31%).

Finally, the survey asked business owners about their experience with or willingness to investigate shared parking opportunities. Of the 29 respondents, 14 (52%) responded that they currently participated in a shared parking situation, and 13 (48%) responded that they did not currently participate (2 did not respond). The majority (63%) of owners who participated in a shared parking situation, reported that they were satisfied with their current parking situation, although it is not entirely clear if some owners reported that they were satisfied with an unshared parking situation, or if some owners did not affirm participating in a shared parking situation but were satisfied with their shared parking arrangements. Owners who were currently not involved in a shared parking situation did not show significant interest in participating in a shared parking situation. Seven respondents reported that they would be willing to be a user of spaces in a shared arrangement. Nineteen respondents reported that they would not be willing to participate in a shared parking arrangement as either a user (8 respondents) or a provider (11 respondents) of spaces. This somewhat reflects the qualitative comments of the respondents, as those comments reflected a belief that parking occupancies were high throughout the downtown,

Figure 5: Parking Types Available to Customers
(besides private lots provided by businesses)

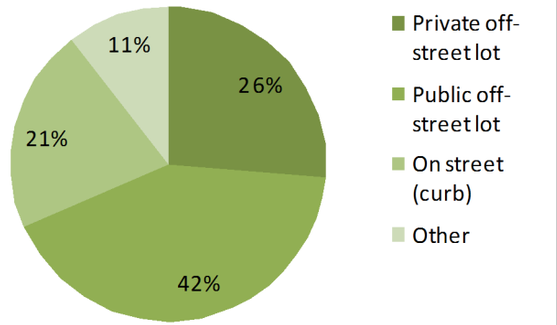


Figure 6: Average Time for Business Transactions

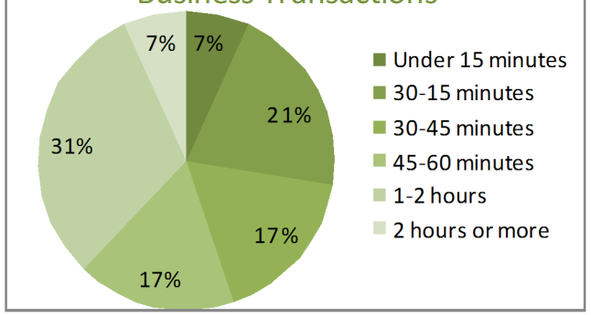


Figure 7: Parking Lots Investigated by Type

and that solutions using existing parking may not be effective. However, 61% of respondents were interested in learning more about a Transportation Management Association, suggesting that business owners are open to learning more about potential solutions for downtown.

Part III: Supply and Demand Data Collection

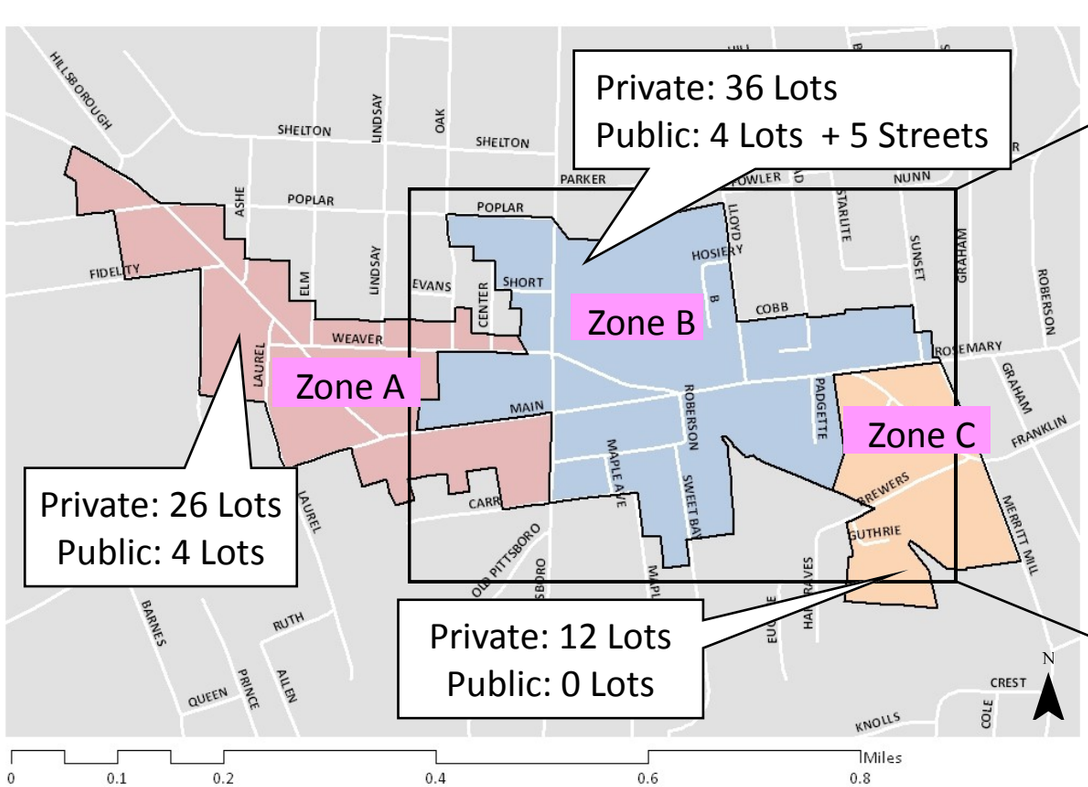
To adequately capture the current supply and demand for parking in the Town of Carrboro, the Team conducted a two-tiered analysis: 1) current supply and demand and 2) land use to incorporate projected development and possible changes in future parking supply and demand.

A. Parking Supply

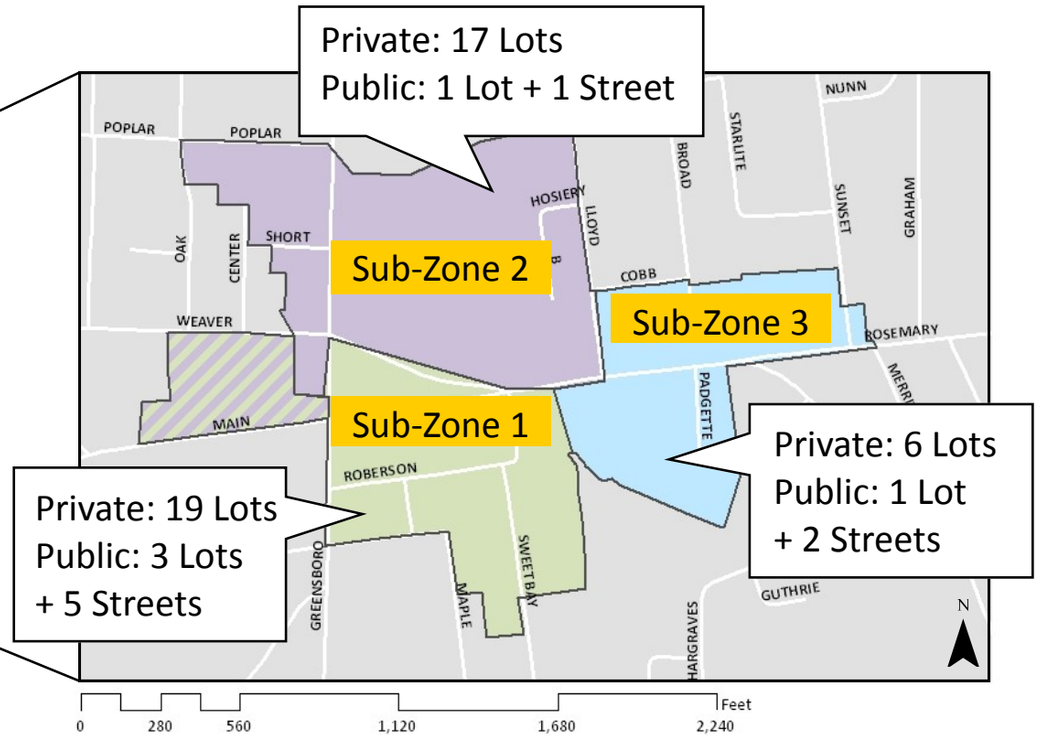
Methodology

The Team gathered parking supply data with hand counts of selected private and public parking lots within the Central Business District (CBD), as well as significant blocks of on-street parking (see Figure 7). Each lot was assigned a unique identifier, and total spaces within each parking lot were counted. If the spaces were unpainted, as was common with gravel lots, concrete bumpers were used to indicate parking spaces. If the lot lacked any parking space indicators, the Team estimated capacity based on existing cars and extrapolating available spots. While conducting hand counts, the Team noted specific characteristics of each parking space. For example, the Team captured data on reserved spaces, including ADA priority, reserved customer parking, or reserved employee parking.

Figure 8: Number of Parking Lots Counted for Supply



Zone Supply



Sub-Zone Supply

*Since Subzones 2 and 3 count the striped, western portion of PAZ B twice, the total for the Subzones will be greater than the total for PAZ B.

[1]There was a third category of supply not included in our data analysis. *Not 9-5*: Total non-restricted spaces outside of 9:00 am-5:00 pm, Monday-Friday.

Available supply is often restricted, either by lot owner or during certain hours

Limitations

The parking supply counts do not include all of the parking lots in the CBD, only specific lots that the Team worked with Town staff to identify. The lots chosen are those most pertinent to the study and the future parking in the downtown.

Analysis Zones and Sub-Zones

Apart from the larger survey of supply counts described above, the team focused on a smaller central area of the CBD. The central area was divided into three Parking Analysis Zones for analysis: A, B, and C (see Figure 9). Since much of the parking activity and all major approved and tentatively approved new developments occur in Zone B, this zone was further divided into Sub-Zones 1, 2, and 3 (see Figure 9). Sub-zones were created to mirror parking trends and peaks. Specifically, Sub-Zone 3, which contains the 300 E. Main St. Partners parking lot, is thought to have peak parking needs during the evenings when events occur at the Cat's Cradle and the Carrboro Arts Center. Sub-Zone 2 contains the Carr Mill lot, which is thought to have several peak parking needs due to Weaver Street Market and Harris Teeter supermarket. Each parking lot was assigned to the appropriate zone and sub-zone for analysis purposes. While the boundaries are somewhat artificial since a number of stores may share nearby lots, these focus areas reflect catchment areas based on data and firsthand observation. The striped area was included in both Sub-Zones 2 and 3, due to the significant overlap.

Findings

Supply data is represented in the following manner. For each lot, parking spaces were divided into two categories:

1. *Total*: Total parking, including all restricted spaces
2. *M-F, 9-5*: Total non-restricted spaces from 9-5, Monday-Friday.

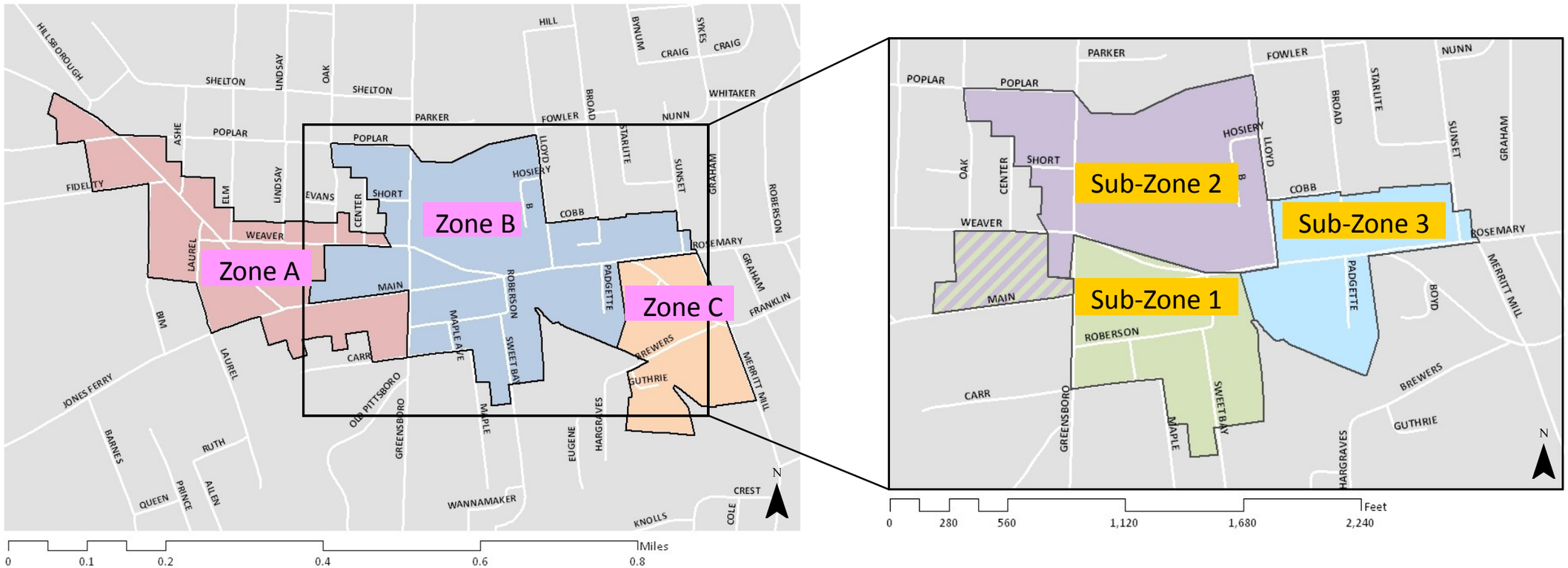
Restricted spaces are spaces dedicated to employees, monthly renters, and ADA reserved. Parking signed as reserved for customer parking was included in the non-restricted space count as most lots appear to enforce these restrictions only at certain times of the day and specific days of the week[1].

Figure 10 indicates a total supply of 2,619 spaces in the lots designated for analysis. Nearly 1,700 (64%) of those spaces are found in Zone B, which is centrally located in the CBD, and is less than ½ mile across in any direction. During business hours (9:00 am-5:00 pm, M-F), however, 2,083 spaces are available, with approximately 1200 spaces (59%) available in Zone B. Of the total spaces in Zone B, nearly 84% are located in Sub-Zones 1 and 2. Sub-Zone 1 has nearly 400 fewer unrestricted private spaces than total spaces. This difference is due to the large number of employee-reserved parking spaces on Roberson Street, behind Main Street. Of particular note is the Carr Mill employee parking lot at the corner of Roberson and Sweet Bay Streets, which contains 253 spaces. Even though this lot is reserved for Carr Mill Employees, anecdotal evidence suggests that the general public uses the spaces as well.

Comparison to Previous Town Data

Prior to this study, the Town of Carrboro used the square footage of lots to estimate the number of spaces. However, the Team found no significant correlation between the hand counts and the numbers provided by the Town. This difference could be for a number of reasons:

Figure 9: Parking Analysis Zones and Sub-Zones

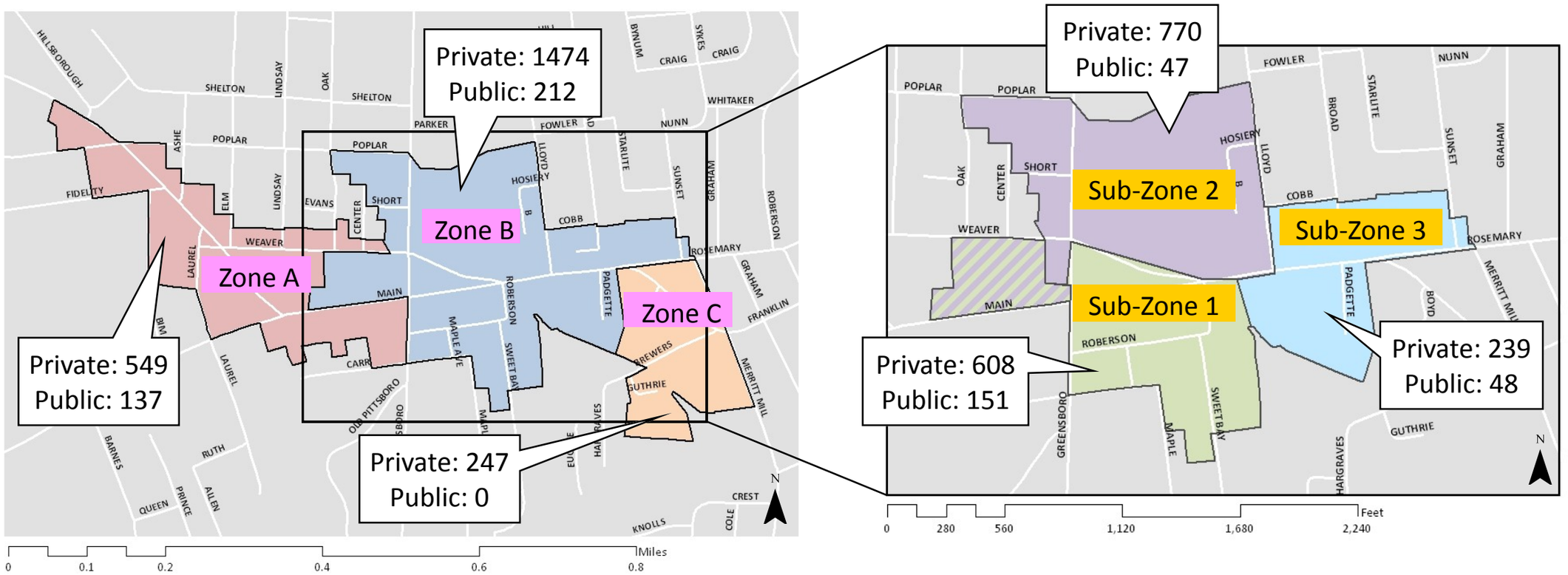


Zone Supply

Sub-Zone Supply

*Since Subzones 2 and 3 count the striped, western portion of PAZ B twice, the total for the Subzones will be greater than the total for PAZ B.

Figure 10: Current Parking Supply (total and unrestricted)



Zone Supply

Sub-Zone Supply

*Since Subzones 2 and 3 count the striped, western portion of PAZ B twice, the total for the Subzones will be greater than the total for PAZ B.

1) The shapefiles drawn in GIS and used to derive the supply estimates are often inconsistent with shapes of the lots;

2) The formulas used to calculate these estimates may not be accurate based on particular features of lots (e.g., space is not always used at the same level of efficiency);

3) The GIS shapefiles are not up to date, as a number of parking lots have been converted into developments in recent years.

Given the lack of correlation between the two counts, the Team advises that all future Town parking figures be based on this updated data.

B. Parking Demand

The Team set out to determine two aspects of parking demand: 1) occupancy and 2) turnover. In order to gather these data, three methods of analysis were used. For occupancy, the Team collected surveys of the number of cars in each lot. For turnover, the Team used a chalking method in public lots and used tube counts provided by the Town for the Car Mill Lot on Greensboro St. and Weaver St.

1. Occupancy

Methodology

Demand data were collected over the course of four days, Saturday, Sunday, Tuesday, and Thursday; February 9, 10, 12, and 14, 2008, respectively. Tuesday and Thursday were chosen as representative weekdays, while Saturday and Sunday were chosen to capture weekend parking demand. There were three components to the parking demand data collection effort: 1) a private lot survey to determine occupancy at varying peak periods throughout each day and the entire week, 2) a public lot survey to determine occupancy, and 3) a survey of turnover in public lots on typical weekdays and weekends. Tube counts of 6 public lots were utilized for data comparison and to verify peak parking times.

Private Lot Survey

Team members met with Town staff to agree upon the most likely peak occupancy hours for each parking lot. The CBD was divided into five demand collection areas (DCA), and each assigned different peaks.

Fidelity St./ Poplar Ave.: DCA A was excluded from the survey due to a perceived lack of a parking "problem" (except during the farmer's market season, which was beyond the temporal limitations of this study)

W. Weaver/ W. Main: DCA B includes many small businesses. This lot was surveyed at 3:00 pm to capture afternoon customers and employees still at work for the day.

Roberson St., W. Carr, East Main: DCA C is in the center of Downtown Carrboro and includes a wide range of businesses which attract customers at different hours of the day, including bars, restaurants, retail establishments, and a bank. Additionally, this area is just south of the Carr Mill Mall. These lots were surveyed three times a day: at 9:30 am, 3:00 pm, and 7:00 pm

Lloyd St.: DCA D includes the lots and on-street parking just north of the Cat's Cradle abutting Lloyd Street. These lots may experience spillover parking from 300 E Main St. and Milltown and were surveyed at 2:00 pm and 7:00 pm on weekdays and at 9:00 pm on weekends.

300 E Main St, KFC: DCA E experiences high parking demand in the evening, generated from the Cat's Cradle, Amante's, and the Arts Center. These lots were surveyed twice each weekday at

Demand was examined for both occupancy and turnover at public lots

This private lot is below 85% occupancy.

11:00 am and 9:00 pm and once each weekend day at 9:00 pm. At each peak time, team members counted the cars in each lot in the demand collection area, noting the total number of cars parked, in addition to the number parked in reserved customer, reserved employee, and ADA compliant spaces.

Public Lot Survey Methodology

Occupancy at public lots was determined in the same way as in private lots. Team members visited each public lot and recorded which spots were occupied. Occupancy was calculated by summing the count for each lot during the survey time periods.

Limitations

There are several limitations related to occupancy that are worth noting:

1. Due to lack of time, the Team was unable to account for service denials at any lots that may have been fully occupied. Lots that are either completely full or near full may deny service to those people looking to park. A future study could be conducted to account for service denials by video-taping cars that enter and exit in lots that experience high demand, or by other methods that can distinguish whether a car has been unable to locate at available space.
2. Per the owners' request, the Team did not survey the Carr Mill Mall lots. Instead occupancy was assumed based on tube counts at the two Greensboro Street entrances and the Weaver Street entrance and by visual estimation of the employee parking lot.
3. Temporal limitations limited the Team from gathering counts during the Wednesday afternoon and Saturday morning Farmer's Market, which generates significant parking demand. This demand, however, is outside of the critical parking areas of the CBD.
4. The number of spots that the Team surveyed in each zone did not remain constant. Therefore percent occupancy may not reflect the true possible percent occupancy for that sub-zone. For example, on Tuesday, the five different times of analysis (9:00 am - 11:00 am, 12:00 pm - 3:00 pm, 3:00 pm - 6:00 pm, 6:00 pm - 9:00 pm, 9:00 pm - 11:00 pm) the number of spaces observed in the demand analysis for Sub-Zone 3 was 256, 256, 22, 256, and 271 for each time, respectively.
5. The Team did not have data for all zones at all times. Refer to Table 2 for more information. Not all zones were fully analyzed. For instance, on weekends, Zone C was not targeted, per the Town's request. Therefore, less than 20% of the total available spaces in Zone C were analyzed. As result of tube count malfunction at the Carr Mill Parking lot, the supply studied in Sub-Zone 2 for 9:00 am - 6:00 pm on Saturday was less than 10% of the total supply for that sub-zone. Additionally, for Sub-Zone 3, on Saturday and Sunday from 9:00 am to 9:00 pm the supply studied was less than 10% of the total supply for that sub-zone.

Findings

Counts of parked cars yielded occupancy levels for Carrboro parking lots, differentiated by area and time of day. The Team utilized an 85% occupancy standard to determine whether there is an over-demand or under-supply for parking in lots and zones at all levels of analysis. Donald Shoup (1995) describes an 85% occupancy rate as the baseline set by traffic engineers. On a given city block accommodating seven spaces, on average, six should be

Table 2: Times of No Data or Minimal Data						
		9:00 am-11:00 am	12:00 pm-3:00 pm	3:00 pm-6:00 pm	6:00 pm-9:00 pm	9:00 pm-11:00 pm
Zone A	Tuesday	*				
	Thursday					
	Saturday					
	Sunday					
Zone B	Tuesday					
	Thursday					
	Saturday					
	Sunday					
Zone C	Tuesday	*	*	X	*	*
	Thursday	*	*	X	*	*
	Saturday	X	X	X	*	*
	Sunday	X	X	X	X	X
Sub-Zone 1	Tuesday					
	Thursday					
	Saturday					
	Sunday					
Sub-Zone 2	Tuesday					
	Thursday					
	Saturday	*	*	*		
	Sunday					
Sub-Zone 3	Tuesday			X		
	Thursday			*		
	Saturday	*	*	*		
	Sunday	*	*	*		

Legend:

***** Denotes when the number of spaces that were surveyed are less than 20% of the total spaces, both private and public, available in that zone or sub-zone.

X Denotes when there was no data

Sub-Zone 3 has high levels of occupancy during evenings and weekends, but has much lower levels of occupancy at other times

occupied and one available to "ensure easy parking access and egress." Though this benchmark was created for on-street parking, as a result of later study and theory (Shoup 2004) this occupancy percentage is now used consistently as a target for most parking scenarios. Above the 85% average occupancy thresholds, there are a significant number of "service denials" – users unable to find a parking space as a result of fully occupied spaces. These service denials may dissuade users from driving to the destination in the future or create an overall sense of a "parking problem" in the vicinity of the occupied spaces.

Findings by Lot

When looking at the occupancy level of Carrboro lots, some trends emerge. Some of the lots above ideal occupancy rates (85% and up) during the day may not be indicative of a parking issue. These elevated rates may be attributed to business lots being full, most likely with employee vehicles. The UNC Health Care lot and the auto repair lot on Lloyd St. are examples of this phenomenon. Lots that exceed ideal capacities at certain times of day are the Bank of America lot, the Open Eye lot, the Cat's Cradle/Arts Center lot, and the 100 East Main Lot. On-street parking on Roberson Street and Weaver Street are also often above ideal capacities.

Figures 18-38: Current Demand by the Time and Day [Appendix A]

Findings by Zones

In general, Zone B has the highest occupancy of the three zones. On Tuesday and Thursday, Zone B steadily increases in occupancy throughout the day, peaking in the early evening (reaching a maximum of 80% on Tuesday and 65% on Thursday). On Saturday, Zone B experiences two peaks: it reaches 60% occupancy between 12:00 pm and 3:00 pm, and it elevates from 55-70% occupancy from the early to late evening. On Sunday Zone B peaks at 60% occupancy between 11:00 am and 3:00 pm and remains stable around this level for the rest of the day. See Appendix C for a more detailed day-by-day analysis of Zone B. Zone A peaks in the afternoon on weekdays (at around 50%) and in the evening on weekends (at around 35% occupancy). On weekdays, Zone C peaks between 60 and 75% around 11 am. The Town requested that we not focus on Zone C because it is not a perceived problem area. Therefore, the Team did not collect sufficient data for weekend analysis of Zone C.

Figures 39-58: Current Demand by Zone and Sub-Zone by Time and Day [Appendix A]

Findings by Sub-Zones

The area in which the highest occupancies were observed is parking Sub-Zone 1. Sub-Zone 3 also sees above ideal occupancies, but this observation is dependent on special events at the Cat's Cradle or the Arts Center rather than any regular temporal pattern or cycle. The major trends in Sub-Zone 1 are as follows: on weekdays, the lots are above ideal occupancy rates from the early evening onwards. On Saturdays, the lots fill to above ideal occupancies in the Early Afternoon, abate slightly in the Late Afternoon, and then fill from the Early Evening onwards. On Sundays, the lots are generally less full than on the other days, but there are high occupancy rates in the Early Afternoon (most likely due to brunch at Carr Mill Mall) and the Early Evening.

Sub-Zones 2 and 3 have the highest and most frequent peak occupancies. Sub-Zone 2 peaks in occupancy on weekdays during the Early Evening between 75% and 90% occupancy. On weekends Sub-Zone 2 peaks at 70-85% occupancy

between 12:00 pm-3:00 pm and decreases steadily afterwards.

Sub-Zone 3 peaks in the evening on weekdays (reaching 75-85% on Tuesday, and 60% on Thursday). On Saturday, Sub-Zone 3 peaks between 12:00 pm-3:00 pm and 6:00 pm-9:00 pm at an occupancy of 80-95%. On Sunday, Sub-Zone 3 peaks on Sunday morning between 9:00 am and 11:00 am On Tuesday, Sub-Zone 1 hovers around 50-60% occupancy until late evening when it peaks at 70-80% occupancy. On Thursday, Sub-Zone 1 remains stable all day between 45 and 60% occupancy. Sub-Zone 1 peaks during the Early Evening and Late Evening on Saturday and Sunday at 65% occupancy and 45-55% occupancy, respectively.

2. Turnover Analysis

Chalking in Public Lots

The data collected for turnover indicates where and when cars are being parked for shorter versus longer periods of time. Ideally, the most centrally located parking spots will have the most frequent turnover, and longer-term parking, such as for downtown employees, will occur at the periphery. Additionally, the turnover analysis indicates how effective the 2-hour time limit for spaces in municipal lots is, and where and when better enforcement may have the greatest positive impact on supply. Although the Team's turnover analysis was only conducted for public lots, the trend in terms of length of stay within different parts of downtown may also be generalized to proximate private lots.

Methodology

In order to determine turnover, car tires were chalked each time a count was completed. Each time the lot was counted, the number of chalk marks on a car was recorded.

At five times throughout the day (9:00 am, 12:00 pm, 3:00 pm, 6:00 pm, and 9:00 pm), Team members:

- Visited each public lot
- Marked the rear, driver-side tire of each car in the lot with chalk
- Recorded which spots were occupied
- Recorded how long each car had been there (based on the number of chalk marks present)

The turnover survey at public lots excluded the Carrboro Town Hall lot as there is no time limit posted and the nature of the lot (primarily for day-long use by Town Hall employees) is different than the other municipal lots. Through this data, the Team was able to derive rates of turnover in each lot (see Findings below).

Due to limited resources, the Team was only able to visit public lots every 3 hours, even though the posted time limit is 2 hours. Thus our findings, in terms of the number of parked cars exceeding the 2-hour limit, is quite conservative, in that it only takes into account cars parked at least an excess of 1 hour of the limit. Throughout the discussion of the Team's findings, only cars parked 3 hours or greater are treated as exceeding the limit.

Limitations

Due to time and resource limitations, data could not be collected more frequently than at 3-hour intervals. While this interval gives a rough picture of the time a car is parked, a much richer analysis could be performed with data collected every hour, half hour, or 15 minutes. This sort of data can provide information about whether time limits should be varied on a greater scale (with

Turnover was assessed using tire chalking methods.

Approximately 20% of cars surveyed violated 2 hour time limits at public lots

some spots reserved for 15-minute or 30-minute parking) based on observations of parking behavior. Additionally, a more refined turnover analysis could better indicate the proportion of people who use the lots as informal park-and-ride lots to access UNC or employees who choose to utilize these lots as longer-term parking facilities. The turnover analysis was also limited in that it could only be conducted for public lots, as the Team was not permitted to chalk tires on private property.

There are also limitations with the dataset collected. During the Tuesday night data counts, it was raining. Although data collectors were still able to see the chalk on the tires, the level of accuracy may be not as high as it is possible that some chalk may have washed off or smeared. Additionally, counts for two time periods were interpolated due to human error in the data collection process (Saturday at 9:00 am for the west public lots and Sunday at 12:00 pm for the east public lots).

Findings

Although the raw data collected includes the number of cars parking for all three-hour intervals recorded (less than 3 hours, 3-6 hours, 6-9 hours, and greater than 9 hours) the number of cars parked greater than 6 hours was relatively small, therefore, analysis has focused solely cars parking greater than or less than 3 hours. Of the total 454 times that a car was observed parking 3 hours or greater (out of a total 1940 cars counted total), the majority (63%) were parking somewhere between 3 and 6 hours (see Table 3). An additional 18% and 6% parked between 6 and 9 hours and 9 and 12 hours, respectively. The 13% observed parking in excess of 12 hours represents about 3 cars that were present at each of the 20 possible time/day combinations.

Figure 12 – Turnover by Lot, summarizes the results of the turnover analysis by municipal lot. The data shows that the majority of users parking in municipal lots do not stay for more than three hours; however, a significant minority violates the limit. Over the 4 days of the survey, 20% of cars counted were parking in excess of 3 hours. This 20% rule holds constant within

the three public lots within Zone B (Century Center, E. Main, and Main/Roberson), averaging between 17% and 20% of cars overstaying the limit throughout the week (see Figure 13, Turnover by Parking Analysis Zone and Sub-Zone). Moreover, there was no difference between weekday versus weekend length of stay, suggesting that those who exceed the time limit may not necessarily be limited to students or faculty working during the week (see Figure 14- Turnover by Day of Week).

Over the four-day analysis period the vehicles that parked for more than 3 hours took up approximately 10% of the available spaces in the parking lots. Because of these violators, only 90% of the total parking supply was available during the analysis period. At any given time, about 30 to 35 additional spaces would be available if parking time limits were respected.

Figure 15 - Turnover by Time of Day, presents turnover by time of day. There is some variation in the level of turnover throughout the day. At 9:00 am, almost all cars were observed to park for fewer than 3 hours. This finding is due to the fact that this period was the first survey time of the day, and only cars parked

Table 3: Time Limit Violations	>3hrs	>6hrs	>9hrs	>12 hrs	Total
Total Over All Time Periods Counted	286	81	26	61	454
Percent Of Total Cars Parking >3hrs	63%	18%	6%	13%	

Figure 11: Tube Count Locations
February 13-March 3

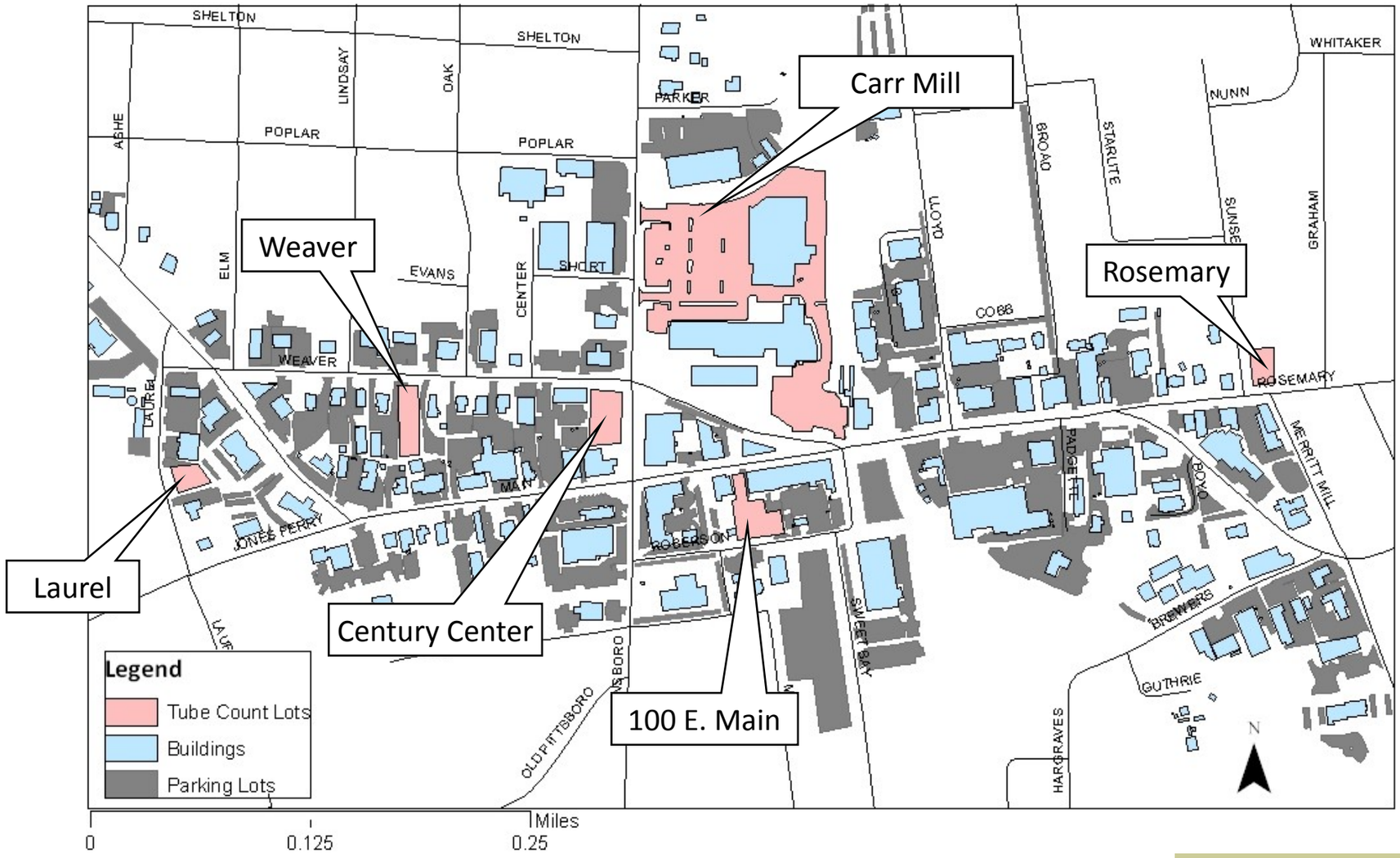
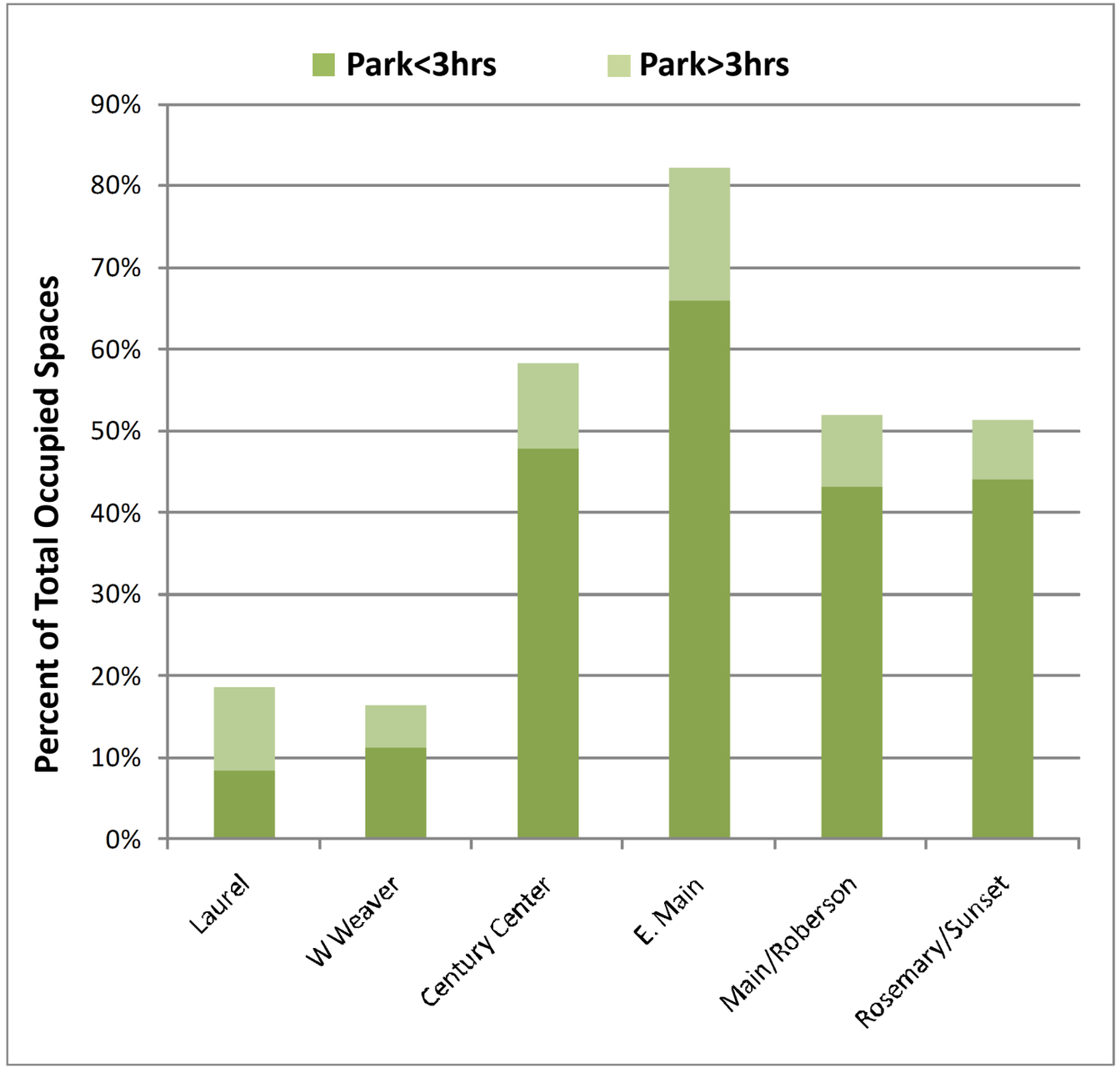


Figure 12: Turnover by Lot



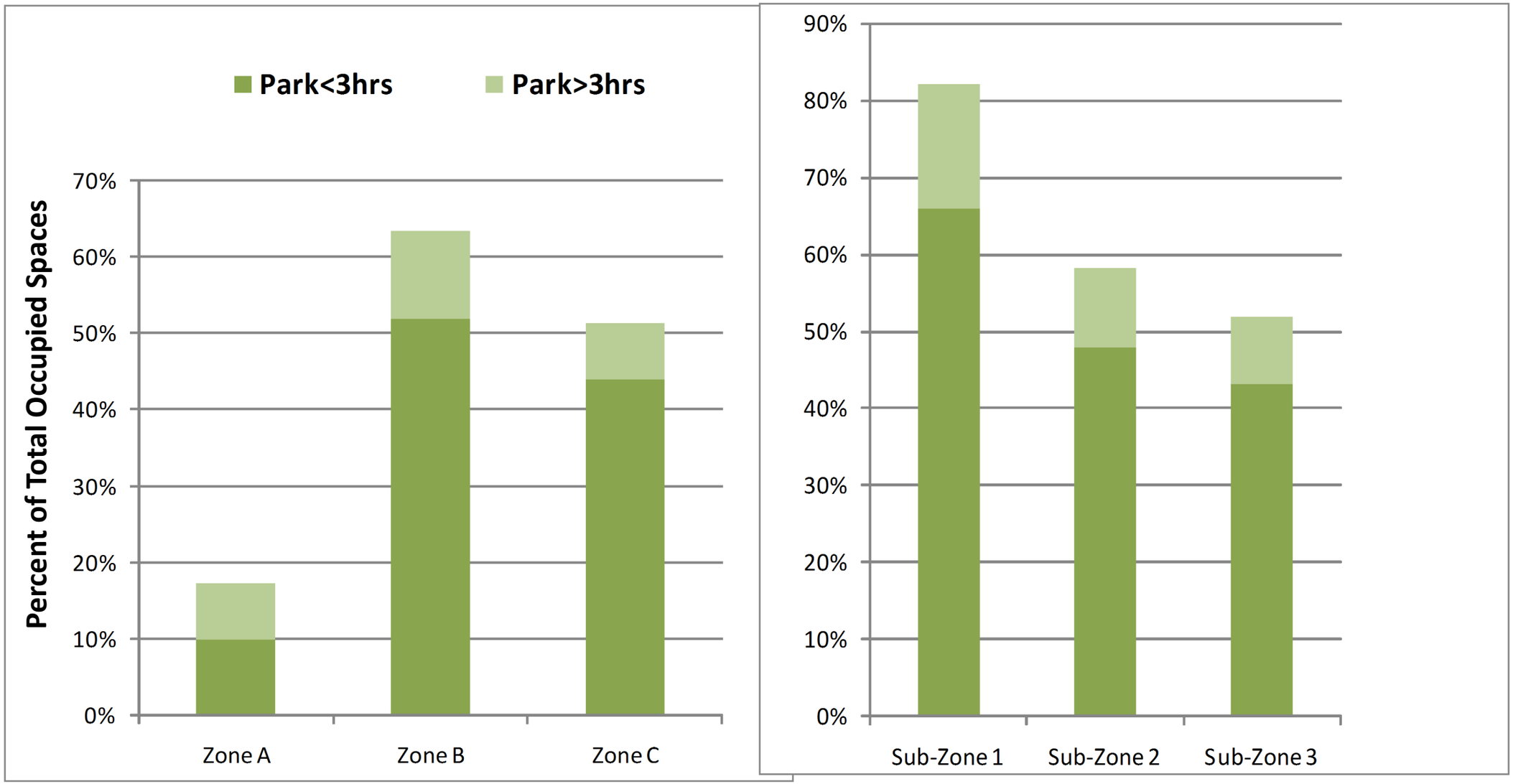
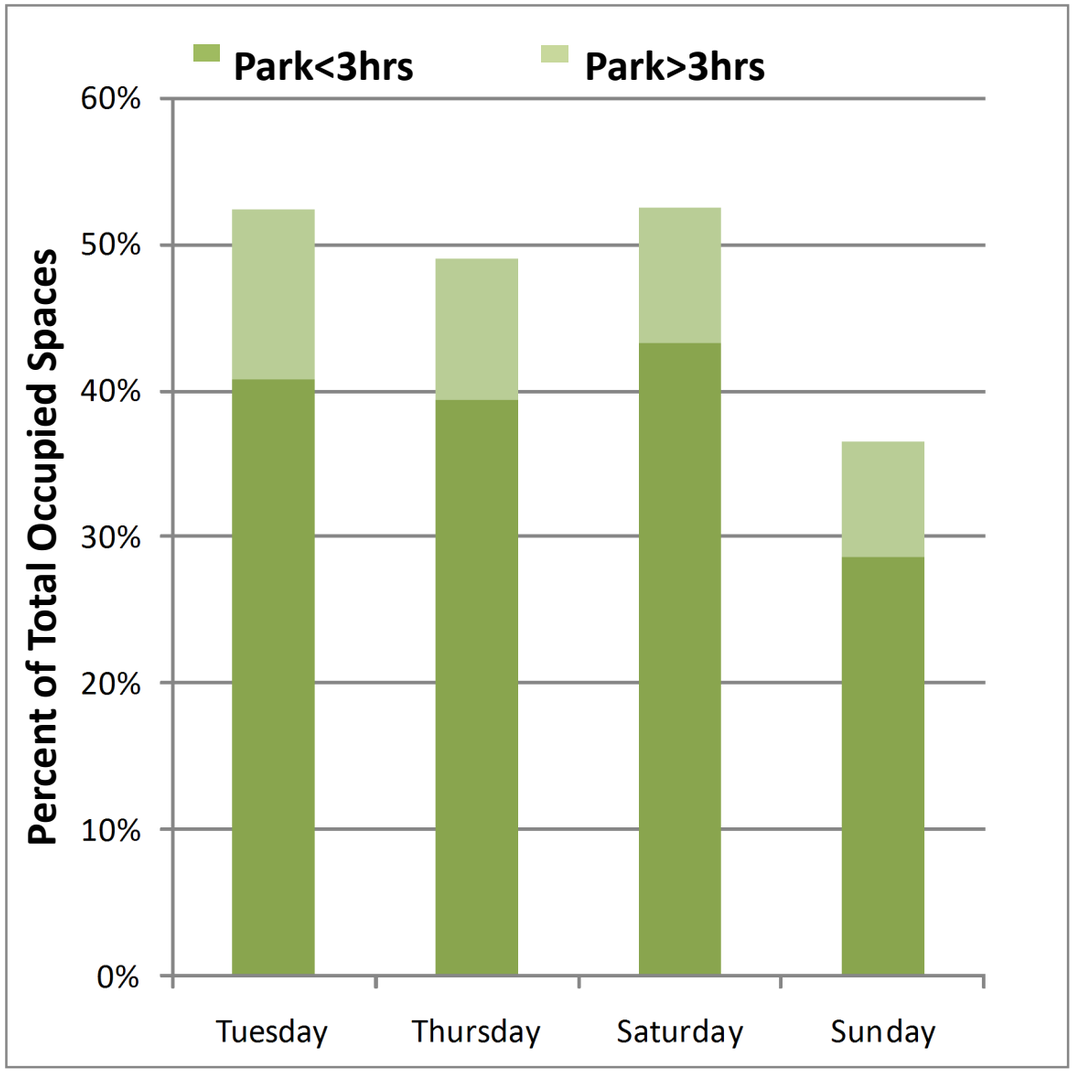
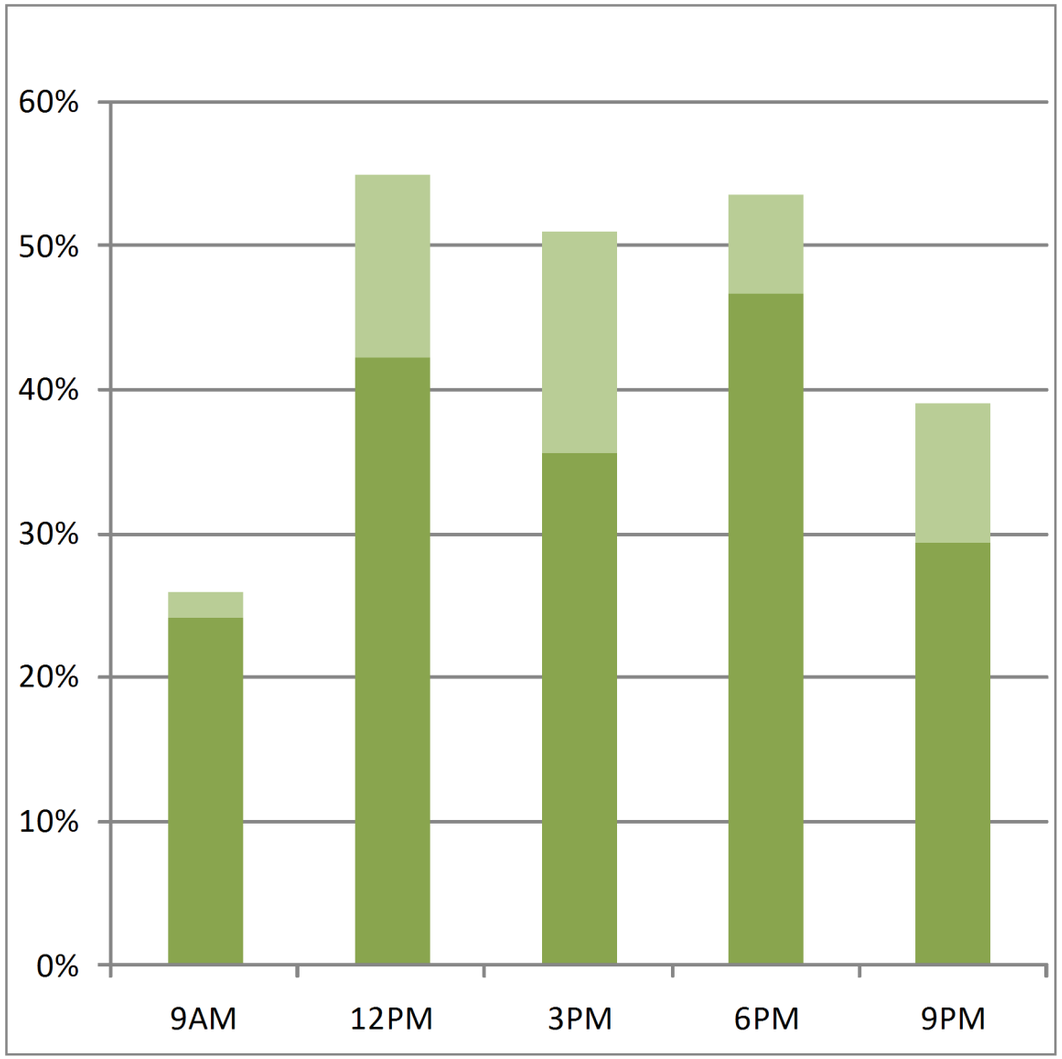


Figure 13: Turnover by Parking Analysis Zone and Sub-Zone





Figures 14 and 15: Turnover by Day of Week and Time of Day

Automatic Vehicle Counts (Tube Counts)

Methodology

In order to supplement the visual parking counts conducted for this project, the town of Carrboro also conducted automatic vehicle counts, or tube counts, at six public parking lots and 1 private parking lot. The public parking lots targeted for automatic vehicle counts include:

- 100 East Main Lot
- Century Center Lot
- Laurel Lot
- Roberson/Main Lot
- Rosemary Lot
- Weaver Lot

Additionally, the vehicles accessing the Carr Mill lot were counted. See Figure 11 for the location of tube counts. The Town of Carrboro Public Works Department used automatic vehicle counters with pneumatic tubes to measure the volume of motor vehicles at each driveway of the targeted parking lots, with two tubes used at each access point. By considering the sequence of counts for the two tubes, the direction of the car can be determined and recorded, thus providing information on the number of vehicles entering and exiting the lot.

The tube counts were conducted from February 13 to March 3, 2008, with each lot monitored for five consecutive days. The data from the five days provide an average daily usage broken down by hour. The data for each lot are used to determine peak periods of use for the parking lot. for each surveyed lot.

Limitations

Assuming a net gain of zero cars over the five day observation period, error can be determined by equalizing the number of entrance movements and exit movements and calculating the difference between the equalized numbers and the observed counts. Error rates for the six public lots surveyed range from +/- 1% for the Century Center Lot and the Roberson/Main Lot to +/- 8% for the Weaver Lot. The error rates for the other lots are provided in Table 4[2].

Apart from the general challenges associated with traffic counters as discussed earlier, the data for Saturday, February 16, were inaccurate. The tube counts for the Carr Mill Mall south driveway consistently portrayed entrance counts making up 62% to 66% of the total counts for that access point on all other days. To compare, entrance counts made up 36% to 38% of the total counts for the north driveway access point. The Saturday data for the south driveway access point, however, showed only 5% of the total counts for that access point to be entrance movements. Because these data compromise the conclusions able to be drawn from the combined data for all access points, all data for Saturday, February 16, were not included.

Findings

When considering the subsequent findings, it is important to consider the current supply at each public lot. These numbers are provided in Table 5.

The tube count data shows peak usage times for each lot over the course of the 5 days of monitoring. The presumed and observed peaks for the lots surveyed are provided in Table 6.

[2]The tube counts may not in fact be 100% accurate if the number of entrance movements and exit movements are not the same over the survey period. In fact, more or fewer cars might have been in the lot at the conclusion of the period compared to the start of the surveying. Thus even the error rates must be considered subject to their own degree of error.

Table 4 – Tube Count Error Rates

Parking Lot	Error Rates
100 East Main	+/- 4%
Century Center	+/- 1%
Laurel	+/- 2.5%
Roberson/Main	+/- 1%
Rosemary	+/- 6%
Weaver	+/- 8%

Table 5 – Public Parking Lot Supply

Parking Lot	Number of Spaces
100 East Main	38
Century Center	34
Laurel	23
Roberson/Main	38
Rosemary	22
Weaver	33

Table 6 - Presumed and Observed Peak Times for Tube Count Parking Lots		
Parking Lot	**Presumed Peak Time(s)**	**Observed Peak Time(s)** *--Bold designates absolute peak*
100 East Main	9:30 am, 3:00 pm, 7:00 pm	**6:00 pm**, 7:00 pm
Century Center	3:00 pm	**12:00 pm**, 4:00 pm, 5:00 pm
Laurel	3:00 pm	**9:00 am**
Roberson/Main	9:30 am, 3:00 pm, 7:00 pm	12:00 pm, **6:00 pm**, 7:00 pm
Rosemary	11:00 pm, 9:30 pm	12:00 pm, **6:00 pm**, 7:00 pm
Weaver	3:00 pm	**12:00 pm,** 1:00 pm, 4:00 pm, 5:00 pm

Overall, according to the tube count data, the presumed peak times matched with the observed peak times for the parking lots in some instances and missed in others. The presumed peak time of 7:00 pm for the 100 East Main Lot was confirmed as well as the 7:00 pm peak time for the Carr Mill Mall lot. Additionally, the Rosemary Lot and the Weaver Lot peak times were off by 1 hour from the presumed times. Other lots such as Laurel and Rosemary did not match well.

According to the tube counts, the most heavily used public parking lot is the 100 East Main Lot located behind the Orange County Social Club, with a maximum average daily usage rate of 96 cars per hour at 6:00 pm.

The least used public parking lot is the Laurel Lot, located near the Carrboro Farmer's Market, with a total average daily usage of 72 cars over a 24-hour period. The Weaver Lot was also lightly used, with a total average daily usage of 90 cars over a 24-hour period. See Table 7: Average Daily Movements per number of spaces. The Weaver Lot, however, had a peak average usage rate of 11 cars at 12:00 pm, compared to the Laurel Lot peak of 12 cars at 9:00 am. See Table 13: Tube Counts Per Hour, Appendix D, p. 105 for movements (cars entering and exiting) aggregated together per hour.

When considering the number of movements into and out of a lot per the total spaces supplied by the lot, the best utilized parking lot is the 100 East Main Lot, with approximately 26 average daily movements per space. According to this method of analysis, the least utilized lot is the Weaver Lot, with less than 3 average daily movements per space.

Table 7 – Average Daily Movement per Number of Spaces	
Parking Lot	**Number of Average Daily Movements per Number of Spaces**
100 East Main	25.6
Century Center	16.9
Laurel	3.1
Roberson/Main	14.9
Rosemary	15.3
Weaver	2.7

C. Parking Demand – Carr Mill Parking Lot

Because business owners in the Carr Mill Mall requested that no hand or visual survey of occupancy in the Carr Mill lot be conducted, no accurate data for usage rates for this lot were available. However, because the Carr Mill lot represents a large portion of the overall private parking supply in downtown Carrboro, an estimate of the occupancy of this lot was required. Therefore, despite some of the inaccuracies described above, tube counts were used to determine usage rates for the Carr Mill lot.

The Carr Mill lot has three vehicular access points: two driveways on Greensboro Street (south driveway and north driveway) and one driveway on Weaver Street. All three of these access points allow for both entering and exiting motor vehicle traffic. In order to capture usage data and occupancy rates for the Carr Mill lot, traffic counts were requested at each of the three access points.

Tube counts were provided for the Carr Mill lot from February 13, 2008, through February 17, 2008, Wednesday through Sunday, at the three access driveways – the two Greensboro Street access points and the Weaver Street access point.

Two tubes were used for both of the Greensboro Street access points. Due to the narrow nature of the Weaver Street entrance, only one tube was used and thus the counts for that entrance only provide total driveway usage, not data on the number of entrances and exits.

In order to account for no exits and entrances recorded at the Weaver Street driveway, all counts for the three access points were assumed to sum to 50% entrances and 50% exit movements. In order to apply the Weaver Street data to the Greensboro Street data, the following methods were applied:

- Entrances and exits at the Greensboro access points were aggregated
- The difference was taken between the larger count and the smaller count (i.e.: 1200 entrances, 1100 exits resulted in a difference of 100 exits)
- For the lesser movement, each time period was given a percentage of the total count over the day (i.e. 110 exits at 4:00 pm resulted in 10% of the total movement for the day)
- The difference from counts was then subtracted from the total Weaver Street counts (i.e. the Weaver Street driveway had a total of 500 movements, and 100 was subtracted) and assigned to a time period based on the previously calculated percentage (i.e. the 4:00 pm count of 10% of all movements had 10 of the 100 Weaver Street counts added)

The remainder of the Weaver St. counts were evenly distributed by time period to the aggregated exits and entrances.

With all entrances and exits calibrated, the assumption was made of 0 cars in the lot at 4:00 am. At this time period, the exit movements were subtracted from the entrance movements. This base number was added to the next time period entrance minus exit movement. This process was repeated for each time period through midnight. Visual analysis of the resulting occupancy levels verified that these calculated numbers were reasonable, with no negative results and between 30 and 50 cars remaining in the lot at midnight.

Upon examination of the reported data, it was clear that entrances and exits were consistent for all dates except Saturday, February 17th. There were reports of disconnected tubes during this day, which was verified through data inspection. As a result, Saturday tube count data was not used for Carr Mill occupancy.

Additionally, counts were not collected on a Tuesday, but instead were collected on a Wednesday. The Team assumed that this Wednesday was a normal weekday, and therefore utilized these counts for the Tuesday analysis and maps.

The occupancy calculated over the course of the average 24-hour period for the Carr Mill Mall Lot is included in Table 8.

Table 8 - Carr Mill Parking Occupancy by Time

Time	Tues.	Thurs.	Sunday
4:00 AM	9	6	3
5:00 AM	17	13	6
6:00 AM	25	28	19
7:00 AM	75	82	33
8:00 AM	142	115	98
9:00 AM	172	173	193
10:00 AM	203	167	252
11:00 AM	236	183	277
12:00 PM	228	205	303
1:00 PM	200	189	256
2:00 PM	159	164	227
3:00 PM	212	165	211
4:00 PM	256	191	207
5:00 PM	288	230	233
6:00 PM	306	328	287
7:00 PM	239	308	248
8:00 PM	213	223	195
9:00 PM	108	147	126
10:00 PM	45	66	74
11:00 PM	23	36	53

Occupancy was selected at 9:00 am, 12:00 pm, 3:00 pm, 6:00 pm and 9:00 pm, as was collected for public lots, and was added accordingly to the corresponding time period for occupancy maps on Tuesday, Thursday, and Sunday.

Table 9: Floor Space Changes Under Each Scenario

Block	Occupied Floor Space (sq.ft.)	Approved Floor Space (sq.ft.)	Change from Existing (sq. ft.)	Change from Existing (%)	Proposed Floor Space (sq.ft.)	Change from Existing (sq. ft.)	Change from Existing (%)
CBD	1,084,655	1,250,556	165,901	15%	1,602,035	517,380	48%
Zone A	309,831	309,831	-	0%	309,831	-	0%
Zone B	617,095	782,996	165,901	27%	1,134,475	517,380	84%
Zone C	174,075	174,075	-	0%	174,075	-	0%
Sub-Zone 1	206,870	326,577	119,707	58%	376,111	169,241	82%
Sub-Zone 2	351,906	351,906	-	0%	351,906	-	0%
Sub-Zone 3	130,129	176,322	46,193	35%	478,267	348,138	268%

Part IV: Land Use Analysis and Projected Changes in Parking Supply and Demand

A. Land Use Analysis

The objective of this land use analysis is to assess how land use affects current and future parking demands in downtown Carrboro. First, this analysis provides an analysis of parking demand per 1,000 square feet for different land uses. Second, this analysis enables an estimation of how future approved and proposed developments are likely to affect the Town's parking demand and supply.

Methodology

Parking generation rate is an expression of the number of vehicles expected to park at a location. This study derived that rate by using the parking demand observed (as described in section III) on "Tuesday Early Evening," and dividing that number by the occupied floor space (per 1,000 square feet). First, parking generation rates were calculated by dividing the occupancy survey (parking demand) number for each zone and sub-zone by the occupied floor space over 1,000 square feet. Based on the maps created in the demand analysis (See Part III), the Team chose to use the "Tuesday, Early Evening" generation rates as representative of generation at the time of greatest demand.

Second, the Team applied the calculated demand per 1,000 square feet for "Tuesday, Early Evening" to the square feet of new buildings in five approved and proposed developments in order to estimate future parking demand. See Table 9: Floor Space Changes Under Each Scenario. This step provides an approximation of how near-term developments will affect the parking situation.

The approved and proposed developments include:

- 300 East Main Phase A (approved),
- 300 East Main Phase B (in Conditional Use Permit process),
- The Alberta (approved),
- Roberson (approved), and
- The Yaggy Commercial Building (proposed, currently occupied by UNC Public Health on Sweet Bay).

See Appendix E: Detailed Land use Methodology for a more detailed account of the methodology used for land use.

Data

Supply and occupancy counts were taken by the Team and are described in Part III. Information on existing building square footage was acquired from Town Geographic Information System (GIS) shapefiles. Floor space and parking provisions were taken from each development proposal supplied by the ATown.

Limitations and Assumptions

The Team made a number of assumptions based on data availability. These and the associated limitations of the analysis are listed below. The analysis method represents an improvement over using data provided by outside sources but is subject to the limitations of available information. The Team believes that it creates a reasonably accurate picture of the relationship between parking generation and land use in the Town of Carrboro.

1. Land use square footage came from orthophotos of the buildings and from known building height rather than from occupancy permits. Although the Team eliminated those buildings that clearly did not contribute to parking generation, the occupied floor space estimations may be slightly high. Lowering the square footage would yield a slightly higher generation rate per square foot.

2. Generation rates were calculated from the worst peak period defined by the occupancy data: Tuesday, Early Evening. Less data was available for this period than other periods of analysis, and it may be that a more complete occupancy survey would yield slightly different results. Likewise, the worst peak locations differ over the day. However, as discussed below, the generation rates determined are reasonable when compared with a period for which more complete data was available.

3. Demand goes up and down irregularly across different parts of the CBD, therefore the peak time in one area may not be a peak time in another area. The Tuesday, Early Evening generation rates were chosen as representative of generation at the time of greatest demand, but choosing a different high-demand period would yield slightly different results.

4. When assessing future approved and proposed project scenarios, generation rates for each zone and sub-zone were applied to every building and lot in the zone or sub-zone, although many were not included in the initial generation rate calculation.

5. For the purpose of the analysis, it is assumed that the new, mixed use developments will generate the same parking demand as existing mixed use buildings.

6. Very little information was collected for Zone C during any time of analysis, as the town considers this the least problematic of the parking zones. As excluding Zone C would have skewed the generation rate, it was incorporated into the analysis under the assumption that the data for the zone is representative of the entire zone.

Different types of land uses generate different parking needs.

Based on occupancy data, which showed that parking demand exceeds recommended occupancy in very specific areas, it was assumed that people were unwilling to walk great distances from their parking spaces. For this reason, only buildings within 50 feet of parking lots for which data was available were included. This captured almost all of the buildings in each zone, as lots are widely dispersed throughout downtown; however, it may be that a wider capture zone for the parking lots would yield slightly lower generation rates.

Table 10: Parking Changes Under Each Scenario

Block	Spaces Available	Approved Spaces	Change from Existing (spaces)	Change from Existing (%)	Proposed Spaces	Change from Existing (spaces)	Change from Existing (%)
CBD	2,650	2,721	71	3%	3,280	630	24%
Zone A	702	702	0	0%	702	-	0%
Zone B	1,693	1,764	71	4%	2,323	630	37%
Zone C	255	255	0	0%	255	-	0%
Sub-Zone 1	759	746	-13	-2%	805	46	6%
Sub-Zone 2	817	817	0	0%	817	-	0%
Sub-Zone 3	287	371	84	29%	878	591	206%

As the Team's calculation of the parking generation rate used the actual counts of parking occupancy collected by the Team, they are more accurate for the Town of Carrboro's purposes than the averages published by the Institute of Transportation Engineers (ITE).

B. Findings

Generation Rates

Figure 16 shows the "Tuesday, Early Evening" generation rate for each zone and sub-zone. All five future permitted and proposed developments are located in Zone B. Table 9 shows summary floor area changes for each zone and sub-zone under approved and proposed scenarios. Table 10 shows summary parking space changes for each zone and sub-zone under approved and proposed scenarios.

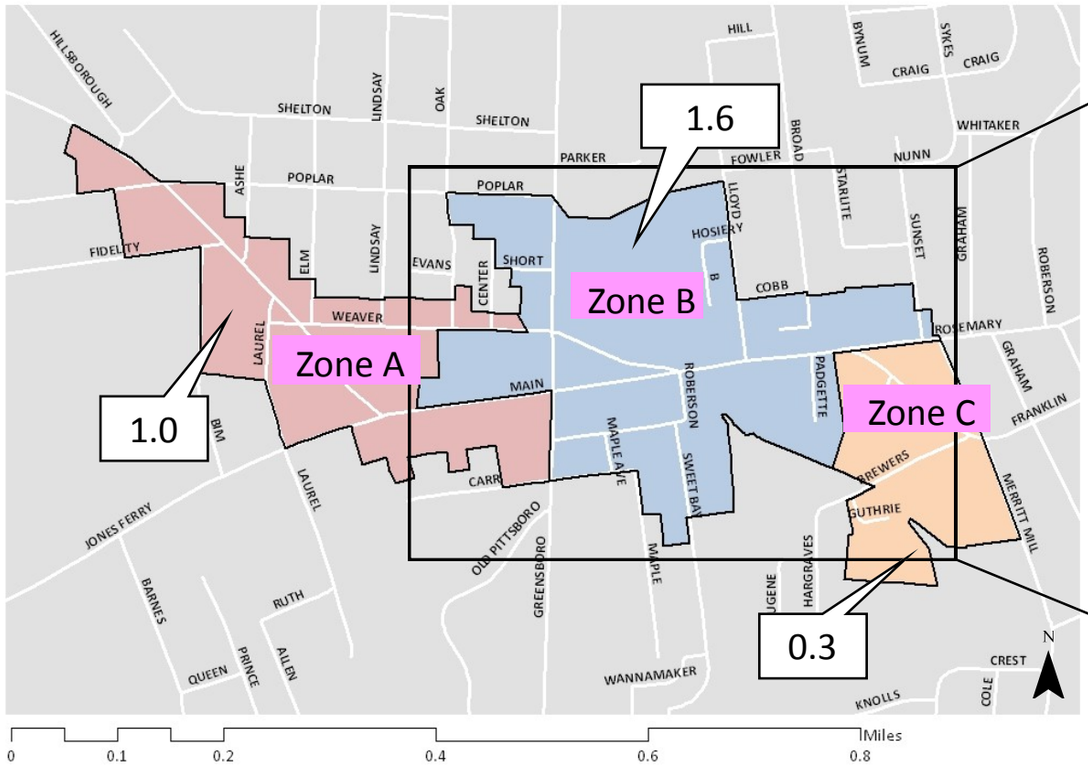
With the construction of approved developments, floor area will jump 85% in Sub-Zone 1 and 35% in Sub-Zone 3. With the construction of proposed developments, floor space rises to 82% over existing floor area in Sub-Zone 1 and an additional 268% over existing area in Sub-Zone 3.

With the construction of approved developments, parking supply will fall 2% in Sub-Zone 1 and rise 29% in Sub-Zone 3. With the construction of proposed developments, parking supply will rise 6% over existing supply in Sub-Zone 1 and rise to 206% over existing supply in Sub-Zone 3.

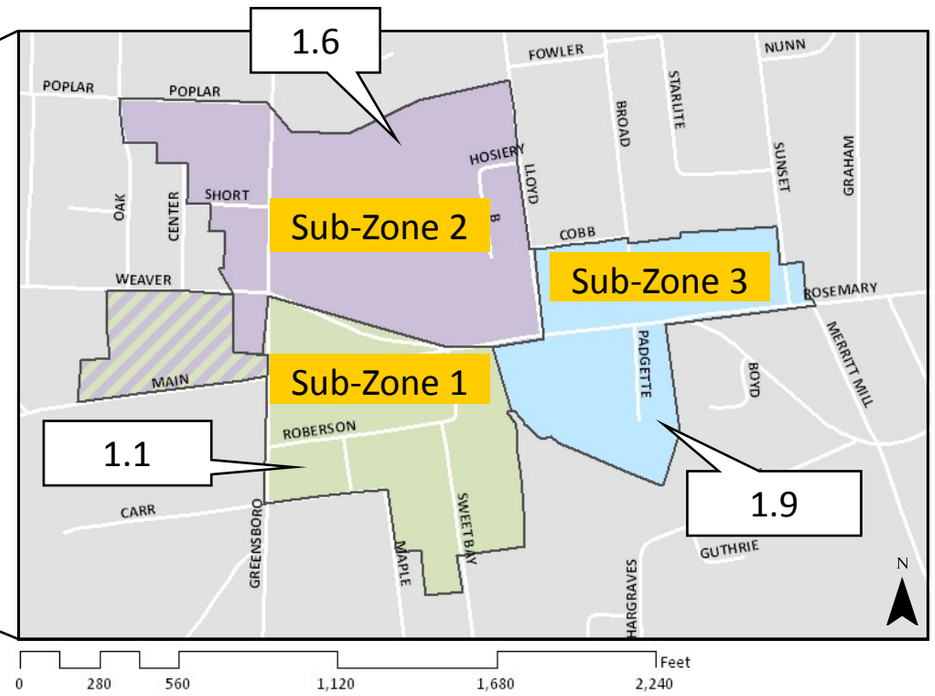
Figure 16: Zone and Sub-Zone Parking Generation Rates

(spaces per 1,000 square feet of building space)

Based on Time of Greatest Demand: Tuesday Early Evening 6PM-9PM



Parking Generation Rate by Zone



Parking Generation Rate by Sub-Zone

*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

***Generation rates were calculated by dividing occupied spaces by occupied building square footage.

Table 11. Summary of Parking Occupancy Changes.			
Parking Occupancy Changes			
Block	Existing	Approved	Proposed
CBD	45-55%	55-65%	60-70%
Zone A	40-50%	40-50%	40-50%
Zone B	55-65%	65-75%	75-85%
Zone C	15-25%	15-25%	15-25%
Sub-Zone 1	15-35%	45-55%	45-55%
Sub-Zone 2	65-75%	65-75%	65-75%
Sub-Zone 3	80-90%	85-95%	100-110%

Projected Future Demand

Table 9 summarizes the percent occupancy changes after inclusion of approved and proposed developments. In every case, occupancy is determined from the raw numbers; for example, CBD occupancy is not an average of zone occupancies. CBD occupancy jumps from an existing rate of 45-55% to 55-65% after the inclusion of approved developments and 60-70% after the inclusion of proposed developments. Zone B jumps from an existing rate of 55-65% to 65-75% after the inclusion of approved developments and 75-85% after the inclusion of proposed developments. Sub-Zone 3 faces the highest occupancy rates, with 80-90% existing, 85-95% approved, and 100-110% proposed. An additional 200 spaces would be needed to restore the Sub-Zone 3 occupancy projection after proposed developments to 85%.

More detailed tables of parking changes, including the number of spaces and calculated demand, can be found in Appendix E, Tables 14, 15, 16, and 17 (pages 110-112).

Part V: Key Findings

A. Key Findings

Based on the Team's analysis of the data collected, the overall findings are:

- In general, parking demand does not exceed ideal (85%) occupancy. Data does not indicate that current demand is outpacing supply for the CBD.
- Parking demand does exceed recommended occupancy at specific sites at certain times and this situation may be exacerbated by future demand.
- Parking spaces in the CBD experience high turnover.
- There is a 20% violation of the 2-hour limit in public lots.
- Most CBD visitors want to park in lots adjacent to the businesses they are visiting.
- The prevalent perception among business owners and others is that there is a parking shortage in the CBD.
- Although data shows that there is not a parking shortage now, there will likely be a shortage in Sub-Zone 3 after the addition of approved and future developments.

These findings are discussed in more detail below.

In general, parking demand does not exceed ideal (85%) occupancy. Data does not indicate that current demand is outpacing supply

Overall, within the total area surveyed and analyzed, findings have shown that there is not a parking problem, especially for locations farther away from the core downtown streets, such as

Roberson, Greensboro, Main and Weaver. There is consistent availability in both public and private parking lots for most users. For users who have difficulty finding a space in a lot specifically assigned to their store or business destination, there are frequently available spaces within a one- or two-block vicinity.

Parking demand does exceed recommended occupancy at specific sites and at certain times and this may be exacerbated by future demand

Within Zone B, however, there are frequently close-to-full or very full parking lots as a result of the numerous businesses attracting many trips and limited parking within the zone. This peak demand occurs primarily on early evening weeknights, during events at Cat's Cradle and the Arts Center or weekends during midday. However, even during these times, there are often some spaces available within assigned lots, with limited spillover to side streets and neighboring lots. Additionally, during these periods of peak demand, there are more spaces available in other lots within the same sub-zone. These periods were limited, often not lasting longer than three hours in a day. Therefore, any resolution must focus specifically on alleviating the demand within Zone B, specifically Sub-Zones 1 and 3, which will experience significant development in the future, and take into account the temporal nature of this demand.

Parking lots in the CBD experience high turnover and there is a 20% violation of the 2-hour limit in public lots

In general, there are a high number of patrons and employees driving into downtown Carrboro, and many of these trips are for relatively short time periods. Though only public lots were examined for turn over, findings indicate frequent turnover of vehicles for the available spaces. Though there were approximately 20% of users parking longer than three hours, the majority of users spend a great deal less than 2 hours in a parking space. This percentage holds true for both weekends and weekdays, suggesting that those who do overstay time limitations are not necessarily commuting UNC students or staff, but may be CBD employees using the lot during a shift or customers who are have a long stay at a downtown business. The 3:00 pm and 9:00 pm time periods have the highest recorded numbers of limit violators, indicating that the violators may be a combination of all the suspected users (UNC students, employees and evening bar patrons) who utilize lots for extended time periods. Therefore, any solution tailored to the times that parking demand exceeds recommended occupancy must consider the parking needs of all these possible users.

Despite distinct peaks, there is a significant amount of usage during the majority of the day for most parking lots, both private and public. (For discussion of these peaks, See Part III: Data Collection). One parking space may be both frequently filled and used by many users within a 24-hour period. Keeping spaces available is critical to maintaining the equilibrium of supply and demand.

Most CBD visitors park in lots adjacent to the businesses they are visiting

Demand analysis shows that people were not fully utilizing available parking in any parking analysis zone or sub-zone. After examining the locations and attractions that draw vehicles to downtown Carrboro, it is clear that people are not currently parking more than approximately 1 block away from their destination and walking. There are also areas such as the Fitch Lumber lot, Lloyd Street across Main from the Cat's Cradle, and the Maple Street Extension, that were empty or only contained a few cars when the parking lots directly across the street were greater than 85%

Public lots adjacent to the downtown are frequently utilized.

full. Potential explanations for this reluctance to walk include a lack of knowledge about these parking areas, a lack of pedestrian amenities, and safety concerns.

The prevalent perception among business owners and others is that there is a parking shortage in the CBD

Of the 29 businesses that responded to the survey distributed by the Town of Carrboro, 25 (86%) stated that they felt there was insufficient parking downtown. Parking shortages were reported at all times but particularly from 11:00 am to 8:00 pm on both weekdays and weekends. The largest number of business reporting shortages at any one time was the 15 businesses reporting shortages between 5:00 pm and 8:00 pm on weekends. The specific nature of the parking shortage was less clear, however, as businesses estimated the number of parking spaces required to remedy the shortage anywhere from 2 to 200 spaces, with an average of 21 and a median of 4 spaces[4]. Twenty-five out of 29 businesses (85%) also stated that they were in favor of a parking deck for the downtown area, though some stated the desire for additional non-deck parking or underground parking only. A few respondents also commented that they feel parking is becoming more difficult and will reach a crisis point when new developments are completed. Although there is the possibility of self-selection bias in these results, as it is conceivable that only people concerned about parking filled out the survey, it is clear that some downtown businesses view parking as a significant issue. In addition, the Town of Carrboro itself has received several letters of concern, particularly from employees who feel unsafe walking to their cars late at night. As these comments do not reflect the results observed in the survey, it is important to address the reasons behind the perception of little parking being different from the actuality of adequate parking.

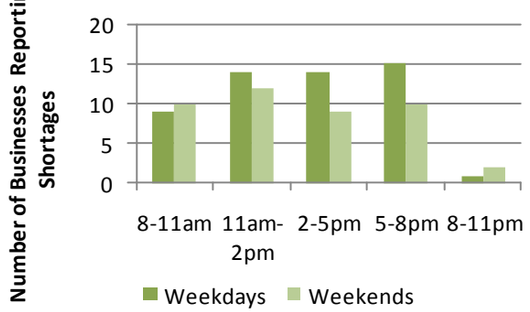
Although there is not a parking shortage now, there will be a shortage in Sub-Zone 3 after the addition of approved and future developments

If the current generation rate is projected forward and applied to approved and tentative developments, Sub-Zone 3 will jump from approximately 75-85% occupancy to approximately 85-95% occupancy (with approved projects) and 100-110% occupancy (with proposed projects). Sub-Zone 1 and Sub-Zone 2 will remain under-used, at 50-60% and 65-75%, even at times of greatest demand.

Sub-Zone 3 has significant changes planned for the future, both in terms of development and land use change. As proposed, the construction of 300 E. Main, Phase B, would include the elimination of a number of private parking spaces and the addition of a parking deck. Although this phase of the development provides parking spaces for a slightly higher generation rate at 2 spaces per 1,000 square feet than the existing rate of 1.9 spaces per 1,000 square feet, occupancy percentages increase in the proposed future scenario due to the loss of existing parking. Existing and planned land use dominated by entertainment venues that have a high level of parking demand for a small square footage help explain this finding.

[4]This variation could be due to some business owners responding based on the specific parking needs of their businesses with others basing their responses on the parking needs of the entire downtown area.

Figure 17: Perception of Parking Shortages by Time of Day, Weekdays and Weekends



Part VI: Recommendations

Like most complex planning issues that include economic, political, and policy dimensions, parking in Carrboro does not lend itself to one perfect solution. The Team's data suggest a disconnect between perceptions about Downtown Carrboro parking and actual supply of spaces. People may be strongly swayed by personal experiences of service denial in certain lots. As other Towns have learned, an increase in parking supply may increase traffic and only further exacerbate Carrboro's traffic flow during peak hours. Therefore it is advisable that the Town identify current issues and create solutions narrowly tailored to these situations in which parking demand exceeds recommended occupancy. Parking may be a manifestation of other more significant issues. With a multi-modal approach in mind, the Team proposes several possible solutions as well as a cost-benefit analysis of key recommendations.

A. List of Recommendations

Note that many of the suggestions listed below have already been proposed to the Town as far back as 20 years, including: educational efforts, such as lighting and signs; stricter enforcement; new restrictions; joint use; and a parking deck.

Changing Expectations/Behavior through Education

Instead of creating more capacity by building extra lots, the Town could alleviate some parking shortages in downtown by changing people's expectations.

Lighting, Signage, and Wayfinding

The Team recommends that the Town install additional lighting, signage, and posted directions to public parking lots that are less used, but have more peak-hour capacity. This recommendation is similar to the one suggested in the previously conducted parking study. High-capacity parking lots are only a few minutes walk away from the busiest lots in the very center of downtown. For example, there is a substantial underutilization of public lots west of Greensboro, except for the Century Center Lot. Additionally, people are not utilizing nearby street parking if a lot is full. Business owners can partner with the Town in education, by informing employees and customers about where they can park and encouraging them to do so. Map distribution can be an effective method of public education (see *Parking Handbook for Small Communities*). Pedestrian improvements, including lighting and better sidewalks, also may be an incentive for people to walk farther to parking, as safety has been a concern in email correspondence with the Town.

Improving existing signs for public lots and providing wayfinding methods may better distribute those who wish to utilize public parking downtown.

Changing Employee Behavior

By changing downtown employee commuting behavior, the Town could free much needed parking spaces. Employees currently park close to where they work. Twenty-three percent of survey respondents replied that they would be interested in exploring park-and-ride options for their employees, suggesting a somewhat favorable atmosphere for implementing changes in travel behavior. Through a travel demand management program or similar scheme, employees could be encouraged to utilize transit service (including park-and-ride), to bike, or to walk, when traveling to work. This program could be implemented with a concurrent improvement in facilities like bicycle parking and shower facilities for commuters. A related solution could be an employee shuttle that carries downtown employees from parking lots located outside of the CBD. Since all business survey respon-

Enforcing two-hour limits at public lots and at on-street parking spaces will increase turnover

dents believe that a large majority of their customers are coming from the Chapel Hill/Carrboro area (see Appendix B: Survey Results), it may also be useful to try and influence the travel behavior of customers arriving downtown.

Enforcement

The most direct way of addressing the problem of people violating the two-hour limits in public lots is to enforce the posted time limits. As shown, enforcement of posted time limits would increase the working supply of the public parking lots by approximately 10 %. Enforcement could take the form of parking tickets for offenders or towing for those parked for over 12 hours. These long-term violators make up less than 20% of the violations; however, the visibility of towing could encourage other violators to obey the time limits. Like in the previous study of parking in Carrboro, the Team found that stricter enforcement of parking could be a solution to parking demand in the core CBD. If the one- or two-hour time limits were enforced, turnover of vehicles would increase, as would the available supply of parking during peak hours.

The Town has voiced a preference to not strictly enforce time limits or parking due to limited resources and the fear that enforcement may decrease the patronage of businesses downtown Carrboro. This preference has been echoed by the 27 businesses that took the business survey, of which 81% believed stricter parking enforcement would not make a difference in the supply of parking. However, when considering the shortage of parking in the central areas of downtown and the Team's findings that the public lots' capacities are being decreased by up to 20% at any time, enforcement may be a more attractive, more administratively simple, and less expensive option than the construction of additional spaces.

Because citizens of Carrboro are not used to enforcement of parking durations, an initial period for education is necessary to improve compliance without unnecessary penalties to patrons of the public lots. New signs and posters could educate the public on the time limits as well as the penalties for violating the restrictions. Additionally, the education could include information on locations for longer-term parking such as the Weaver Lot, Laurel Lot, or the Town Hall Lot. Working with the enforcement of the time limits, the education phase could include a 6-week period with warning tickets that state what the fine would be after the probationary period, allowing the public time to adjust to the newly enforced restrictions.

New Restrictions

Because the public parking lots farther from the 100 block of Main Street in Carrboro, such as the Weaver Lot, Laurel Lot, and Town Hall Lot, typically do not face the level of demand as those in the center of the downtown, long-term parking should be encouraged in the peripheral lots mentioned above while short-term parking is encouraged in the central lots.

A complementary policy can be enacted through stricter time limits for the 100 East Main Lot and the Rosemary/Main Lot and laxer limits for the other public lots. For instance, 75 percent of the spaces in the central lots could be reserved for 1-hour parking while the remainder is reserved for 30-minute parking. The peripheral lots could allow all-day parking in order to encourage employees of businesses downtown to park in these spaces instead of the ones closest to the main commercial area of Carrboro. More information is needed to determine the best combination of time restrictions to maximize turnover while maintaining an adequate supply of longer-term parking to ensure healthy businesses.

Joint Use

The Town already has a joint-use policy specified in its regulations that applies to proposed mixed use developments. Section 15-297 of the Town Code allows for the joint use of parking spaces and the crediting of the spaces to certain land uses for proposed developments. According to the Town Code, the Town has the discretion to reduce the overall parking requirements and instead require the parking ratios listed in section 15-297(c) for properties within the Town Center Business (B-1(c)), the General Business (B-1(g)) and the Fringe Commercial (B2) zones, or where the use classifications have two or more distinct parking peaks. For example, certain uses in these categories may have a reduction ratio ranging from 1.1 to 1.7 of required parking. These ratios are based on the particular use designated to that parcel. Permissible uses within each zone can be found in the Town Code Table of Permissible Uses.

Many communities have found joint use of parking lots, or shared parking, helpful (Smith 2004). The Team recommends that the Town continue to provide incentives for new development through this section of its land ordinance and to clarify and expand current joint –use requirements. The town also may want to explore methods to make shared parking more transparent for Town citizens. This clarity could be achieved through signage or Town policy and community outreach.

As example of an area that would be ideal for joint use is the parking area on Sweet Bay, behind the Institute of Public Health building. This lot shows little occupancy during non-office hours. The Town could investigate using such capacity to alleviate parking demand in the peak evening hours of Sub-Zone 3, by entering into a joint-use agreement for that lot.

Parking Cash-Out

Parking cash-outs are travel demand management tools that can be used on both existing and new developments. An employer participating in a parking cash-out program may offer commuting employees the choice of receiving the cash equivalent of a parking spot that each of them would take instead of offering subsidized parking. The employees would then take alternative modes such as biking, taking transit, or walking to work. Implementing parking cash-out programs would provide savings for the Town, developers and businesses. Developers benefit because they do not have to set aside as many parking spaces and could devote the land to floor space or green space. Alternative land uses can increase the value of the development. Businesses that offer parking cash-out programs can benefit from leasing or selling the spaces to other parties.

However, studies show that businesses that have adequate short-term parking may not perceive substantial savings from reduced parking demand. The Town will need to demonstrate and convince those businesses that financial benefits accumulate in the medium and long term. In the medium and long term these businesses will be able to continue growing and attracting customers without having to provide a substantial number of parking spaces in addition to what they currently own.

Developer impact fees

The Town may consider requiring developers to pay parking impact fees in lieu of providing the required parking. In-lieu fees offer developers an alternative option of meeting parking requirements. The fees may be structured in ranges and differ depending on the type of land use, since it is known that parking genera-

Encouraging private lot owners to engage in joint use or shared parking will give all customers more parking options

Payment-in-lieu may be utilized to improve bicycle and pedestrian facilities, lowering demand for parking and improving the urban environment.

tion rates vary by type of land use. It is important to note that parking impact fees are applicable only to new developments or to redevelopments.

These fees or payments in-lieu can be designed with specific uses in mind. The Town may designate parking impact fees received from developers to improve transit services and pedestrian amenities to encourage alternative modes of travel to and from the CBD. The collected fees may even be used to finance public parking, since public parking functions as shared parking for all patrons of the CBD. When managed and signed properly, public parking effectively supports the parking needs in downtown. In-lieu fees are particularly useful in downtown redevelopments or historic preservation since older developments typically do not have enough space to provide the required minimum parking once redeveloped. Giving developer or business an option to pay in-lieu fees helps preserve the character of downtown and finance public infrastructure or amenities.

B. Cost-Benefit Analysis of Three Potential Solutions

A solution that is often suggested for resolving current and future parking issues is the construction of a parking deck. While it may be cost prohibitive for the Town to build a multi-story garage, there may be opportunities in the future to partner with a developer already building a parking deck. Such an arrangement could allow the Town to purchase an additional tier of public parking within a garage. Using this scenario as an example we assume that the tier would increase parking supply at the site by 72 spaces. The most recent Carrboro Capital Improvement Plan estimates the development cost of structured parking to cost $16,000 per space (page 2.7). Given this assumption, the Town would spend approximately $1.15 million for the 72 spaces.

One alternative to the parking deck could be the provision of park-and-ride bus service from the Jones Ferry lot to run exclusively to the Carrboro CBD for employees. This lot is approximately 1.4 miles from Carr Mill Mall. Chapel Hill Transit currently estimates a cost of $65/service hour for each of their buses. Thus, if the Town were to pay for an exclusive bus for 5 hours per day, 365 days per year, the estimated cost would be $118,500 per year, approximately 1/10th the cost of the additional spaces. These costs could be reduced if a van were used instead of a bus or if it were used for fewer, more select hours. For example, the van could be used as an on-demand type service, where employees could call the van when needed to get back to the lot. This arrangement would reduce the number of hours the van or bus would be used, thus reducing fuel, and possibly reducing operator costs. Thus, it is realistic to assume that this service could be offered for $100,000 per year or less.

The service would be in addition to the current service to the park-and-ride lot. If new service is provided, businesses would need to agree to have their employees use the Park-and-Ride lots instead of parking in the CBD. Making a conservative estimate using the Two Theme Analyst tool in ArcView 9.x® with data from the Census Transportation Planning Package and the Triangle Regional Model forecasts from Durham-Chapel Hill-Carrboro Metropolitan Planning Organization, and, there are 960 employees in Zone B. If it is conservatively assumed that no more than one-third of these employees are parked in Zone B at the same time, then if 23% of those parked employees used the park-and-ride lot instead, 72 spaces would open up downtown for customers – the same number as would be provided for in the parking

deck. This analysis still allows three out of four employees to park in the downtown lots while still freeing up a similar amount of spaces for potential CBD customers.

A similar alternative could be to convert the W. Weaver Street Public Lot (on Weaver Street, east of West Main Street) and other public lots near Town Hall to permitted employee parking. Savings versus a parking deck could be used to pay for improved sidewalks, lighting, and landscaping. The pedestrian improvements would help address issues of crime and lack of safety for employees who need to walk from the highly impacted sub-zones to the employee lots. Local municipalities estimate the cost of new sidewalks, curbs, gutters, plantings, and lighting to be $50 per linear foot for a 5-foot wide sidewalk. With these assumptions, the Town of Carrboro can build new sidewalks and repair existing sidewalks (where applicable) so that there are refurbished sidewalks on both sides of the street, including amenities, from the Town Hall parking lots to the site of the new 300 E. Main Street development for less than $370,000, approximately 30% the cost of the additional tier of parking. Existing sidewalks could be improved for all of Zone B, including amenities, for $436,400, approximately 38% the cost of the additional tier, and all existing sidewalks in the CBD could receive this treatment for $928,950. Obviously, these costs would be significantly lower if certain streets and areas were targeted or if certain areas only needed amenities and not sidewalk improvements.

Table 12 shows the difference in costs between the three options in the first year and the total costs from 2008-2038, given a discount rate of 7.5% and an inflation rate of 3% per year. Both the parking deck and the sidewalk scenarios assume a 10% maintenance fee every 10 years.

The sidewalk alternative may be the most cost-effective because it creates a lasting infrastructure improvement which will enhance the walkability of downtown and promote alternative modes of transportation. This alternative may achieve additional goals to parking, such as reduced traffic volume, reduced crime through more eyes on the street, and additional desirability of being downtown. The park-and-ride solution avoids a large up front investment, which allows the Town flexibility to use money at a future date when the opportunity for a solution that might better address the parking issue could present itself (i.e., a parking deck closer to the centralized issues near Carr Mill Mall). In addition, the park-and-ride lot may be able to hold more than 72 spaces, which means that solution could free up more spaces throughout the downtown.

Using Chapel Hill Transit along with park-and-ride service to transport employees will make downtown spaces more available for customers

Image Source: Carrboro Citizen, available at:: http://www.carrborocitizen.com/main/wp-content/uploads/2007/08/busbackpagerev.jpg

Table 12: Cost-Benefit Analysis of Creating 72 Additional Parking Spaces.

Improvement	Cost (2008 dollars)	Present Value of Costs over 30 Year Period
Additional tier of parking	$1,150,000	$1,287,000
Park-and-ride bus service	$100,000 per year	$1,754,000
Sidewalk improvements for Zone B	$436,400	$495,510

Both the sidewalk improvement scenario and the park-and-ride service alternative address parking issues outside of a specific site. The parking deck addresses only the issues at a particular location; however, the parking deck most directly addresses the future parking concerns of that site. Combinations of these various options should be considered by policymakers and stakeholders.

Methodology

The cost benefit analysis used for this discussion is based on several assumptions and definitions. The analysis is limited to the quantitative comparison of the costs of the three alternatives. The discussion provides a qualitative comparison of the benefits; however, these benefits are excluded from the numerical analysis in order to minimize the assumptions used.

The most notable aspects of the analysis include:

- Time Frame
- Specific Costs
- Present Value of Costs
- Discount Rate
- Rate of Inflation

Time Frame

The time frame used in this analysis is 30 years. This number was chosen arbitrarily to represent a reasonable long-term point of view for policy decisions. The cost benefit analysis can be rerun for any time period to get a more accurate comparison for each policy decision.

Specific Costs

Each alternative consists of specific costs such as the construction cost for the parking deck, the operating costs of the park-and-ride service, or the maintenance costs of the sidewalks. Changes can be made to these assumed costs as more specific numbers are calculated based on the needs of each scenario as they are determined.

Present Value of Costs

The ultimate comparison of the alternatives is based on the present value of the costs of the alternatives. The analysis assumes that the value of money changes over time and that it is more valuable to have money to spend now than to have money to spend later. In order to standardize the costs over several years, the comparisons are based on the present value of the costs with future costs discounted by a set rate, the discount rate.

Discount Rate

The discount rate is a tool used to devalue costs (and benefits) of projects in future years with the assumption that money is more value to spend or save for the present. A low discount rate means that future value is similar to present value. A high discount rate devalues future costs and benefits compared to their current values. The discount rate used in this analysis is 7.5 % This discount rate can be altered to better fit the Town of Carrboro's preferences toward future investment.

Rate of Inflation

The rate of inflation refers to the change in costs of consumer goods. As economies grow, the cost of living typically increases. These cost increases determine the specific rate of inflation. The present value cost numbers for this analysis are based on a 3% rate of inflation, each year for the next 30 years. This particular rate is not unusual when compared to historical rates.

C. Further Studies

In the course of the Team's research, there was the conclusion that further research could be valuable in order to fully comprehend the supply and demand of parking in downtown Carrboro. Several additional measures should be taken to expand upon this initial exploratory study. The following future studies are encouraged:

Seasonal Demand Analysis

Due to temporal limitations, the demand analysis was based on one week during February. While this week did include warm weather and several events that would attract patrons to Carrrboro's CBD, the conclusions of parking demand over an entire year are limited. Similar studies of demand should be conducted throughout the calendar year to provide a greater level of accuracy for analyzing demand. Also, due to the time of year, the Team was unable to capture data from the Farmer's Market lot. Therefore, it is suggested that the Town conduct parking supply and demand analysis for the Farmer's Market, when it is in season.

Service Denials

As mentioned, this study does not include an investigation of service denials. Neither the vehicle counts nor the tube counts can determine if potential patrons of a business are denied parking either by a full/near-full lot or by a perception of potential denial. Video surveys of times of peak demand should be conducted to see if patrons experience service denials and, if so, how frequently. This information is valuable for determine how much potential business is lost due to inadequate parking supply.

Detailed Turnover Analysis

The frequency of parking space turnover is essential for determining the supply of parking at any given time. High turnover increases the supply of parking without physical changes to the built environment. However, too much turnover might discourage people from using spaces. Further study of turnover rates is necessary to determine the best combination of time limits that most efficiently meets the needs of visitors to the CBD.

Expanded Coverage Area

Due to several limitations discussed, the parking analyses conducted in this study did not comprise all of the downtown parking lots. As discussed, the demand analysis did not include the Carr Mill Mall parking lot. Due to its size and to the activity of cars in that area, this lot should be included in order to create a more accurate analysis of the overall parking opportunities and challenges in the Carrboro CBD. Additionally, not all lots were surveyed during each time period for this study. Future studies could include these omitted lots or alternative presumed peak times based on the periods of peak demand observed in this study.

Additional Surveys

As noted, response to the Team's business survey was limited. Further rounds of survey should be conducted in order to increase the rate of response. A greater rate of response would allow for more accurate conclusions from the results. To supplement the business survey, a residential survey could be crafted and distributed to target patrons of Carrboro businesses to determine their opinions of parking, service denial, turnover, and general perceptions of these issues. This information would be useful for determining future Town policy.

Database of Generation Rates

Another useful tool for future consideration is a comprehensive database of parking demand generation rates by each land use type. As noted in this report, the parking generation rates for different areas of the CBD are based on the assumption that all parcels are mixed use. The creation of an electronic database from existing occupancy permits could make practicable a more nuanced analysis of the relationship between square footage, land use type, and parking needs.

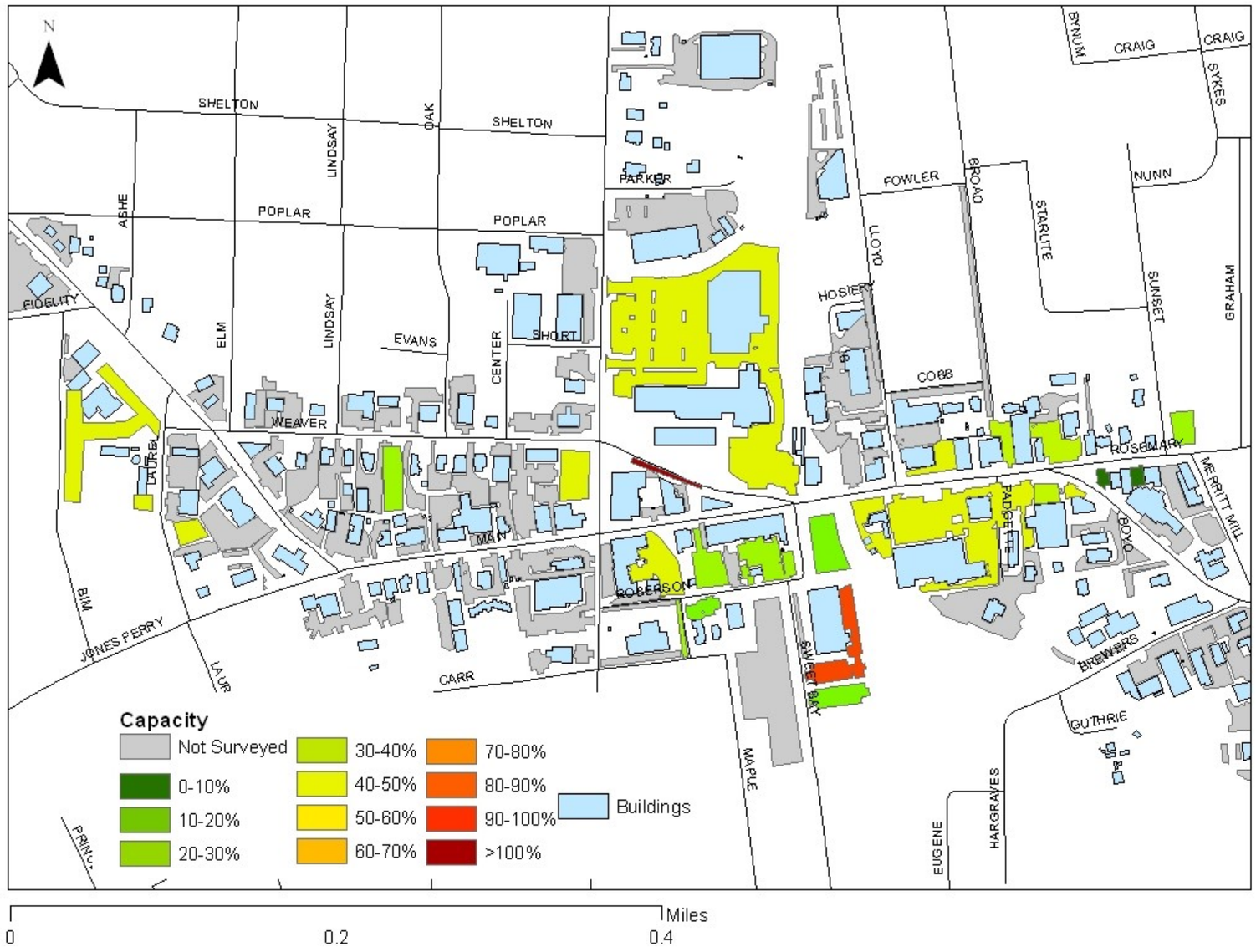
Parking Sharing

An additional issue for future study is the formalization of private parking sharing agreements. This report looks at joint-use agreements; however, it does so only topically. Further studies could consider ways to make official the often informal agreements between private lot owners. These formalized agreements would benefit both owners and patrons, as more spaces would then be available for each business, and the agreements would be more transparent to customers wishing to park in the CBD.

Other Modes

Finally, this study did not include any detailed analysis of other modes of transportation, including bicycling and walking. While these modes, especially walking, are difficult to target and measure, some attempt to determine biking and walking rates is necessary to help provide a more complete picture of the downtown environment. By determining where and when people bike or walk, the Town can better meet the needs of all of those who patronize Carrboro businesses, not simply those who choose to drive.

Figure 18: Existing Conditions: Tuesday Morning 9AM-11AM



*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill Mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

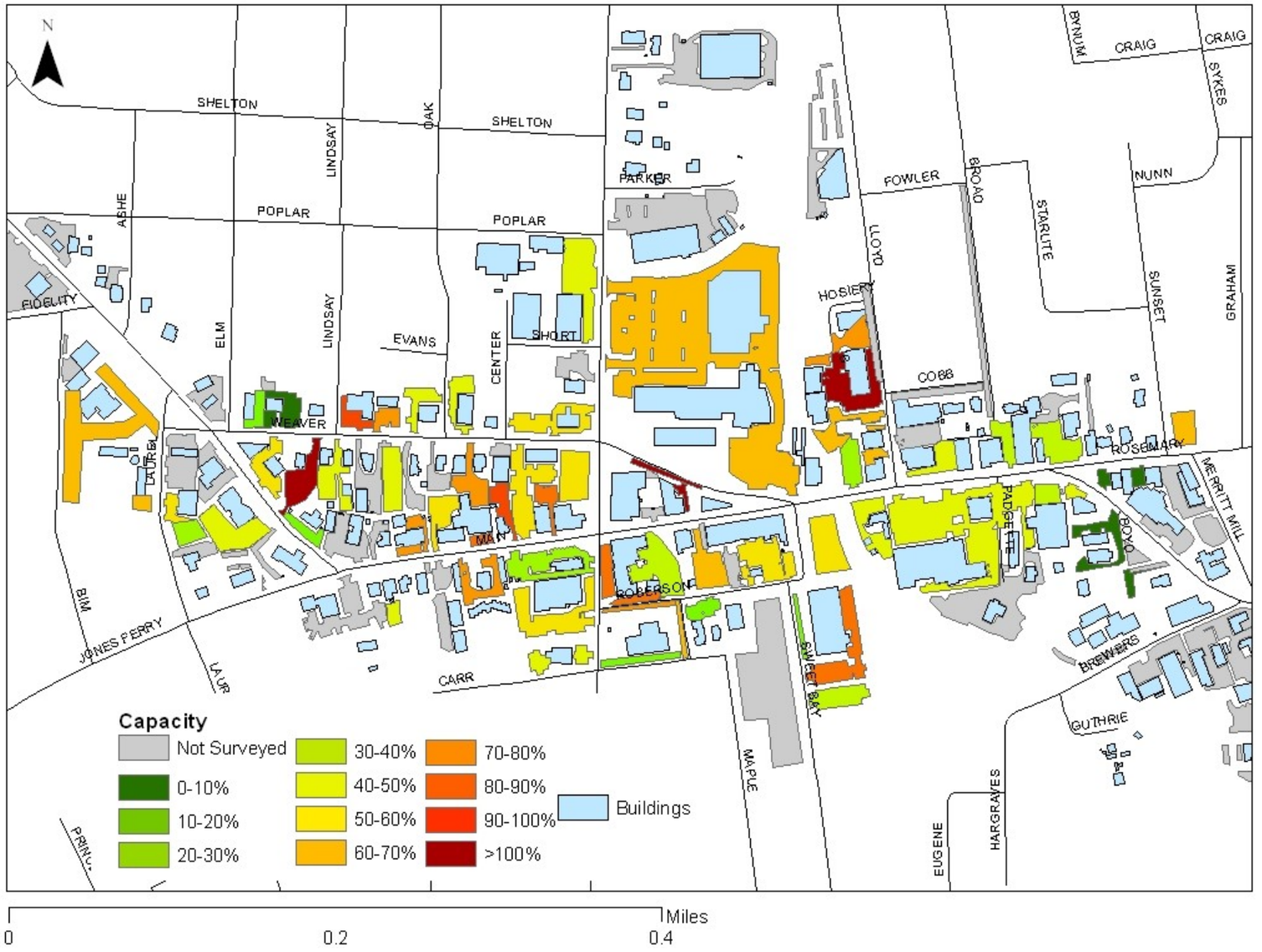
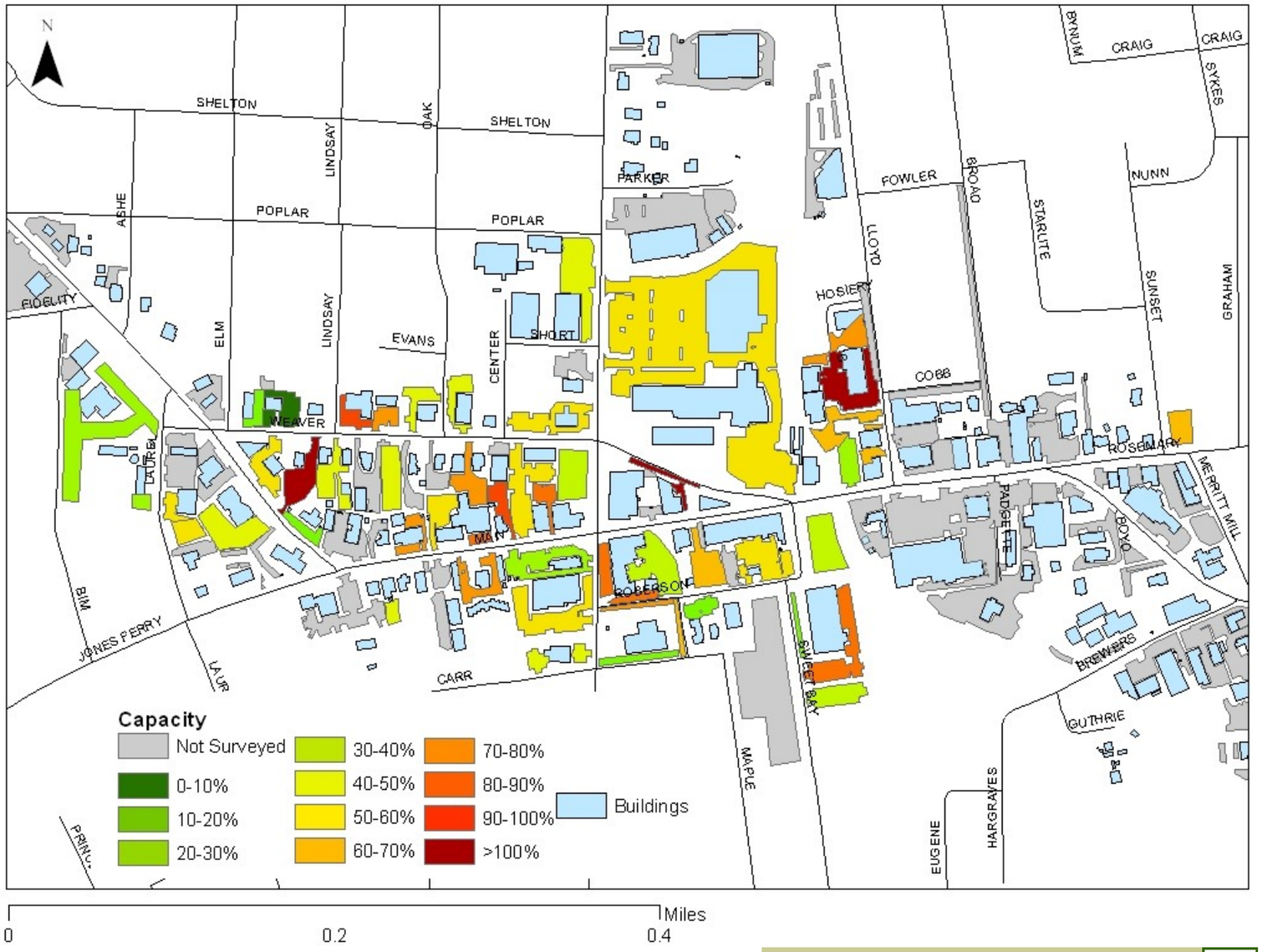


Figure 19: Existing Conditions: Tuesday Early Afternoon 11PM-3PM

*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill Mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

Figure 20: Existing Conditions: Tuesday Late Afternoon 3PM-6PM



*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill Mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

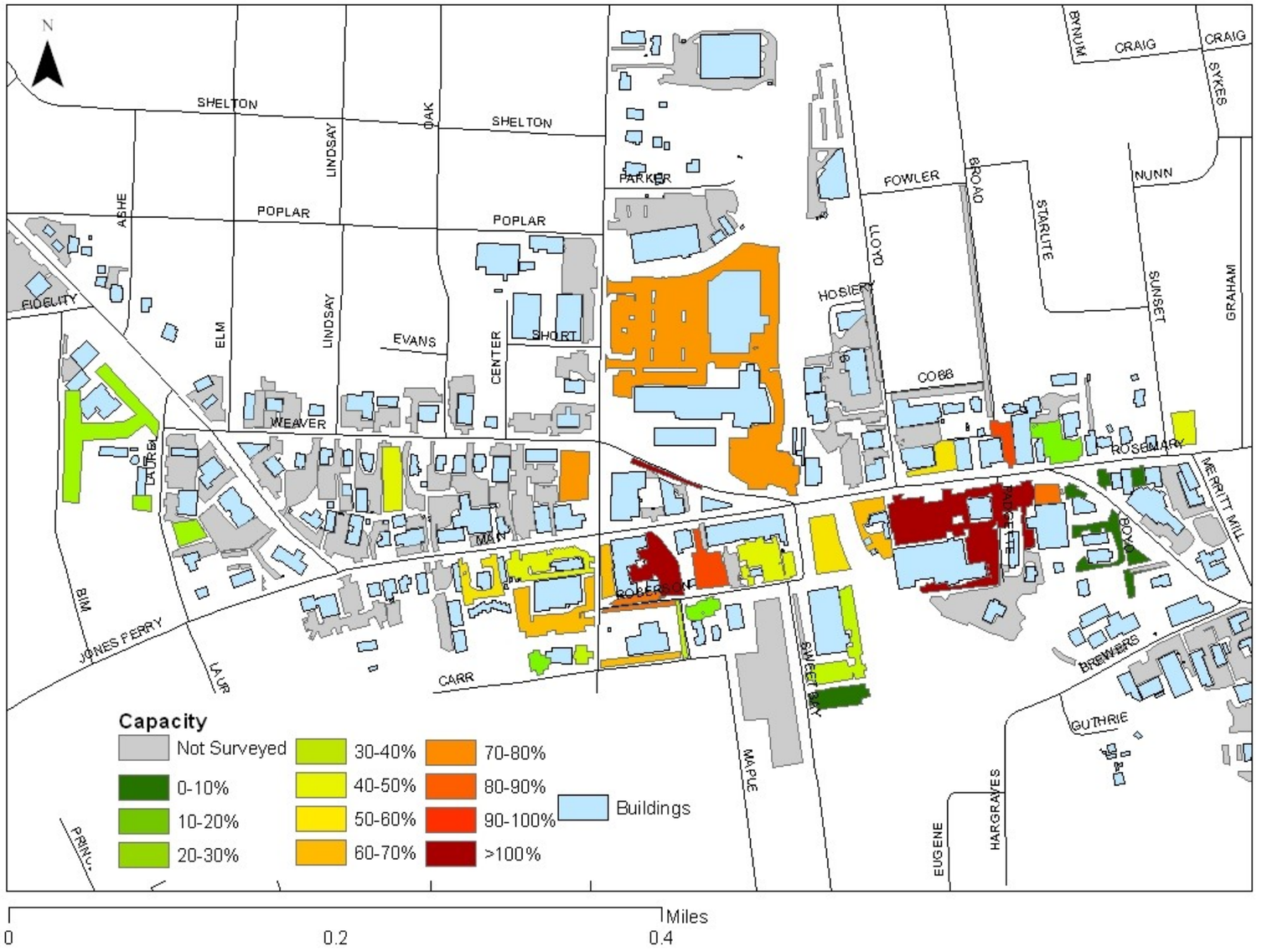
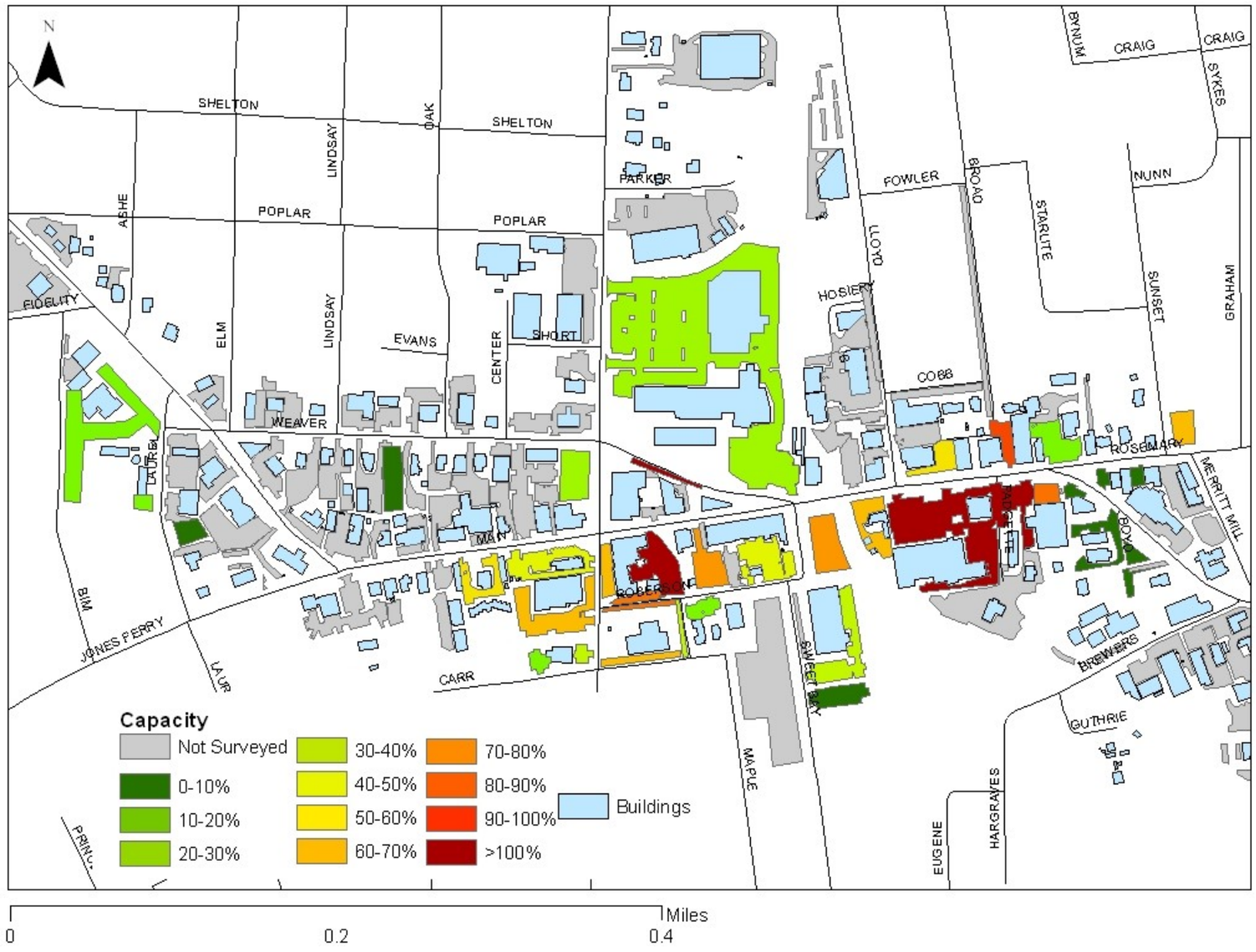


Figure 21: Existing Conditions: Tuesday Early Evening 6PM-9PM

*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill Mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

Figure 22: Existing Conditions: Tuesday Late Evening 9PM-12AM



*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill Mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

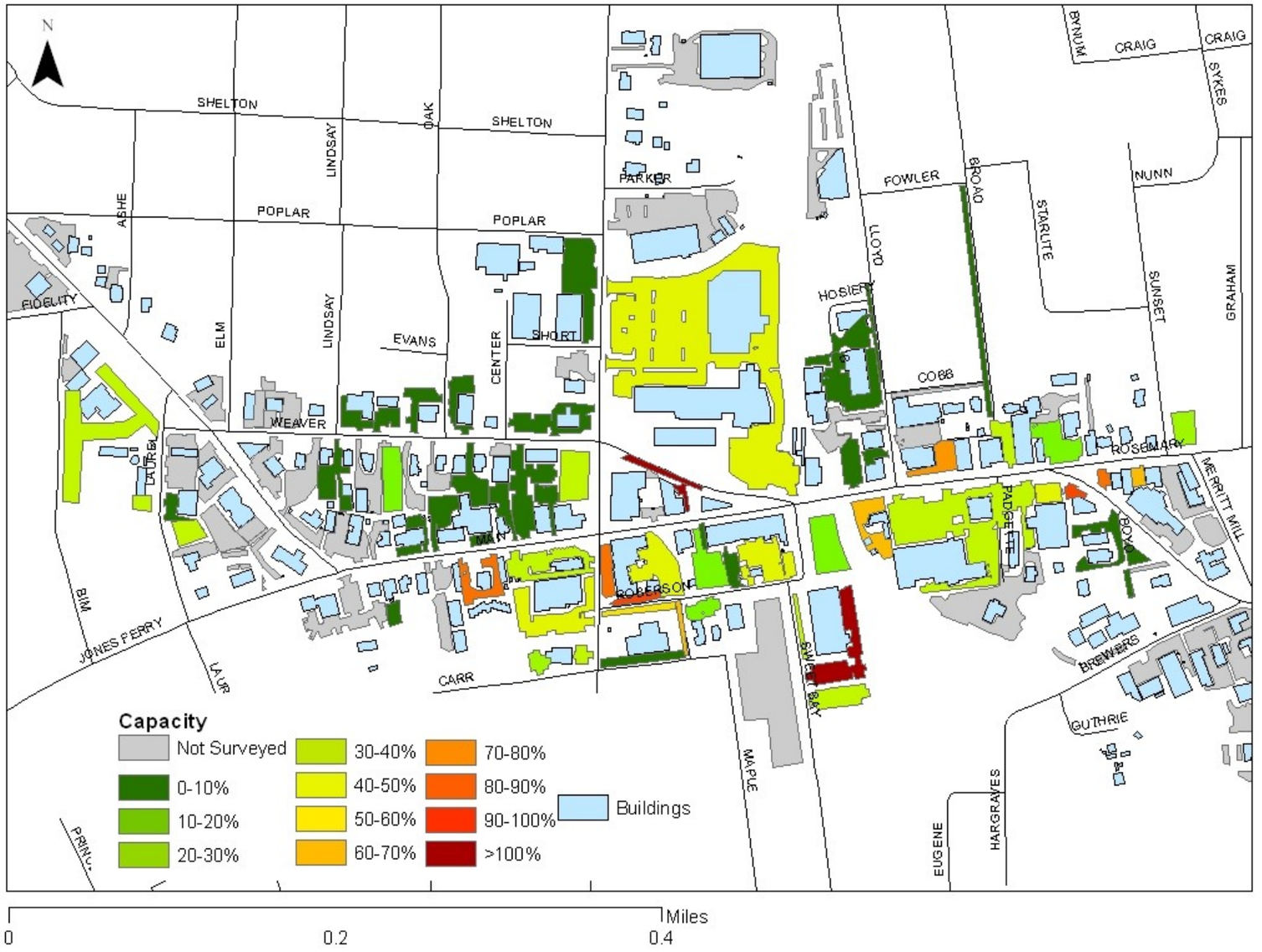
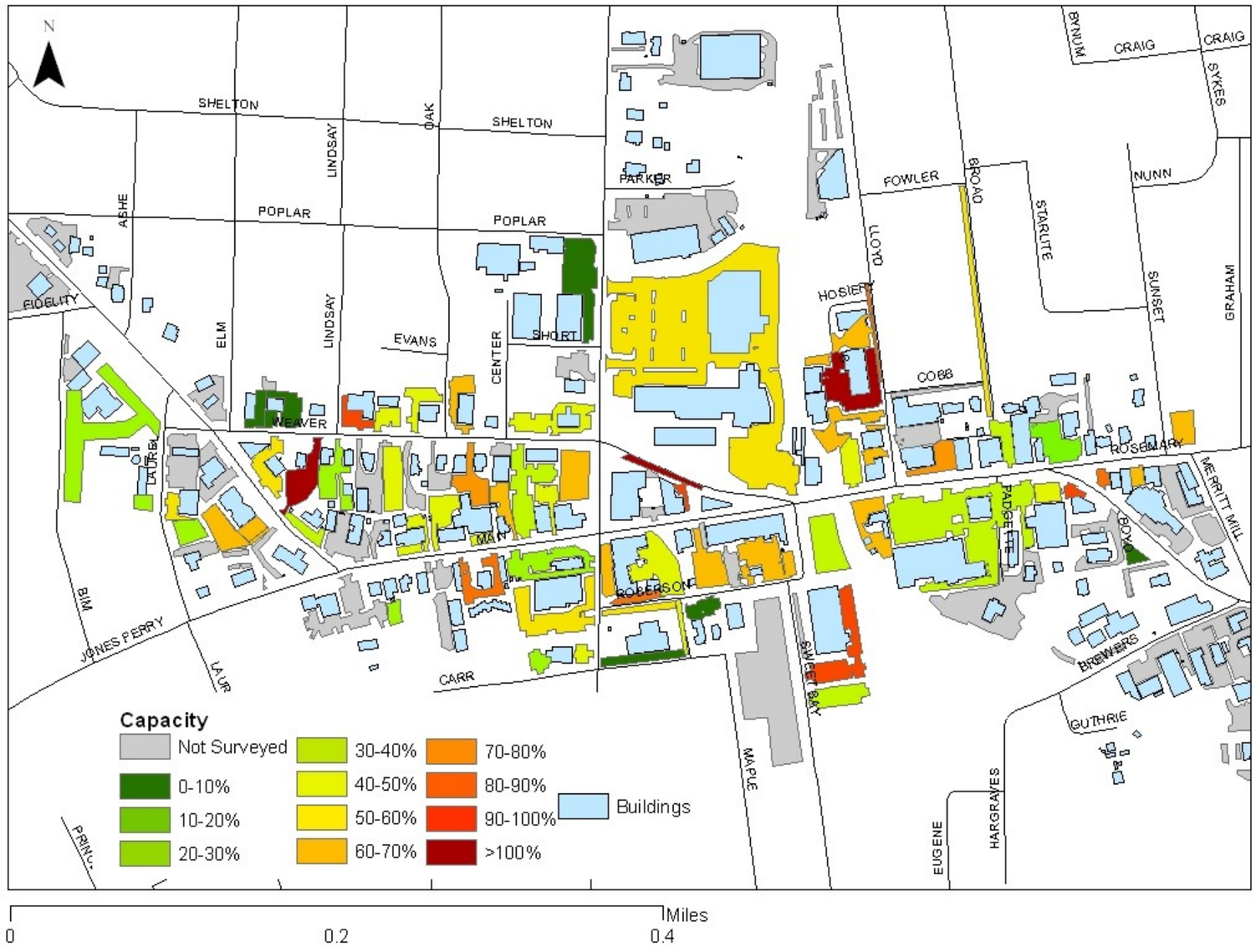


Figure 23: Existing Conditions: Thursday Morning 9AM-11AM

*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill Mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

Figure 24:Existing Conditions: Thursday Early Afternoon 11AM-3PM



*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill Mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

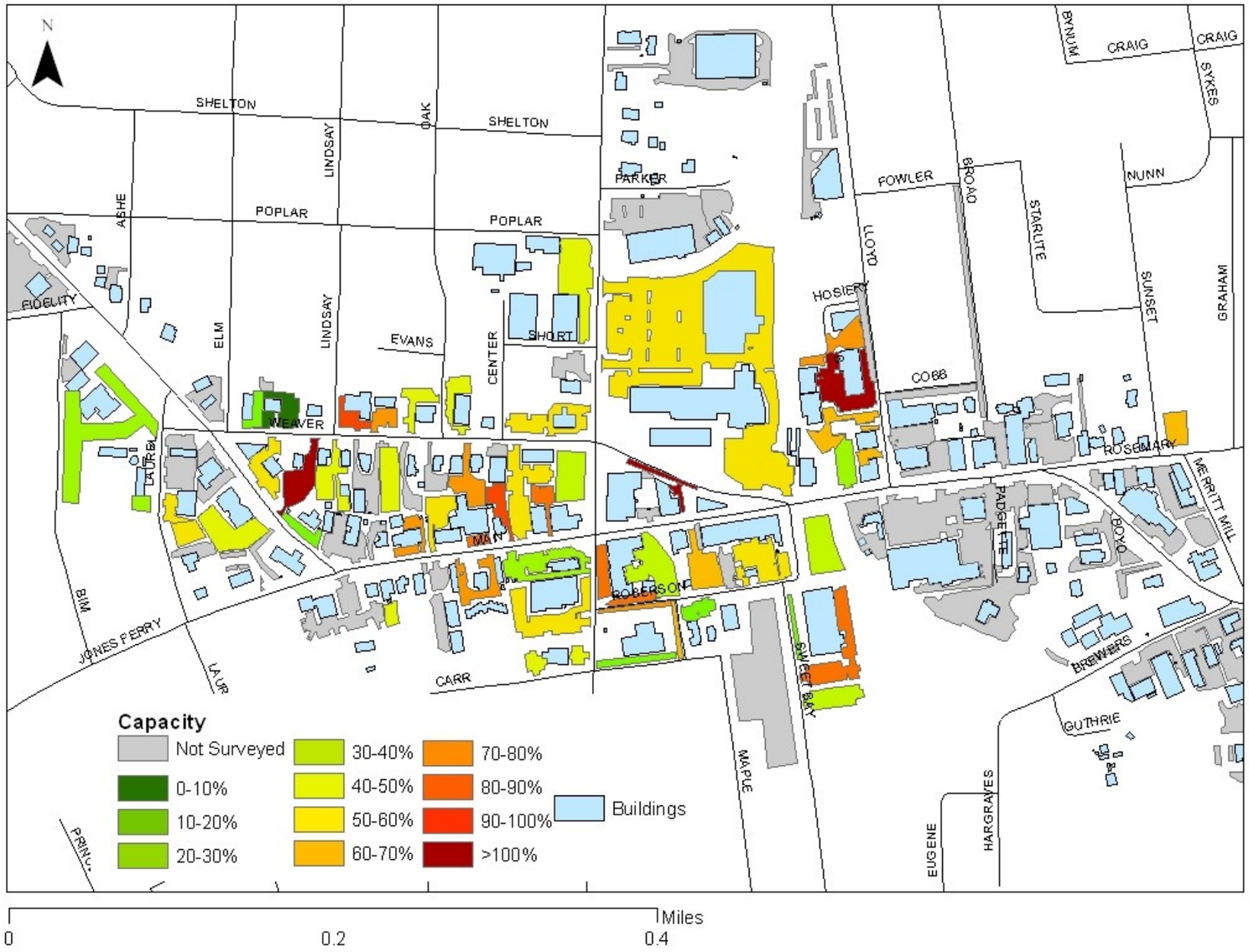
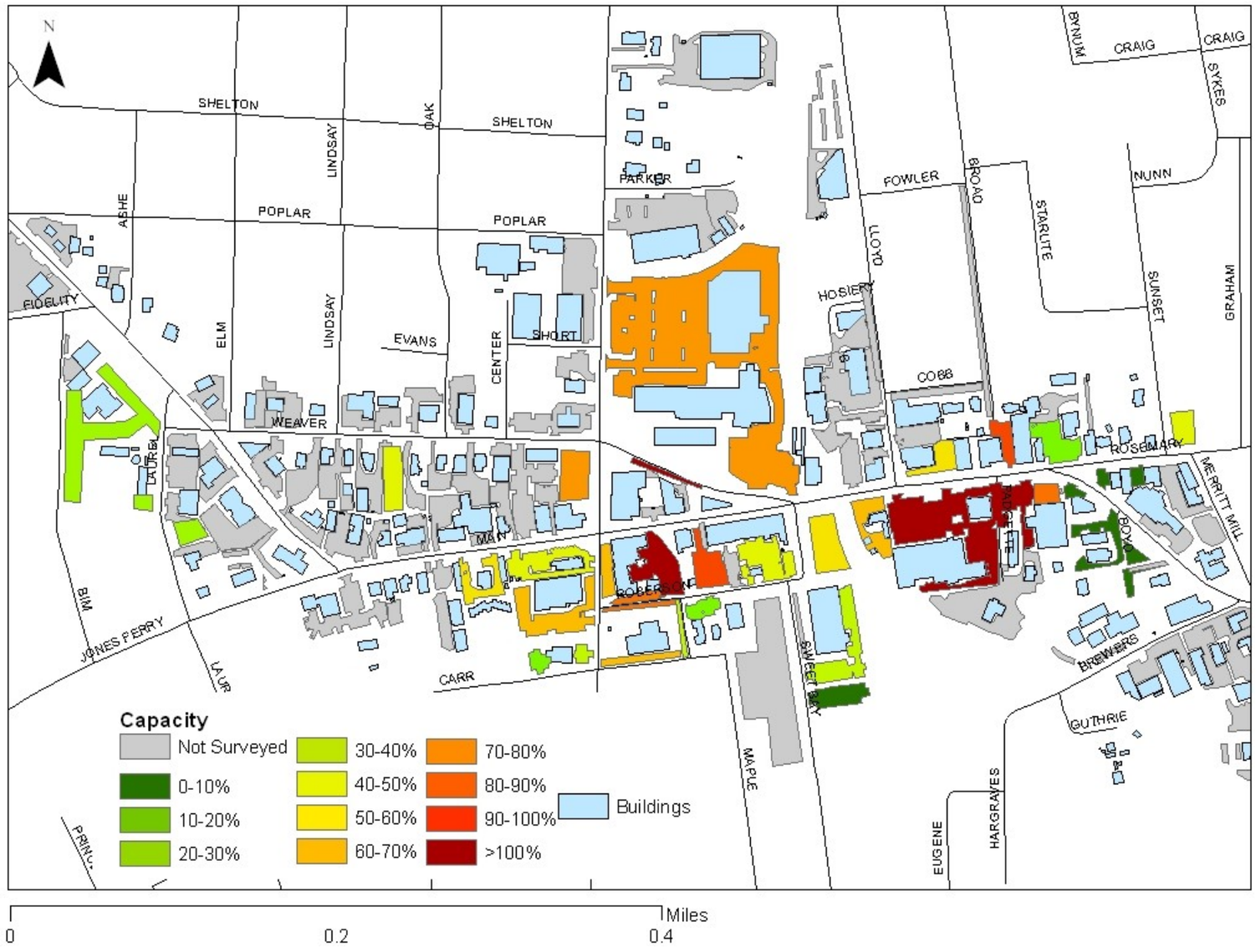


Figure 25: Existing Conditions: Thursday Late Afternoon 3PM-6PM

*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill Mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

Figure 26: Existing Conditions: Thursday Early Evening 6PM-9PM



*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill Mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

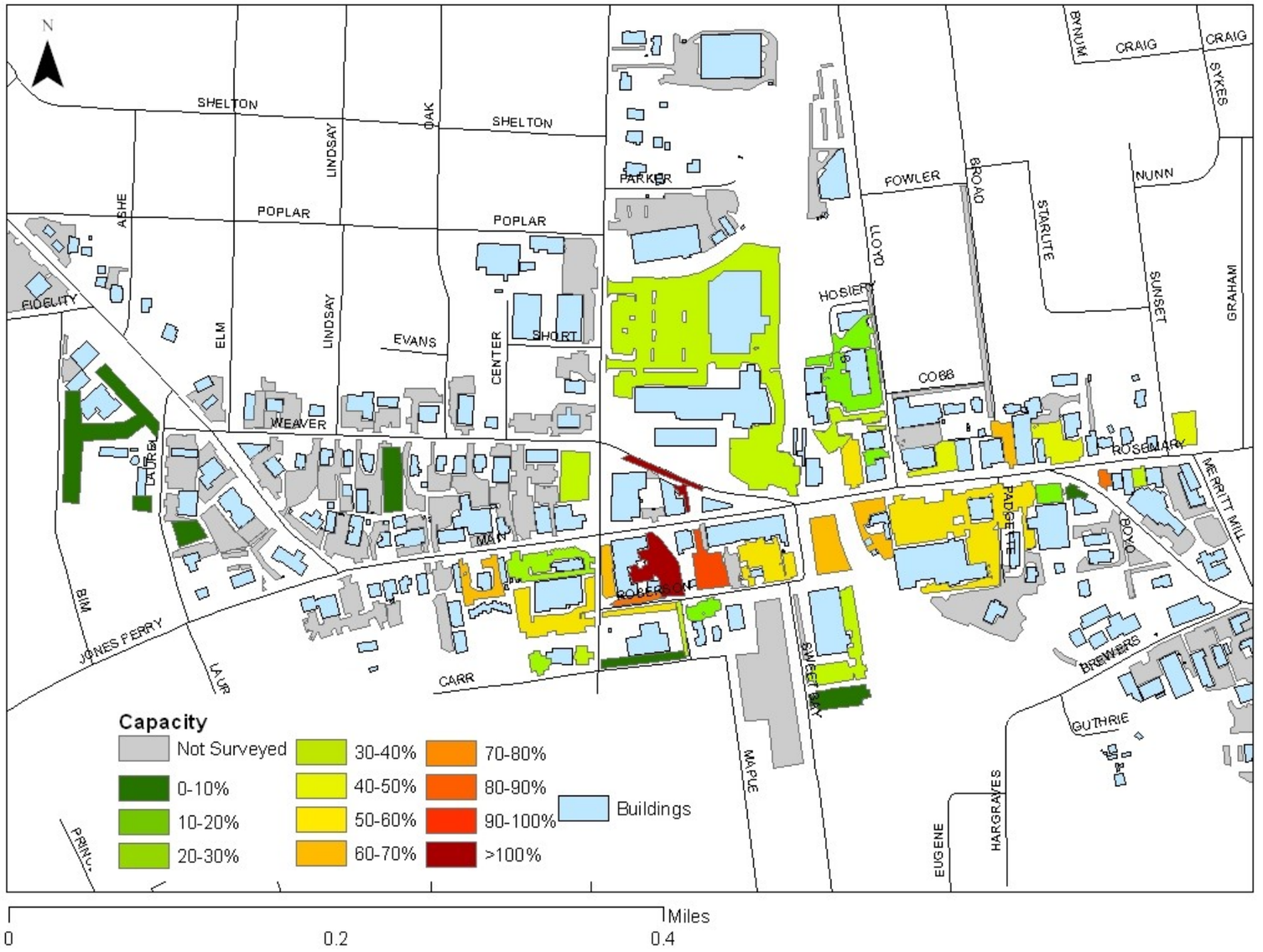
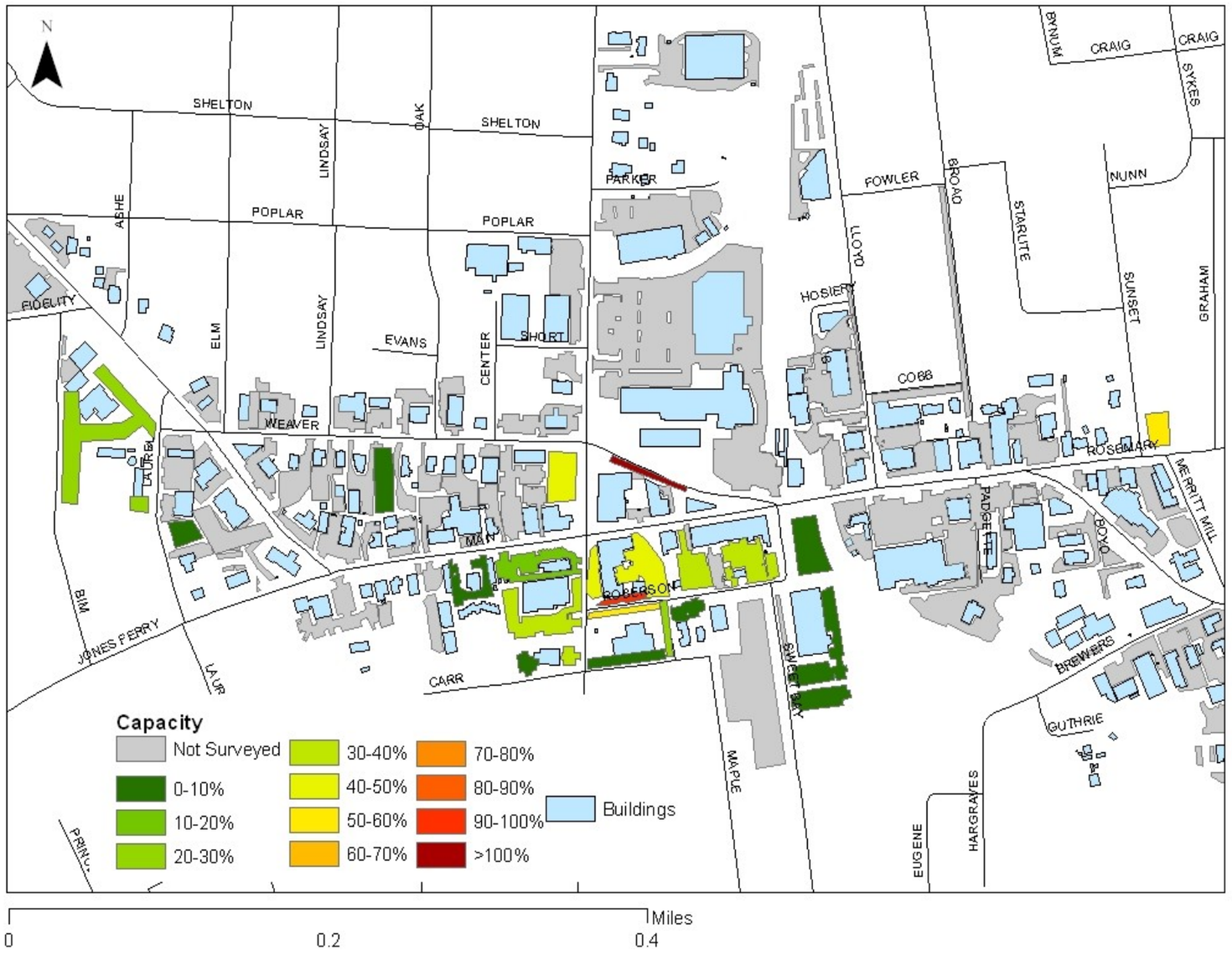


Figure 27: Existing Conditions: Thursday Late Evening 9PM-12AM

*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill Mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

Figure 28: Existing Conditions: Saturday Morning 9AM-11AM



*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill Mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

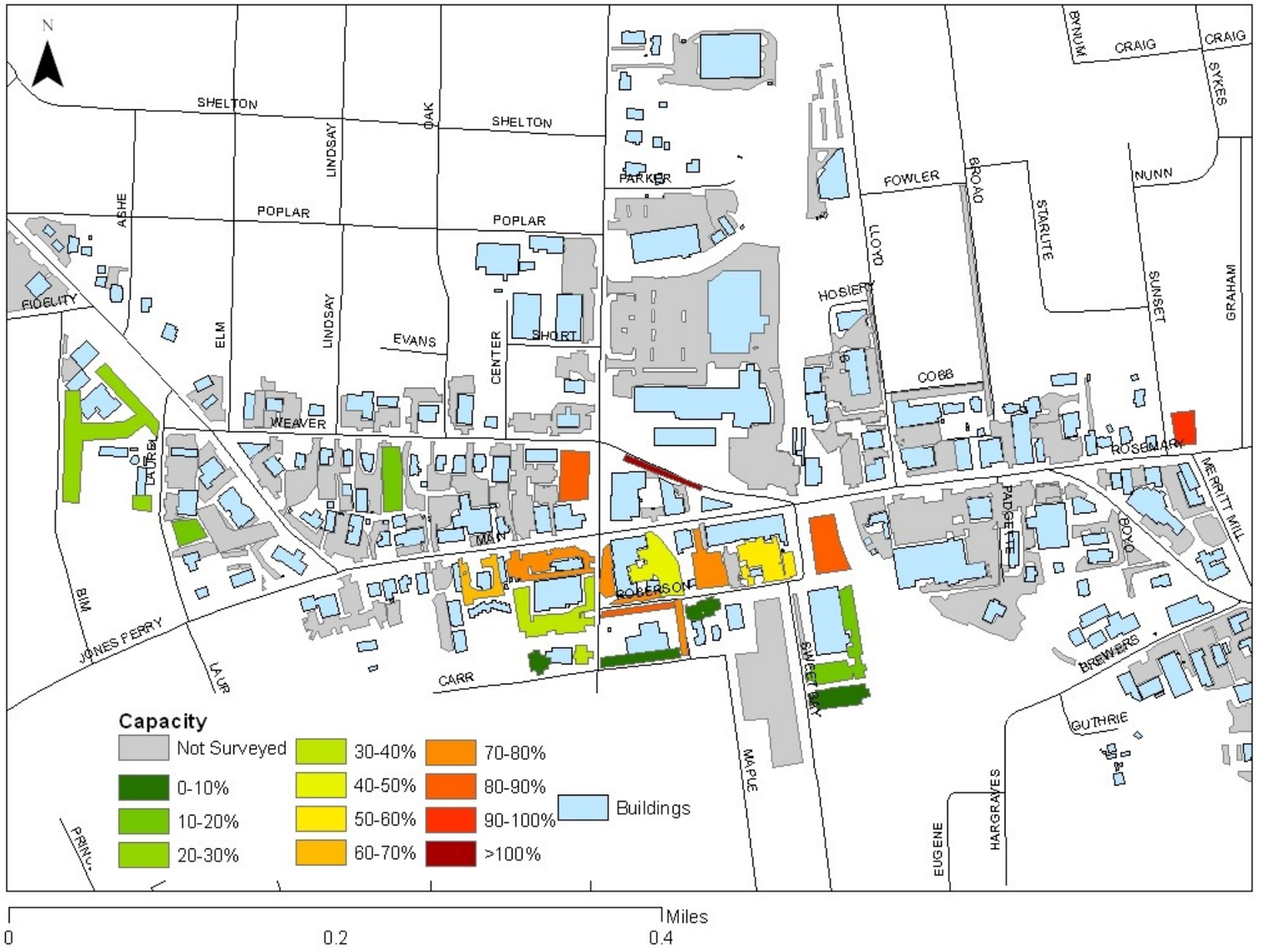
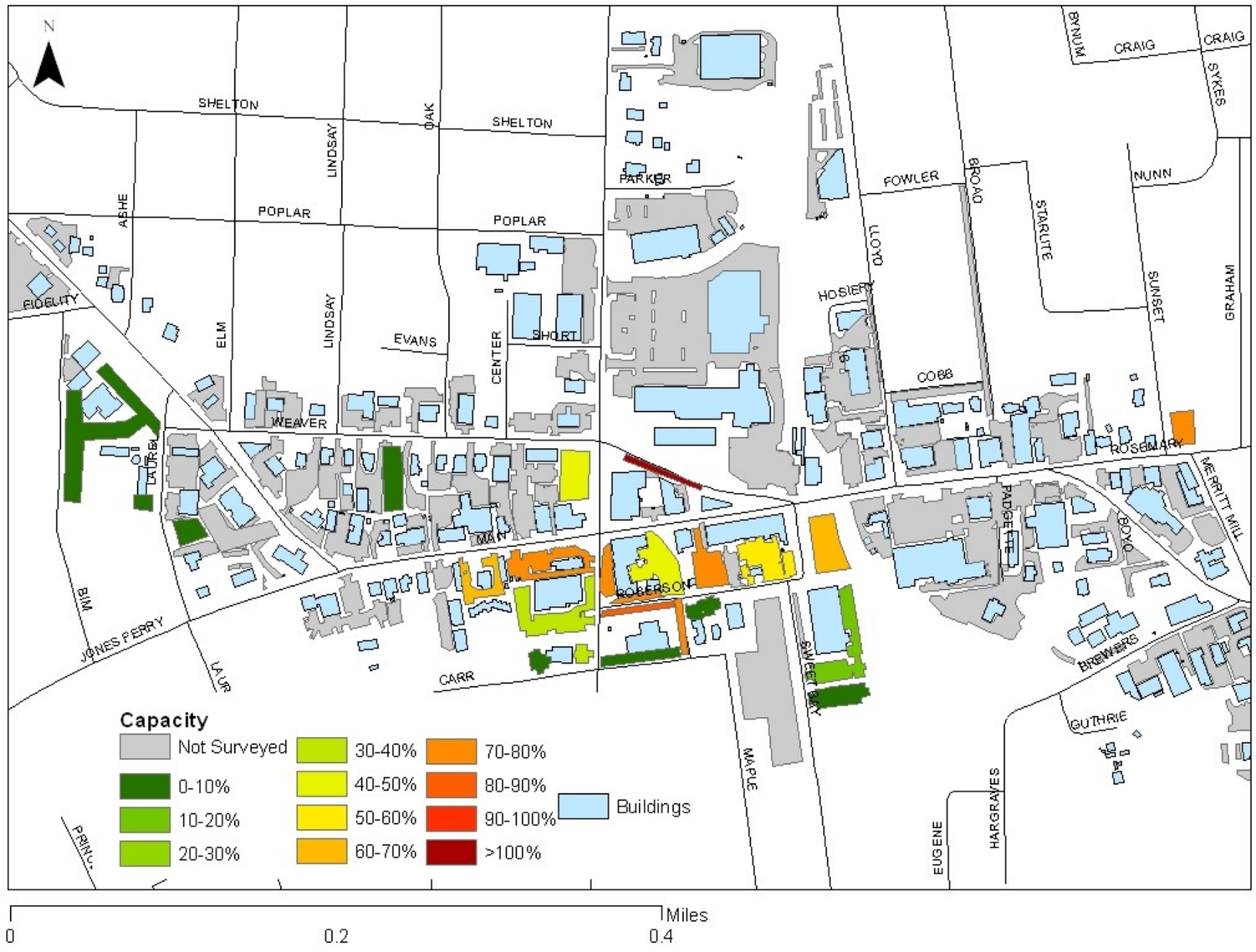


Figure 29: Existing Conditions: Saturday Early Afternoon 11AM-3PM

*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill Mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

Figure 30: Existing Conditions: Saturday Late Afternoon 3PM-6PM



*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill Mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

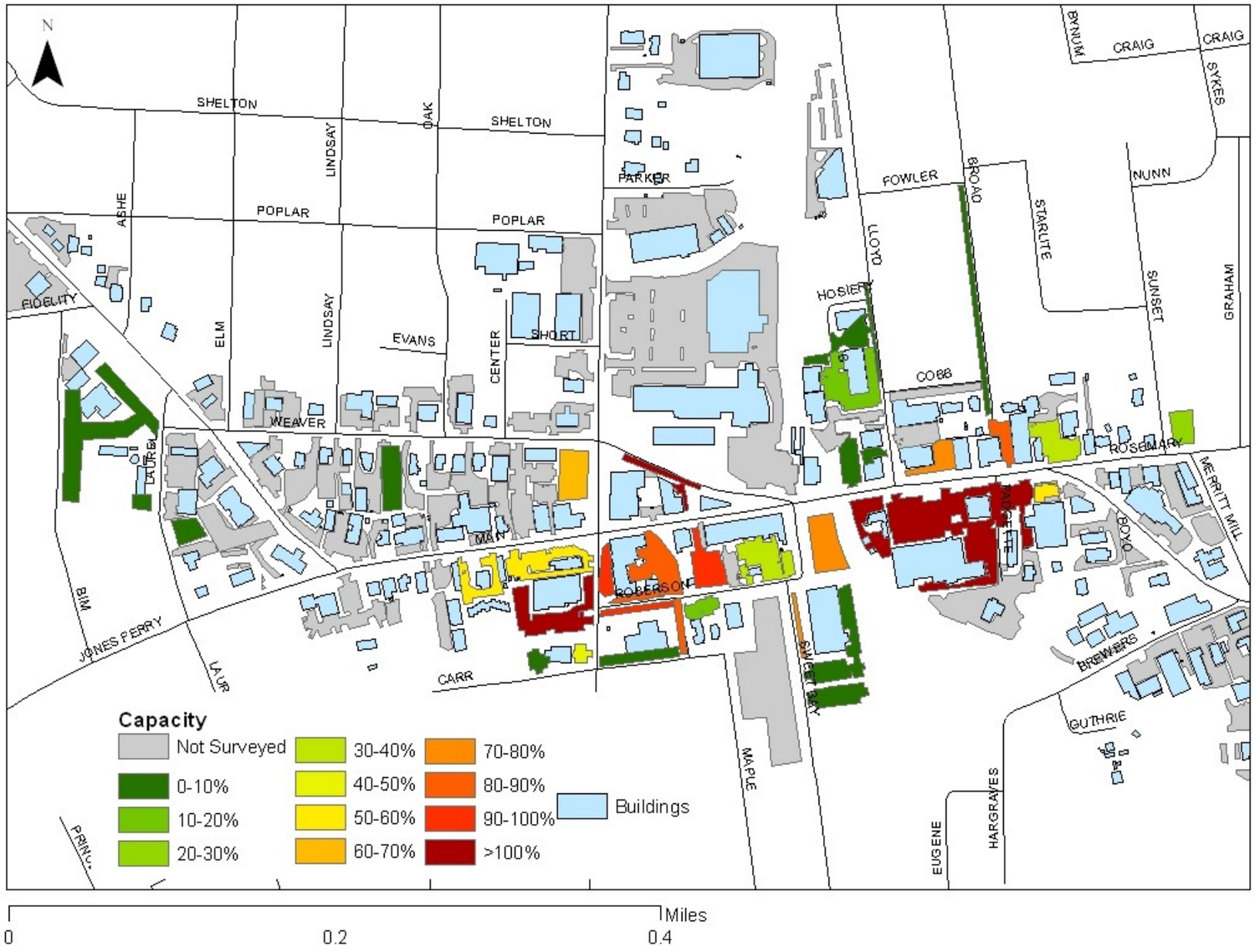
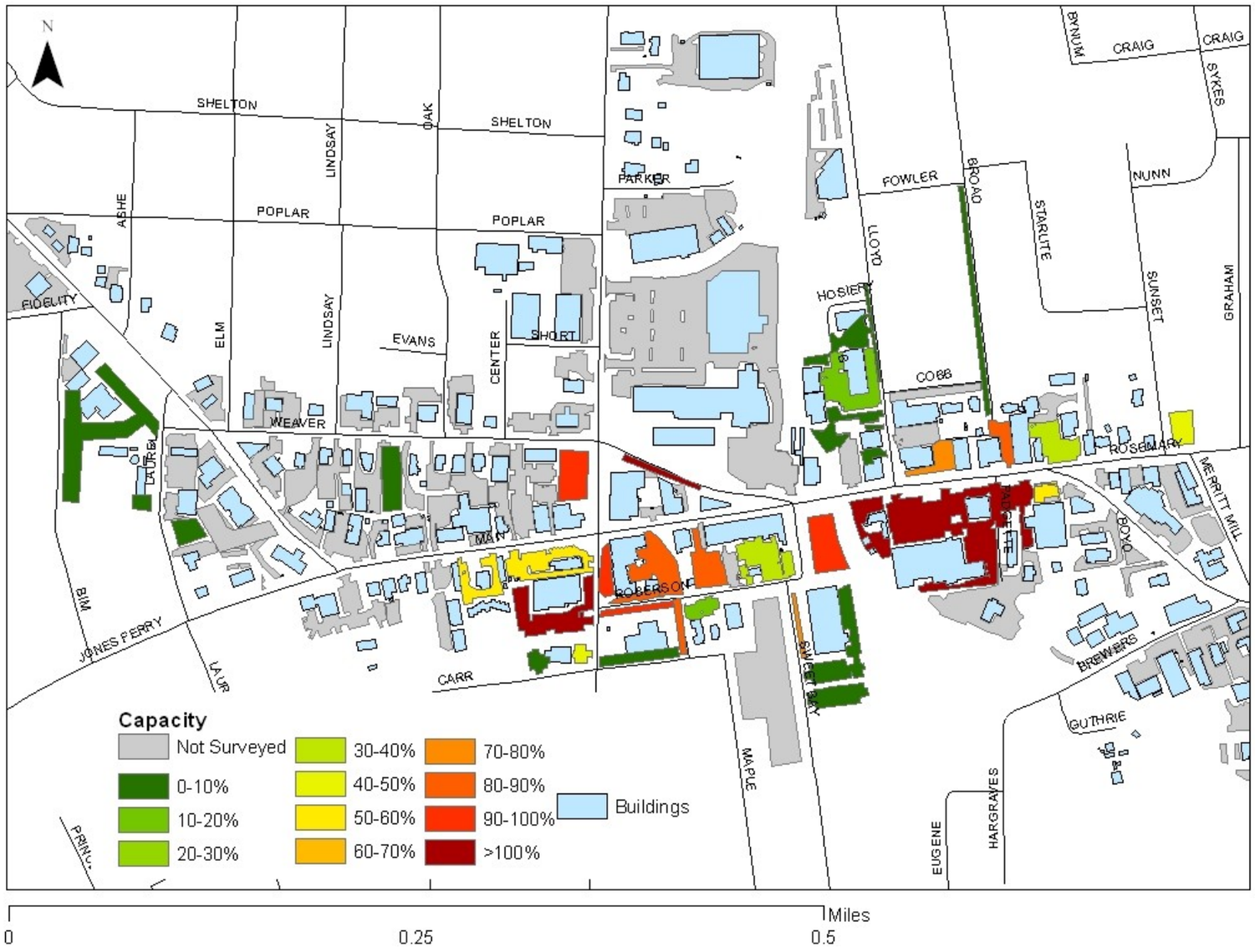


Figure 31: Existing Conditions: Saturday Early Evening 6PM-9PM

*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill Mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

Figure 32: Existing Conditions: Saturday Late Evening 9PM-12AM



*All demand analysis completed i
February 2008

**Occupancy was calculated for the Carr Mill Mal
parking lot using tube counts (described in Tube Coun
Methodology) and by hand counts for all other lots. I
includes both public an
private lots

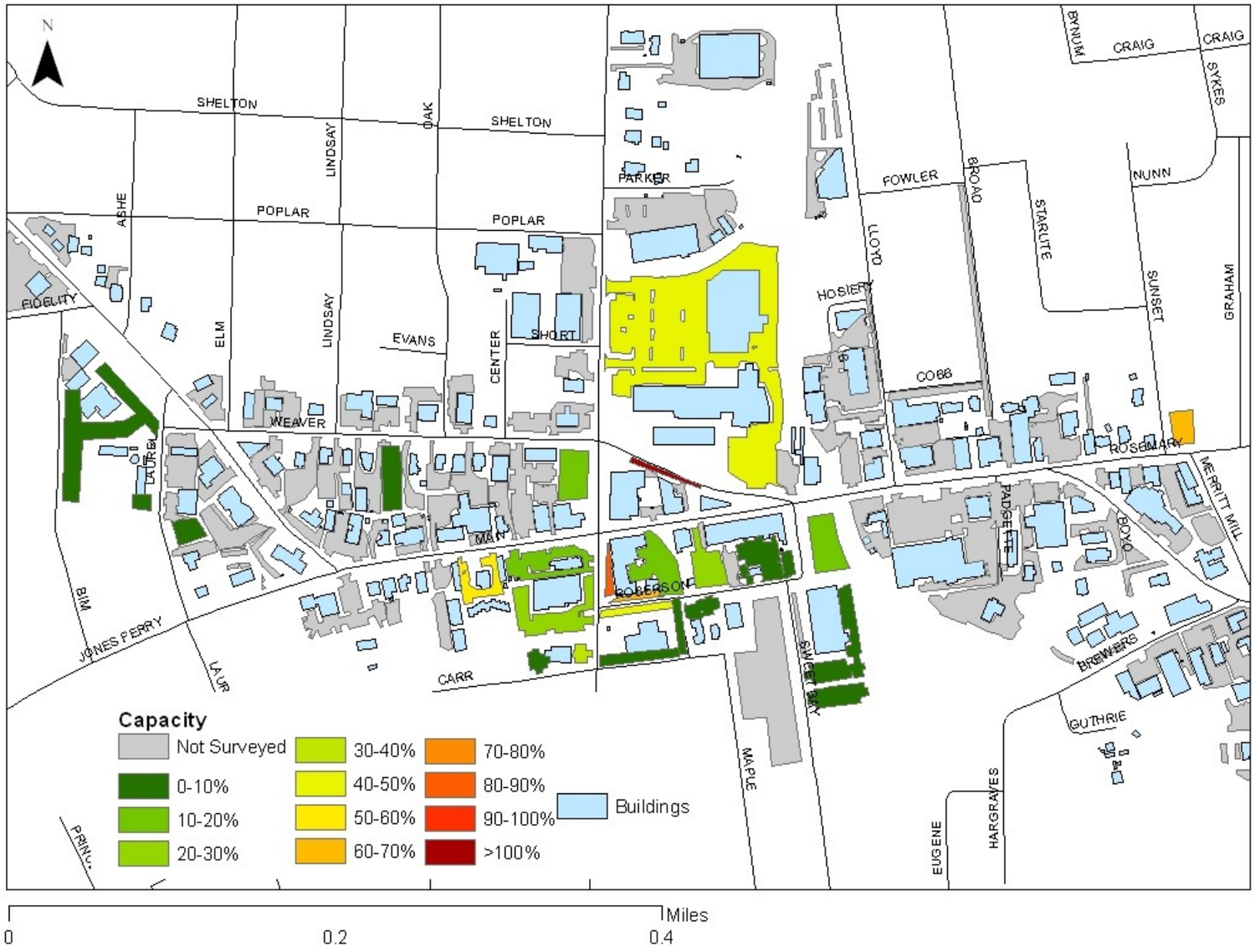
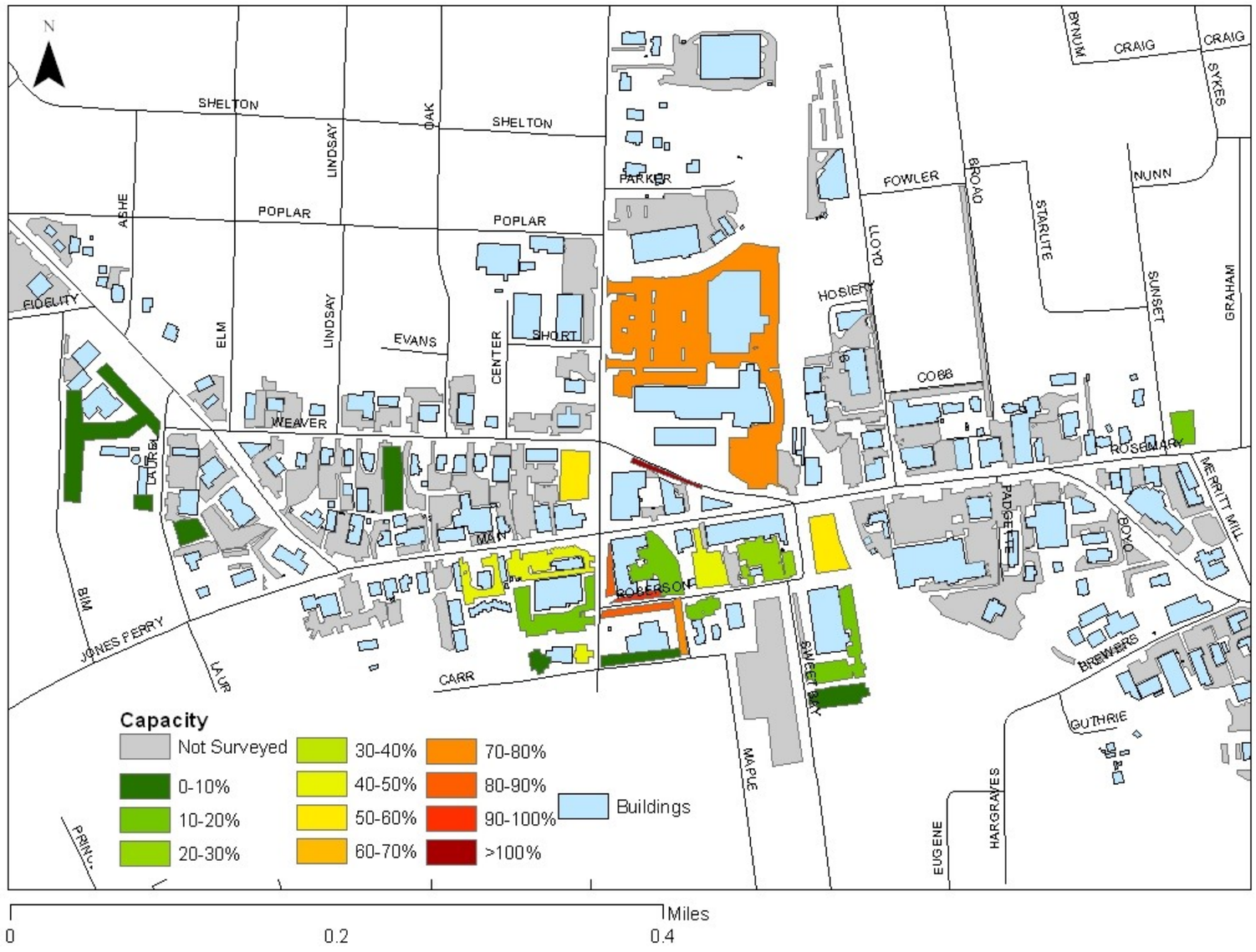


Figure 33: Existing Conditions: Sunday Morning 9AM-11AM

All demand analysis completed in ebruary 2008.

*Occupancy was calculated for the Carr Mill Mall arking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It ncludes both public and rivate lots.

Figure 34: Existing Conditions: Sunday Early Afternoon 11AM-3PM



*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill Mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

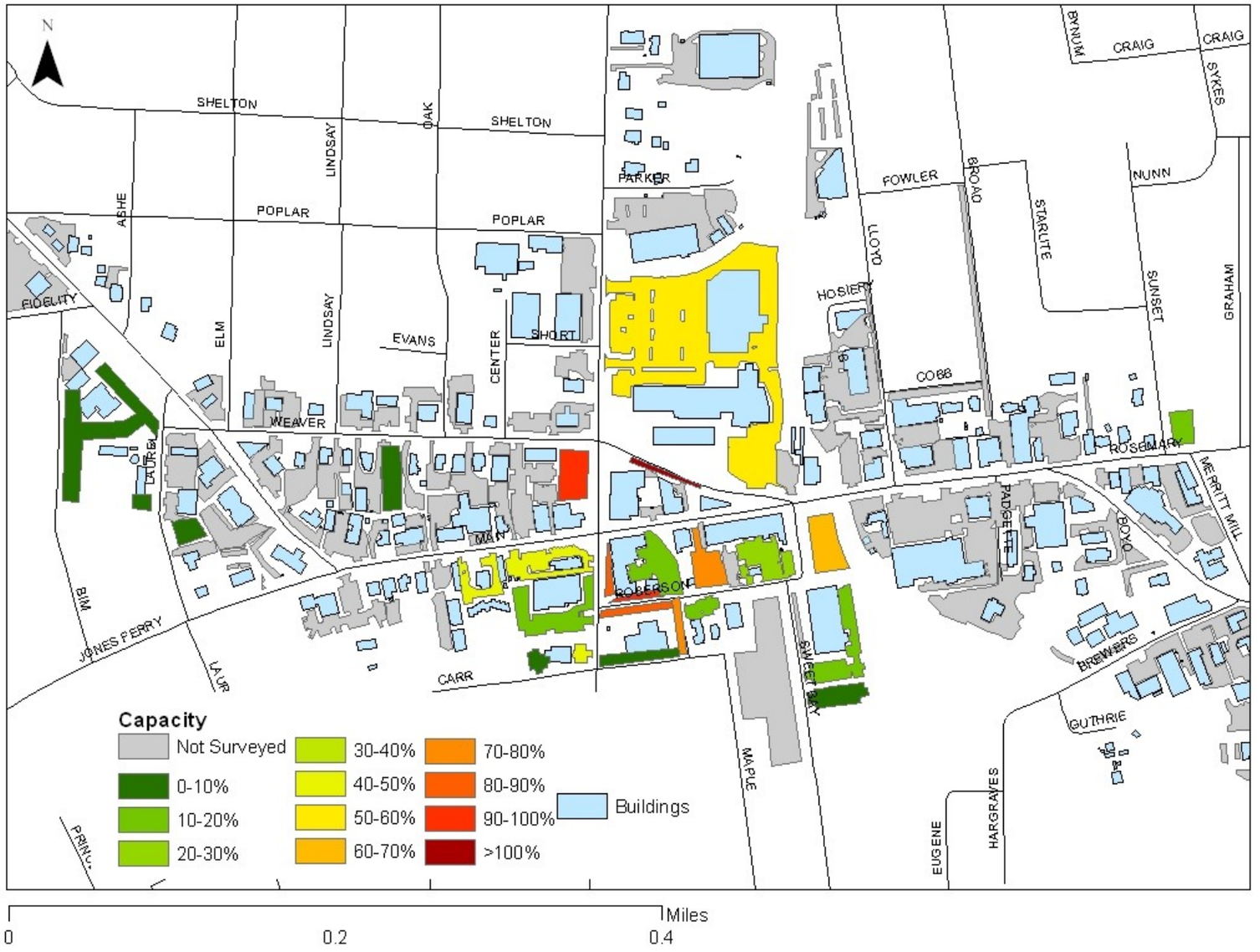
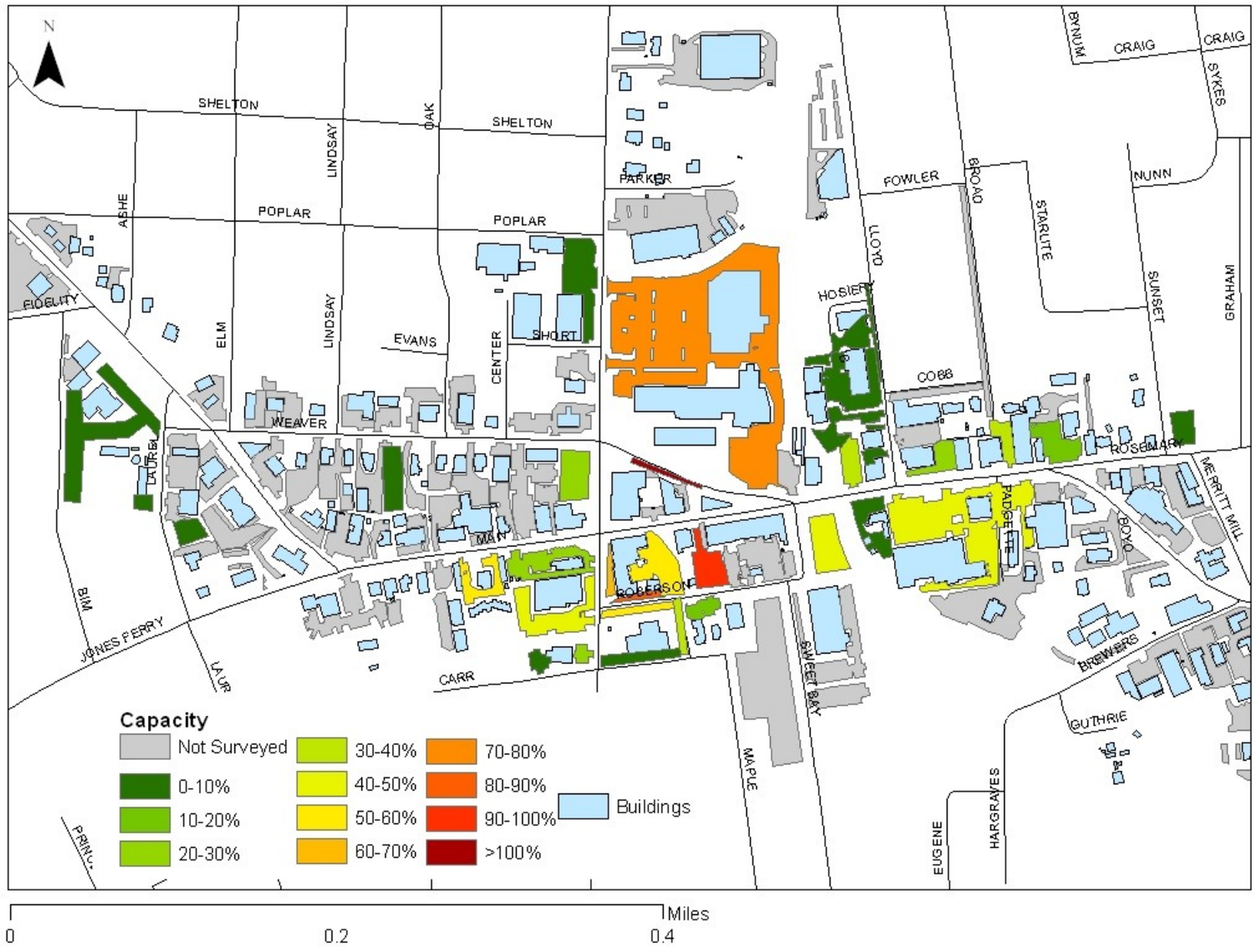


Figure 35: Existing Conditions: Sunday Late Afternoon 3PM-6PM

*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill Mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

Figure 36: Existing Conditions: Sunday Early Evening 6PM-9PM



*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill Mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

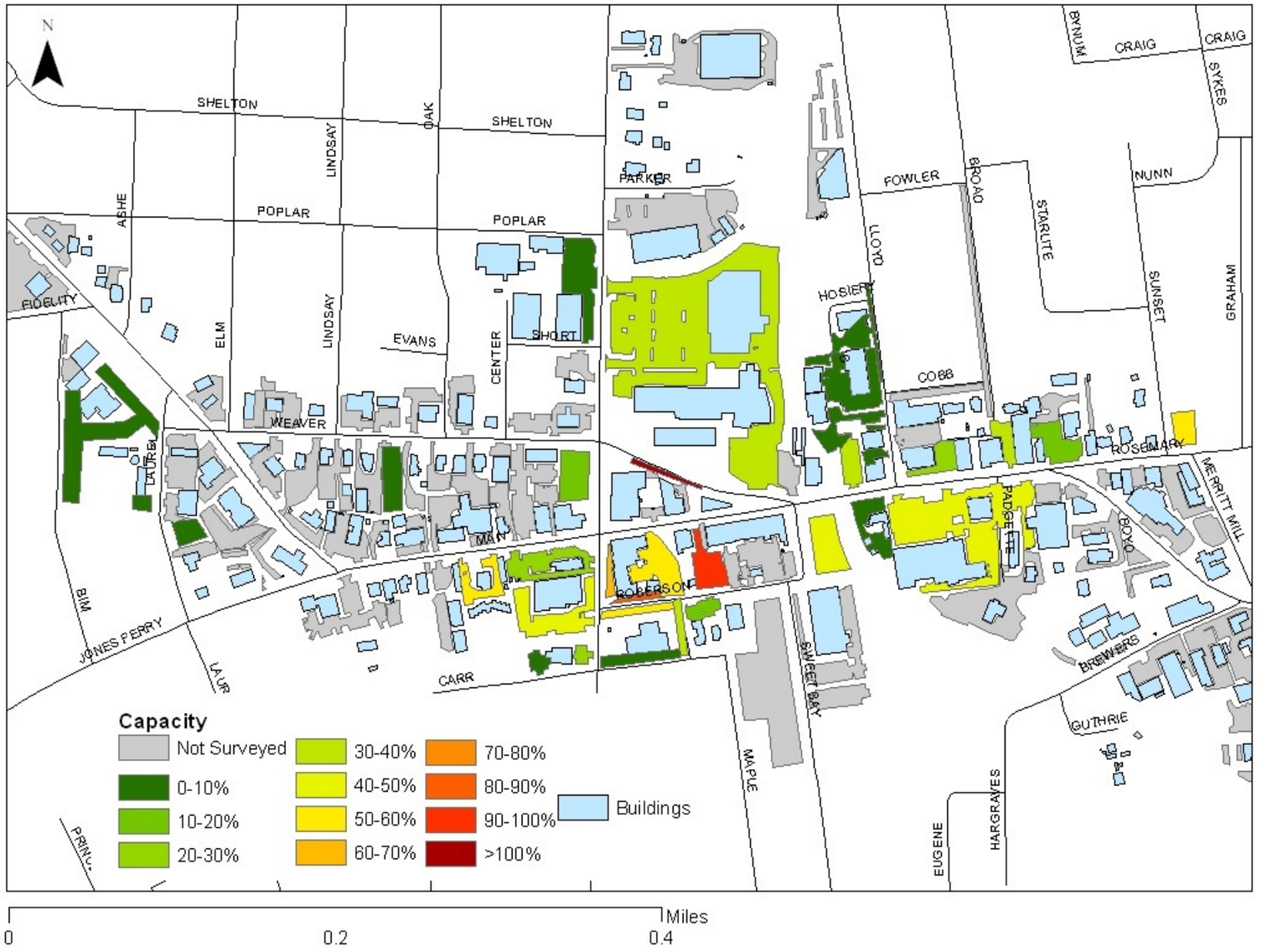
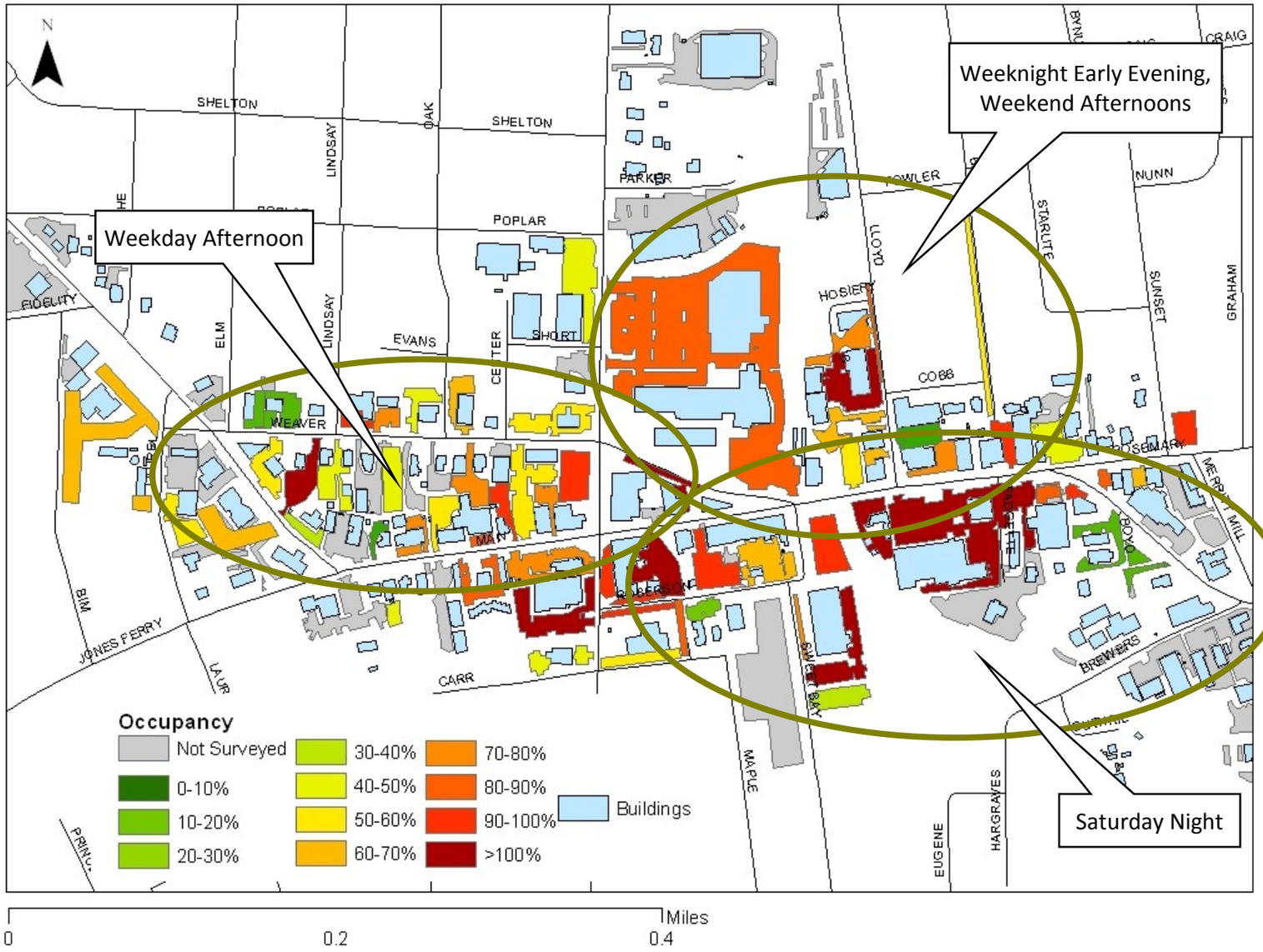


Figure 37: Existing Conditions: Sunday Late Evening 9PM-12AM

*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill Mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

Figure 38: Highest Occupancy Across All Days and Time Periods

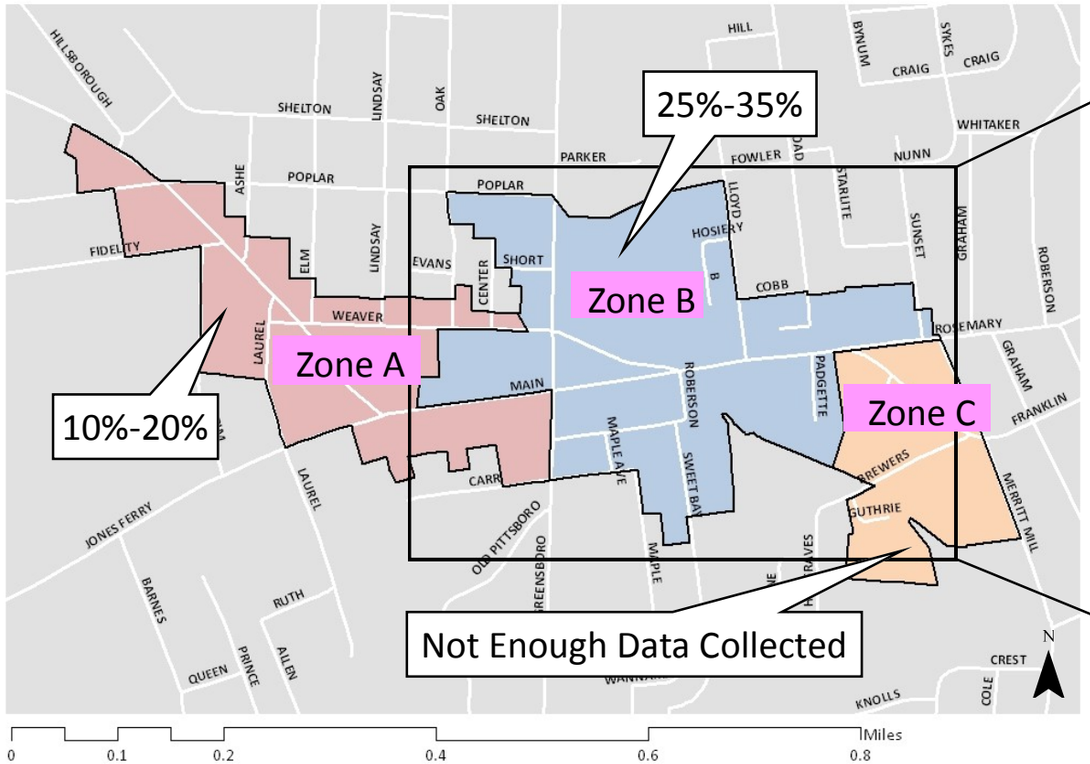


*All demand analysis completed in February 2008.

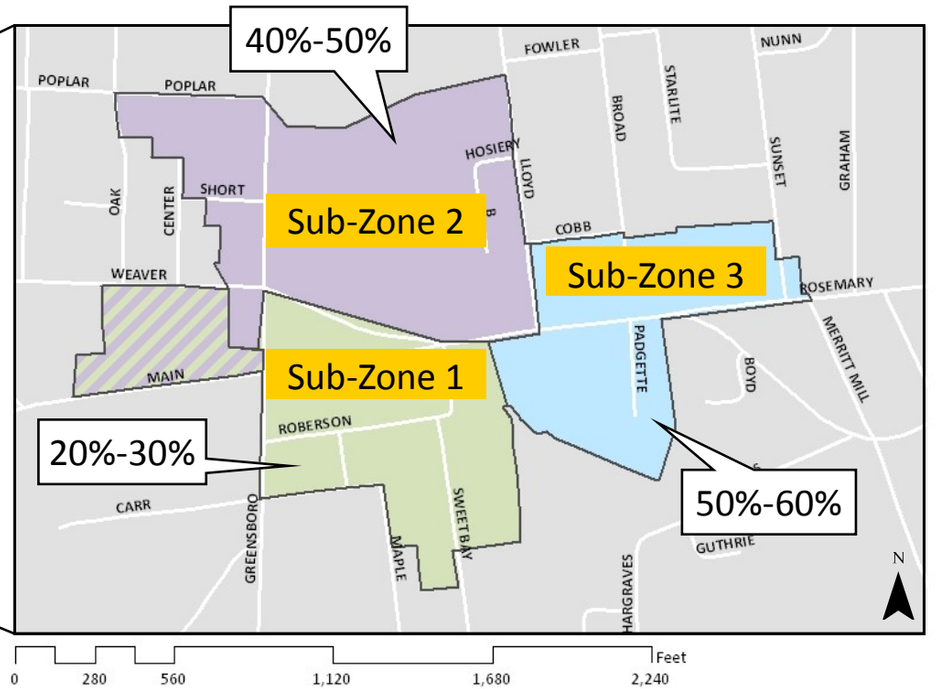
**Occupancy was calculated for the Carr Mill Mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

Figure 39: Existing Conditions: Zone and Sub-Zone Occupancy
Saturday Morning 9AM –11AM*

*Carr Mill Lots Not Surveyed on This Day



Zone Occupancy



Sub-Zone Occupancy

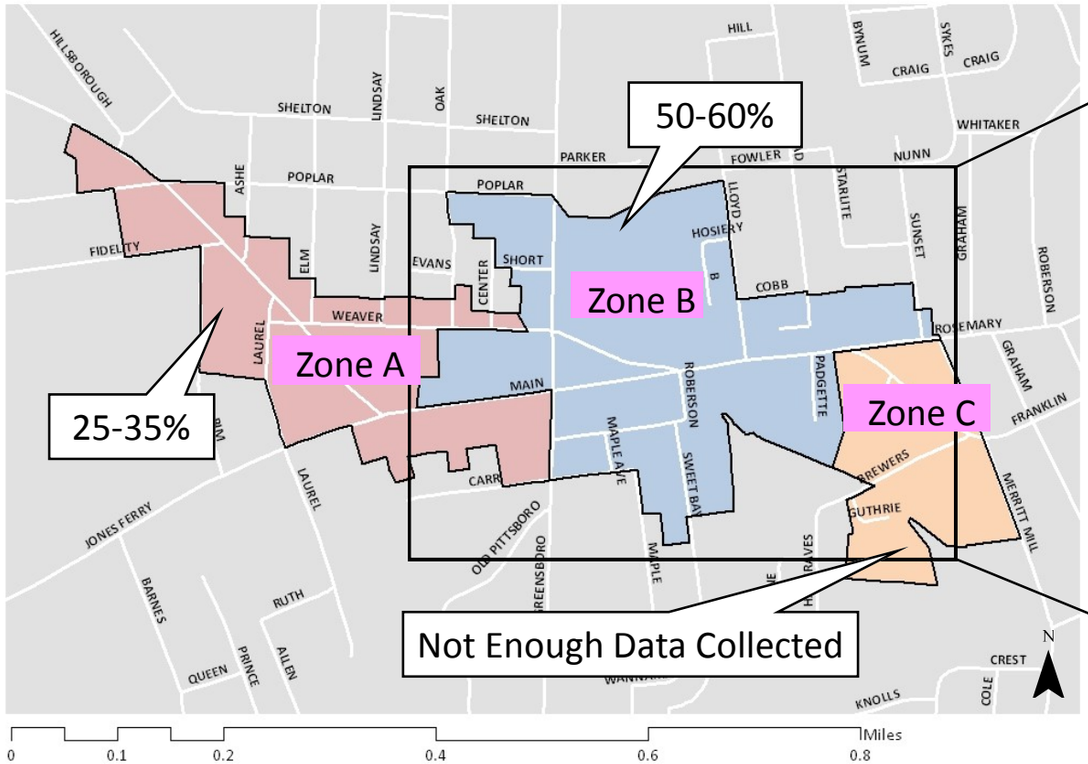
*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

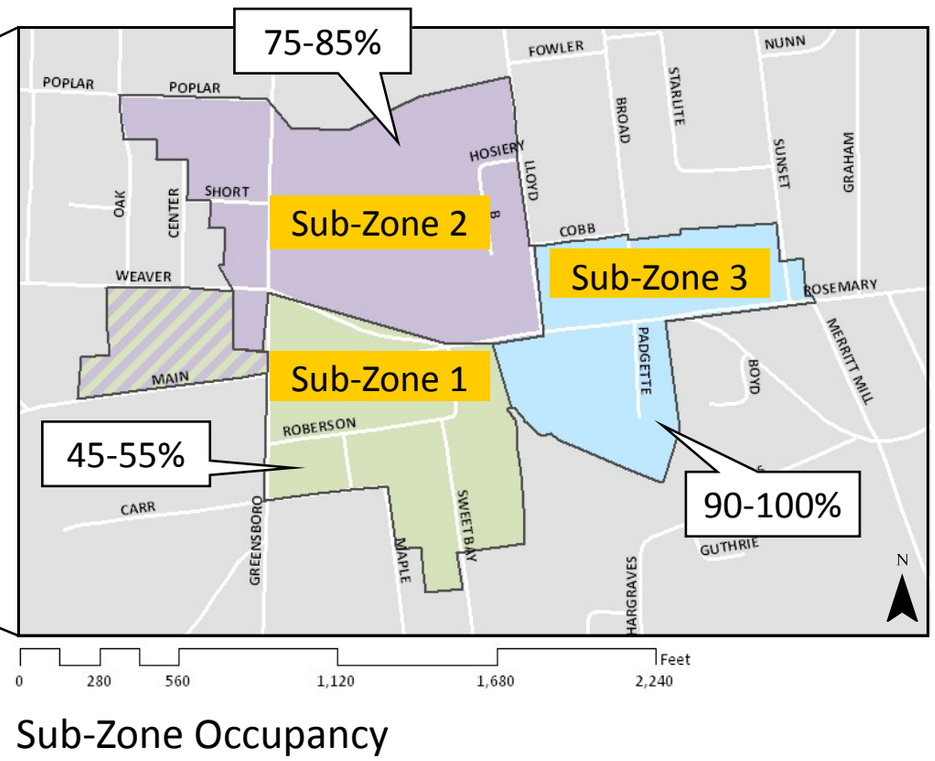
***Occupancy was calculated by dividing total demand of lots surveyed within an analysis zone or sub-zone by total supply of spots surveyed during this time period. These numbers exclude both the supply and demand of lots not surveyed during this time period.

Figure 40: Existing Conditions: Zone and Sub-Zone Occupancy Saturday Early Afternoon 12PM-3PM*

*Carr Mill Lots Not Surveyed on This Day



Zone Occupancy



Sub-Zone Occupancy

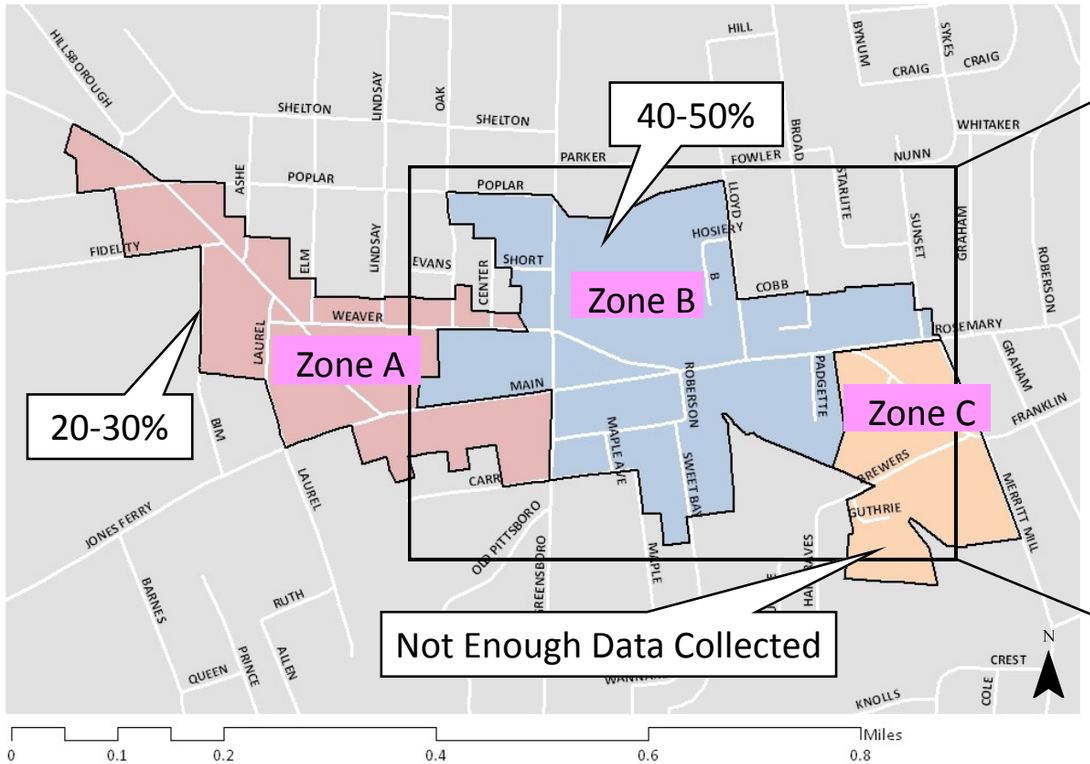
*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

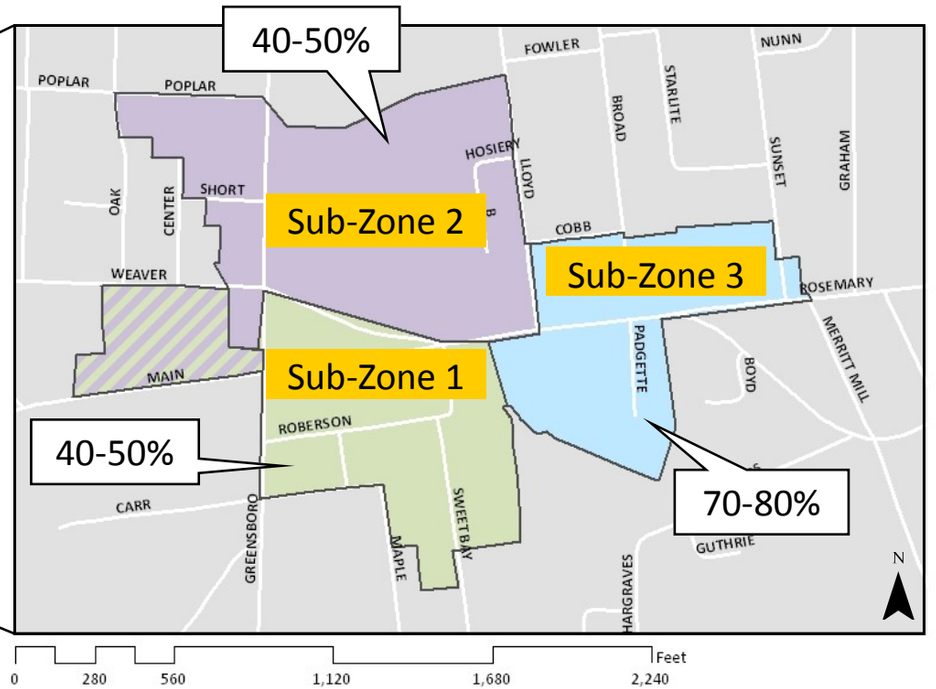
***Occupancy was calculated by dividing total demand of lots surveyed within an analysis zone or sub-zone by total supply of spots surveyed during this time period. These numbers exclude both the supply and demand of lots not surveyed during this time period.

Figure 41: Existing Conditions: Zone and Sub-Zone Occupancy
Saturday Late Afternoon 3PM-6PM*

*Carr Mill Lots Not Surveyed on This Day



Zone Occupancy



Sub-Zone Occupancy

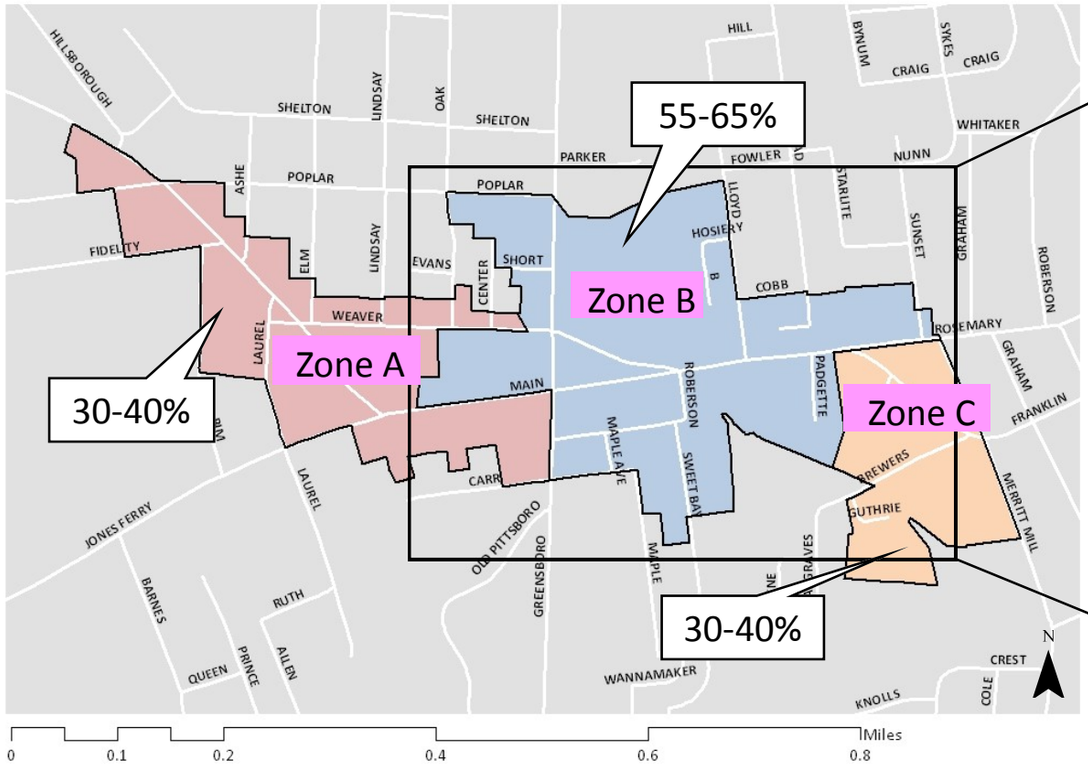
*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

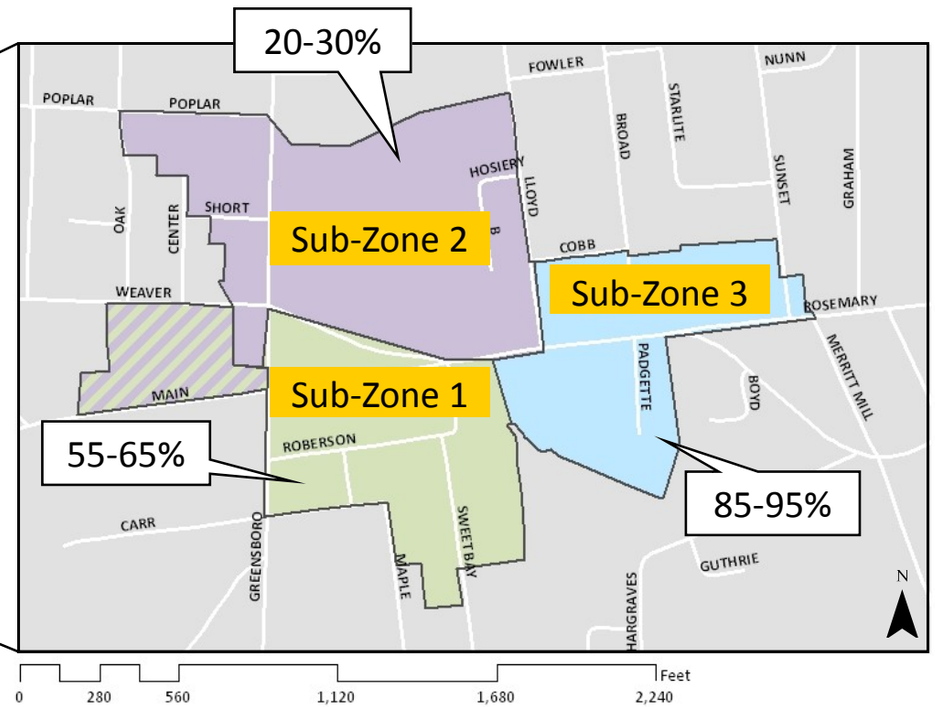
***Occupancy was calculated by dividing total demand of lots surveyed within an analysis zone or sub-zone by total supply of spots surveyed during this time period. These numbers exclude both the supply and demand of lots not surveyed during this time period.

Figure 42: Existing Conditions: Zone and Sub-Zone Occupancy Saturday Early Evening 6PM-9PM*

*Carr Mill Lots Not Surveyed on This Day



Zone Occupancy



Sub-Zone Occupancy

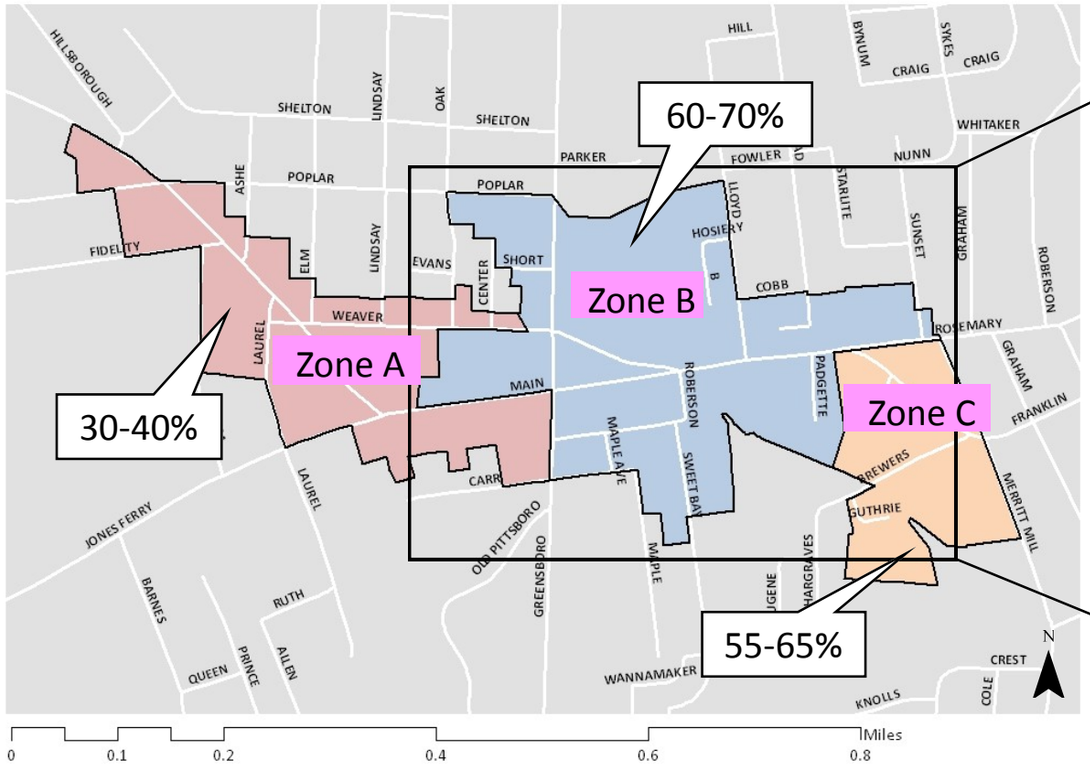
*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

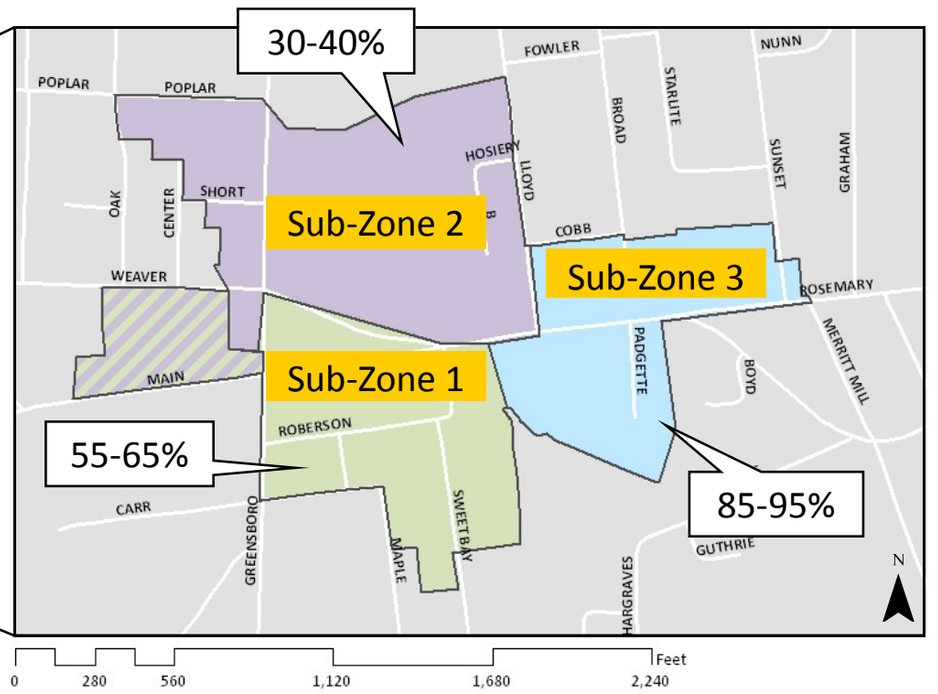
***Occupancy was calculated by dividing total demand of lots surveyed within an analysis zone or sub-zone by total supply of spots surveyed during this time period. These numbers exclude both the supply and demand of lots not surveyed during this time period.

Figure 43: Existing Conditions: Zone and Sub-Zone Occupancy
Saturday Late Evening 9PM-11PM*

*Carr Mill Lots Not Surveyed on This Day



Zone Occupancy



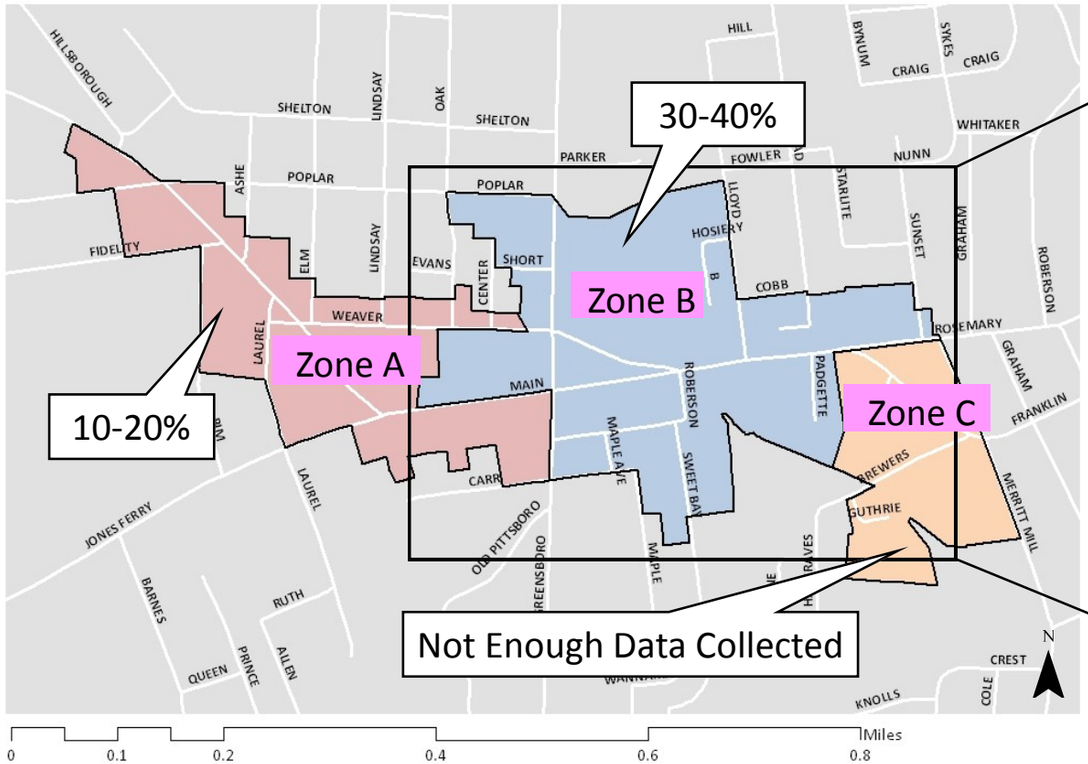
Sub-Zone Occupancy

*All demand analysis completed in February 2008.

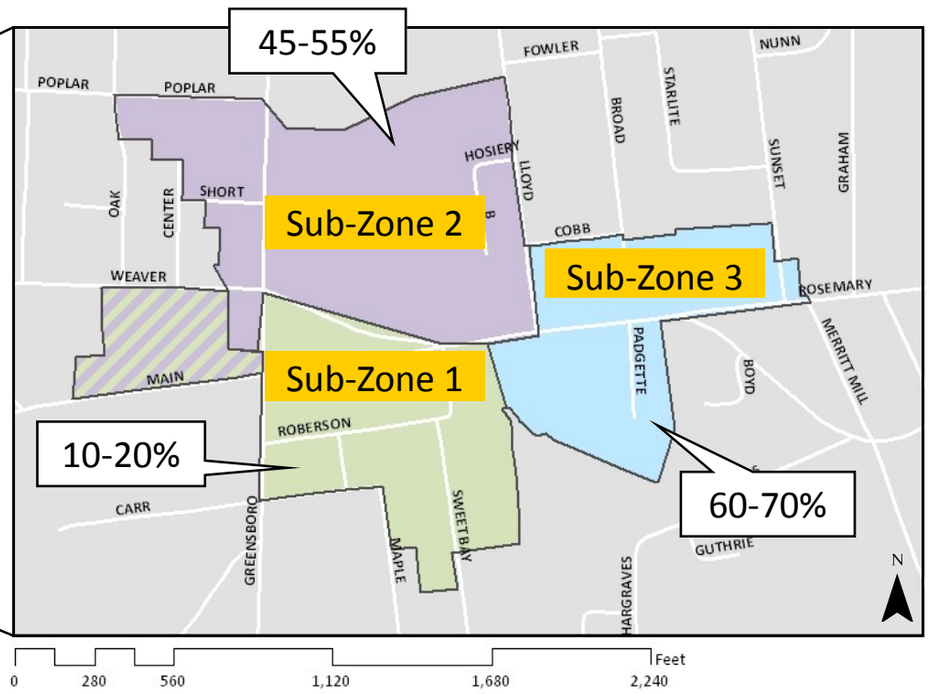
**Occupancy was calculated for the Carr Mill mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

***Occupancy was calculated by dividing total demand of lots surveyed within an analysis zone or sub-zone by total supply of spots surveyed during this time period. These numbers exclude both the supply and demand of lots not surveyed during this time period.

Figure 44: Existing Conditions: Zone and Sub-Zone Occupancy Sunday Morning 9AM-11AM



Zone Occupancy



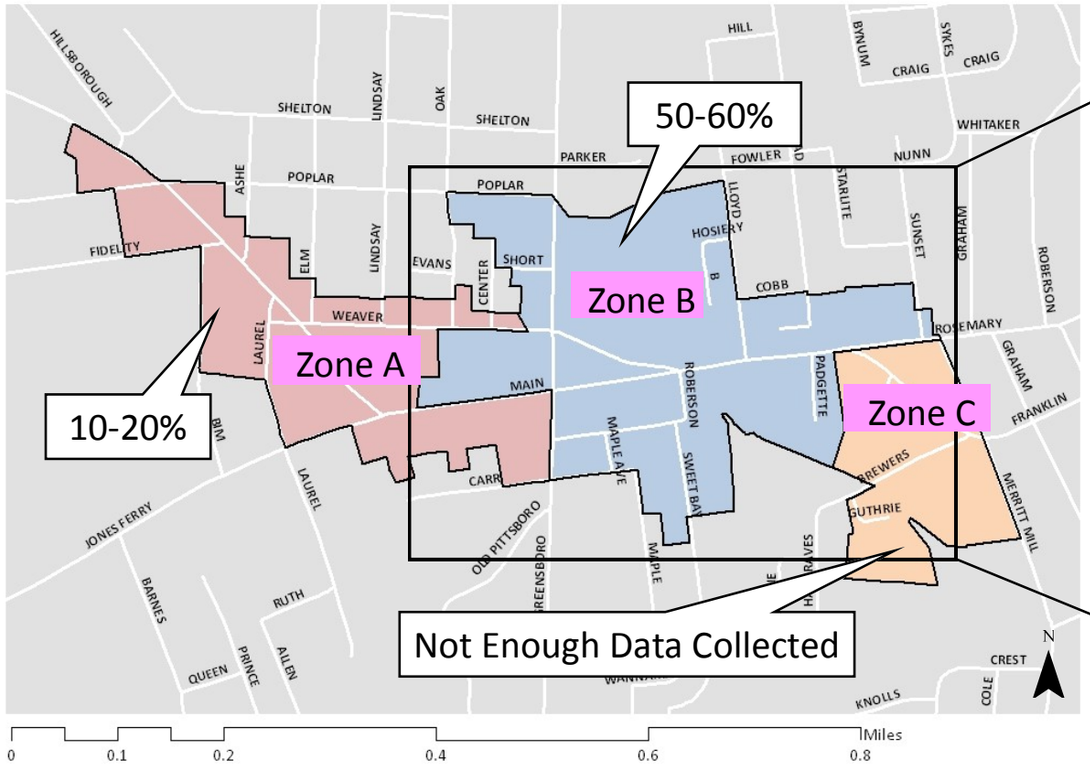
Sub-Zone Occupancy

*All demand analysis completed in February 2008.

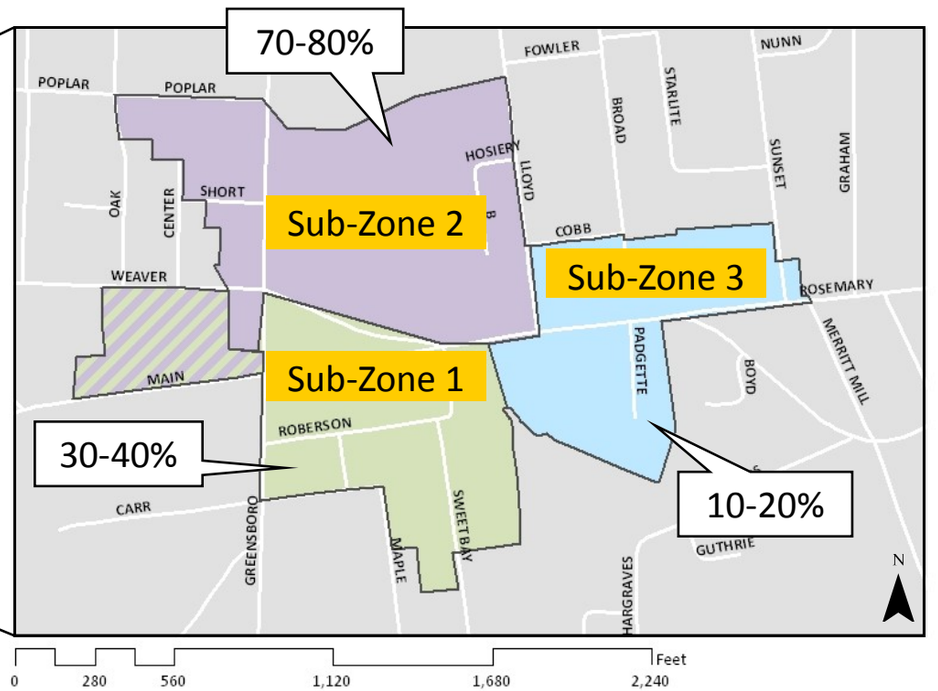
**Occupancy was calculated for the Carr Mill mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

***Occupancy was calculated by dividing total demand of lots surveyed within an analysis zone or sub-zone by total supply of spots surveyed during this time period. These numbers exclude both the supply and demand of lots not surveyed during this time period.

Figure 45: Existing Conditions: Zone and Sub-Zone Occupancy
Sunday Early Afternoon 11AM-3PM



Zone Occupancy



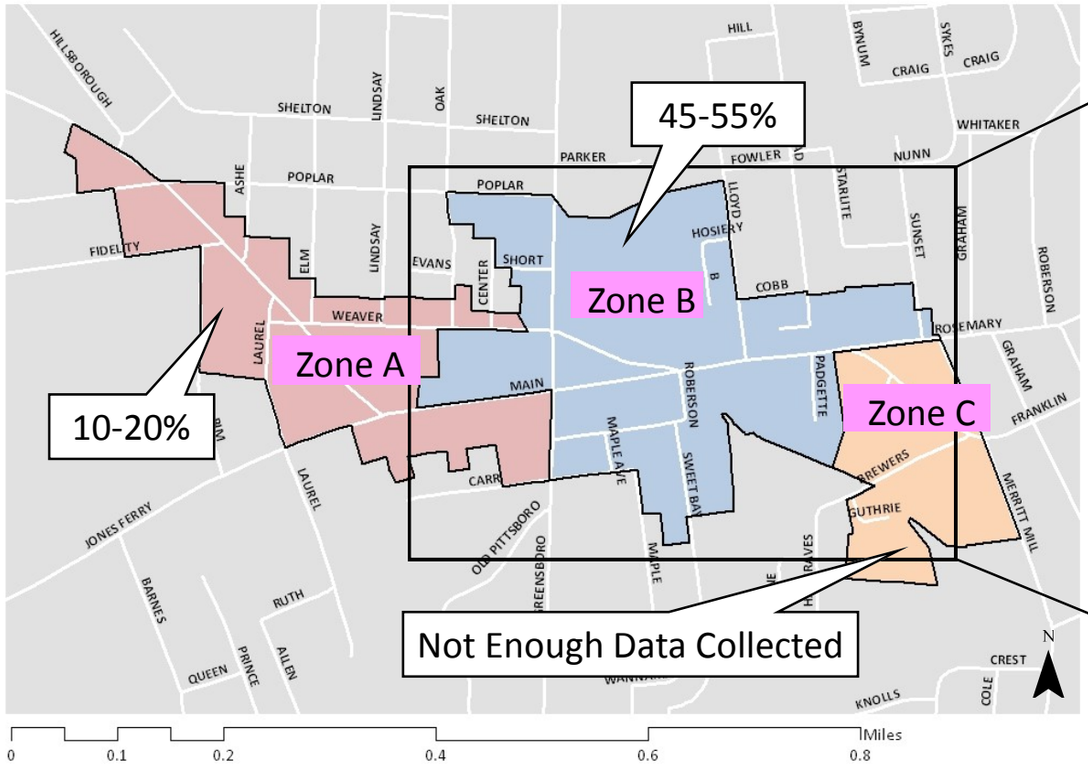
Sub-Zone Occupancy

*All demand analysis completed in February 2008.

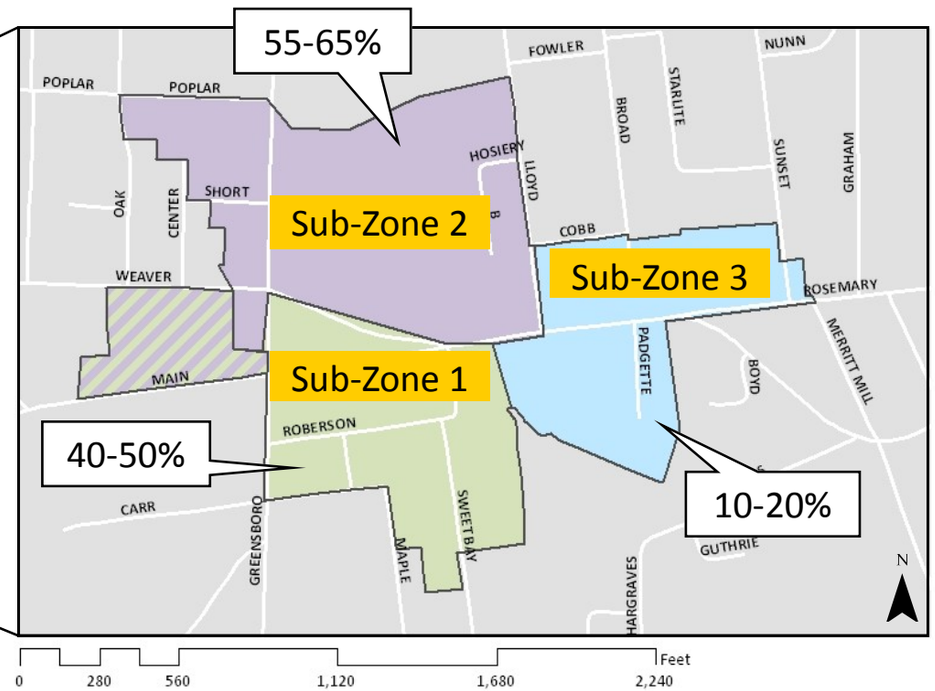
**Occupancy was calculated for the Carr Mill mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

***Occupancy was calculated by dividing total demand of lots surveyed within an analysis zone or sub-zone by total supply of spots surveyed during this time period. These numbers exclude both the supply and demand of lots not surveyed during this time period.

Figure 46: Existing Conditions: Zone and Sub-Zone Occupancy Sunday Late Afternoon 3PM-6PM



Zone Occupancy



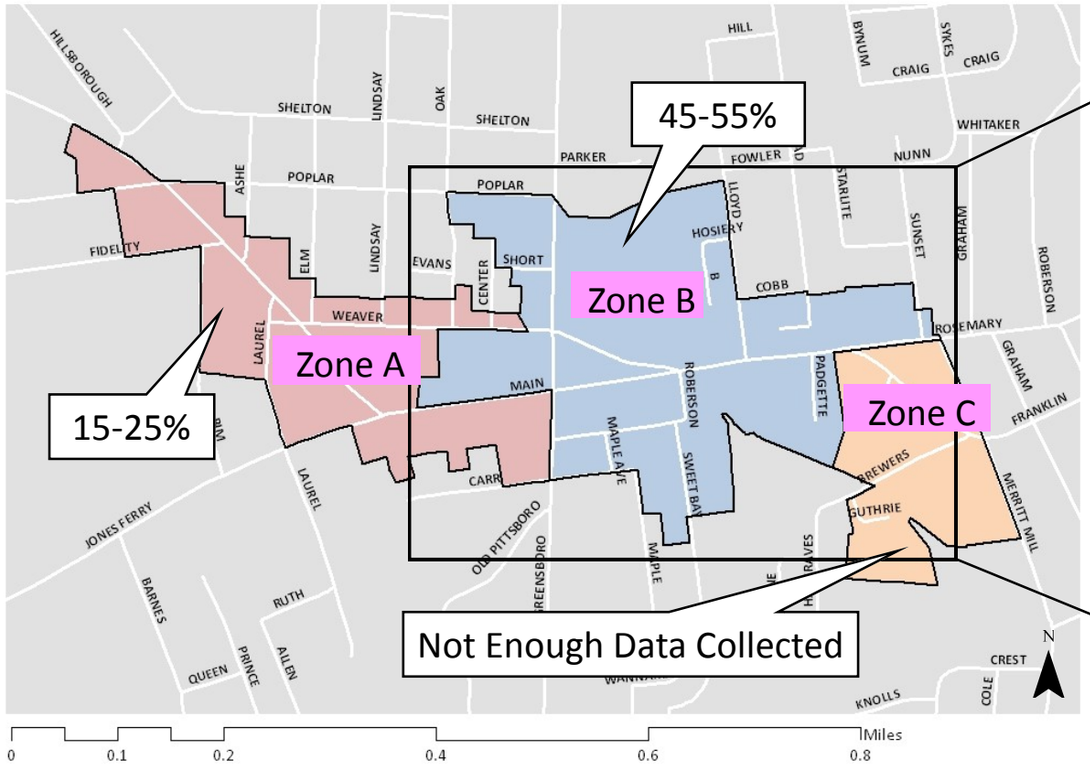
Sub-Zone Occupancy

*All demand analysis completed in February 2008.

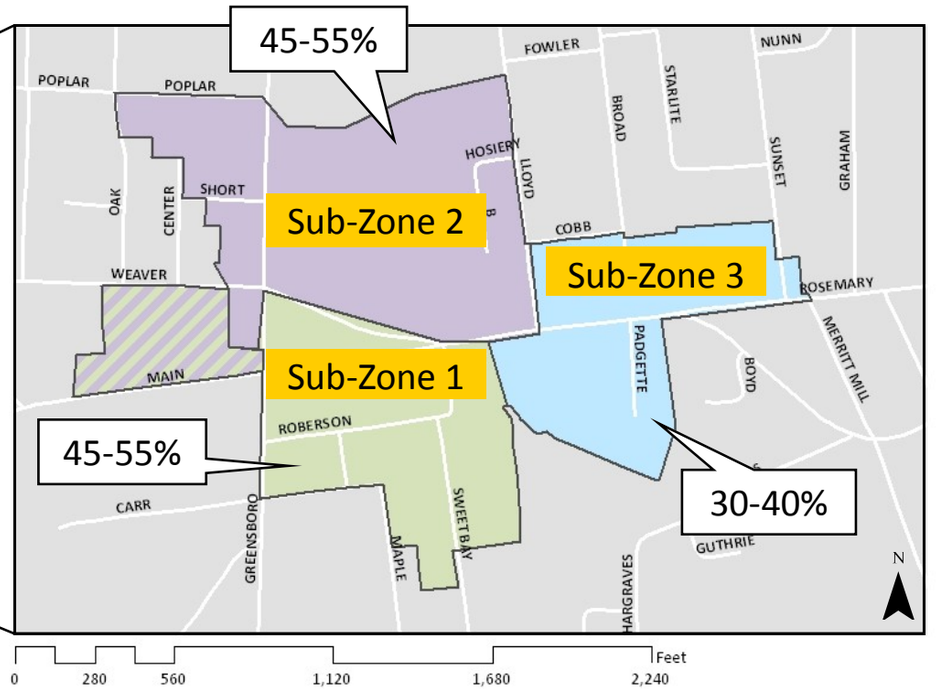
**Occupancy was calculated for the Carr Mill mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

***Occupancy was calculated by dividing total demand of lots surveyed within an analysis zone or sub-zone by total supply of spots surveyed during this time period. These numbers exclude both the supply and demand of lots not surveyed during this time period.

Figure 47: Existing Conditions: Zone and Sub-Zone Occupancy
Sunday Early Evening 6PM-9PM



Zone Occupancy



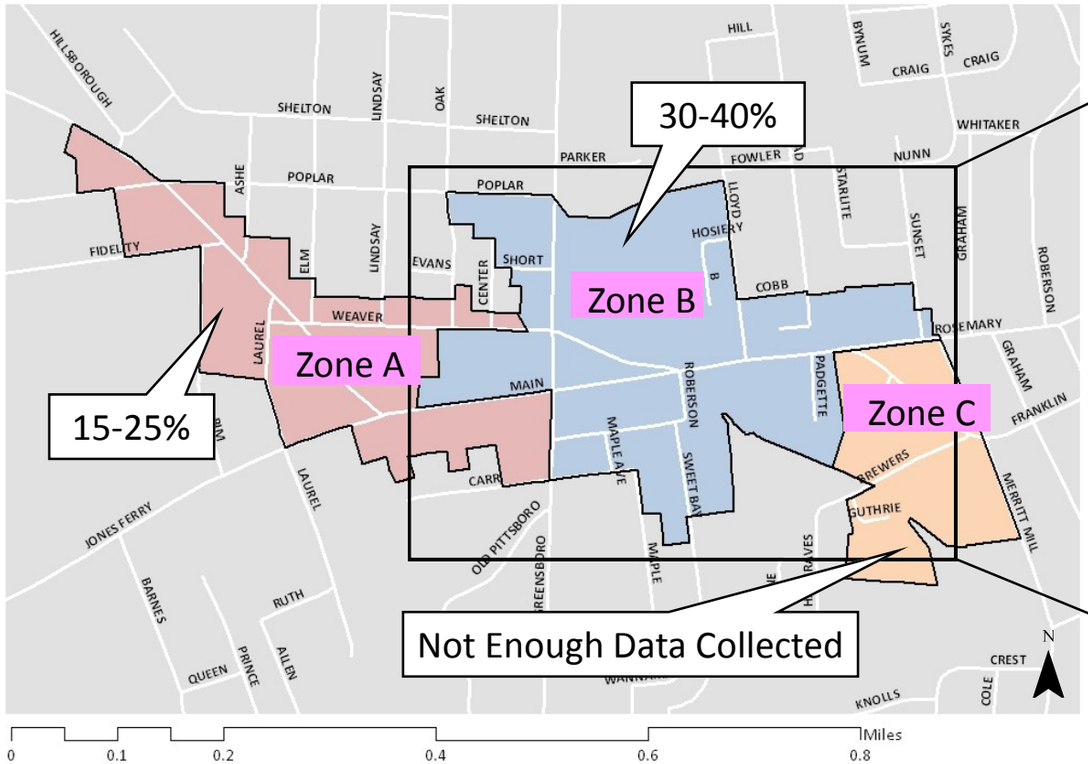
Sub-Zone Occupancy

*All demand analysis completed in February 2008.

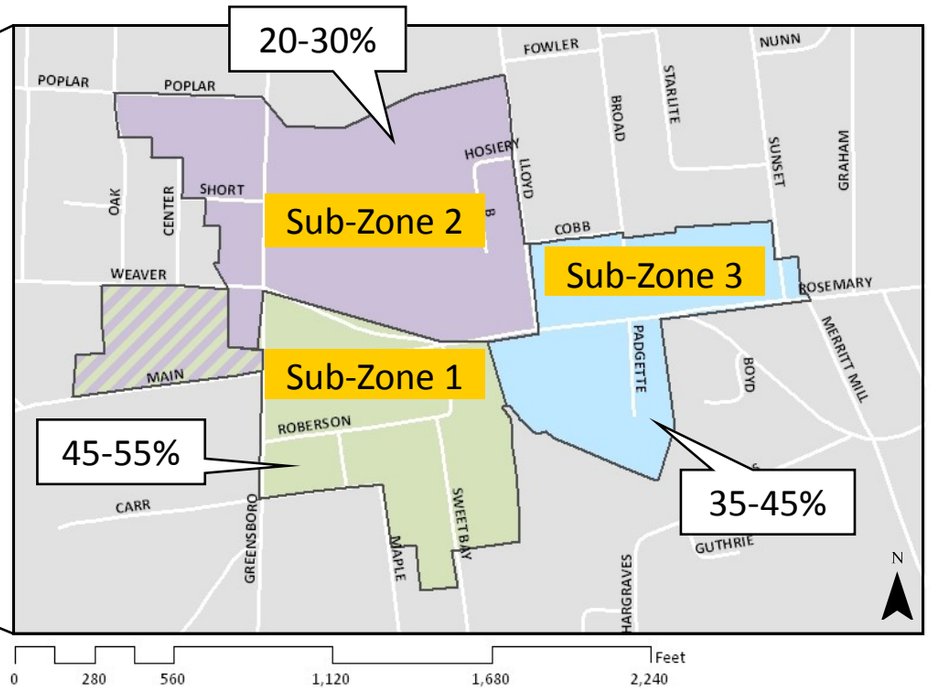
**Occupancy was calculated for the Carr Mill mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

***Occupancy was calculated by dividing total demand of lots surveyed within an analysis zone or sub-zone by total supply of spots surveyed during this time period. These numbers exclude both the supply and demand of lots not surveyed during this time period.

Figure 48: Existing Conditions: Zone and Sub-Zone Occupancy Sunday Late Evening 9PM-11PM



Zone Occupancy



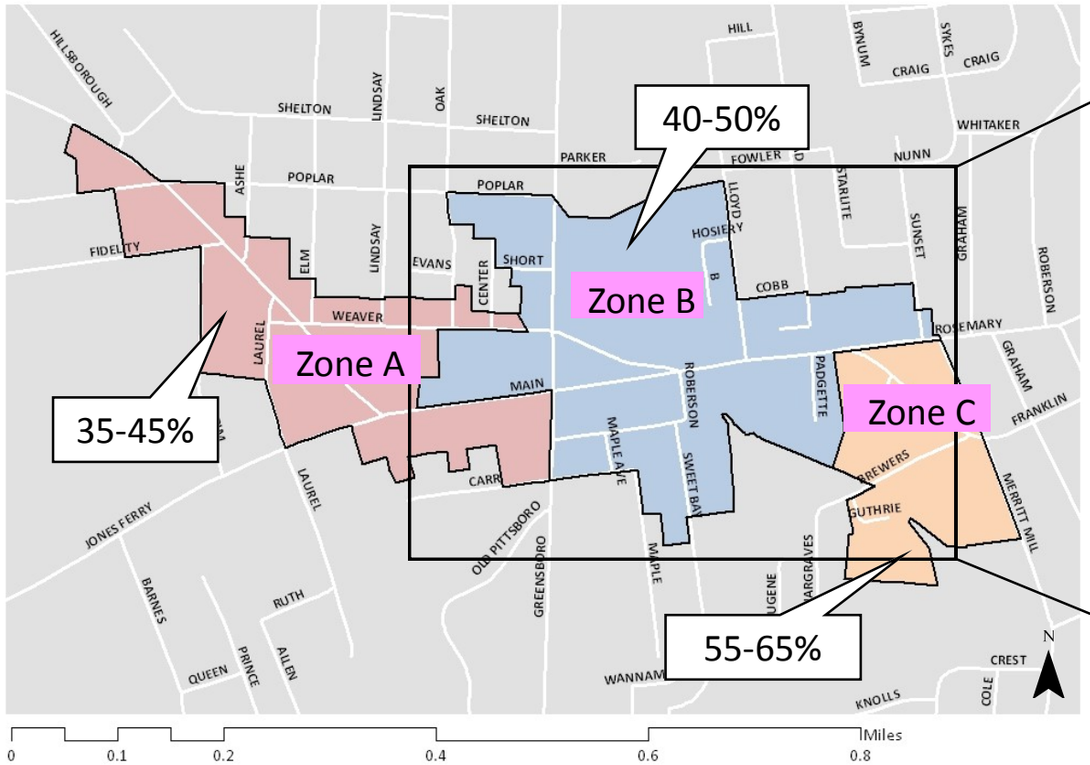
Sub-Zone Occupancy

*All demand analysis completed in February 2008.

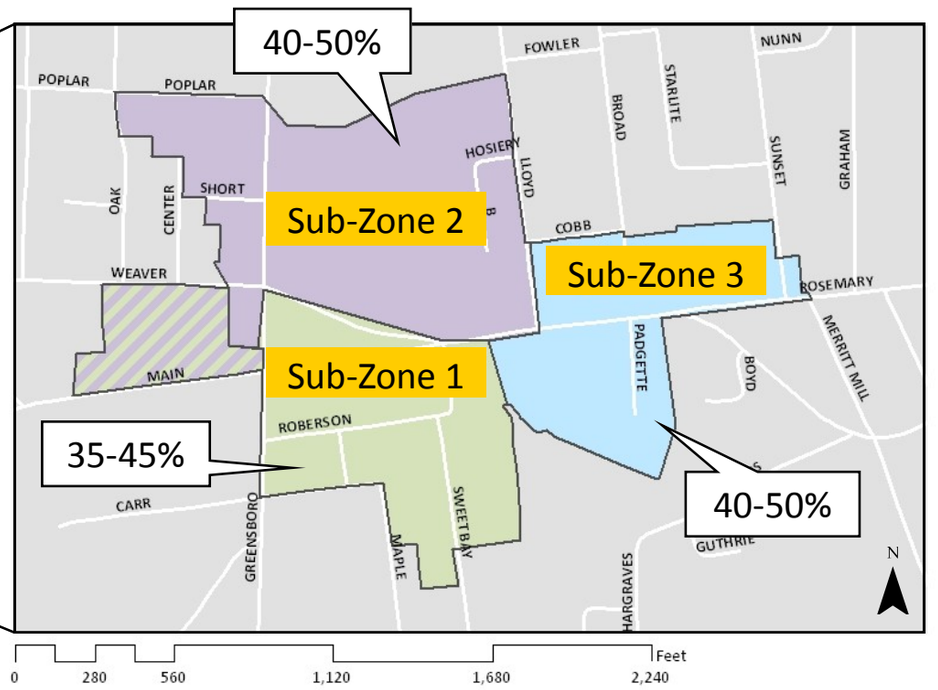
**Occupancy was calculated for the Carr Mill mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

***Occupancy was calculated by dividing total demand of lots surveyed within an analysis zone or sub-zone by total supply of spots surveyed during this time period. These numbers exclude both the supply and demand of lots not surveyed during this time period.

Figure 49: Existing Conditions: Zone and Sub-Zone Occupancy
Tuesday Morning 9AM –11AM



Zone Occupancy



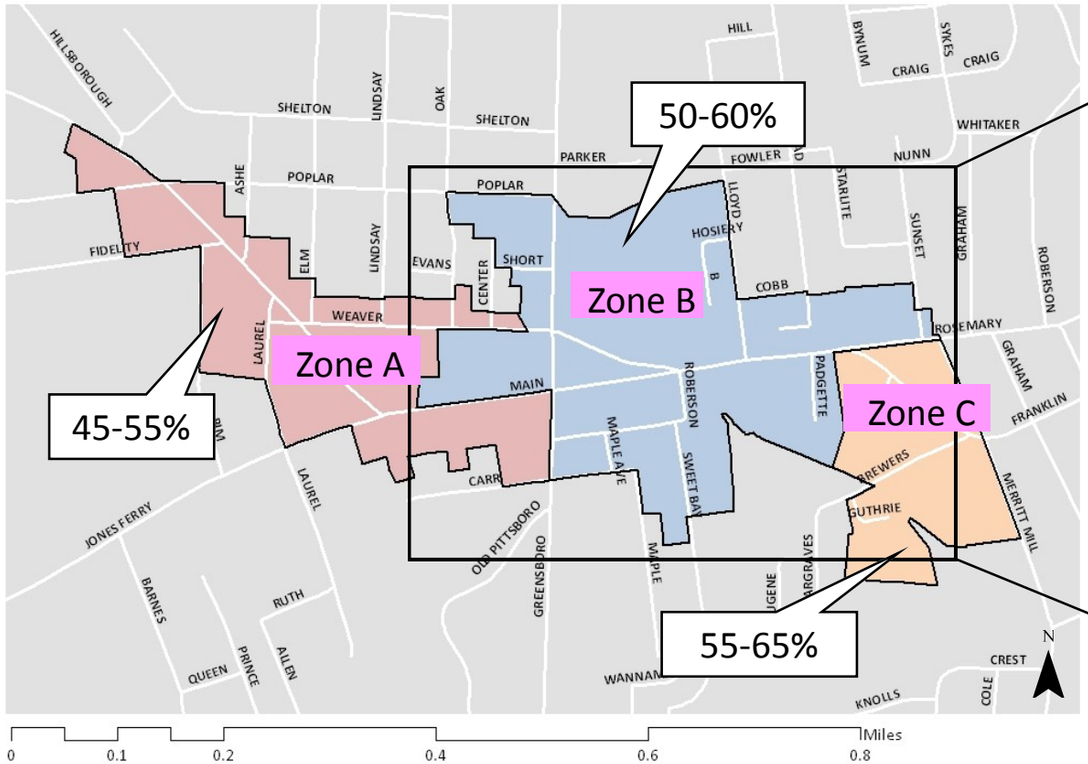
Sub-Zone Occupancy

*All demand analysis completed in February 2008.

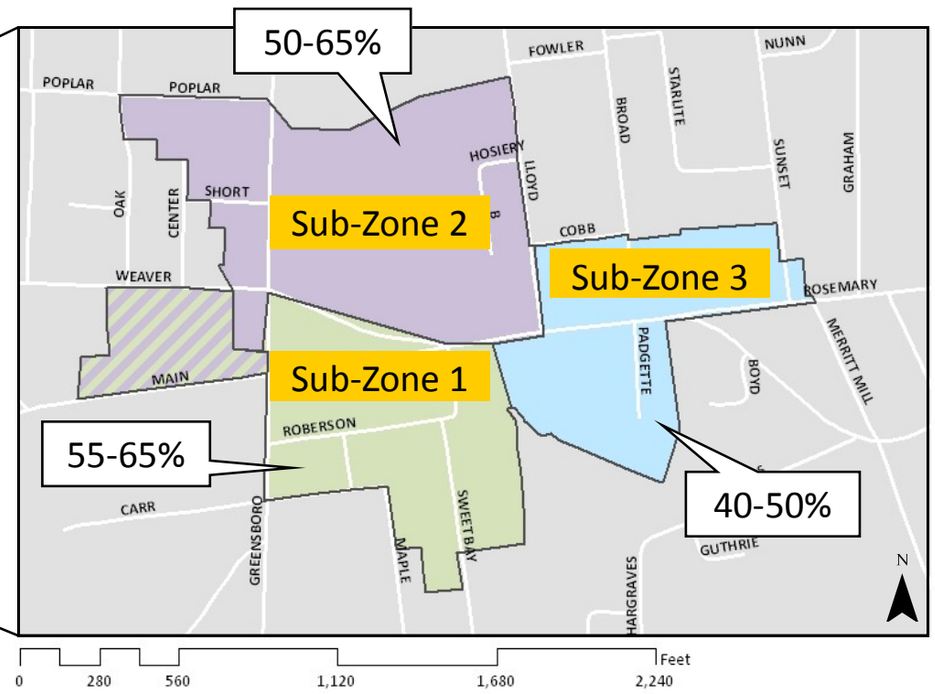
**Occupancy was calculated for the Carr Mill mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

***Occupancy was calculated by dividing total demand of lots surveyed within an analysis zone or sub-zone by total supply of spots surveyed during this time period. These numbers exclude both the supply and demand of lots not surveyed during this time period.

Figure 50: Existing Conditions: Zone and Sub-Zone Occupancy Tuesday Early Afternoon 11AM—3PM



Zone Occupancy



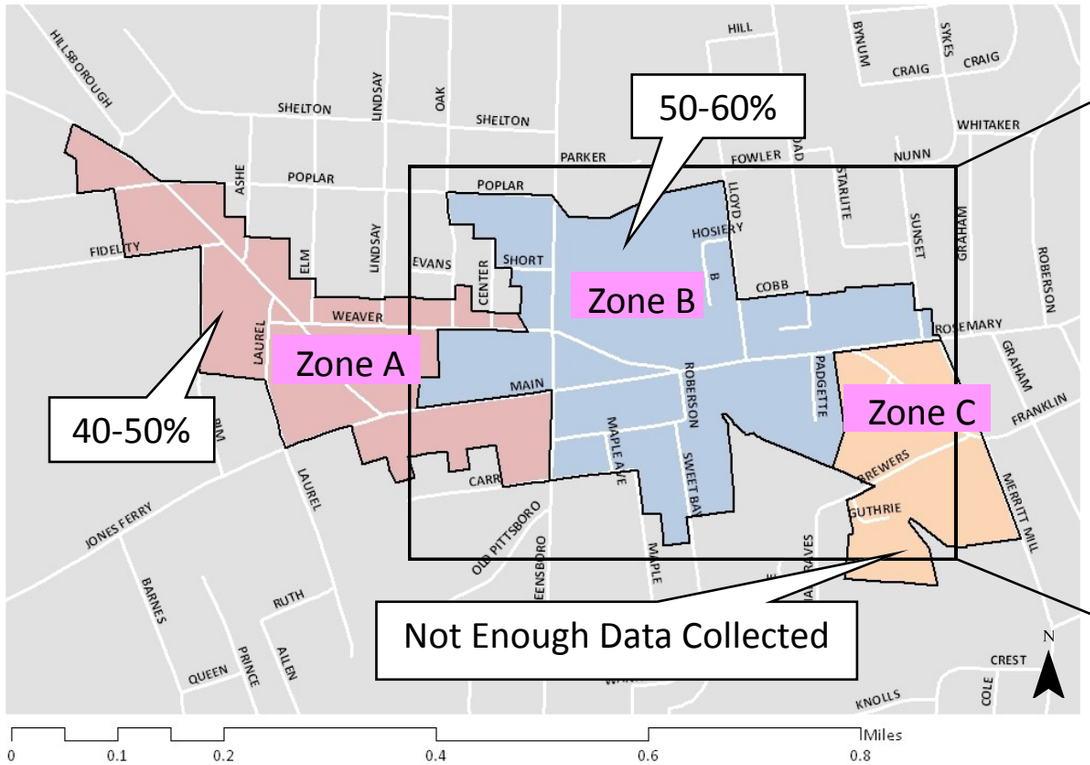
Sub-Zone Occupancy

*All demand analysis completed in February 2008.

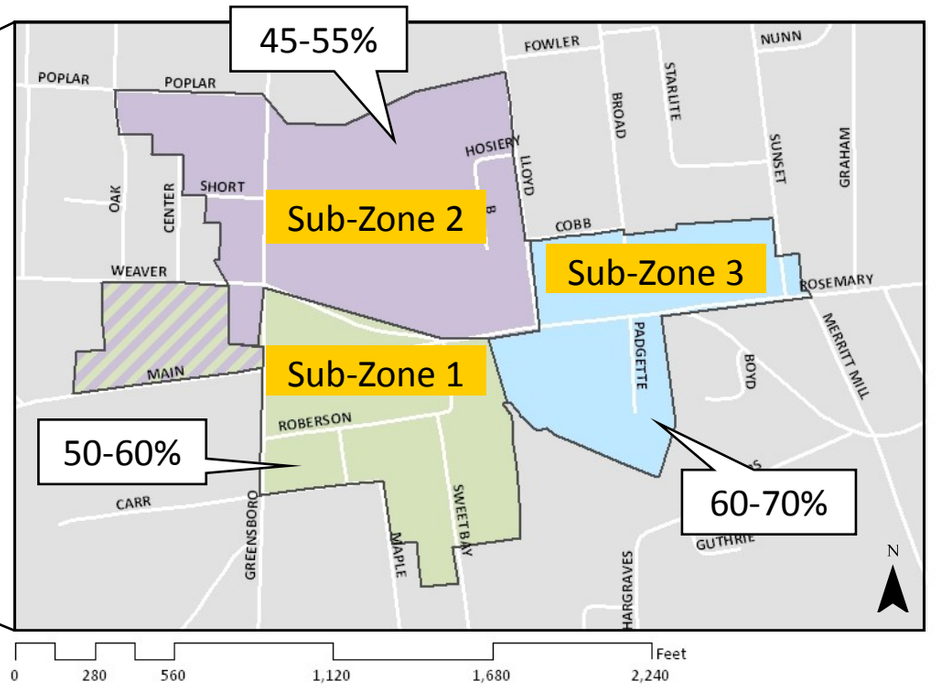
**Occupancy was calculated for the Carr Mill mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

***Occupancy was calculated by dividing total demand of lots surveyed within an analysis zone or sub-zone by total supply of spots surveyed during this time period. These numbers exclude both the supply and demand of lots not surveyed during this time period.

Figure 51: Existing Conditions: Zone and Sub-Zone Occupancy
Tuesday Late Afternoon 3PM—6PM



Zone Occupancy



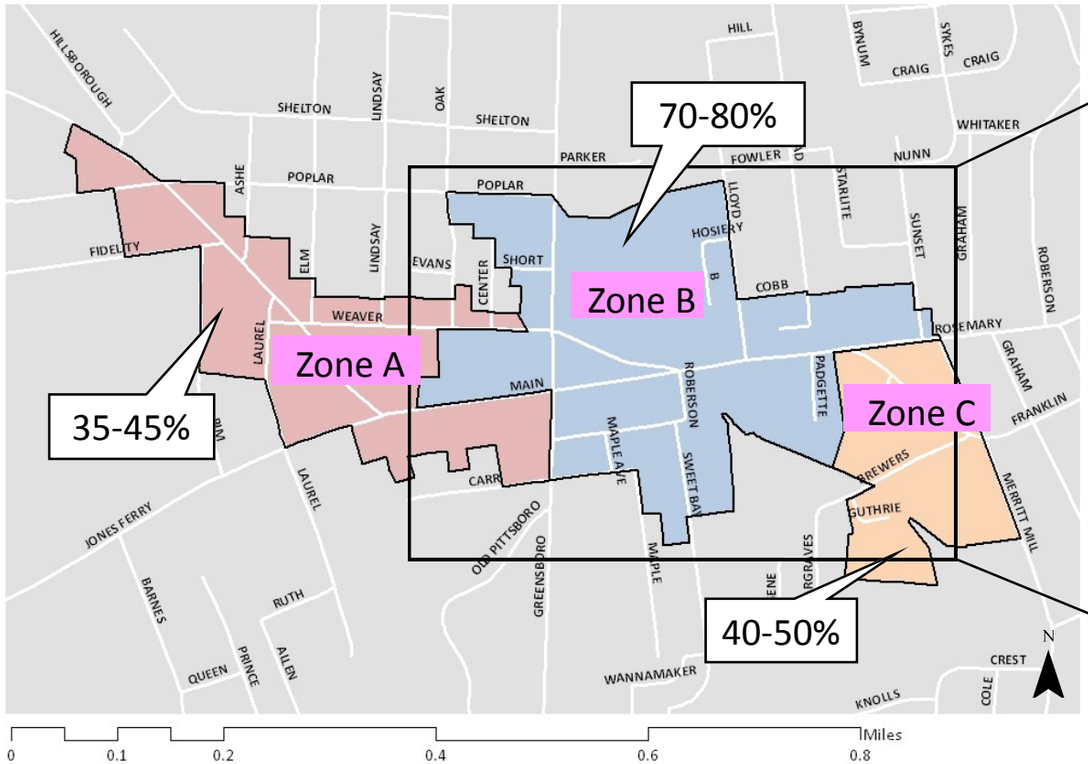
Sub-Zone Occupancy

*All demand analysis completed in February 2008.

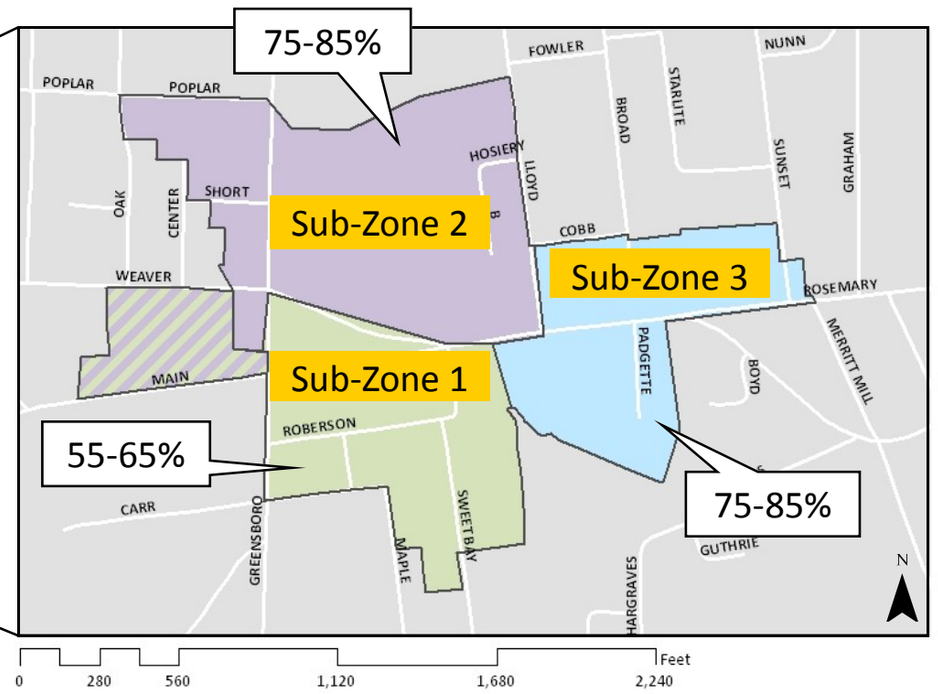
**Occupancy was calculated for the Carr Mill mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

***Occupancy was calculated by dividing total demand of lots surveyed within an analysis zone or sub-zone by total supply of spots surveyed during this time period. These numbers exclude both the supply and demand of lots not surveyed during this time period.

Figure 52: Existing Conditions: Zone and Sub-Zone Occupancy
Tuesday Early Evening 6PM—9PM



Zone Occupancy



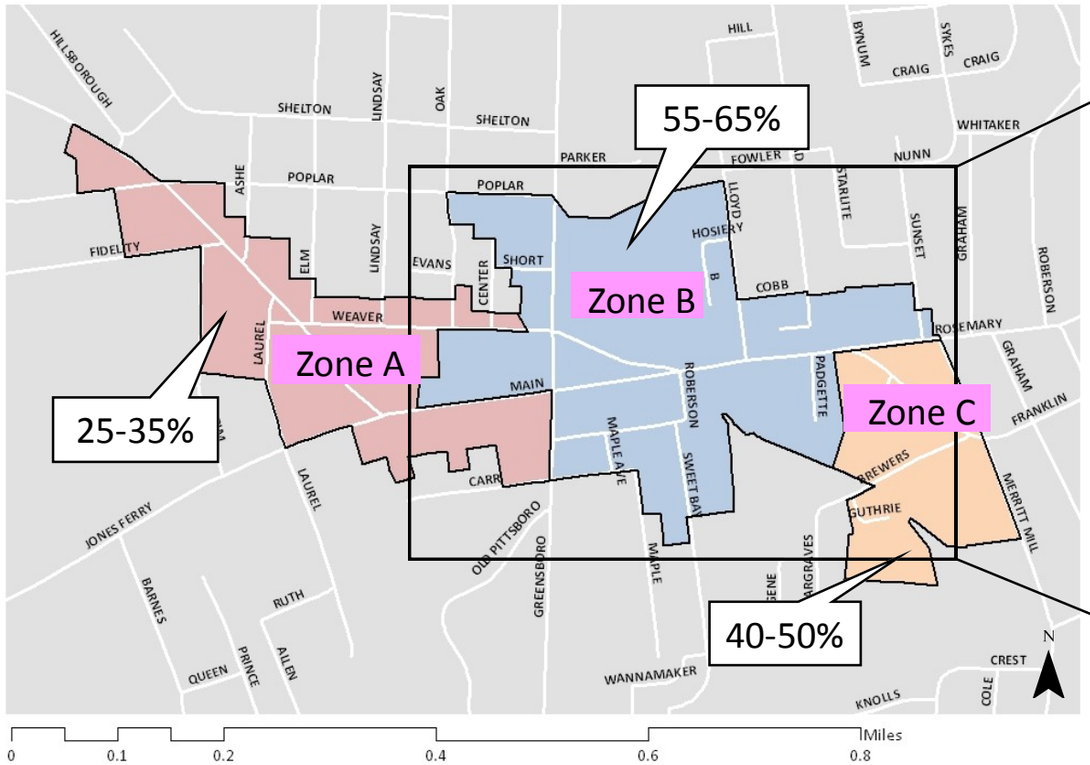
Sub-Zone Occupancy

*All demand analysis completed in February 2008.

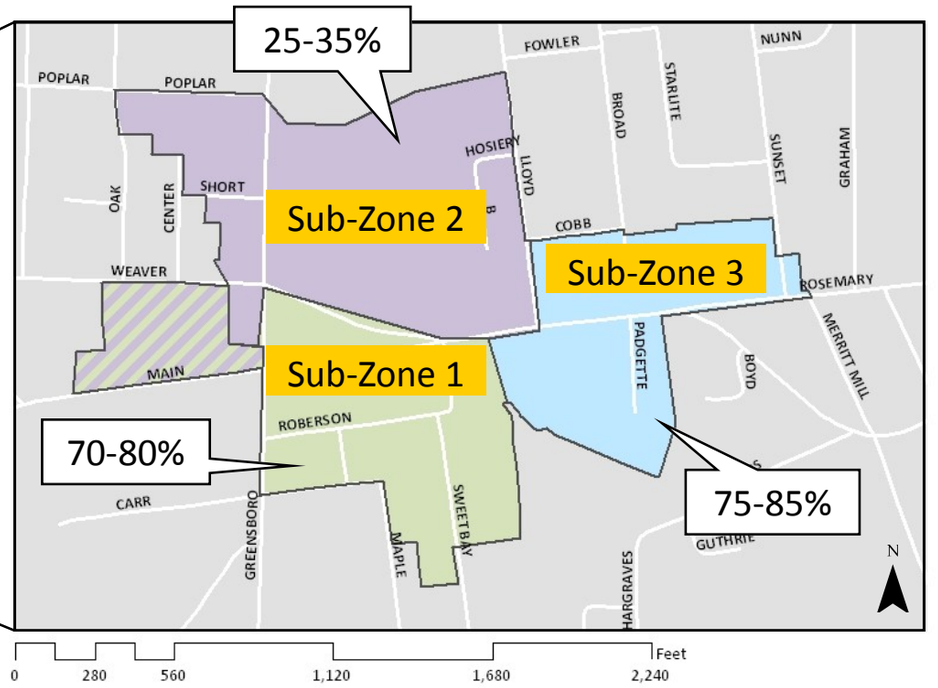
**Occupancy was calculated for the Carr Mill mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

***Occupancy was calculated by dividing total demand of lots surveyed within an analysis zone or sub-zone by total supply of spots surveyed during this time period. These numbers exclude both the supply and demand of lots not surveyed during this time period.

Figure 53: Existing Conditions: Zone and Sub-Zone Occupancy
Tuesday Late Evening 9PM-11PM



Zone Occupancy



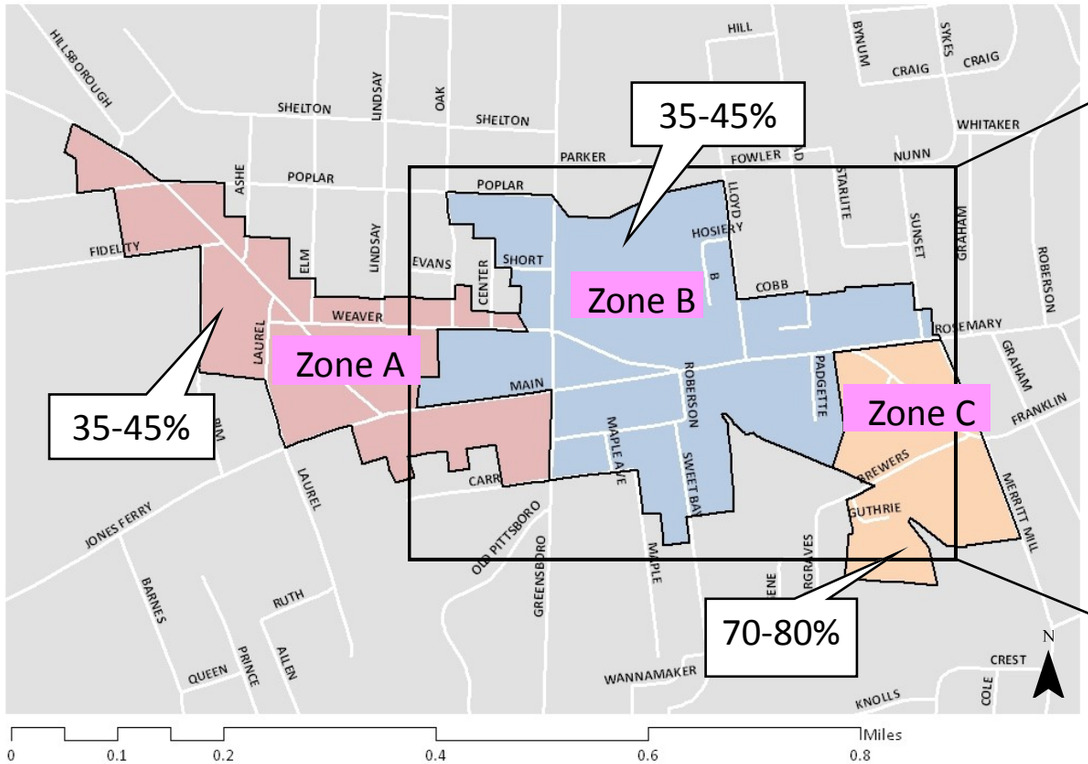
Sub-Zone Occupancy

*All demand analysis completed in February 2008.

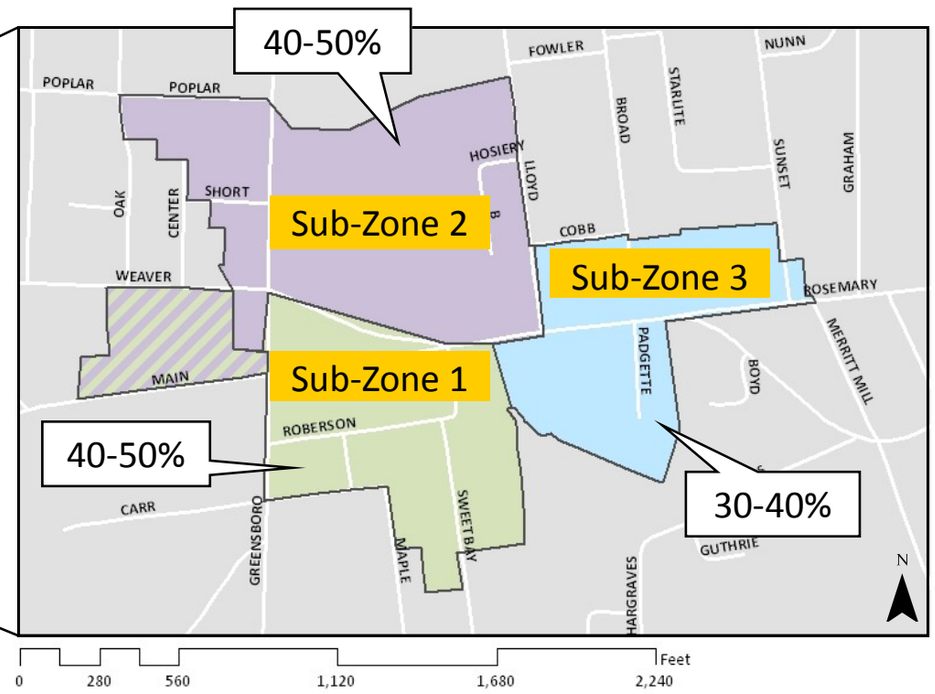
**Occupancy was calculated for the Carr Mill mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

***Occupancy was calculated by dividing total demand of lots surveyed within an analysis zone or sub-zone by total supply of spots surveyed during this time period. These numbers exclude both the supply and demand of lots not surveyed during this time period.

Figure 54: Existing Conditions: Zone and Sub-Zone Occupancy Thursday Morning 9AM –11AM



Zone Occupancy



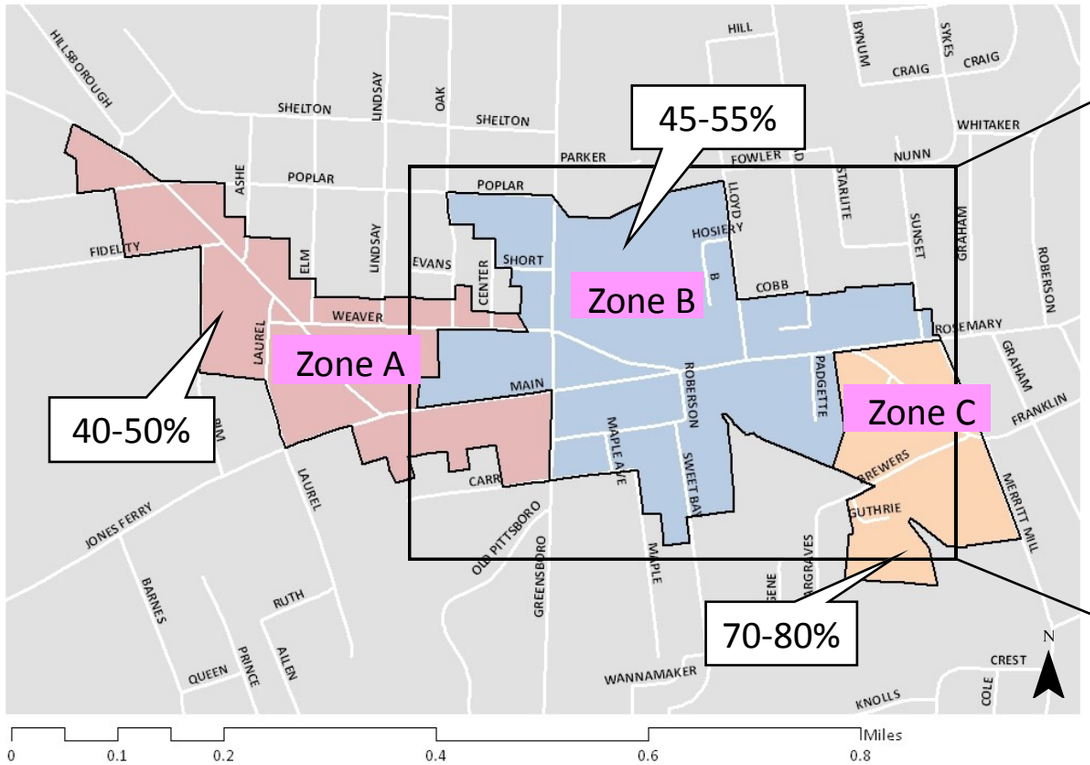
Sub-Zone Occupancy

*All demand analysis completed in February 2008.

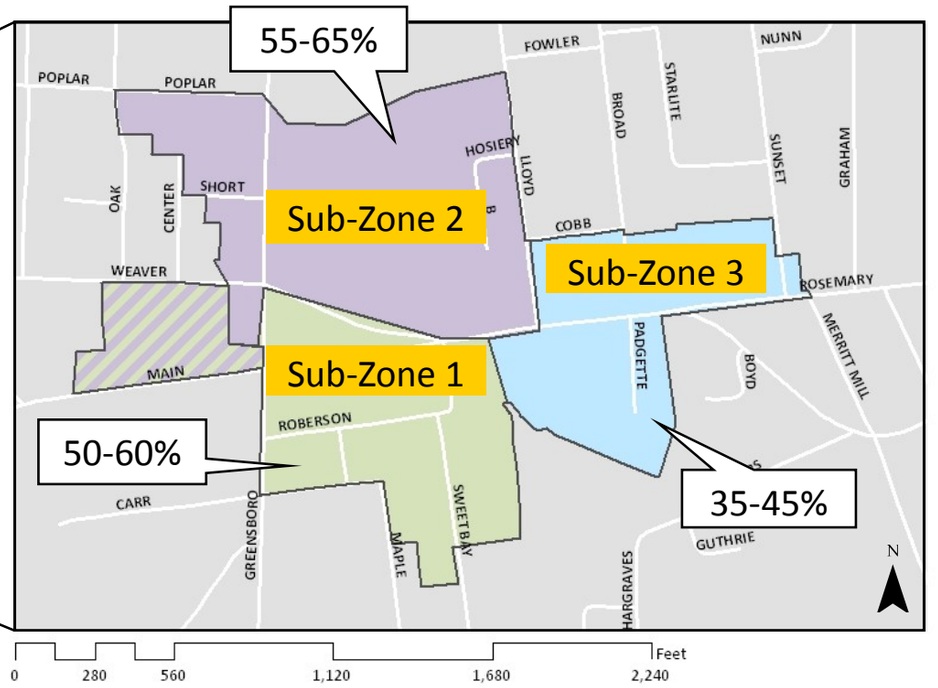
**Occupancy was calculated for the Carr Mill mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

***Occupancy was calculated by dividing total demand of lots surveyed within an analysis zone or sub-zone by total supply of spots surveyed during this time period. These numbers exclude both the supply and demand of lots not surveyed during this time period.

Figure 55: Existing Conditions: Zone and Sub-Zone Occupancy
Thursday Early Afternoon 11AM-3PM



Zone Occupancy



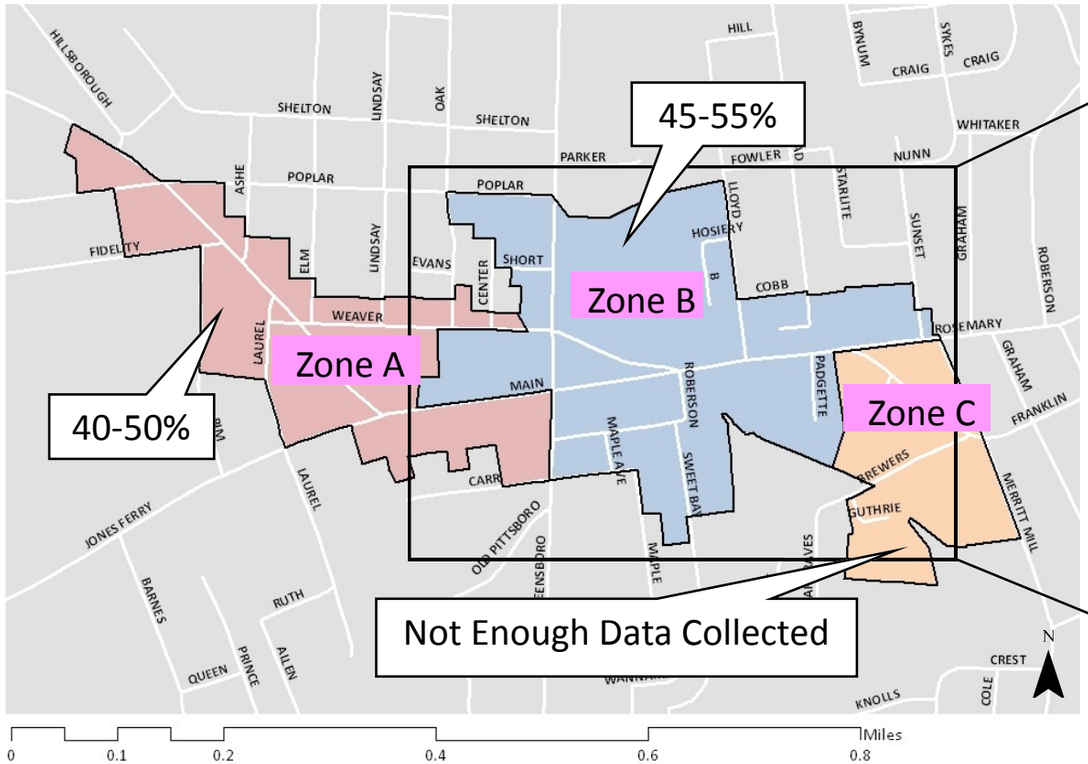
Sub-Zone Occupancy

*All demand analysis completed in February 2008.

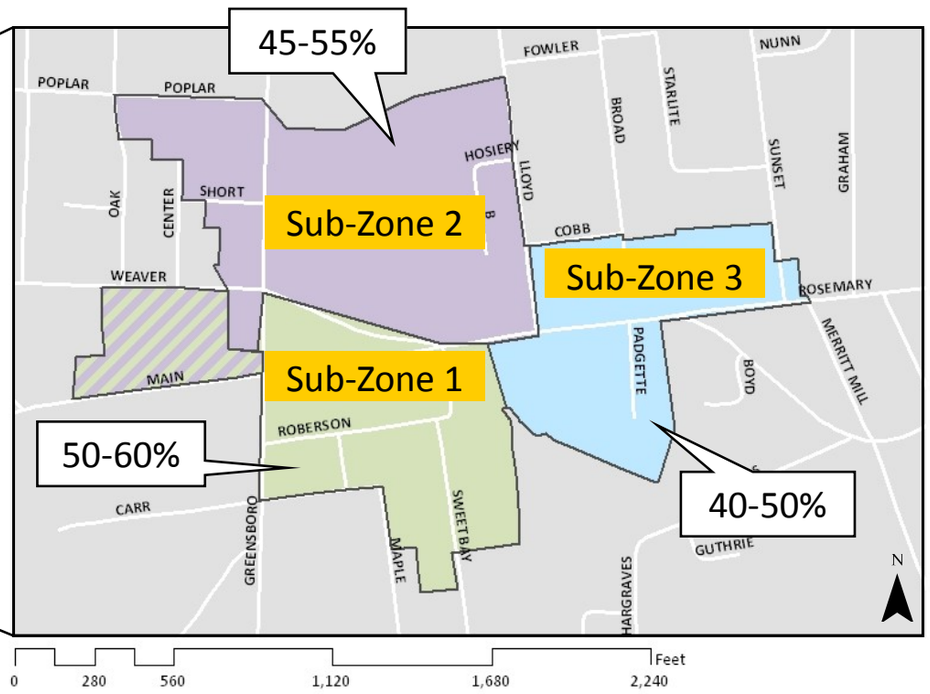
**Occupancy was calculated for the Carr Mill mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

***Occupancy was calculated by dividing total demand of lots surveyed within an analysis zone or sub-zone by total supply of spots surveyed during this time period. These numbers exclude both the supply and demand of lots not surveyed during this time period.

Figure 56: Existing Conditions: Zone and Sub-Zone Occupancy Thursday Late Afternoon 3PM-6PM



Zone Occupancy



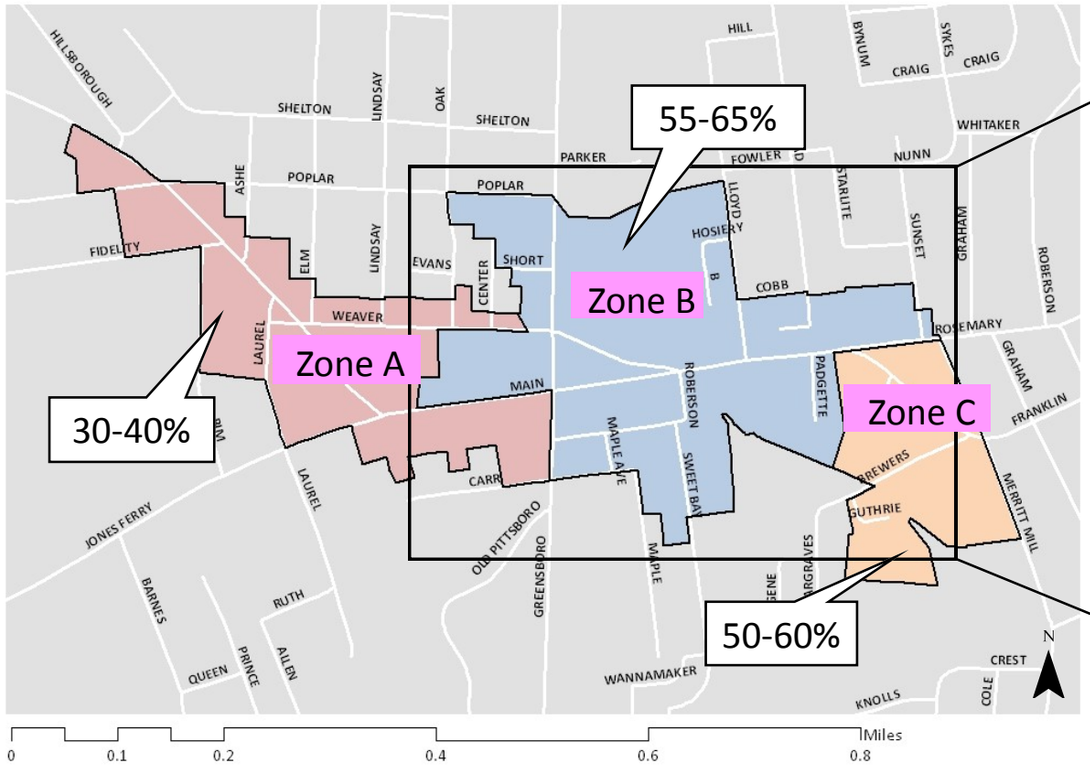
Sub-Zone Occupancy

*All demand analysis completed in February 2008.

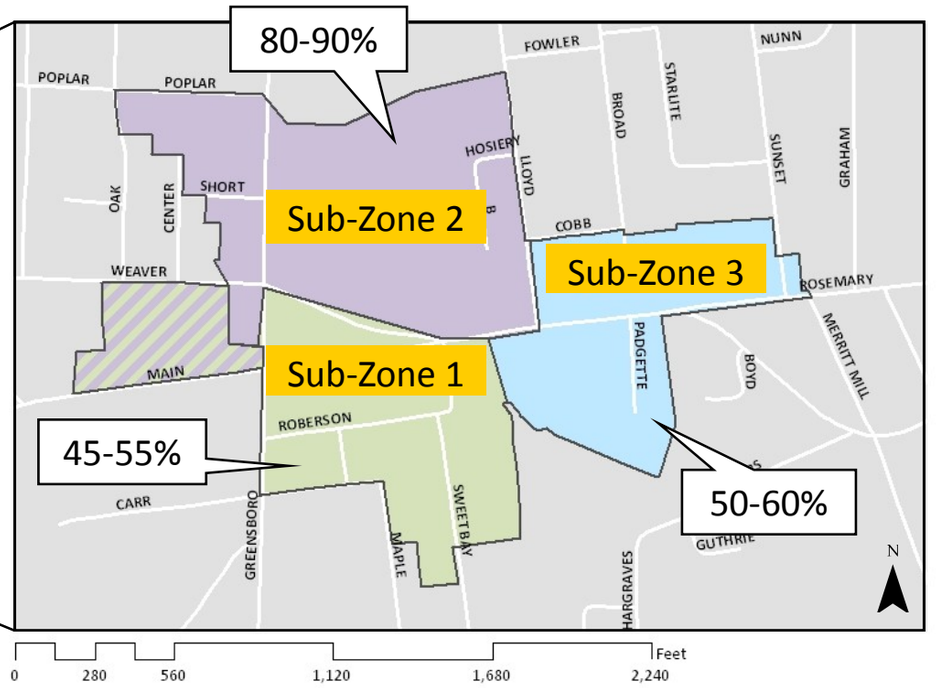
**Occupancy was calculated for the Carr Mill mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

***Occupancy was calculated by dividing total demand of lots surveyed within an analysis zone or sub-zone by total supply of spots surveyed during this time period. These numbers exclude both the supply and demand of lots not surveyed during this time period.

Figure 57: Existing Conditions: Zone and Sub-Zone Occupancy
Thursday Early Evening 6PM—9PM



Zone Occupancy



Sub-Zone Occupancy

*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

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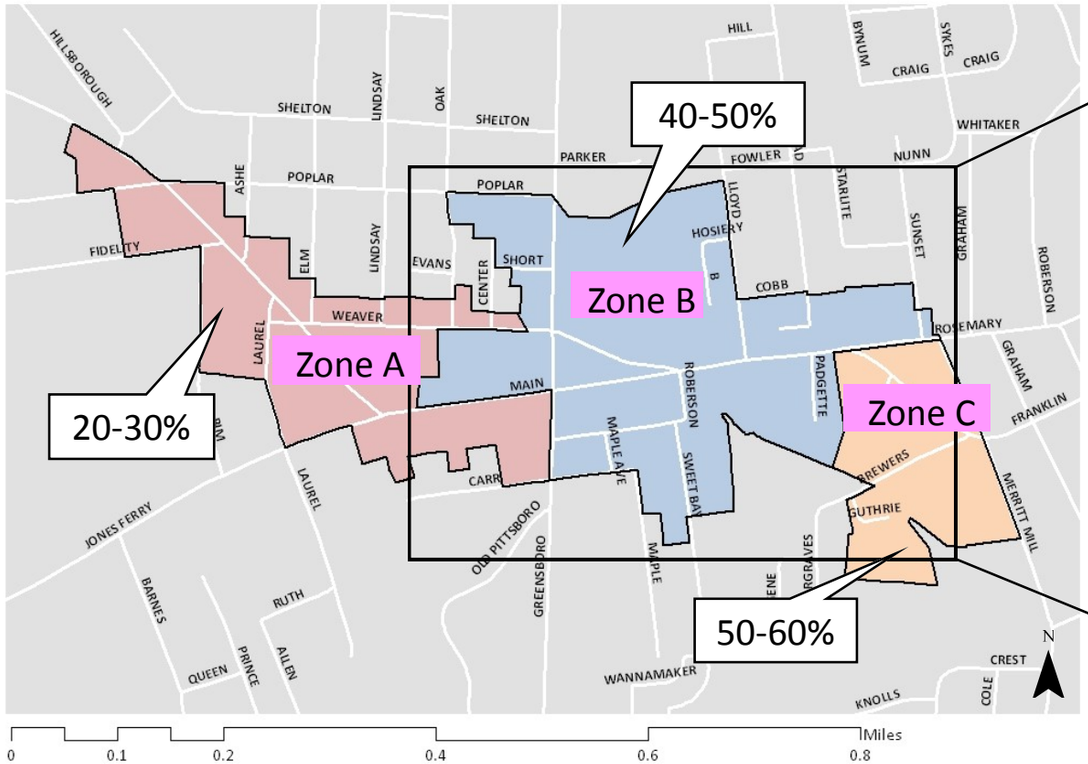
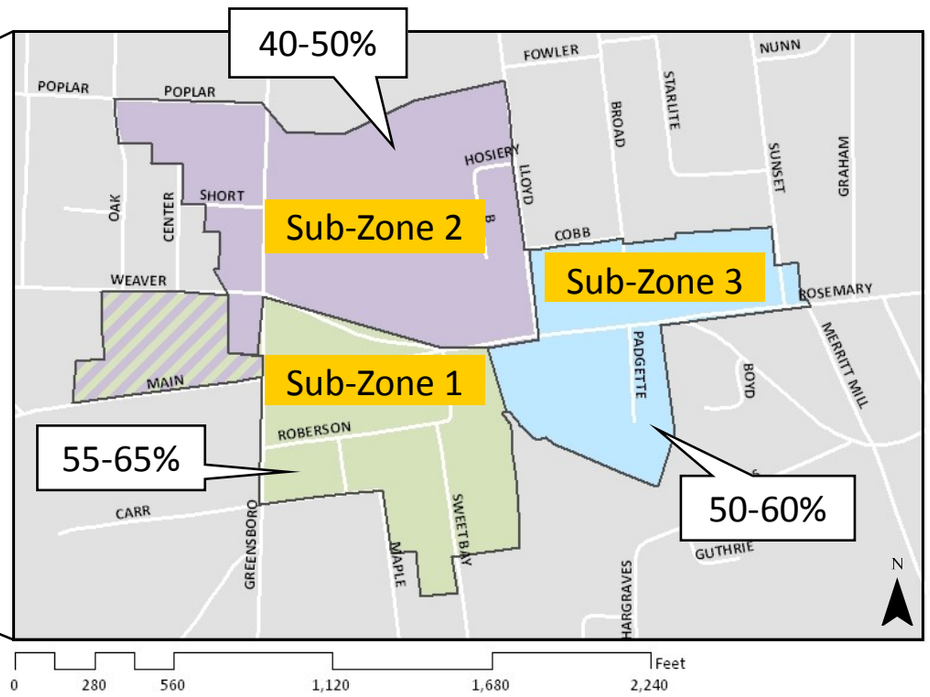
Figure 58: Existing Conditions: Zone and Sub-Zone Occupancy Thursday Late Evening 9PM-11PM



Zone Occupancy



Sub-Zone Occupancy

*All demand analysis completed in February 2008.

**Occupancy was calculated for the Carr Mill mall parking lot using tube counts (described in Tube Count Methodology) and by hand counts for all other lots. It includes both public and private lots.

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CARRBORO PARKING SURVEY

PURPOSE: The Town of Carrboro is seeking to update the information collected by the Parking Task Force in 2001. This information will be used to review options for public parking, as the Town continues to work with private business owners. Because your input is vital, please assist us in our efforts by answering the questions listed below. Please complete this survey by March 21.

	A1		B1		C1		D1		E1		F1		G1		H1
	A2		B2		C2		D2		E2		F2		G2		H2
	A3		B3		C3		D3		E3		F3		G3		H3
	A4		B4		C4		D4		E4		F4		G4		H4
	A5		B5		C5		D5		E5		F5		G5		H5
	A6		B6		C6		D6		E6		F6		G6		H6

BUSINESS NAME:

BUSINESS LOCATION: (Please check the coordinates of the square(s) that most closely approximates the physical location of your business.)

1. What type of business do you have?

- ☐ Retail/Commercial (Grocery, General merchandise, Auto, etc.)
- ☐ Hospitality (Restaurant, Social Club)
- ☐ Office
- ☐ Medical

2. Which hours does your business operate? (Check all that apply)

	WEEKDAY Hours	WEEKEND Hours
8-11am		
11am-2pm		
2-5pm		
5-8pm		
8-11pm		

3. How many employees work at your business? _____

4. Typically, when do they work? (Fill out all that apply)

	WEEKDAY # of Employees	WEEKEND # of Employees
8-11am		
11am-2pm		
2-5pm		
5-8pm		
8-11pm		

5. How do your employees get to work? (Check all that apply)

- ☐ Private automobile
- ☐ Carpool
- ☐ Bus
- ☐ Bike
- ☐ Walk
- ☐ Other (please explain): _____

6. Do you provide your **EMPLOYEES** with parking in a private lot?

- ☐ Yes
  - If YES, number of spaces provided: _____
- ☐ No
  - If NO, where do they park? (Check all that apply)
    - ☐ Private off-street lot
    - ☐ Public off-street lot
    - ☐ On-street (curb)
    - ☐ Other (please explain):_____

7. Where do your employees park? (Please check the coordinates of the square(s) that most closely approximates where your employees park. Please check all that apply.)

	A1		B1		C1		D1		E1		F1		G1		H1
	A2		B2		C2		D2		E2		F2		G2		H2
	A3		B3		C3		D3		E3		F3		G3		H3
	A4		B4		C4		D4		E4		F4		G4		H4
	A5		B5		C5		D5		E5		F5		G5		H5
	A6		B6		C6		D6		E6		F6		G6		H6

8. Do you provide your **CUSTOMERS** with parking in a private lot?

- ☐ Yes
- ☐ If YES, number of spaces provided:
- ☐ No
- ☐ If NO, where do they park? (Check all that apply)
  - ☐ Private off-street lot
  - ☐ Public off-street lot
  - ☐ On-street (curb)
  - ☐ Other (please explain):

9. If you are able, please indicate where a majority of your customers are coming from (check all that apply):

- ☐ Carrboro/Chapel Hill
- ☐ Hillsborough/Orange County
- ☐ Durham/Durham County
- ☐ Chatham County
- ☐ Raleigh-Cary-Apex/Wake County
- ☐ Outside of the Triangle

10. When have you noted or been informed of a parking shortage by customers or employees? (Check all that apply)

	Weekday Shortages	Weekend Shortages
8-11am		
11am-2pm		
2-5pm		
5-8pm		
8-11pm		

11. How many extra spaces do you think you would need to overcome that shortage?

_____ Spaces

12. How would you describe parking in downtown Carrboro?

- ☐ There is enough parking
- ☐ There is insufficient parking
- ☐ There is too much parking
- ☐

13. Do you think that strict enforcement of parking in the downtown would make a difference in the parking supply?

- ☐ Yes
- ☐ No
- ☐
- ☐

14. What is the average time to make a transaction at your business?

- ☐ Under 15 minutes
- ☐ 15-30 minutes
- ☐ 30-40 minutes
- ☐ 45-60 minutes
- ☐ 1-2 hours
- ☐ 2 hours or more

15. How often do you tow cars from your parking lot(s)?

- ☐ Never
- ☐ Every 6 months – 1 year
- ☐ Every 3-6 months
- ☐ Every month
- ☐ More frequently
- ☐ I don't have a parking lot

16. Do you participate in a shared parking situation?

- ☐ Yes
- ☐ No

17. If yes, are you satisfied with the arrangement?

- ☐ Yes
- ☐ No

18. If you DO NOT already participate in a shared parking situation, would you be interested in participating in a shared parking arrangement with other businesses or the Town as:

A user of spaces

- ☐ Yes
- ☐ No

A provider of spaces

- ☐ Yes
- ☐ No

19. Are you in favor of a parking deck for the downtown?

- ☐ Yes
- ☐ No

20. Are you in favor of metered parking (either on-street or off-street)?

- ☐ Yes
- ☐ No

20. Are you interested in exploring park-and-ride opportunities for your employees?

- ☐ Yes
- ☐ No

21. If so, which lots would you consider? (Check all that apply)

- ☐ Carrboro Plaza
- ☐ Jones Ferry Road (near University Lake)
- ☐ Something closer
- ☐ Something farther away

22. Do you currently rent or charge for any of the parking spaces in your business' private lot?

- ☐ Yes
- ☐ If Yes, how many spots? _____
- ☐ If Yes, how much? ☐ Hourly
- ☐ ☐ Daily
- ☐ ☐ Weekly
- ☐ ☐ Monthly
- ☐ No
- ☐ If No, would you consider it?
- ☐ ☐ Yes
- ☐ ☐ No

23. Would you be interested in participating in a Transportation Management Association (TMA)? TMAs are non-profit, member-controlled organizations that provide transportation services in a particular area, such as a commercial district, mall, medical center or industrial park. They are generally public-private partnerships, consisting primarily of area businesses with local government support. TMAs can provide a variety of services that encourage more efficient use of transportation and parking resources.

	Yes			
	Not sure. I'd like to learn more about it.			
	No			

Please use the space below to add any additional comments:

Thank you for filling out this survey! If you have any questions, please direct them to James Harris at jharris@townofcarrboro.org or 919-918-7319.

Please return the survey to: Carrboro Town Hall (301 W. Main Street), ATTN: Adena Messinger, Planning Department, Carrboro, 27510, by ***March 21,*** *2008.*

Survey Results

1. BUSINESS NAME:

Text Response
Balloons & Tunes
Redstone Properties
Open Eye Cafe
The Steve Darden Agency (Allstate Insurance)
the framers corner
Carrboro Massage Therapy
nested company
CARRBURRITOS
The Clean Machine
Summerwind Pools & Spas
DSI Comedy Theater
PTA Thrift Shop, Inc.
tyler's restaurant and taproom
Elmo's Diner
6 blank responses
Family Support Network of North Carolina - UNC School of Medicine
Carrboro Yoga Company
CHICLE
Nicole Amundsen, LCSW
Natalie Jones Sadler, MD
None recorded
North Carolina Crafts Gallery
The Arts Center

2. BUSINESS LOCATION: (From the map above, please choose the coordinates of the square(s) that most closely approximates the physical location of your business. Please check all that apply.)

#	Answer		Response	%
1	A1		1	4%
2	A2		0	0%
3	A3		0	0%
4	A4		0	0%
5	A5		0	0%
6	A6		0	0%
7	B1		0	0%
8	B2		1	4%
9	B3		3	11%
10	B4		1	4%
12	B6		0	0%
13	C1		0	0%
14	C2		1	4%
15	C3		2	7%
16	C4		0	0%
17	C5		0	0%
18	C6		0	0%
19	D1		0	0%
20	D2		1	4%
21	D3		3	11%
22	D4		2	7%
23	D5		0	0%
24	D6		0	0%
25	E1		0	0%
26	E2		8	29%
27	E3		1	4%
28	E4		1	4%
29	E5		0	0%
30	E6		0	0%
31	F1		0	0%
32	F2		2	7%

#	Answer		Response	%
33	F3		2	7%
34	F4		1	4%
35	F5		0	0%
36	F6		0	0%
37	G1		0	0%
38	G2		0	0%
39	G3		1	4%
40	G4		0	0%
41	G5		0	0%
42	G6		0	0%
43	H1		0	0%
44	H2		0	0%
45	H3		0	0%
46	H4		0	0%
47	H5		0	0%
48	H6		0	0%

Statistic	
Total Responses	28

3. What type of business do you have?

#	Answer		Response	%
1	Retail/commercial (Grocery, General merchandise, Auto, etc.)		14	48%
2	Hospitality (Bar, Restaurant, Social club)		6	21%
3	Office		7	24%
4	Medical		2	7%

Statistic	
Total Responses	29

4. Which hours does your business operate? (Please check all that apply)

#	Question	8-11am	11am-2pm	2-5pm	5-8pm	8-11pm	Responses
1	WEEKDAY hours	26	28	28	25	7	114
2	WEEKEND hours	19	22	21	15	6	83

Statistic	WEEKDAY hours	WEEKEND hours
Total Responses	29	23

5. How many employees work at your business?

Text Response
4
4
15
2
3
7
3
18
13
5
2
20
30
85
2
9
16
6
10
1
15
40
5

Text Response
1
1
14
2
8
0

Statistic	
Total Responses	29

5. Typically, when do they work? (Fill out all that apply)

WEEKEND # of Employees				
8-11am	11am-2pm	2-5pm	5-8pm	8-11pm
4	4	4	3	0
1	3	4	0	0
2	2	2	2	2
2	2	1	0	0
03	03	03	03	0
3	3	4	2	0
2	2	2	2	0
4	7	7	5	5
8	8	8	8	0
4	4	4	3	0
2	2	2	2	2
12	16	14	0	0
0	5	5	11	11
15	15	15	15	15
2	2	2	2	0
9	9	9	4	2
3	5	5	3	0
3	3	3	1	0
2	2	2	2	0
1	1	1	0	0
15	15	15	3	0
3	2	2	3	0
5	5	5	10	5
1	1	1	1	0
1	0	1	0	0
14	14	14	14	0
2	2	2	2	0
8	8	8	2	
0	0	0	0	0

WEEKEND # of Employees				
8-11am	11am-2pm	2-5pm	5-8pm	8-11pm
4	4	4	0	0
0	1	1	0	0
3	3	3	2	2
0	0	0	0	0
01	01	01	0	0
1	1	1	0	0
2	2	2	2	0
4	7	7	5	5
4	4	4	4	0
2	2	2	0	0
0	0	2	2	2
7	8	8	0	0
0	5	5	12	13
21	22	22	20	20
0	0	0	0	0
0	0	0	0	0
4	6	6	4	0
1	2	2	1	0
3	3	3	0	0
1	0	0	0	0
0	0	0	0	0
3	2	2	3	0
0	1	2	2	0
0	0	0	0	0
0	0	0	0	0
6	6	6	6	0
2	2	1	1	0
0	0	0	0	0

Statistic	WEEKDAY # of Employees	WEEKEND # of Employees
Total Responses	29	28

7. How do your employees get to work?

#	Answer		Response	%
1	Private automo-bile		27	93%
2	Carpool		6	21%
3	Bus		7	24%
4	Bike		11	38%
5	Walk		12	41%
6	Other (please explain)		2	7%

Other (please explain)
all of the above
3 walk/4 drive

Statistic	
Mean	1.28
Variance	0.21
Standard Deviation	0.45
Total Responses	29

8. Do you provide your EMPLOYEES with parking in a private lot?

#	Answer		Response	%
1	Yes		21	72%
2	No		8	28%
	Total		29	100%

Statistic	
Mean	1.28
Variance	0.21
Standard Deviation	0.45
Total Responses	29

9. If YES, number of spaces provided.

Text Response
4
4
3
53
3
6
2
0
8
6
0
6
0
0

Text Response
0
9
0
0
0
1
0
617
0
1
0
0
2
8
0

10. If NO, where do they park?

#	Answer		Response	%
1	Private off-street lot		4	44%
2	Public off-street lot		3	33%
3	On street (curb)		2	22%
4	Other		4	44%

Other
Carr Mill Employee Lot
Carr Mill Lot Behind Maple
They park in the Carr Mill Parking Lot
Carr Mill Employees Lot

Statistic	
Total Responses	9

11. Where do your employees park? (From the map above, please choose the coordinates of the square(s) that most closely approximates where your employees park. Please check all that apply.)

#	Answer		Response	%
1	A1		0	0%
2	A2		0	0%
3	A3		0	0%
4	A4		0	0%
5	A5		0	0%
6	A6		0	0%
8	B1		0	0%
9	B2		1	4%
10	B3		3	12%
11	B4		1	4%
12	B5		0	0%
13	B6		0	0%
14	C1		0	0%
15	C2		0	0%
16	C3		1	4%
17	C4		0	0%
18	C5		0	0%
19	C6		0	0%
20	D1		0	0%
21	D2		1	4%
22	D3		2	8%
23	D4		4	15%
24	D5		1	4%
25	D6		0	0%
26	E1		0	0%
27	E2		2	8%
28	E3		3	12%
29	E4		2	8%
30	E5		6	23%
31	E6		1	4%
32	F1		0	0%
33	F2		0	0%
34	F3		0	0%
35	F4		1	4%
36	F5		2	8%
37	F6		0	0%

#	Answer		Response	%
38	G1		0	0%
39	G2		0	0%
40	G3		1	4%
41	G4		0	0%
42	G5		0	0%
43	G6		0	0%
44	H1		0	0%
45	H2		1	4%
46	H3		0	0%
47	H4		0	0%
48	H5		0	0%
49	H6		0	0%

Statistic	
Total Responses	26

12.Do you provide your CUSTOMERS with parking in a private lot?

#	Answer		Response	%
1	Yes		21	72%
2	No		8	28%
	Total		29	100%

Statistic	
Mean	1.28
Variance	0.21
Standard Deviation	0.45
Total Responses	29

13. If YES, how many spaces?

Text Response
10
4
15
53
4
6
2
5
10
6
0

Text Response
15
17
0
615
0
0
615
615
5
615
615

Text Response
0
0
0
0
7
4
0

Statistic	
Total Responses	29

14. If NO, or if your customers park in other lots in addition to the space you provide, where do they park?

#	Answer	Response	%
1	Private off-street lot	5	42 %
2	Public off-street lot	8	67 %
3	On street (curb)	4	33 %
4	Other	2	17 %

Other
wherever they can
Carr Mill Lot

Statistic	
Total Responses	12

15. If you are able, please indicate where a majority of your customers are coming from (check all that apply):

#	Answer	Response	%
1	Carrboro/Chapel Hill	29	100%
2	Hillsborough/Orange County	14	48%
3	Durham/Durham County	12	41%
4	Chatham County	8	28%
5	Raleigh-Cary-Apex/Wake County	9	31%
6	Outside of the Triangle	9	31%

16. When have you noted or been informed of a parking shortage by customers or employees? (Check all that apply)

#	Question	8-11am	11am-2pm	2-5pm	5-8pm	8-11pm	Responses
1	WEEKDAY shortages	9	14	14	15	1	53
2	WEEKEND shortages	10	12	9	10	2	43

Statistic	WEEKDAY shortages	WEEKEND shortages
Total Responses	23	17

17. How many extra spaces do you think you would need to overcome that shortage?

Text Response
2
0
15
0
2
0
5
26
2
0
100
5
15
20

Text Response
150
6
0
0
0
0
0
25
15
200
2
0
4
5
25

Statistic	
Total Responses	29

18. How would you describe parking in downtown Carrboro?

#	Answer		Response	%
1	There is enough parking		4	14%
2	There is insuffi-cient parking		25	86%
3	There is too much parking		0	0%
	Total		29	100%

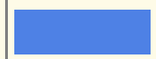
Statistic	
Mean	1.86
Variance	0.12
Standard Deviation	0.35
Total Responses	29

19. Do you think that strict enforcement of parking in the downtown would make a difference in the parking supply?

#	Answer		Response	%
1	Yes		5	17 %
2	No		24	83 %
	Total		29	100 %

Statistic	
Mean	1.83
Variance	0.15
Standard Deviation	0.38
Total Responses	29

20. What is the average time to make a transaction at your business?

#	Answer		Response	%
1	Under 15 minutes		2	7%
2	30-15 minutes		6	21%
3	30-45 minutes		5	17%
4	45-60 minutes		5	17%
5	1-2 hours		9	31%
6	2 hours or more		2	7%
	Total		29	100%

Statistic	
Mean	3.66
Variance	2.16
Standard Deviation	1.47
Total Responses	29

21.How often do you tow cars from your parking lot(s)?

#	Answer		Response	%
1	Never		15	58%
2	Every 6 months - 1 year		1	4%
3	Every 3-6 months		0	0%
4	Every month		0	0%
5	More frequently		2	8%
6	I don't have a parking lot		8	31%
	Total		26	100%

Statistic	
Mean	2.88
Variance	5.63
Standard Deviation	2.37
Total Responses	26

22. Do you participate in a shared parking situation?

#	Answer		Response	%
1	Yes		14	52%
2	No		13	48%
	Total		27	100%

Statistic	
Mean	1.48
Variance	0.26
Standard Deviation	0.51
Total Responses	27

23. If yes, are you satisfied with the arrangement?

#	Answer		Response	%
1	Yes		10	63%
2	No		6	38%
	Total		16	100%

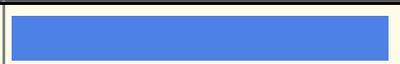
Statistic	
Mean	1.38
Variance	0.25
Standard Deviation	0.50
Total Responses	16

24. If you DO NOT already participate in a shared parking situation, would you be interested in participating in a shared parking arrangement with other businesses or the Town as:

#	Question	A user of spaces	A provider of spaces	Responses
1	Yes	7	0	7
2	No	8	11	19

Statistic	
Mean	1.48
Variance	0.26
Standard Deviation	0.51
Total Responses	27

25. Are you in favor of a parking deck for downtown?

#	Answer		Response	%
1	Yes		25	86%
2	No		4	14%
	Total		29	100%

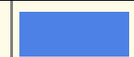
Statistic	
Mean	1.14
Variance	0.12
Standard Deviation	0.35
Total Responses	29

26. Are you in favor of metered parking (either on-street or off-street)?

#	Answer		Response	%
1	Yes		8	29%
2	No		20	71%
	Total		28	100%

Statistic	
Mean	1.71
Variance	0.21
Standard Deviation	0.46
Total Responses	28

27. Are you interested in exploring park-and-ride opportunities for your employees?

#	Answer		Response	%
1	Yes		7	25%
2	No		21	75%
	Total		28	100%

Statistic	
Mean	1.75
Variance	0.19
Standard Deviation	0.44
Total Responses	28

28. If so, which lots would you consider?

#	Answer		Response	%
1	Carrboro Plaza		4	50%
2	Jones Ferry Road (near University Lake)		4	50%
3	Something closer		3	38%
4	Something farther away		0	0%

Statistic	
Total Responses	8

29. Do you currently rent or charge for any of the parking spaces in your business' private lot?

#	Answer		Response	%
1	Yes		3	12%
2	No		22	88%
	Total		25	100 %

Statistic	
Mean	1.88
Variance	0.11
Standard Deviation	0.33
Total Responses	25

30. If YES

How many spots?	How much are the spots rented for?
9	10
15	$10

31. If you charge for parking spaces, how often is the price entered in the question above charged?

#	Answer		Response	%
1	Hourly		0	0%
2	Daily		0	0%
3	Weekly		0	0%
4	Monthly		3	100%
	Total		3	100%

32.If NO, would you consider renting out spots?

#	Answer		Response	%
1	Yes		1	6%
2	No		16	94%
	Total		17	100%

Statistic	
Mean	1.94
Variance	0.06
Standard Deviation	0.24
Total Responses	17

33. Would you be interested in participating in a Transportation Management Association (TMA)? TMAs are non-profit, member-controlled organizations that provide transportation services in a particular area, such as a commerc…

#	Answer		Response	%
1	Yes		2	8%
2	Not sure. I'd like to learn more about it.		16	62%
3	No		8	31%
	Total		26	100%

34. Please use the space below to add any additional comments:

Text Response
my objection to the deck is that it would be out-of-scale and out-of-sync with Carrboro. I do understand that additional parking in the immediate downtown is needed -- and I liked the plan floated a few years ago to make weaver and main one way, with angled parking on Weaver; that would help with more than just parking. I'd be okay with a "deck" if it was part of (the bottom of) a mixed-use building. please be smart about this, I love my little town!
Many of these questions are not all or nothing....meaning I could and would have picked more than one answer depending on circumstances, so the bias of the need to pick only one is present in these results.
We are unusual in that we have no parking difficulties. The Walkway Bldg has about 12k sq feet and 53 parking spaces. This equals roughly 4 spaces for each 1000 sq feet of office space. This parking lot is minimally used on weekends and only a stones throw from the Farmers Market. You should negotiate with the owner for use of the lot.
We are a low traffic business working one on one with clients for massage, acupuncture and psychotherapy. Our parking is sufficient for our business. However, as a customer in downtown Carrboro, I am confused about the signs at the lot where the old farmer's market used to be off of Robeson Street. We used to park there all of the time, and now it says it's for Mall employees only. That lot is huge and way too big to be restricted to mall employees. Am I right?

Text Response
Don't assume that the answers you get from business owners are the same as answers from landlords. There are different interests and concerns at work. For example, I would consider a shared parking agreement in my building. The landlord will over her dead body. There has to be a mechanism for those who do not have access to any parking for their building to share the burden with those that do. Several businesses behind 118 E Main have none or inadequate parking for their needs. They end up parking in spaces reserved for others. There is a domino effect and the more parking is at a premium the worse this gets. At that point, no body wants to share. That is when each person has their one spot staked out at all hours whether or not they are using it to be sure they have one when they need it. This is not in the town's interest. The Town must provide meaningful incentives to those that do share their resources. Carr Mill Mall essentially serves as the town public parking lot with no thanks or consideration. I beleieve that will end very soon and there will be a parking crisis. There must be a mechanism to make this right for them. They have provided a great service to the town that has made it as successful as it has been economically. Don't assume that the town can just mandate where employees can park. That will not be popular with most businesses. I have a hard enough time finding and keeping good employees. I don't want to put up obstacles to them getting to work on time. I personally bike. That is simply not an option for most people.
Questions should be numbered to help if the survey makes you go back. Parking deck would be perfect. A trolley system re-introduced from Downtown Chapel Hill to Carrboro on a LOOP would be fantastic on Thursday Friday and Saturday evenings.
Need More Public Parking signs around town
I think if the parking area beside OCRS was used more efficiently some of the pressure could be taken off the south parking lot at Carr Mill (in front of FleetFeet and Townsend Bertram & Co). ALL Carr Mill Employees should be required to park in the Southern most portion of the Employee Park-
Insufficient parking for Century Center, Farmer's Market. Unintelligible (Restaurants?) in downtown are stressing other private lots to maximum. Municipal Parking needs to be a priority downtown. 150 -300 spaces needed NOW.
The community illegally depends on parking at Carr Mill/Weaver St. lots, including participants in Century Center programs. Recently approved developments are only going to add to the problem. Build a parking deck in the middle of town.
Employees pay to park in Carr Mill Mall Employee Lot
The lack of parking in Chapel Hill, on campus & public parking is what makes people park in Carr Mill. I would like to see more parking decks for buildings and businesses to have parking. Though I know it is a complicated subject. Carrboro is not getting any smaller and Carr Mill has served the community well, but the town needs to pony up for some new decks (without parks on top that no one will go to). Just my 2 cents.

Text Response
Employees = 5 full-time & 20 part-time
Do you provide your EMPLOYEES with parking in a private lot? - Yes, use Carr Mill as part of rental agreement. Are you in favor of a parking deck for downtown? - Yes, sub-grade underground ONLY. * Charging for parking discourages commerce - look at how downtown Chapel Hill suffers. I do not think charging for parking is a solution - it discourages business (look at Chapel Hill - people avoid it in part because of parking costs/limitations). Plus, I think above-ground parking decks are UGLY and space wasters - underground makes more sense. And keep Carrboro sunny by not building higher than 4 stories.
I share a lot with Weaver Street Market - there is rarely enough parking for my patients. Are you satisfied with the shared parking arrangement? - For now, not for my patients. Carr Mill Mall has full capacity parking at lunch and dinner. Adding more businesses without adequate parking for them is just dumb. Do not expand the Town of Carrboro beyond its capacity to park the cars that all already here. I share a lot with Weaver Street Market and Carr Mill Mall and there is rarely enough parking for my patients.
I don't have as many concerns with parking on my end of town, but I definitely think the "downtown" district needs more parking. I'm glad my business is where it is BECAUSE of little parking downtown.

Appendix C: Detailed Zone B Day-by-Day Analysis

Tuesday, major trends: Early evening congestion in all of Zone B, most likely due to food shopping or patronage of restaurant/bars. Late evening congestion in Sub-Zones 1 & 3, most likely due to Cat's Cradle events or patronage of restaurant/bars.

The times that parking demand exceeds ideal occupancy are in the early evening. From 6:00 pm to 9:00 pm the Bank of America, Cat's Cradle, and KFC lots, and the Roberson/Main public lot are all above ideal occupancy (85%). By the late evening – 9:00 pm to midnight – conditions have improved somewhat, but the Bank of America, Cat's Cradle, and KFC lots are still above ideal occupancies.

Thursday, major trends: Evening congestion in all of Zone B, most likely due to food shopping or patronage of restaurant/bars. Late evening congestion is only evident in Sub-Zone 1, most likely due patronage of restaurant/bars.

Aside from some scattered lots that are over an ideal occupancy, there is no concentrated area of above ideal occupancy before early evening (6:00 pm to 9:00 pm), when the Bank of America, Cat's Cradle, and KFC lots and the Roberson/Main lot are all above ideal occupancy. By the late evening (9:00 pm to midnight), only the Bank of America lot and the Roberson/Main lot are above acceptable occupancies.

Saturday, major trends: An afternoon trend concentrated in Sub-Zone 1, an evening trend concentrated in Sub-Zones 1 & 3.

The weekend trend is more of the lots at or near an above ideal occupancy during the afternoon hours. In the Early Afternoon (11:00 am-3:00 pm), the Bank of America, Open Eye and Wendy's lots, on-street parking on Maple Extension, and the Roberson/Main public lot are all close to an above ideal occupancy and the Century Center, 100 E. Main and Rosemary public lots and on-street parking on Roberson Street are all above ideal occupancies. This congestion clears somewhat in the late afternoon (3:00 pm to 6:00 pm), where a number of lots including the Open Eye, Wendy's lots, the Roberson/Main public lot and on-street parking on Maple Extension are all close to ideal occupancy. At this time, on-street parking on Roberson Street is still at an above ideal occupancy. In the early evening (6:00 pm-9:00 pm), conditions worsen again with close to above ideal occupancies at the Roberson/Main public lot, the Gourmet Kingdom parking lot, and on-street parking on Sweet Bay, and above ideal occupancies at the Glass Half Full, Open Eye, Bank of America, Cat's Cradle, and KFC lots, and on-street parking along Roberson and Maple Extension. These conditions continue into the late evening (9:00 pm-midnight), at which time the Century Center and 100 E. Main public lots go above ideal occupancies.

Sunday, major trends: Early afternoon and early evening congestion in Sub-Zone 2, most likely due to brunch or food shopping. Overall, there is fairly light demand.

Parking demand does not exceed recommended occupancy until the early afternoon (11:00 am-3:00 pm), where the biggest problem spots are the Open Eye lot and on-street parking on Roberson. In the late afternoon (3:00 pm-6:00 pm), the Century Center public lot and on-street parking on Maple Extension are close to an above ideal occupancy, and the Open Eye lot, the Century Center public lot, and on-street parking on Roberson are above ideal occupancies. In the early evening (6:00 pm-9:00 pm), the Roberson/Main public lot and on-street parking on Roberson are above ideal occupancies. Only the Roberson/Main public lot,

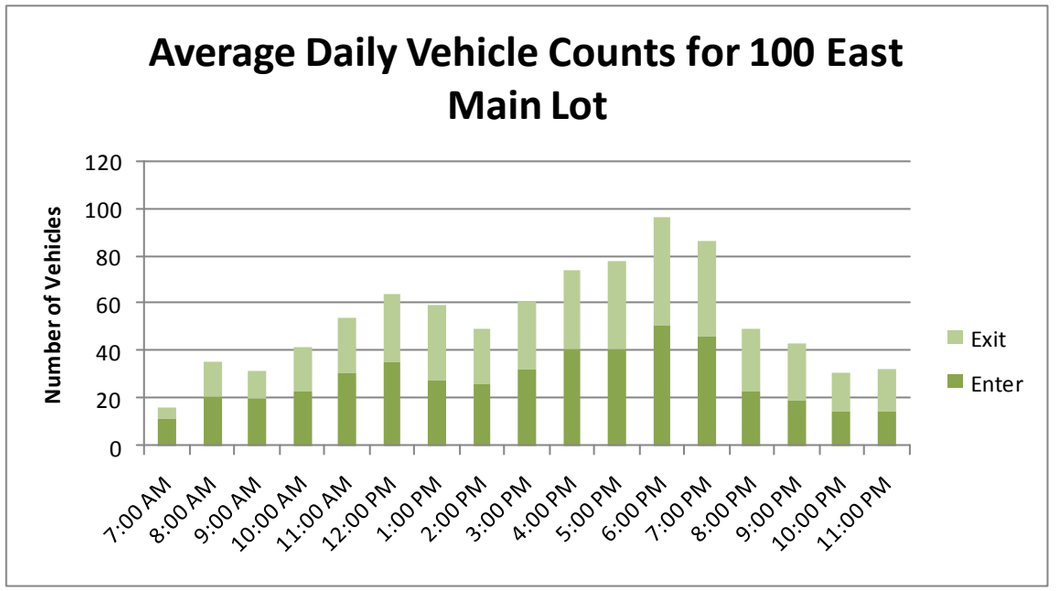
and on-street parking on Roberson are above ideal occupancies by the late evening (9:00 pm-midnight).

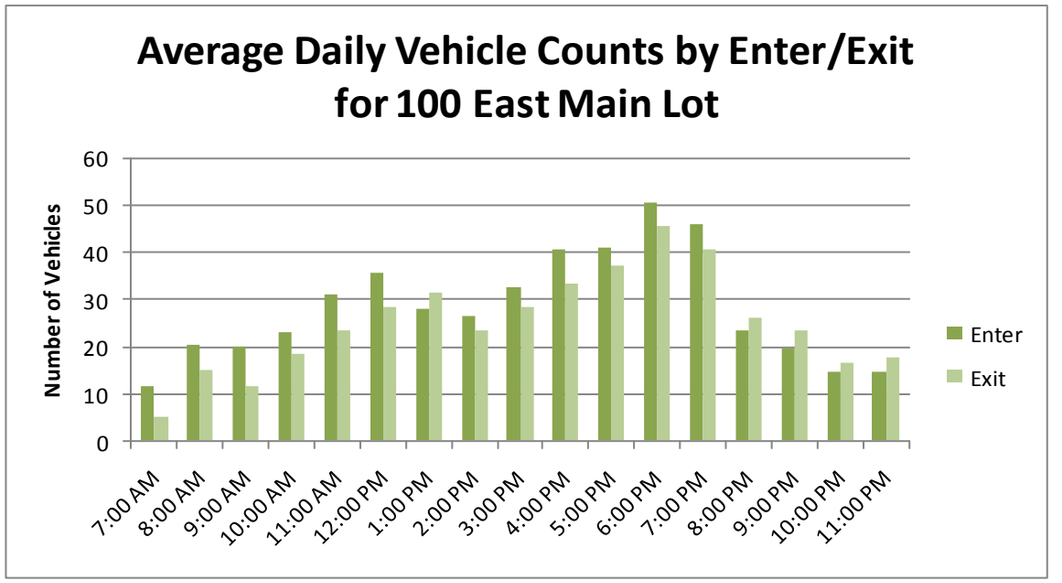
Appendix D: Tube Counts

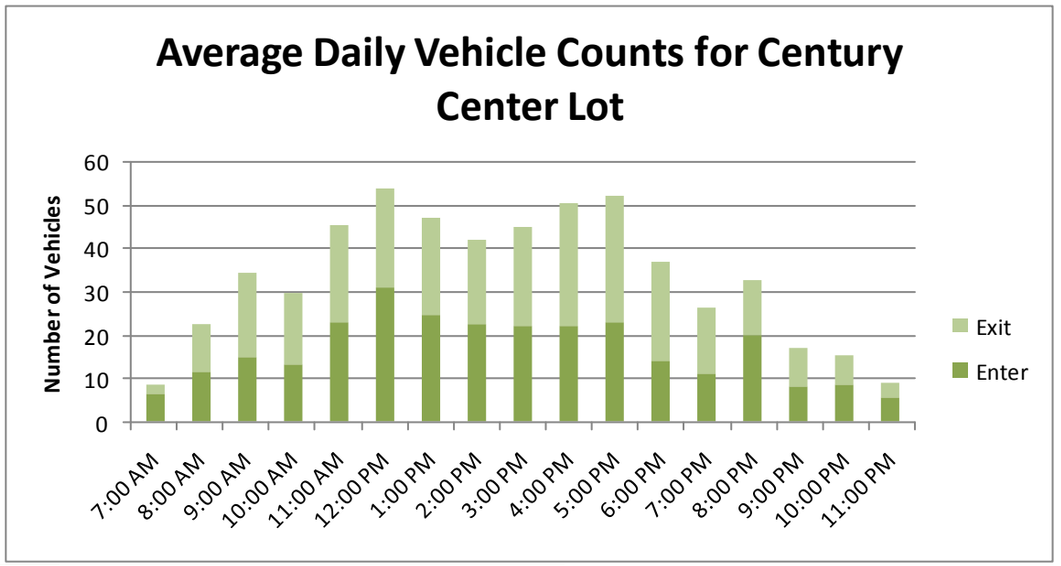
Table 13: Movements Per Hour

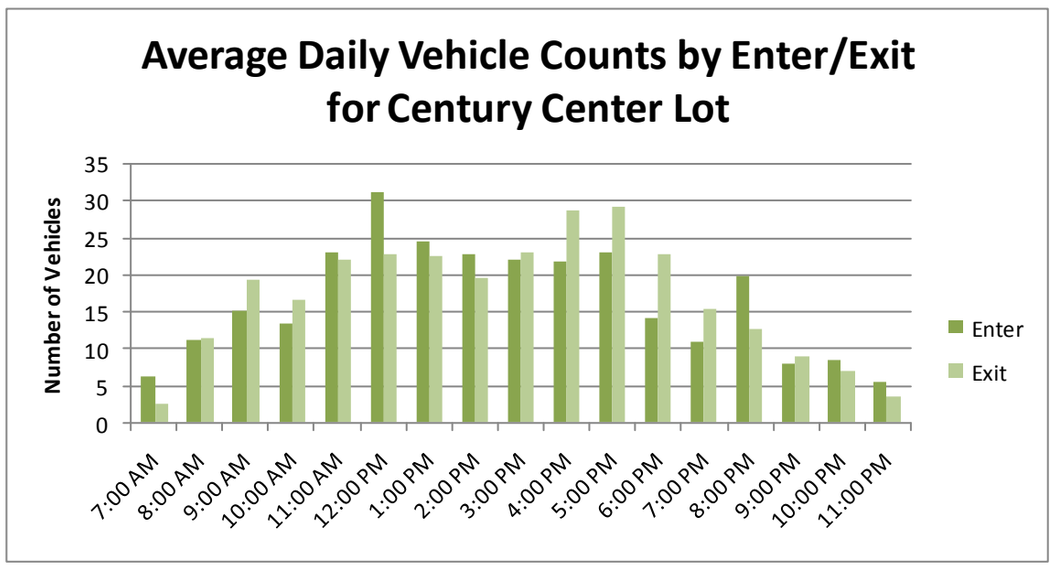
Time	100 East Main	Century Center	Laurel	Rosemary	Weaver	Carr Mill Mall
12:00 am	22	4	0	2	0	597
1:00 am	24	1	0	2	0	295
2:00 am	19	0	0	2	0	168
3:00 am	2	1	0	0	0	91
4:00 am	1	0	0	1	0	63
5:00 am	4	1	0	0	0	96
6:00 am	2	1	0	0	0	210
7:00 am	16	9	4	3	1	725
8:00 am	35	23	9	6	6	1600
9:00 am	32	34	12	12	3	1873
10:00 am	41	30	9	15	7	2193
11:00 am	54	45	8	22	8	2654
12:00 am	64	54	3	29	11	3021
1:00 am	59	47	5	26	9	3098
2:00 am	49	42	6	25	8	2988
3:00 am	61	45	4	23	4	3384
4:00 pm	74	50	5	22	9	3869
5:00 pm	78	52	5	25	9	4101
6:00 pm	96	37	1	35	6	4003
7:00 pm	86	26	0	33	4	3736
8:00 pm	49	32	0	26	2	2914
9:00 pm	43	17	1	12	1	2246
10:00 pm	31	15	0	10	1	1544
11:00 pm	32	9	0	6	1	1016

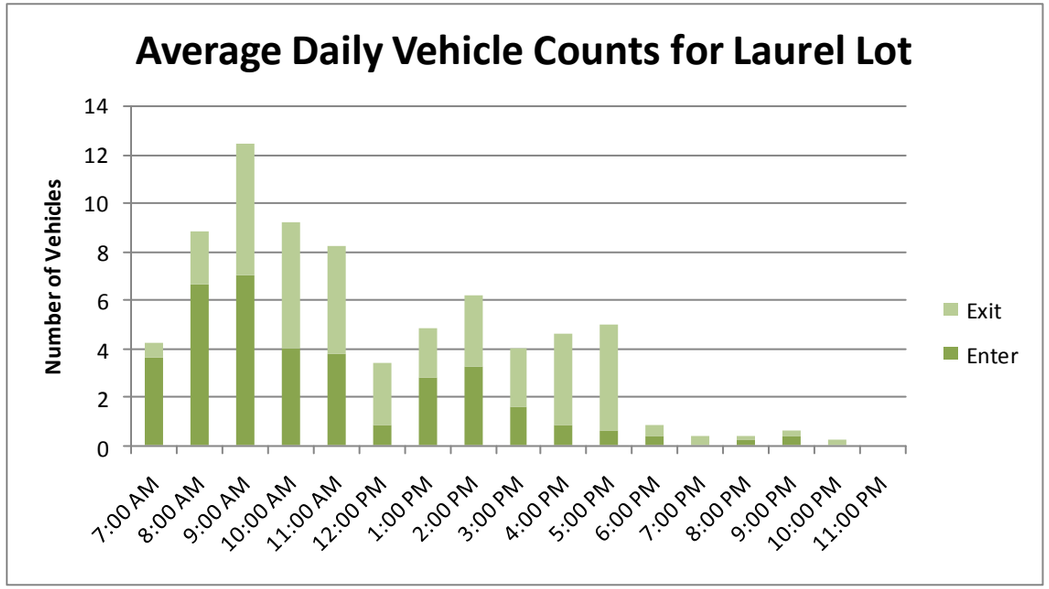
For lot locations, please see Figure 11: Tube Count Locations, p. 21

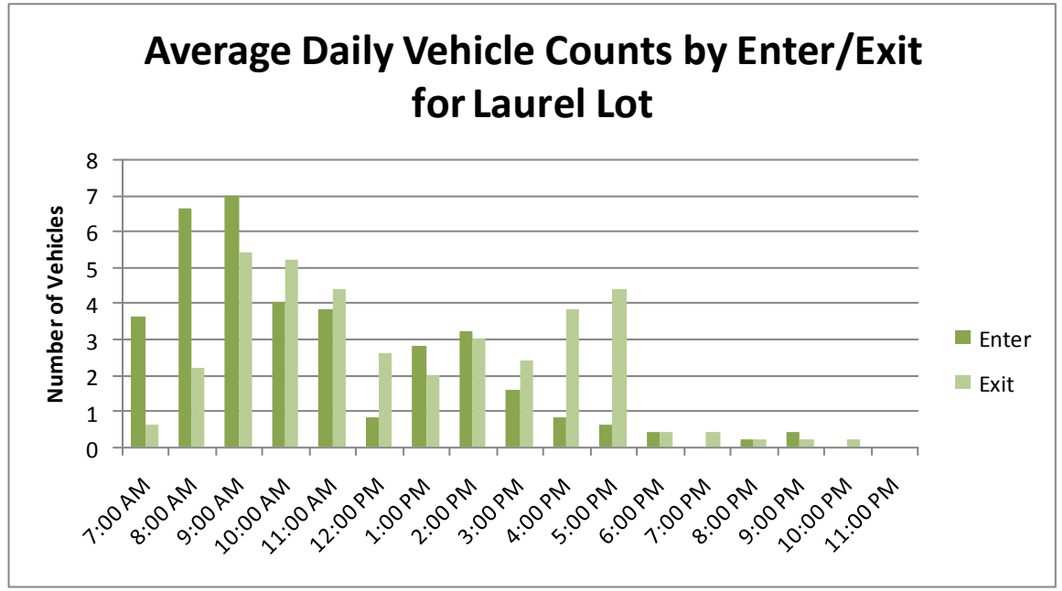

Average Daily Vehicle Counts for 100 East Main Lot
Number of Vehicles
120
100
80
60
40
20
0
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Exit
Enter

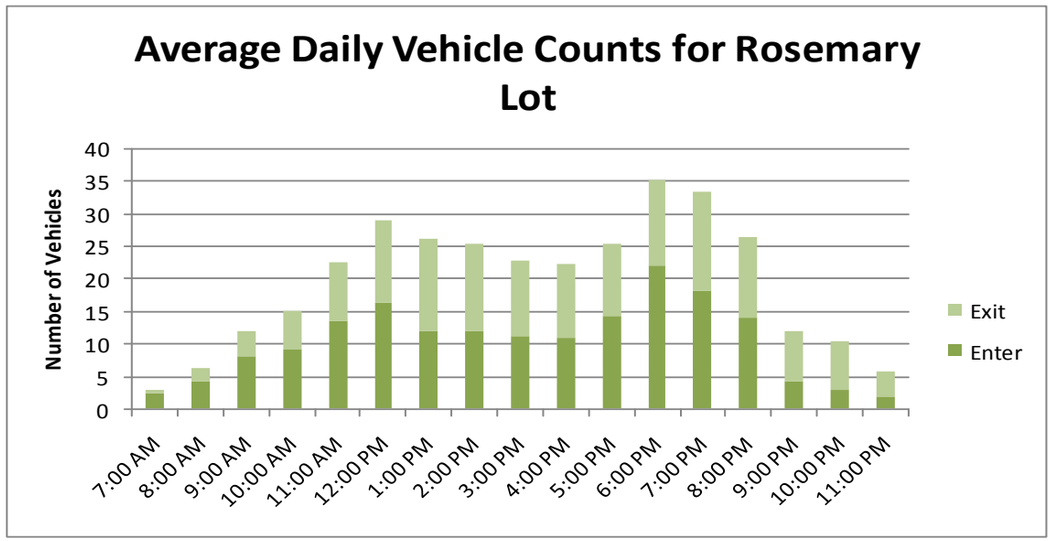

Average Daily Vehicle Counts by Enter/Exit for 100 East Main Lot
Number of Vehicles
60
50
40
30
20
10
0
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Enter
Exit

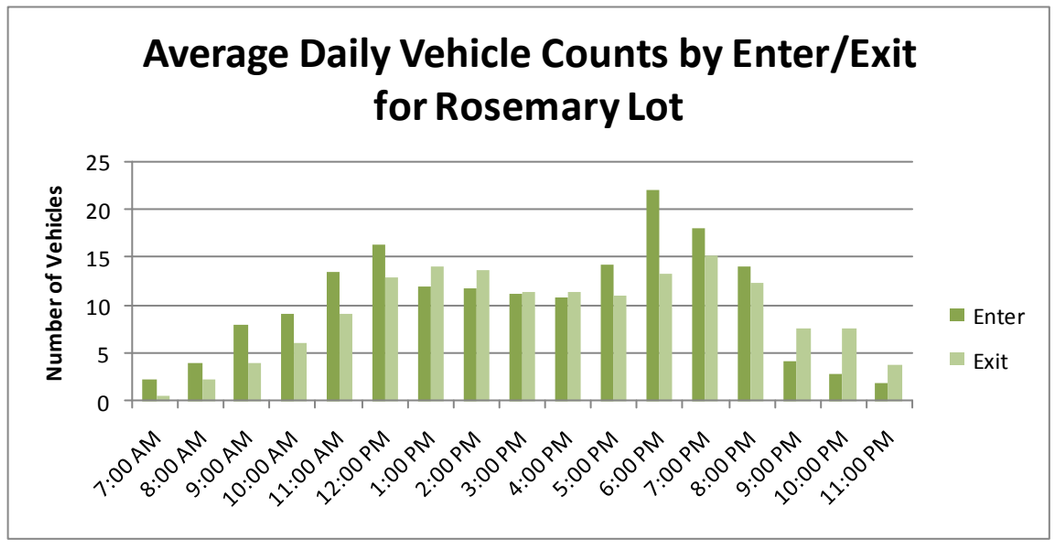

Average Daily Vehicle Counts for Century Center Lot
Number of Vehicles
60
50
40
30
20
10
0
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Exit
Enter

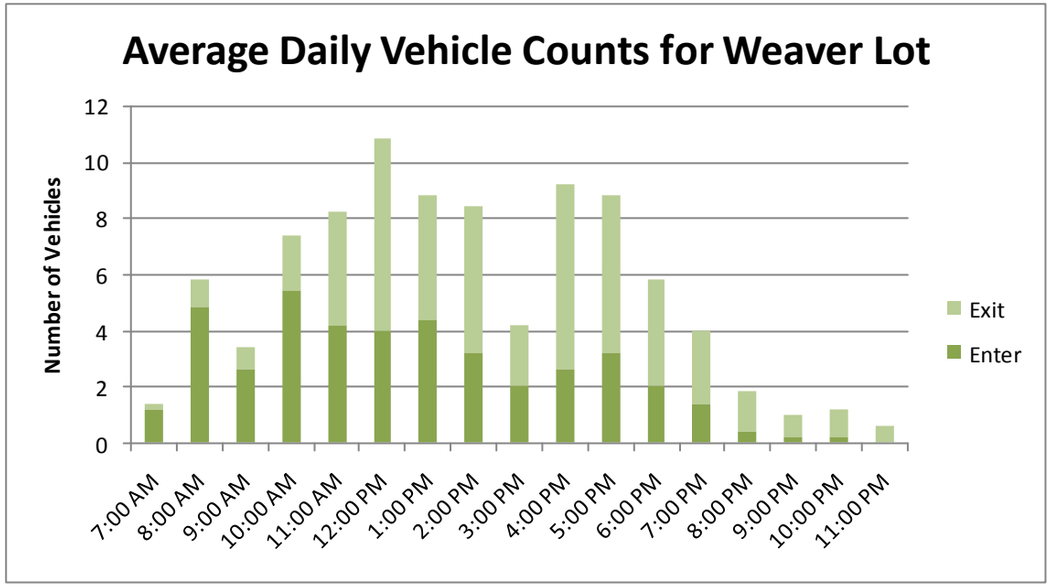

Average Daily Vehicle Counts by Enter/Exit for Century Center Lot
Number of Vehicles
35
30
25
20
15
10
5
0
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Enter
Exit

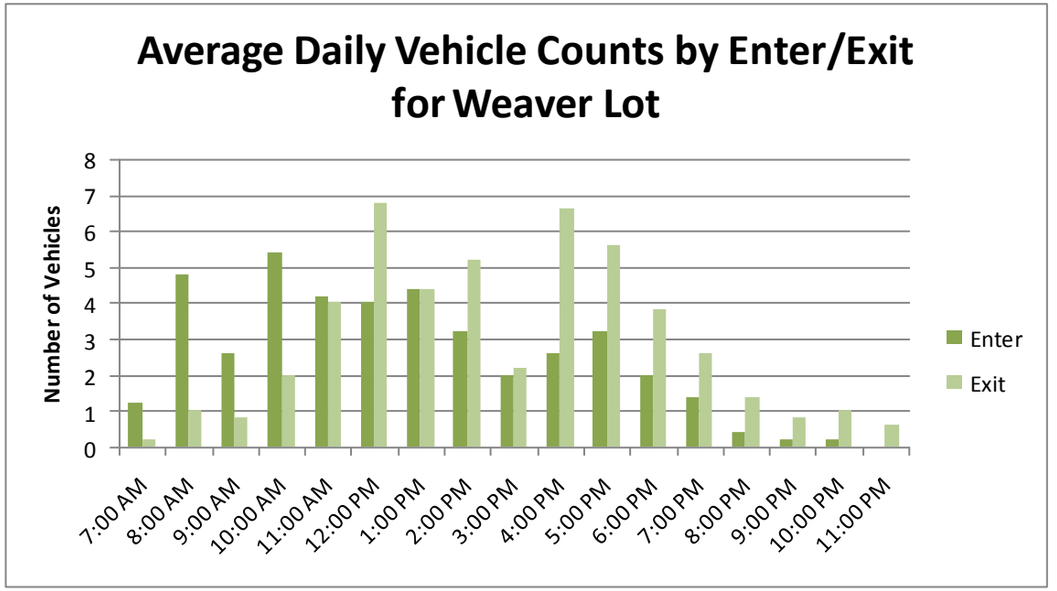

Average Daily Vehicle Counts for Laurel Lot
Number of Vehicles
0
2
4
6
8
10
12
14
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Exit
Enter

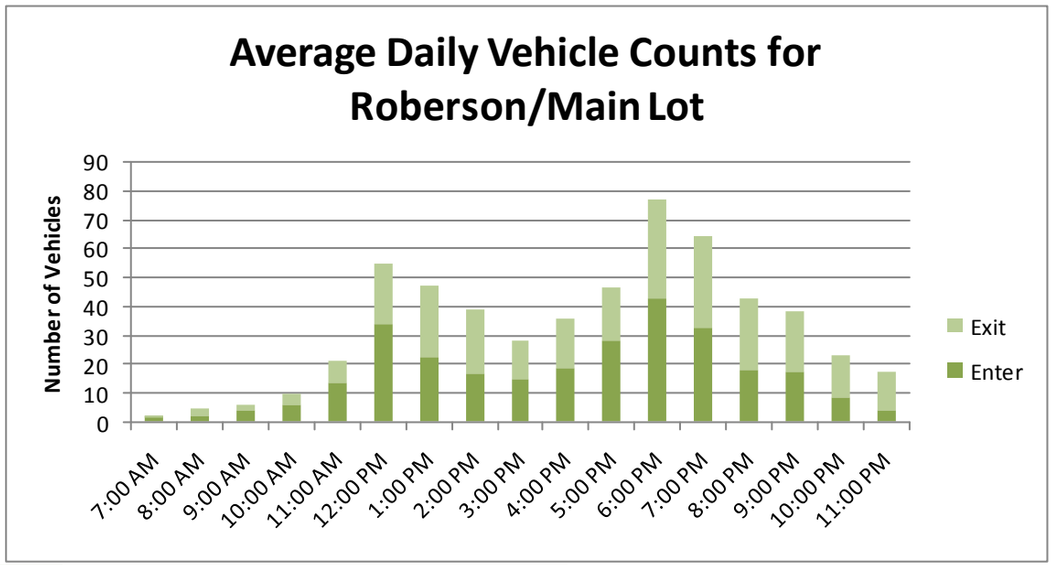

Average Daily Vehicle Counts by Enter/Exit for Laurel Lot
Number of Vehicles
0
1
2
3
4
5
6
7
8
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Enter
Exit

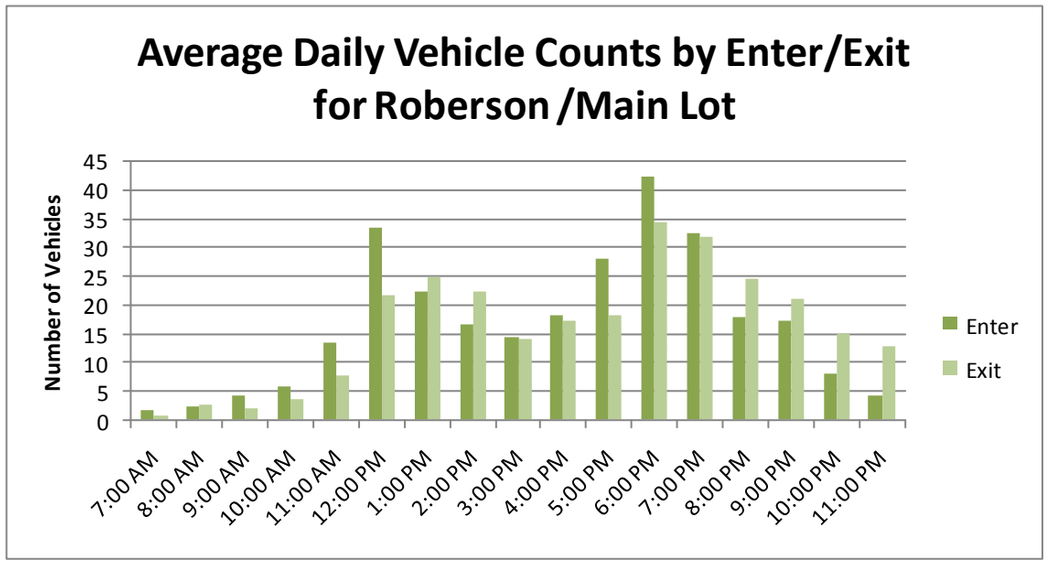

Average Daily Vehicle Counts for Rosemary Lot
Number of Vehicles
0
5
10
15
20
25
30
35
40
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Exit
Enter


Average Daily Vehicle Counts by Enter/Exit for Rosemary Lot
Number of Vehicles
0
5
10
15
20
25
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Enter
Exit


Average Daily Vehicle Counts for Weaver Lot
Number of Vehicles
0
2
4
6
8
10
12
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Exit
Enter


Average Daily Vehicle Counts by Enter/Exit for Weaver Lot
Number of Vehicles
0
1
2
3
4
5
6
7
8
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Enter
Exit


Average Daily Vehicle Counts for Roberson/Main Lot
Number of Vehicles
0
10
20
30
40
50
60
70
80
90
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Exit
Enter


Average Daily Vehicle Counts by Enter/Exit for Roberson /Main Lot
Number of Vehicles
0
5
10
15
20
25
30
35
40
45
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
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5:00 PM
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11:00 PM
Enter
Exit

Appendix E. Detailed Land Use Methodology

Land Use Methodology included three steps:

1. Collect Data
2. Calculate Existing Parking Generation Rates
3. Projecting Future Parking Demand

Step 1: Data Collection and Layer Creation

Editing Existing Data

In order to determine the square footage of each building and generate the parking demand for each land use, the Team used existing data from the Town, Google Maps and Live Search Maps. The Team updated data from the Town's former transportation intern with Town copies of Orange County orthophotography that is updated monthly with new permit information. The Team then eliminated building footprint polygons smaller than 225 square feet, which often represent storage sheds, dumpsters, and similar non-air-conditioned areas, due to the low likelihood that these footprints generate demand for parking. Then the Team used Street View© images from Google Maps and Live Search Maps© to add information on the number of stories in new buildings to the STORY field. The field called SQ_FT_0228 represents the square footage of each building multiplied by the number of stories (AREA * STORY).

Layer Creation

The Team looked at Tuesday, Early Afternoon and Tuesday, Early Evening as the periods with the most data and of the highest demand. Four new shapefiles were created for analysis of these periods. Tu_alllots.shp contains those parking lots for which demand counts were available for Tuesday, Early Afternoon. Tu_buildings.shp contains all of the buildings within 50 feet of those lots, reflecting the expectation, supported by the demand analysis that people generally park close to their destination. Tu_Lots_4.shp contains those parking lots for which demand counts were available for Tuesday, Early Evening, and Tu_bldgs_4.shp contains all of the buildings within 50 feet of those lots.

To look at future parking demand, two separate shapefiles were created for buildings: bldgs_future_approved.shp and bldgs_future_tentative.shp - from cbd_bldg_story.shp to analyze future approved and tentative projects. The team edited the shapefiles to spatially represent the proposed projects. Then information about the uses (retail, commercial, or residential), building footprint square footage, number of stories, and total square footage of each building was added to the attributes table.

Two other shapefiles were created for parking: private_park_future_approved.shp and private_park_future_tentative.shp, which illustrate changes in the parking supply for both public and private parking lots. Both shapefiles reflect the required parking spaces, provided parking spaces (as proposed by developers), and shortage of parking spaces for each approved or tentative developments.

Within each layer, buildings and lots were assigned a zone and sub-zone in new attribute columns. Buildings that overlapped boundaries were included in both areas.

2. Calculating Existing Parking Generation Rates

The method for calculating parking demand generation comes from *The Parking Handbook for Small Communities* (1994). The authors recommend collecting data on the square feet occupied by specific land uses (e.g. grocery store, bank, post office). As this level of detail was not available in an easily accessible format for this study, "Mixed" was defined as the single land use category for Carrboro CBD.

Parking generation rates were calculated by dividing the occupancy survey (parking demand) number for each zone and sub-zone by the occupied floor space over 1,000: Generation Rate (unknown) = Parking Demand / (floor space / 1,000)

Table 14 shows the generation rate for each zone and sub-zone and the occupancy predicted by the generation rate. We compared the generation rates for Tuesday, Early Afternoon, which has the most complete data set of any period surveyed, with Tuesday, Early Evening, which appeared from the occupancy maps to be the worst demand period. The Team does not assume a constant generation rate across the CBD. The calculated demand for the CBD comes from adding the calculated demand in Zone A, Zone B, and Zone C.

3. Projecting Future Parking Demand

To project future parking demand, the Team applied the generation rate calculated for existing parking to the future approved and proposed developments: Generation Rate * (floor space / 1,000) = Parking Demand (unknown)

This resulted in the anticipated parking demand. The anticipated demand was then compared to future supply numbers to create

Table 14. Parking Generation with a Comparison of Peak Use and Calculated Demand for Tuesday, Early Afternoon.

Block	Tuesday, Early Afternoon Generation Rate	Tuesday, Early Evening Generation Rate (Spaces/1000	Tuesday, Early Afternoon Calculated Occupancy	Tuesday, Early Evening Calculated Occupancy
CBD	-	-	55%	65%
Zone A	1.4	1	56%	42%
Zone B	1.3	1.6	55%	72%
Zone C	0.3	0.3	33%	25%
Sub-Zone 1	1.3	1.1	94%	64%
Sub-Zone 2	1.5	1.6	62%	79%
Sub-Zone 3	1	1.9	45%	77%

occupancy percentages for each zone and sub-zone.

Note about methodology

Using the method described, there are discrepancies between occupancy percentage from count data and occupancy percentage calculated by the generation rate, particularly in Zone C and Sub-Zone 1, the two areas for which there was the least amount of data. As discussed above, generation rate was determined from buildings within 50 feet of the lots for which data was available. Another alternative would have been to find generation rate by assuming equal occupancy across all lots in the zone or sub-zone from the counts taken. As lots were chosen for count inclusion based on the likelihood that they would be full, this would have severely overestimated occupancy. If future studies include all lots in the occupancy survey, this discrepancy can be avoided.

Table 15. Differences in Occupancy Calculation

Block	% Occupancy Found from Generation Rate Applied to All Lots	% Occupancy Found from Generation Rate Applied to "Tuesday, Early Evening" Lots	From occupancy and demand survey
CBD	45-55%	60-70%	
Zone A	40-50%	35-45%	30-40%
Zone B	55-65%	65-75%	70-80%
Zone C	15-25%	20-30%	40-50%
Sub-Zone 1	25-35%	60-70%	55-65%
Sub-Zone 2	65-75%	75-85%	75-85%
Sub-Zone 3	80-90%	75-85%	75-85%

Detailed Tables

Table 16. Occupancy after Completion of Approved Projects

Block	Approved Floor Space (sq.ft.)	Approved Parking Spaces	Generation Rate (Spaces/1000 sq.ft.)	Calculated Demand (spaces)	Difference Between Approved and Calculated Demand	% Occupancy
CBD	1,250,556	2,721	-	1,615	1,106	55-65%
Zone A	309,831	702	1.0	310	392	40-50%
Zone B	782,996	1,764	1.6	1,253	511	65-75%
Zone C	174,075	255	0.3	52	203	15-25%
Sub-Zone 1	326,577	746	1.1	359	387	45-55%
Sub-Zone 2	351,906	817	1.6	563	254	65-75%
Sub-Zone 3	176,322	371	1.9	335	36	85-95%

Table 17. Occupancy after Completion of Proposed Projects

Block	Proposed Floor Space (sq.ft.)	Proposed Parking Spaces	Generation Rate (Spaces/1000 sq.ft.)	Calculated Demand (spaces)	Difference Between Approved and Calculated Demand	% Occupancy
CBD	1,602,035	3,280	-	2,177	1,103	60-70%
Zone A	309,831	702	1.0	310	392	40-50%
Zone B	1,134,475	2,323	1.6	1,815	508	75-85%
Zone C	174,075	255	0.3	52	203	15-25%
Sub-Zone 1	376,111	805	1.1	414	391	45-55%
Sub-Zone 2	351,906	817	1.6	563	254	65-75%
Sub-Zone 3	478,267	878	1.9	909	-31	100-110%

Appendix F: Shapefiles Used in the Land Use and Future Development Analysis

Private Parking and Town Parking.shp

Tot_Park: Total parking, including all restricted spaces

Park_9_5: Total non-restricted spaces from 9-5, Monday-Friday (excludes ADA and any restricted spaces during 9-5, M-F), includes reserved customer parking

ParkNoRest: Total non-restricted spaces outside of 9-5, M-F.

PRKG: estimated number of spaces based on polygon area

PRKG_SPACE: estimated number of spaces based on polygon area (rounded, because 94.35 parking spaces makes no sense)

Included_bldgs.shp

Created by updating/merging the cbd_bldg_story.shp file received from Adena Messinger, Carrboro Town Planner, in January 2008 with bldgfootprints.shp downloaded from the Carrboro Town website.

cbd_bldg_story.shp was created by Ben, an intern with the town in 2000(?), and includes his analysis of usable square footage (existing and hypothetical) for buildings in the central business district. bldgfootprints.shp contains shapefiles created from planemetrics in 2007(?).

All buildings under 225 square feet were removed (in the AREA attribute column) as a way to eliminate buildings and structures used for storage/non-parking generating uses.

SQ_FT**:** Square feet of the building based on the planemetric square footage and the number of stories

HYP: A hypothetical number of stories decided by Ben based on an unknown logic

HY2: Hypothetical floor height, take two

SQ_FT_HYP: The area of the building based on planemetric area (AREA) multiplied by HYP.

SQ_FT_HY2: The area of the building based on planemetric area (AREA) multiplied by HYP2.

LUTYPE: Land use type

BUSTYPE**:** Basic descriptor of the businesses in each building - unfinished

Bldgs_future_approved.shp

Created from Included_bldgs.shp.

This shapefile contains approved future development polygons used to input their estimated parking demand for LU analysis.

Peak_Park: Peak parking demand estimated by the developer

Bldgs_future_tentative.shp

This shapefile contains proposed future development polygons that have not been approved by the Town.

Peak_Park: Estimated peak parking demand of the development

Private_park_future_approved.shp

This shape files contains parking polygons for the approved future developments.

Park_Req: Parking required by the Town

Park_Prov: Parking actually provided by the development

Park_Short: Parking shortage (required - provided)

Park_Satel**:** satellite parking (only applicable to 300 East Main Phase A, approved)

Private_park_future_tentative.shp

This shapefile contains parking polygons for future developments that have not been approved.

Attributes metadata are the same as the shapefile above.

Appendix G: Bibliography

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