WALKER
PARKING CONSULTANTS

PARKING SUPPLY/DEMAND AND
ALTERNATIVES ANALYSIS

WRIGHT STATE UNIVERSITY

DAYTON, OHIO

Prepared for:
Mr. Robert Kretzer
Director Parking and Transportation
Department

FINAL REPORT

WRIGHT STATE
UNIVERSITY

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October 29, 2004

Mr. Robert Kretzer
Director Parking and Transportation Department
E138 Student Union
3640 Colonel Glenn Highway
Dayton, Ohio 45435-0001

Re: Parking Supply/Demand and Alternatives Analysis
Walker Project No. 13-2725.00

Dear Mr. Kretzer:

We are pleased to submit the attached final report of the updated Parking Supply/Demand and Alternatives Analysis for the Wright State University campus. This report examines current parking adequacy and future parking needs. This report also presents alternatives for addressing future parking needs by increasing the parking supply.

We appreciate this opportunity to be of service to Wright State University. It has been a pleasure providing our analysis of the current and future parking conditions for the University.

Sincerely,

WALKER PARKING CONSULTANTS

Jon Martens
Parking Consultant

cc:

Enclosure

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EXECUTIVE SUMMARY

Wright State University (WSU) retained Walker Parking Consultants (Walker) in 1991 to provide a professional parking and traffic study. With this current assignment, Walker is engaged by WSU to update the parking supply, demand, and alternatives section of the 1991 parking study. This includes a review of the current parking supply, evaluation of current and future parking demand, and provides an evaluation of alternatives to increase the future parking supply to meet the anticipated future parking space shortfall.

The total campus parking supply, as inventoried by Walker, includes 11,047± marked parking spaces. The campus parking supply is primarily located within the following four areas: 1) main campus (5,332 parking spaces), 2) remote lots (1,283 parking spaces), 3) residential (1,290 parking spaces), and 4) the Nutter Center (3,142 parking spaces). Over half of these parking spaces are not located in proximity to the main parking demand generator, the core campus. When the inventory is adjusted to reflect a cushion necessary for efficient operation, the supply of parking is reduced to an effective supply of 9,871 parking spaces.

Based on our analysis of the current parking supply and demand at the WSU campus, each user group has an adequate supply of parking. However, when user group parking demand is portioned into the various areas, parking adequacy for commuter students in the Main Campus Area operates at a slight deficit (16 spaces). Current parking adequacy by user groups is summarized in the following table.

Current Parking Adequacy by User Group

User Group	Effective Supply	Design Day Demand	Parking Surplus (Deficit)
Commuter Students	5,667	3,276	2,391
Faculty/Staff	1,884	1,505	379
Visitor	171	92	79
Resident Students	2,067	1,347	720
Total	9,789	6,220	3,569

Parking adequacy for each of the campus areas is provided in the following table.

Parking Adequacy by Area

	Design-Day Demand	Effective Supply	Surplus (Deficit)
Main Area			
Commuter Students	3,047	3,031	(16)
Faculty/Staff	1,400	1,455	55
Visitor	92	171	79
Resident Students	0	0	0
Remote Area			
Commuter Students	33	90	57
Faculty/Staff	90	144	54
Visitor	0	0	0
Resident Students	310	906	596
Resident Area			
Commuter Students	0	0	0
Faculty/Staff	0	0	0
Visitor	0	0	0
Resident Students	1,037	1,161	124
Nutter Center			
Commuter Students	197	2,546	2,349
Faculty/Staff	15	285	270
Visitor	0	0	0
Resident Students	0	0	0

The University Master Plan calls for the expansion of the Biological Sciences facilities and re-routing of University Boulevard through several existing parking lots. Both projects will impact the parking supply in the Main Campus Area, resulting in an overall reduction of 411 parking spaces. In addition to this change to the parking supply, the University predicts an increase in student enrollment, faculty/staff employment, and visitors. The decrease in parking supply as well as the increase in parking demand will result in a parking deficit of approximately 662 parking spaces in the Main Campus Area for commuter students and faculty/staff by the 2013-2014 academic year, as shown in the following table.

Main Campus Area Parking Adequacy

	2003-04 Surplus (Deficit)	2008-09 Surplus (Deficit)	2013-14 Surplus (Deficit)
Main Area			
Commuter Students	(16)	(282)	(395)
Faculty/Staff	55	(216)	(267)
Visitor	79	77	74
Resident Students	0	0	0
Remote Area			
Commuter Students	57	56	55
Faculty/Staff	54	50	46
Visitor	0	0	0
Resident Students	596	583	572
Resident Area			
Commuter Students	0	0	0
Faculty/Staff	0	0	0
Visitor	0	0	0
Resident Students	124	80	41
Nutter Center			
Commuter Students	2,349	2,341	2,334
Faculty/Staff	270	269	269
Visitor	0	0	0
Resident Students	0	0	0

In order to construct an adequate number of parking spaces to meet the deficit plus the supply cushion, we must adjust the parking deficit by the effective supply factor (10 percent). Thus, the design capacity needed to meet deficits within the Main Campus Area within five years is 553 parking spaces (498/0.90 = 553), and 736 parking spaces within ten years (662/0.90 = 736).

To provide adequate parking within the Main Campus Area, Walker reviewed several alternatives. These include re-stripping parking lots, adding surface parking lots, adding structured parking, and increasing the use of shuttle parking. The alternatives were each rated with respect to a set of weighted criteria to determine the most favorable

alternatives for the University. The following table highlights the top six alternatives to satisfy the anticipated parking deficit in the Main Campus Area.

Top Six Alternatives to Increase Supply

Rank	Top Six Alternatives	Potential Added Capacity
1	Reconfigure visitor lot 16[1]	54
2	Reconfigure lot 4	57
3	Add lot next to visitor lot 16	220
4	Addition to Lot 11	65
5	Expand lot 7B	280
6	Expand lot 11	145
	Totals:	821

[1] This is not added capacity, but a transfer from visitor to student or faculty/staff.

Source: Walker Parking Consultants

Reconfiguring the Visitor Lot 16 was completed as the alternatives were developed. This satisfied 54 parking spaces of the anticipated deficit within the Main Campus Area.

Based on the projected five-year and ten-year parking deficits, the table on the following page lists our recommendations for increasing the parking capacity.

Recommended Alternatives to Increase Parking Supply

Alternative	Rank	Added Spaces Within 5 Years	Added Spaces Within 10 Years
Reconfigure visitor lot 16	1	54	
Reconfigure lot 4	2	57	
Add lot next to visitor lot 16	3	220	
Addition to Lot 11	4	65	
Expand lot 7B	5		280
Expand lot 11	6	145	
Total Spaces:		541	280
Total Added Spaces:		821	

*Notes: The size of the expanded lots, 7B and 11, could be reduced to more closely match the total recommended parking supply increase.
Addition to Lot 11 is new lot across University Blvd.
Expand Lot 11 is in green space close to library and Lot 11.

Source: Walker Parking Consultants

As noted, the recommendations would more than adequately meet the anticipated shortfall in parking adequacy. If desired, the expansions of Lot 7B and Lot 11 could easily be reduced to more closely match the desired parking supply level.

Walker's conclusion is that the WSU campus has an adequate parking supply to meet current parking demand, with the exception of the commuter student population in the Main Campus Area, which has a deficit of 16 parking spaces. The Main Campus Area parking supply will be reduced when the Biological Sciences facilities are expanded and University Boulevard is relocated to improve pedestrian and vehicular traffic flow. In addition, anticipated continued growth in user populations will require the University to add parking capacity in the Main Campus Area. Our recommendations provide a combination of solutions that include changing user group allocations, new parking layouts, and new surface parking additions.

It is important that the University take action to provide adequate parking prior to the expansion of the Biological Sciences facilities and the re-routing of University Boulevard.

INTRODUCTION

BACKGROUND

Wright State University (WSU) engaged Walker Parking Consultants (Walker) to provide an updated Parking Supply/Demand and Alternatives Analysis of the WSU campus in Dayton, Ohio.

The purpose of this engagement is threefold:

- Determine existing and future campus parking adequacy within the WSU campus.
- Examine potential methods to increase parking supply, starting with the least expensive solutions first, from reconfiguring existing parking facilities more efficiently to constructing a parking facility.
- Consider various sites for proposed new parking facilities and rate each alternative according to a consistent set of weighted criteria.

During the course of our analysis, Walker observed that several key surface lots on the main campus remained full for most of the day. These lots are allocated to both student and facility/staff user groups. Planned developments to the campus will reduce the current parking supply and compound the current observed parking congestion.

Known developments that are planned at the WSU campus include:

- Expansion of the Biological Sciences Facilities
  (construction to start in 2006)
- Re-routing of University Boulevard
  (within 5 years)

This study examines potential parking options within a five-year and ten-year time frame based on current WSU master planning, including the projects listed above. Potential options include reconfiguration of existing surface parking and the installation of additional surface parking spaces for short-term parking solutions. In addition, the possibility of adding a parking structure is explored to meet the long-term parking needs of the campus.

SCOPE OF SERVICES

The following is the Scope of Services for this study, as established in the engagement agreement.

TASK 1 – PARKING SUPPLY/DEMAND ANALYSIS

1. Meet with the appropriate university representatives to discuss the study's goals and objectives and to confirm boundaries, procedures and project schedule.

2. Obtain and review any existing reports or studies pertinent to the university's parking and traffic conditions. Discuss all plans for future capital construction development.

3. Verify the inventory of existing parking spaces, denoting capacity, user designations and restrictions on use.

4. Conduct parking occupancy surveys on one day to determine typical occupancy of parking spaces within the study area. Occupancy surveys will be conducted during peak hours as agreed to by university representatives.

5. Based on all data collected, establish a parking demand model that will be used to determine present and future parking adequacy at the university. Parking adequacy will be stated in terms of parking space surplus or deficit by user group and parking area.

TASK 2 – PARKING ALTERNATIVES ANALYSIS

1. Review existing vehicular and pedestrian access and circulation patterns for their relationship to existing and proposed parking facilities.

2. Based on any deficiencies calculated, determine whether the current space count can be increased through re-striping.

3. Determine whether any existing facilities can be expanded to meet area-parking needs.

4. Develop options for expanding with surface and/or structured parking.

5. Assess the use of remote parking areas and shuttling services.

6. Determine conceptual construction and project costs for identified alternatives including estimated operational expenses for comparison and evaluation purposes.

7. Evaluate the various alternatives on the basis of qualitative criteria to be mutually agreed upon with University representatives. The criteria may include, but not be limited to, capital cost, life cycle cost, ability to generate revenue, campus planning issues, pedestrian access, traffic access, aesthetics, parking efficiency, implementation time, security and future versatility. A weighted matrix will be used to achieve more objectivity and to rank the alternatives.

STUDY AREA

The Wright State University (WSU) main campus is located on the northeast side of Dayton Ohio in the suburb of Fairborn. The study area is generally bound by Clonel Glenn Highway to the south, Kauffman Road to the north, Zink Road to the west, and Route 844 to the east.

The campus consists of an academic core area, remote parking areas, residential areas, and the Nutter Center indoor arena. All parking is provided by surface parking lots. Parking is managed by the Parking and Transportation Department, with offices located in the Student Union building. In addition to providing parking services to the campus, the department also manages the campus shuttle service.

A review of the campus indicates that supply/demand factors vary within the campus based on the location of the parking supply and demand generators. To provide a more accurate understanding of the current and future parking conditions the study area is divided into four study areas. These areas are designated as follows:

(1) Main Campus Area
(2) Remote Parking Area
(3) Residential Area
(4) Nutter Center Area

(1) The Main Campus Area is located north of Colonel Glenn Highway, generally between University Boulevard and Center Road. The core of this area contains the major educational buildings and is generally surrounded by surface parking.

(2) The Remote Parking Area is defined as those properties lying to the northeast of the main campus. These parking areas include Lots 18, 19, and 20. All are separated from the main campus by forested areas, and are connected by University Boulevard. Major improvements in this area include the Fine Arts building, Day Care Center, and remote parking. These areas are served by the campus shuttle service.

(3) The Residential Area includes the Forest Lane apartments, College Park apartments, Honors dorm, Village apartments, and the Woods apartments. The residential area is located roughly to the northwest of the main campus and is linked to the campus via the shuttle system and walking paths.

(4) The Nutter Center Area is anchored by the Nutter Center indoor arena and contains several large surface lots that surround the arena. The area is generally bound by University Boulevard to the north, Colonel Glenn Highway to the south, Raider Road to the west, and High Way 844 to the east.

The campus is depicted in Figure 1 on the following page.

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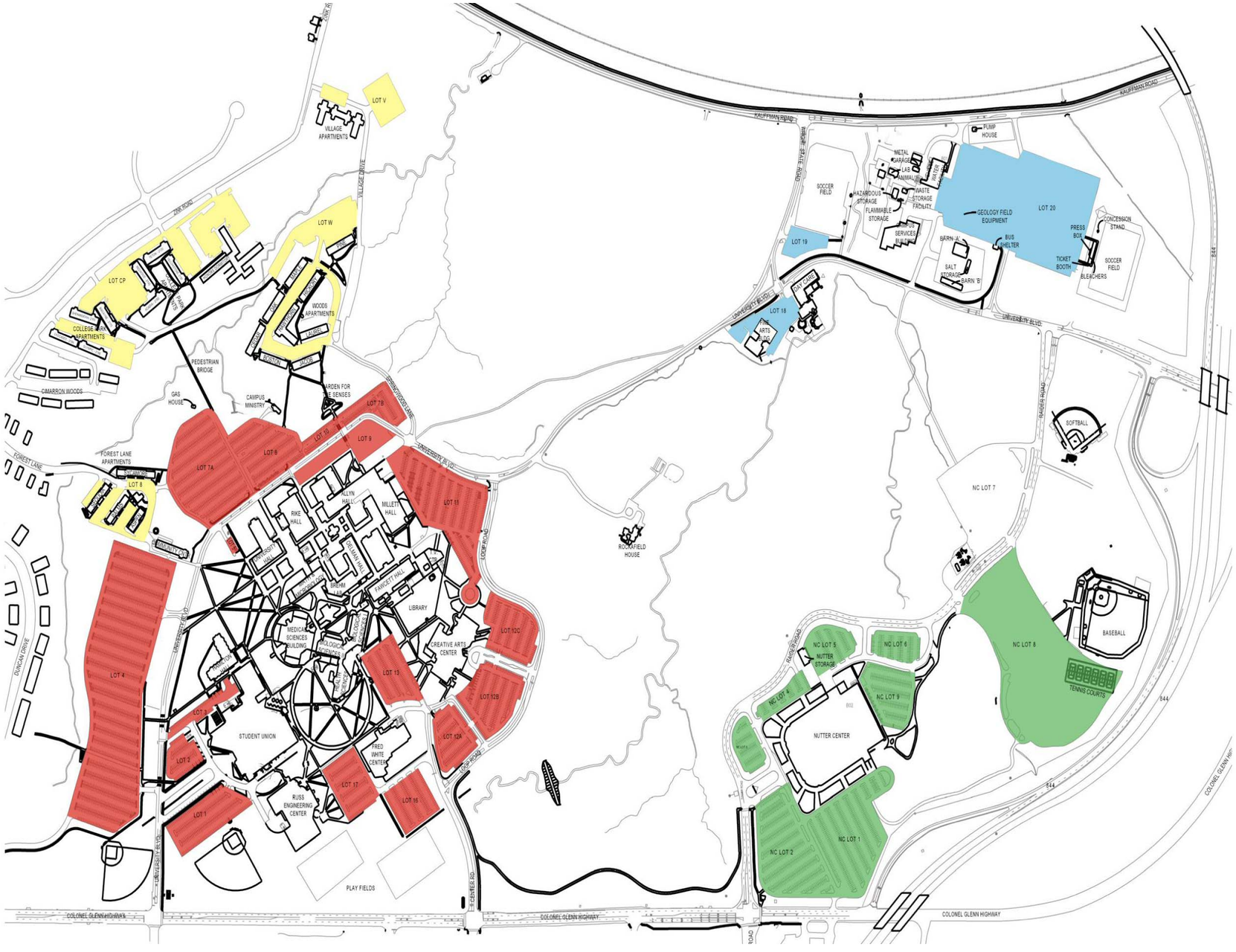
Figure 1: Study Area



LEGEND:

- Residential
- Main Campus
- Nutter Center
- Remote Areas

NORTH

DEFINITION OF TERMS

The following definitions are provided to help clarify some of the parking terms used and are particular to this document. More complete discussions are provided throughout this document.

Parking Supply: The total number of parking spaces within the defined subject parking system.

Effective Parking Supply: The number of available parking spaces, less a cushion (effective supply factor) to keep parking patrons from spending time looking for last available spaces, and to allow for the dynamics of vehicles moving in and out of spaces. It is also needed to provide extra spaces when parking facilities are under repair.

User Group: The amount of parking spaces required for various faculty staff employee groups (employees, commuter and resident students and visitors) are determined separately. Each of these populations is classified as a user group.

Parking Demand: The number of parking spaces required to satisfy students, faculty/staff and visitor needs on any given day. This is estimated by comparing the number of vehicles parked in the study area, the building destination of students and faculty/staff and number of students and employees in the study area.

Driving Ratio: The percentage of a particular user group that drives a vehicle to the University campus and parks.

Occupancy: The number of parking spaces occupied by vehicles. This information is gathered by performing parked vehicle counts in each parking facility located within the Campus.

Demand Ratio: The ratio of the number of vehicles observed to occupy parking spaces compared to a reference statistic. For example, if there are 1,000 commuter students and observed peak occupancy of 400 vehicles in the commuter student lot, the Demand Ratio is 0.40 (400/1000) per commuter student.

Parking Adequacy: Parking adequacy is measured in terms of supply vs. demand, resulting in a surplus or deficit. The parking surplus/deficit is the difference between the supply of parking spaces and the demand for those spaces. The demand is compared to the effective supply.

METHODOLOGY

The methodology of this parking supply/demand study consists of the following:

- Reviewing background information and data provided by University
- Obtaining parking supply data, occupancy counts and permit sales data
- Analyzing the current parking occupancy
- Developing a parking model for existing parking demand
- Utilizing projections provided by the University to develop a future parking supply/demand model

The primary objective of the parking supply and demand task is to quantify the parking surplus/deficit that exists now and in the future. The parking deficit is the difference between the parking supply and parking demand. When the parking supply exceeds the parking demand, a surplus of parking is said to be present. However, a deficit of parking exists when the parking demand exceeds the parking supply.

It is important to define the conditions upon which a parking system should be designed. Some organizations intend to provide adequate parking for every potential parking facility user every day of the year. Consequently, a substantial number of parking spaces lie vacant throughout much of the year. The benefit of such a parking system is that parkers, whether employees, students, or visitors, are never turned away because of lack of adequate parking.

As is more commonly the case, most organizations would rather have fewer of their assets utilized as parking. These organizations plan for a parking system that meets the needs of its parking patrons most days of the year, but less than every day of the year. The disadvantage of this type of parking system is that from time to time, the parking demand may exceed the effective parking supply.

The level at which the parking demand should be accommodated is a policy decision that must be made by the University. For the purpose of this analysis, adequate parking conditions are defined as those that occur on a typical weekday during the fall semester, because the fall semester traditionally has the highest enrollment counts.

It is impossible to identify in advance one day that will perfectly represent the typical busy day; however, parking occupancy data was

collected for all University controlled parking lots from 8:00 a.m. to 8:00 p.m. on Tuesday May 24, 2004. In addition to this Spring count, Walker will conduct a second count in the Fall 2004 semester from 8:00 a.m. to 6:00 p.m. on September 15th. This second count in the Fall will be used to validate the findings.

We estimate parking demand by using the survey data collected to calculate parking demand ratios. Parking demand ratios reflect the number of parking spaces required per user group (student, faculty/staff and visitor). The parking demand ratio is equal to the presence ratio multiplied by the driving ratio. The presence ratio is the portion of a user group that is present during the peak hour. The driving ratio is the percentage of a particular user group that drives a vehicle to the campus.

The process for estimating parking demand consists of the following steps:

1. The on-campus demand, by user group, was approximated for each parking facility by separating the total observed parked vehicles into user groups from information provided by Parking Services.
2. A parking demand ratio was calculated for each user group population from the observed parking demand and parking survey.
3. The calculated demand ratios are applied to each projected user group population.

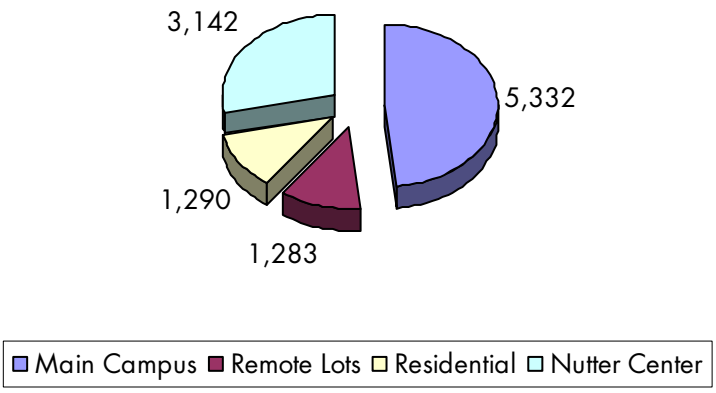
Using the future year design statistic and the current parking demand ratios allows us to estimate future parking demand.

PARKING SUPPLY

The University's Parking and Transportation Department provided an inventory of parking spaces for the campus during the initial project kick-off meeting. The inventory was reviewed and updated as needed.

The total campus parking supply is approximately 11,047 parking spaces. This includes all areas of the campus: Main Campus Area, Remote Area, Residential Area, and the Nutter Center Area. The adequacy of this number is somewhat misleading, as over half of the parking spaces are located away from the main parking demand generator, the core campus. The following figure depicts the total parking supply segmented into each of the main areas of the WSU campus.

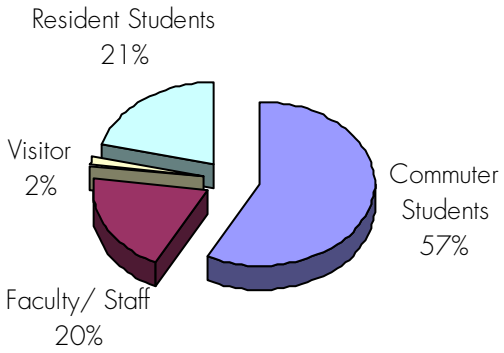
Figure 2: Parking Supply by Area, May 2004



Source: Walker Parking Consultants, May 2004

Each of these parking areas serves a mix of unique user groups. For example, the Nutter Center Area is primarily used for physical fitness activities, while the Residential Area and most of the Remote Area is used for resident students. Freshman resident students are required to park in the remote area; however, employees and some commuter students also park in the lots. The Main Campus Area provides parking for commuter students, faculty/staff, and visitors. The breakdown of parking spaces by user group for the entire campus is shown in the following figure.

Figure 3: Parking Supply, May 2004



Source: Walker Parking Consultants, May 2004

A detailed breakdown of the parking inventory can be found in the appendix.

EFFECTIVE PARKING SUPPLY

It is a generally accepted principle in parking supply/demand analyses that the supply of parking achieves optimum efficiency at 85% to 95% occupancy. At high occupancy levels, a small reserve provides a necessary "cushion" to allow for the dynamics of vehicles moving in and out of parking stalls and reduces the time required to search for the last few available parking spaces. This cushion also allows for daily, weekly and seasonal variations as well as vacancies created by restricting facilities to certain users, miss-parked vehicles and minor maintenance or construction. When occupancy exceeds the optimum level, delays and frustration in finding a parking space are typically observed. Thus, at levels of occupancy that exceed the effective parking supply, the parking system may be perceived as inadequate even though parking spaces are available.

As a result, the "effective parking supply" is used for analyzing the adequacy of the parking system rather than the total supply or inventory of spaces. The point of optimum efficiency for a particular facility depends on a variety of factors, including:

Capacity – Small scattered facilities operate less efficiently than one large facility. Conversely, it is more difficult to find the available space in a large lot or parking structure than in a smaller surface lot.

Type of Users – Regular parkers such as students or faculty and staff can find the available space more efficiently than an infrequent visitor.

Assignment of Spaces – A facility or area of a facility that is dedicated for a specific group of users will have vacancies that cannot be used by other parkers. In general, a facility that has individually reserved spaces will have more vacancies than a facility that has area-reserved spaces.

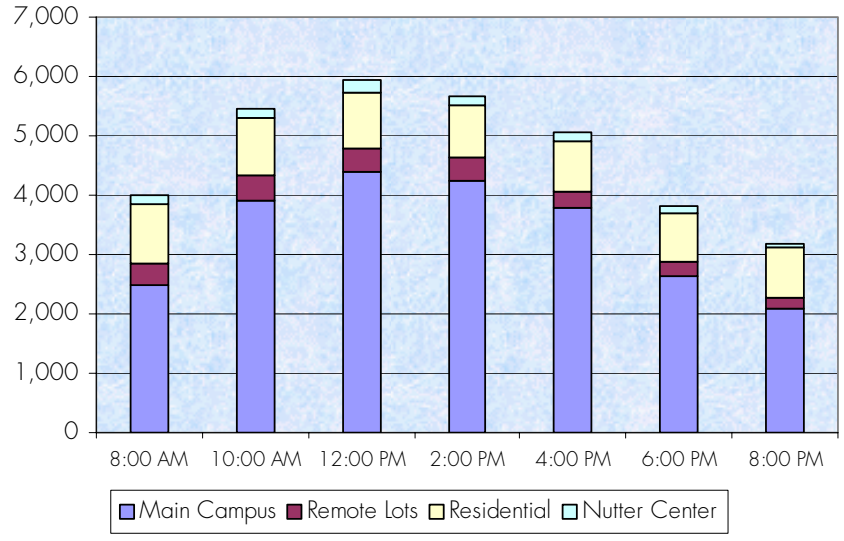
For WSU, an effective supply factor of 90% was used for all permit parking with the exception of the reserved faculty/staff spaces, where the observed peak occupancy of 70% was utilized. Eighty-five percent was used for visitor parking.

The current "effective" parking supply at WSU is 9,871 spaces, or 89% of the total supply (total number of parking spaces times an effective supply factor equals the effective parking supply). A detailed breakdown of the effective supply is located in the appendix.

PARKING OCCUPANCY

An important first step in determining parking demand patterns is to study the occupancy of the existing parking supply. On Tuesday, May 25th, Walker collected parking occupancy data for all on-campus parking facilities. Each facility was counted at two-hour intervals from 8:00 a.m. to 8:00 p.m. That occupancy data is illustrated in the following figure.

Figure 3: Parking Occupancy



Source: Walker Parking Consultants, field data, Tuesday, May 25, 2004

The peak parking occupancy was observed during the 12:00 p.m. vehicle count, when 5,931 parking spaces were occupied. This represents a 54% occupancy rate for the overall campus. When the peak-parking occupancy is examined by area, we can identify specific areas that are experiencing high occupancy.

During the 12:00 p.m. occupancy count, the highest observed parking occupancy was found within the Main Campus Area, with an 83% parking occupancy rate. This compares to the lowest observed occupancy counts, which were at the Nutter Center that was only 7% occupied during the 12:00 p.m. count.

The following table details parking occupancy throughout the day for each of the campus areas.

Table 1: Parking Occupancy Rates by Area

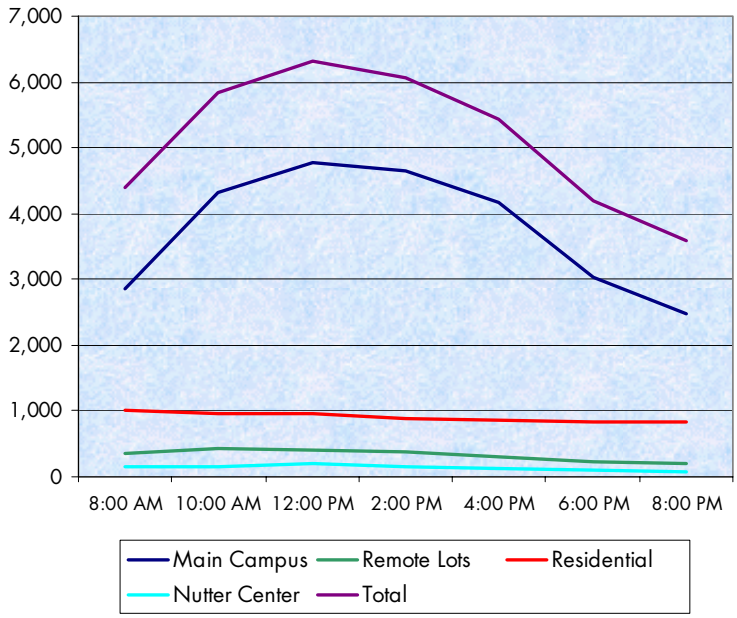
Observed Vehicles			Peak				
Area	8:00 AM	10:00 AM	12:00 PM	2:00 PM	4:00 PM	6:00 PM	8:00 PM
Main Campus	2,478	3,923	4,379	4,256	3,779	2,650	2,077
Remote Lots	358	417	397	384	291	238	204
Residential	999	951	953	876	849	823	846
Nutter Center	163	153	202	163	127	107	68
Total	3,998	5,444	5,931	5,679	5,046	3,818	3,195

Percent Occupied							
Area	8:00 AM	10:00 AM	12:00 PM	2:00 PM	4:00 PM	6:00 PM	8:00 PM
Main Campus	47%	74%	83%	80%	71%	50%	39%
Remote Lots	28%	33%	31%	30%	23%	19%	16%
Residential	86%	82%	82%	75%	73%	71%	73%
Nutter Center	6%	5%	7%	6%	4%	4%	2%
Total	36%	49%	54%	52%	46%	35%	29%

Source: Walker Parking Consultants, May 2004

This table reveals that although the 12:00 p.m. count has the highest observed parking occupancy rates overall, some areas experienced peak parking occupancy at slightly different times. This can be seen in the residential area, which experienced a higher occupancy during the 8:00 a.m. count (86% vs. 82%) than during the 12:00 p.m. vehicle count. This is also true for the remote lots, which experienced a slightly higher occupancy during the 10:00 a.m. count than during the 12:00 a.m. count (33% vs. 31%).

Figure 4: Parking Occupancy by Area



Source: Walker Parking Consultants, May 2004

PARKING DEMAND

An important first step in determining future parking demand patterns is to study the occupancy of the existing parking supply as it relates to the population statistics of the University. The relationship between the parking demand numbers and the population statistics, are related as parking demand ratios. Parking demand ratios are used to stratify the user groups. This technique accomplishes two objectives:

1. It allows for more accurate projections of future needs, as the population of different groups tends to increase or decrease at different rates.

2. It provides for an understanding of the specific parking needs of different groups both now and in the future.

The demand ratio represents the number of parking spaces required by each member of a user group during design day conditions. Demand ratios are expressed as the number spaces required per population statistic (student, faculty/staff, visitor). The Parking demand ratios are derived by correlating the observed parking occupancy numbers to the user-group-population statistics. The University provided Walker the following population statistics.

Table 2: Spring Quarter - 2004 Population Statistics

Student Enrollment	14,478
Faculty/Staff	2,247
Commuter Student	12,089
Resident Student	2,389

Source: Wright State University

The parking demand ratio calculations, based on current user group statistics and observed parking space occupancies, are detailed in the following table.

Table 3: Parking Demand Ratios

User Group	Survey Day Demand [1]		Population[2]		Ratio
Commuter Students	2,995	÷	12,089	=	0.25
Faculty/Staff	1,515	÷	2,247	=	0.67
Visitors	99	÷	2,247	=	0.04
Resident Students	1,234	÷	2,389	=	0.52

1 Demand = Peak Observed Occupancy
Handicap Spaces not included; reserved spaces counted with Faculty/Staff
2 Population data as follows:
Students - Spring Quarter 2004 - WSU
Faculty/Staff - Provided by WSU, Spring 04
Resident - 16.5% of Students, per Fall 2003 Student Fact Book, p L34

Source: Walker Parking Consultants, May 2004

When designing a parking system, it is important to build a system that can support peak conditions, but not necessarily *absolute* peak conditions. We estimated the design-day parking conditions based on the adjusted observed Spring quarter occupancy counts. We conclude that during typical peak parking periods, approximately 0.25 spaces are needed for each commuter student, 0.67 spaces are needed for each faculty/staff member, 0.04 for spaces are needed for each visitor, and 0.52 spaces are needed for each resident student. Note that visitor demand is determined as a function of faculty and staff member population.

DESIGN-DAY

Parking demand is the accumulation of vehicles generated by the students, faculty/staff, and visitors to WSU within the study area. The peak demand is projected for a design day. The design day is defined as a busy day, which occurs frequently enough so that a lack of parking on such as day would be a constraint on the University's delivery of services and the quality of life on campus.

Based on our experience, we know that the fall quarter typically has the largest attendance of the entire school year. With this in mind, Walker typically uses fall occupancy count data to calculate the design-day parking demand. Because the occupancy counts were

conducted during the spring quarter, Walker used the Fall 2003 population statistics to the survey day parking demand ratios. The following represent the Fall 2003 population statistics provided by WSU.

Table 4: 2003 Population Statistics

Commuter Students	13,104
Faculty/Staff	2,247
Visitor	2,292
Resident Students	2,590

Source: Wright State University

The population statistics are based on data received from WSU. It is assumed the number of faculty/staff remain about the same and that during the course of the academic year, and thus there is no adjustment for the faculty/staff user group. Visitor parking is positively adjusted 2% reflect greater presence and parent visitation demand in the fall.

The following table represents the design-day parking demand for the entire campus during the 2003/04 school year.

Table 5: Design Day Demand

User Group	Population		Ratio		Design-Day Parking Demand
Commuter Students	13,104	x	0.25	=	3,276
Faculty/Staff	2,247	x	0.67	=	1,505
Visitor	2,292	x	0.04	=	92
Resident Students	2,590	x	0.52	=	1,347
Total					6,220

Source: Walker Parking Consultants

With the design-day parking demand calculated, the parking adequacy can be determined. Parking adequacy is measured in terms of effective supply vs. demand, resulting in a surplus or deficit. The parking surplus/deficit is the difference between the effective supply of parking spaces and the demand for those spaces.

Table 6: Campus Design-Day Parking Adequacy 2003/2004

User Group	Effective Supply	Design Day Demand	Parking Surplus (Deficit)
Commuter Students	5,667	3,276	2,391
Faculty/Staff	1,884	1,505	379
Visitor	171	92	79
Resident Students	2,067	1,347	720
Total	9,789	6,220	3,569

Source: Walker Parking Consultants, May 2004

Overall, the campus parking supply is adequate for each of the user groups. The next step evaluates the parking adequacy for each of the areas.

In order to evaluate the adjustments and assumptions in calculating the demand ratios, Walker performed an additional occupancy count in the 2004 Fall Quarter. When the 2004 Fall Quarter population statistics were applied to the calculated ratios and compared to the peak occupancy data collected on September 15, 2004, the two differed by only 5%.[1]

Table 7: Fall 2004 Comparison

User Group	Demand Ratio		2004 Fall Quarter Population[1]		Calculated Parking Demand
Commuter Students	0.25	x	14,112	=	3,528
Faculty/Staff	0.67	x	2,767	=	1,854
Visitors	0.04	x	2,767	=	111
Resident Student	0.52	x	2,832	=	1,473
					6,966
Observed 2004 Fall Quarter Peak Parking Occupancy[4]					7,326
				Difference[5]	360
					5%

[1] Population data provided on by WSU

Source: Walker Parking Consultants

[1] Occupancy data for the Fall 2004 Quarter can be found in the Appendix

AREA ANALYSIS

The following table summaries each area's parking adequacy.

Table 8: Area Parking Adequacy 2003/2004

	Design-Day Demand	Effective Supply	Surplus (Deficit)
Main Area			
Commuter Students	3,047	3,031	(16)
Faculty/Staff	1,400	1,455	55
Visitor	92	171	79
Resident Students	0	0	0
Remote Area			
Commuter Students	33	90	57
Faculty/Staff	90	144	54
Visitor	0	0	0
Resident Students	310	906	596
Resident Area			
Commuter Students	0	0	0
Faculty/Staff	0	0	0
Visitor	0	0	0
Resident Students	1,037	1,161	124
Nutter Center			
Commuter Students	197	2,546	2,349
Faculty/Staff	15	285	270
Visitor	0	0	0
Resident Students	0	0	0

Source: Walker Parking Consultants, May 2004

As seen in the tables, all of the areas have a surplus of parking except for commuter students in the Main Campus Area, with a 16 space deficit.

FUTURE PARKING CONDITIONS

Various changes will impact future parking conditions for the Wright State University Campus. These include normal changes to the student population, changes in staffing levels, additions to the campus, and other changes that impact the current parking inventory. This section provides our understanding of the anticipated changes and relates how these changes will impact the supply and demand of the parking system.

CAMPUS POPULATIONS

The University provided Walker Student FTE projections covering the period from 2004 through 2020. The growth rate for this period is calculated to be 0.7% per year. Faculty/Staff is increased at the current student/staff ratio of 0.14 faculty/staff per student. Changes to the Residents user group are based on 16.5% of the total student population, which assumes dorm space will remain available either through increased room occupancy or new construction.

These assumptions result in the following five and ten year user group population forecasts.

Table 9: Projected Campus Population

User Group	2003	2009	2014
Total Students	15,694	16,365	16,946
Commuter Students	13,305	13,665	14,150
Faculty/Staff	2,247	2,343	2,426
Resident Students	2,389	2,700	2,796

Source: Walker Parking Consultants

Utilizing the projected population statistics and parking demand ratios determined under the existing conditions, we can calculate the projected parking demand for years 2008-09 and 2013-14. The resulting future parking demand forecast is shown in the following tables.

Table 10: Future Parking Demand, 2008-09

User Group	Estimated Population		Ratio		Design-Day Parking Demand
Commuter Students	13,665	x	0.25	=	3,416
Faculty/Staff	2,343	x	0.67	=	1,570
Visitor	2,343	x	0.04	=	94
Resident Students	2,700	x	0.52	=	1,404
Total					6,484

Source: Walker Parking Consultants

Table 11: Future Parking Demand, 2013-14

User Group	Estimated Population		Ratio		Design-Day Parking Demand
Commuter Students	14,150	x	0.25	=	3,538
Faculty/Staff	2,426	x	0.67	=	1,625
Visitor	2,426	x	0.04	=	97
Resident Students	2,796	x	0.52	=	1,454
Total					6,714

Source: Walker Parking Consultants

With the future parking demand calculated, we must evaluate the known changes to the parking supply.

PHYSICAL CHANGES

Along with the anticipated future growth of the population of the WSU campus, there are several improvements planned for the campus that will impact the parking supply. These changes include the expansion of the Biological Sciences facilities into the existing parking Lot 13 and the re-routing of University Boulevard through several existing parking lots.

Expansion of the Biological Sciences facilities – Scheduled to commence in 2006, this addition is to be located on the site of Lot 13, resulting in a loss of 193 faculty and staff and 17 handicap parking spaces (210 total spaces).

Re-routing of University Boulevard – The existing University Boulevard will be re-routed through parts of Lots 6, 7, 9, and 10. Changes to the existing lots will result in the loss of approximately 201 commuter student and faculty/staff parking spaces. This is tentatively scheduled to take place within the next five years.

The following table detail the current and future effective parking supply as impacted by the changes detailed above.

Note: Handicap spaces are not included in the tabulation.

Table 12: Future Effective Parking Inventory

User Group	2003-04	2008-09	2013-14
Commuter Students	5,667	5,531	5,531
Faculty/Staff	1,884	1,673	1,673
Visitor	171	171	171
Resident Students	2,067	2,067	2,067
Total	9,789	9,442	9,442

Source: Walker Parking Consultants

The table depicts the improvements to the campus known at the time of this report. These two changes impact only the Main Campus Area, and both are planned to occur within the next five years. For planning purposes, we assumed the University Boulevard re-routing would decrease the total parking supply by 151 commuter student spaces and 50 staff spaces (201 spaces).

FUTURE PARKING ADEQUACY

We calculate future parking adequacy using the future parking demand and future parking supply figures discussed. This is represented in the following tables.

Table 13: Parking Adequacy by User Group, 2008-09

User Group	Design-Day Demand	Effective Supply	Surplus (Deficit)
Commuter Students	3,416	5,531	2,115
Faculty/Staff	1,570	1,673	103
Visitor	94	171	77
Resident Students	1,404	2,067	663
Total	6,484	9,442	2,958

Source: Walker Parking Consultants

Future adequacy is further segmented into each of the parking areas in the following table.

Table 14: Area Parking Adequacy, 2008-09

	Design-Day Demand	Effective Supply	Surplus (Deficit)
Main Area			
Commuter Students	3,177	2,895	(282)
Faculty/Staff	1,460	1,244	(216)
Visitor	94	171	77
Resident Students	0	0	0
Remote Area			
Commuter Students	34	90	56
Faculty/Staff	94	144	50
Visitor	0	0	0
Resident Students	323	906	583
Resident Area			
Commuter Students	0	0	0
Faculty/Staff	0	0	0
Visitor	0	0	0
Resident Students	1,081	1,161	80
Nutter Center			
Commuter Students	205	2,546	2,341
Faculty/Staff	16	285	269
Visitor	0	0	0
Resident Students	0	0	0

Source: Walker Parking Consultants

The breakdown of adequacy by area forecasts that the Main Campus Area will experience a shortage of 282 commuter student parking spaces and 216 faculty/staff parking spaces. This shortage is due to the changes in parking supply as well as the anticipated growth in student population and faculty and staff. All other areas forecast an adequate parking supply.

By year Ten, the shortage is predicted to increase further, based on the anticipated growth in the overall student and staff populations. The following tables depict the anticipated parking conditions by year ten.

Table 15: Parking Adequacy by User Group, 2013-14

User Group	Design-Day Demand	Effective Supply	Surplus (Deficit)
Commuter Students	3,538	5,531	1,993
Faculty/Staff	1,625	1,673	48
Visitor	97	171	74
Resident Students	1,454	2,067	613
Total	6,714	9,442	2,728

Source: Walker Parking Consultants

Adequacy is segmented by parking area in the following page.

Table 16: Area Parking Adequacy, 2013-14

	Design-Day Demand	Effective Supply	Surplus (Deficit)
Main Area			
Commuter Students	3,290	2,895	(395)
Faculty/Staff	1,511	1,244	(267)
Visitor	97	171	74
Resident Students	0	0	0
Remote Area			
Commuter Students	35	90	55
Faculty/Staff	98	144	46
Visitor	0	0	0
Resident Students	334	906	572
Resident Area			
Commuter Students	0	0	0
Faculty/Staff	0	0	0
Visitor	0	0	0
Resident Students	1,120	1,161	41
Nutter Center			
Commuter Students	212	2,546	2,334
Faculty/Staff	16	285	269
Visitor	0	0	0
Resident Students	0	0	0

Note: Figures are rounded

Source: Walker Parking Consultants

The previous tables forecast that the campus parking as a whole maintains adequate parking, however, the commuter student and faculty/staff population will face a shortage of parking spaces in the Main Campus Area.

When each area is analyzed, the Main Campus Area is projected to have a deficit of 395 commuter student parking spaces and a deficit of 267 faculty/staff parking spaces within ten years.

Our alternative analysis will provide various ways to increase the main campus parking supply to meet the predicted deficits for both the commuter student and faculty/staff user groups.

PARKING ALTERNATIVES ANALYSIS

INTRODUCTION

The current parking capacity of the WSU campus parking system is adequate, although not all of the spaces are conveniently located, as evidenced by the high occupancies recorded in the most popular parking lots. Changes to the system will result in a parking deficit for both students and faculty/staff in the Main Campus Area. Anticipated growth in student population and staff will further aggravate the problem.

Master Plan Projects over the next five years will displace existing parking. The loss of these spaces by these projects, plus the growth in students, faculty and staff, will result in a need to provide additional parking over this time period. By the 2008-09 school year, a parking deficit is predicted to occur on the Main Campus Area for both students and faculty/staff of about 498 parking spaces (282 commuter student and 216 faculty/staff parking spaces). This deficit is estimated to increase to 662 parking spaces by 2014 (395 commuter student and 267 faculty/staff parking spaces).

To construct an adequate number of parking spaces to meet the deficit plus maintain the current supply cushion, we must adjust the parking deficit by the effective supply factor (90 percent). Thus, to meet the predicted deficits within the Main Campus Area, the design capacity that needs to be constructed within five years is 533 parking spaces (498/0.90=533) and 736 parking spaces within 10 years (662/0.90=736).

To meet this need Walker worked with the University to identify possible solutions to increase the current parking supply. These alternatives are identified and summarized in the following table and maps.

Table 17: WSU Parking Alternatives

ID	Alternative
1	Expand to Lot 4 (along Col Glenn HW)
2	Expand to Lot 4 (northwest corner)
3	Expand Lot 11
4	Expand Lot 7B
5	Build deck on Lot 11 site
6	Reconfigure Visitor Lot 16
7	Add lot next to visitor Lot 16
8	Increase use of remote Lot 20
9	Reconfigure Lot 4
10	Addition to Lot 11
11	Addition to Lot 4; Relocate Athletic Field

Source: Walker Parking Consultants, 2004

WALKER PARKING CONSULTANTS

Figure 5: Parking Alternatives

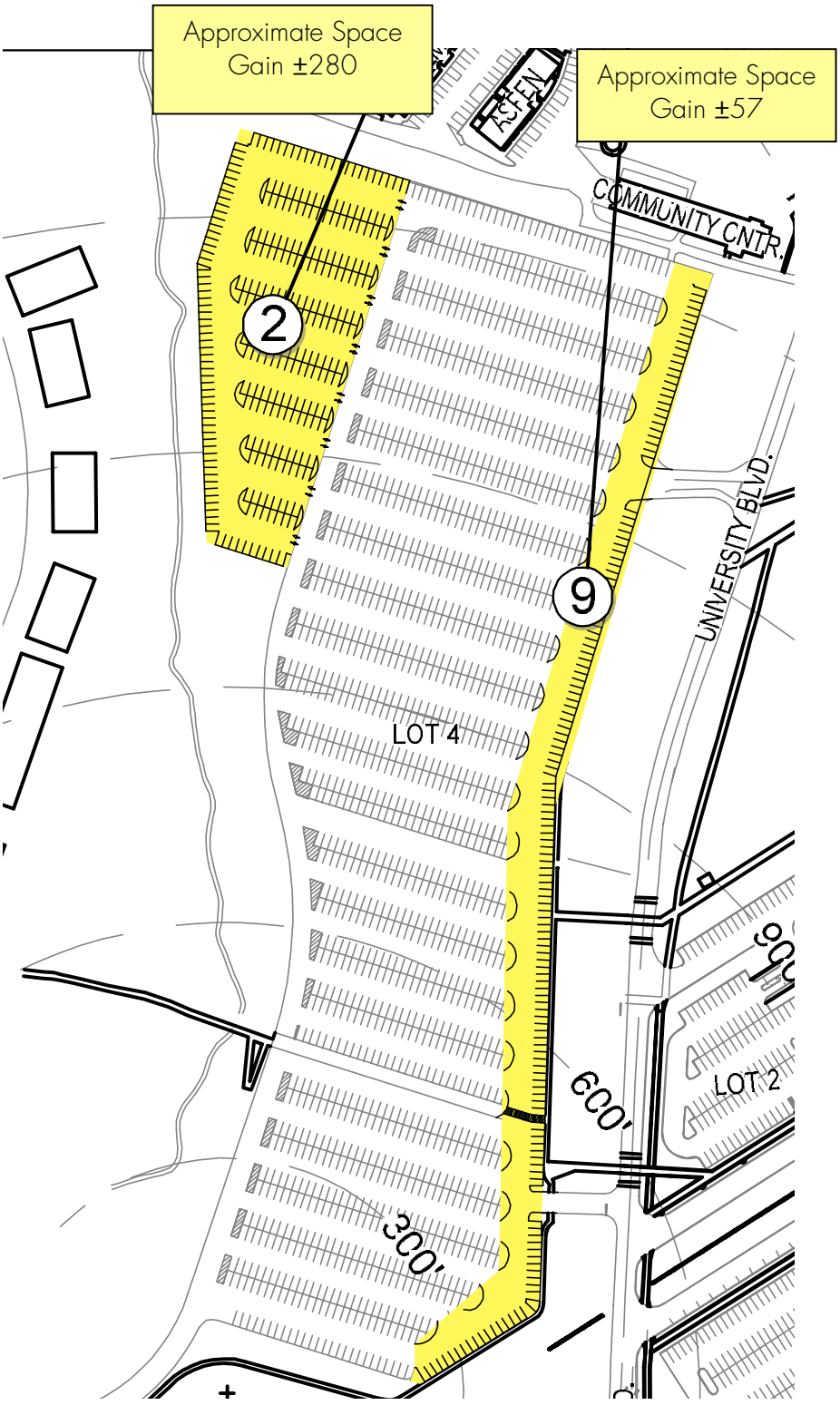
LEGEND:

Walking Distances
- 300 ft.
- 600 ft.
- 900 ft.
- 1200 ft.
- 1500 ft.

Alternatives
- Proposed Surface Parking
- Proposed Structured Parking
- Proposed Parking By Others
- ① New Lot (by others)
- ② Expand Existing Lot
- ③ Proposed Lot
- ④ Proposed Lot
- ⑤ Proposed Garage
- ⑥ Reconfigure Existing (by others, not shown)
- ⑦ Reconfigure/Expand Existing
- ⑧ Shuttle Route (not shown on figure)
- ⑨ End Bay Parking to East Edge
- ⑩ Reconfigure Existing Site
- ⑪ Proposed Lot

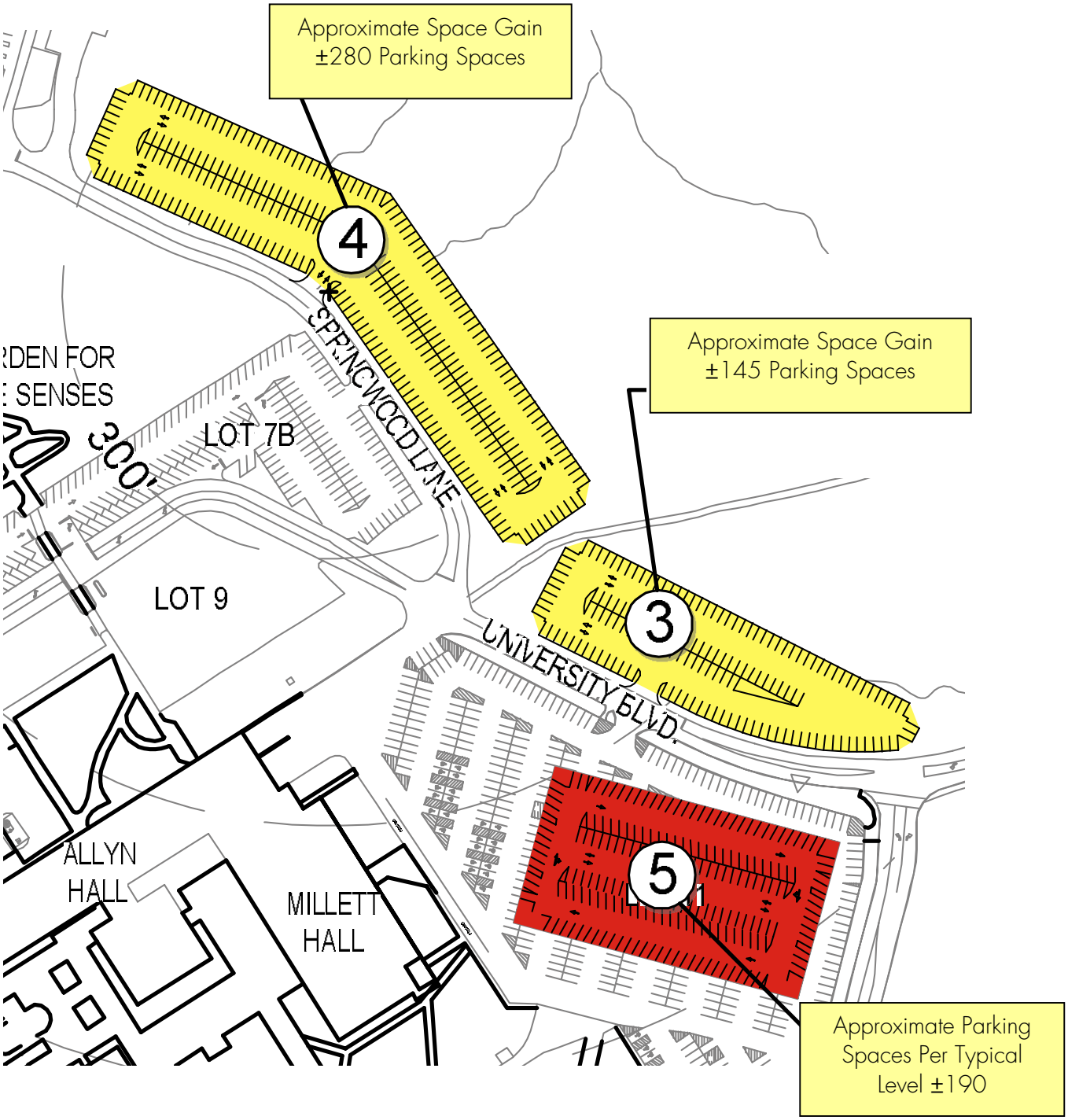
NORTH

Figure 6: Alternatives #2 and #9



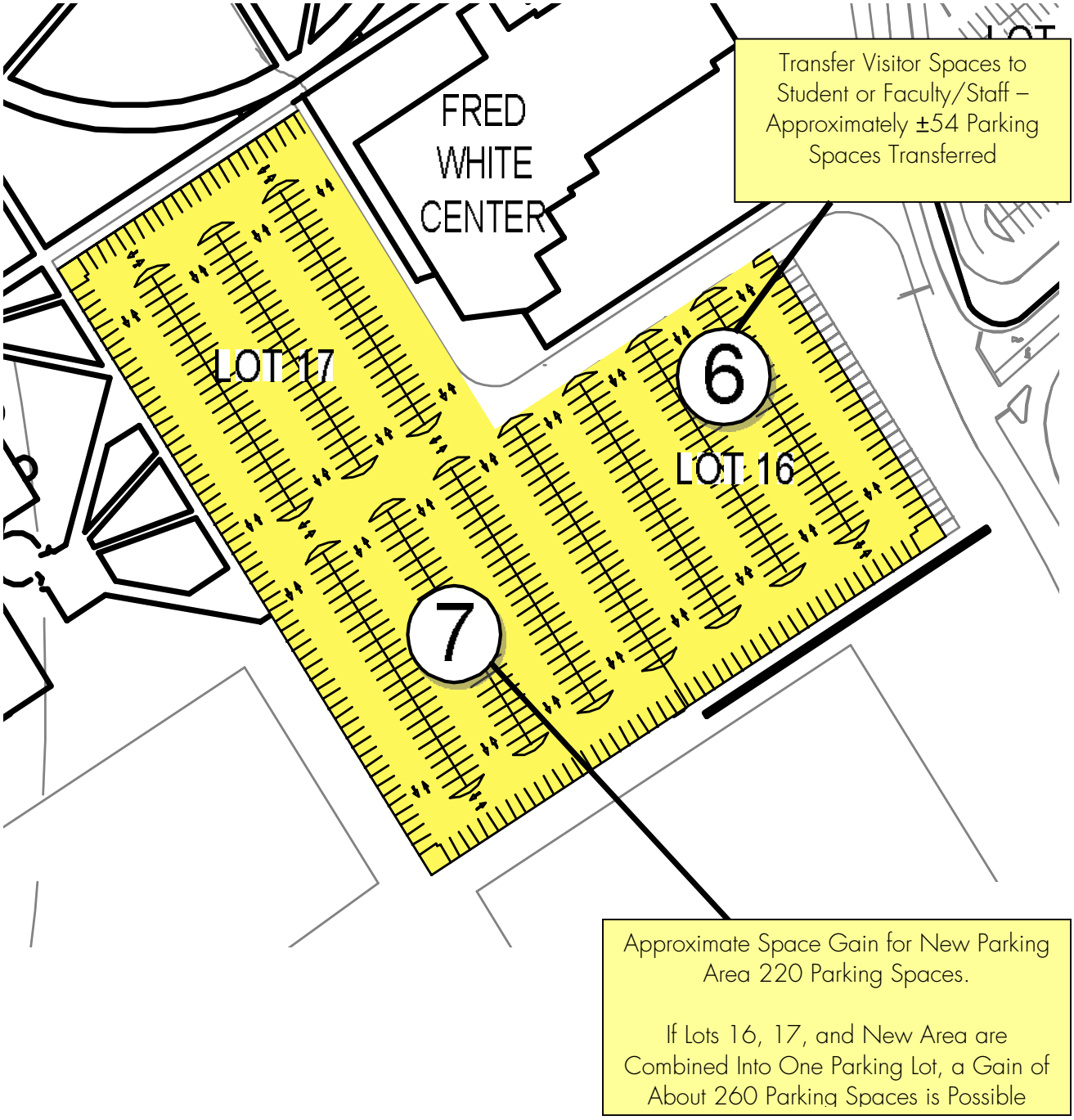
Source: Walker Parking Consultants

Figure 7: Alternatives #3, #4, and #5



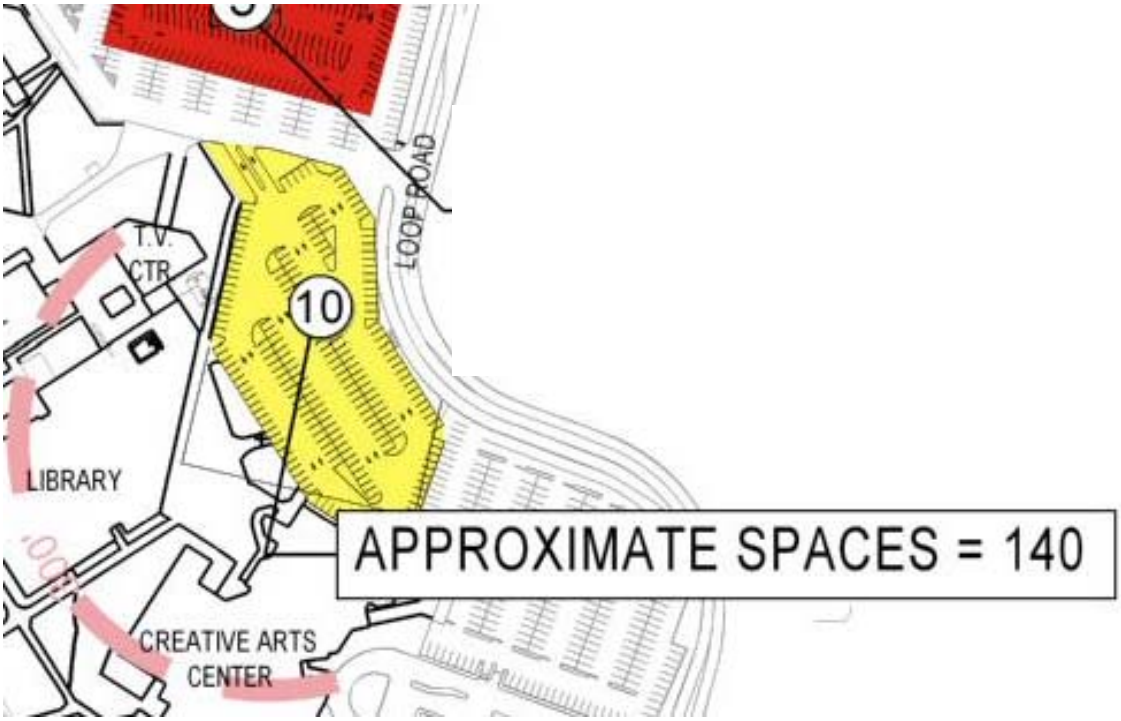
Source: Walker Parking Consultants

Figure 8: Alternatives #6 and #7



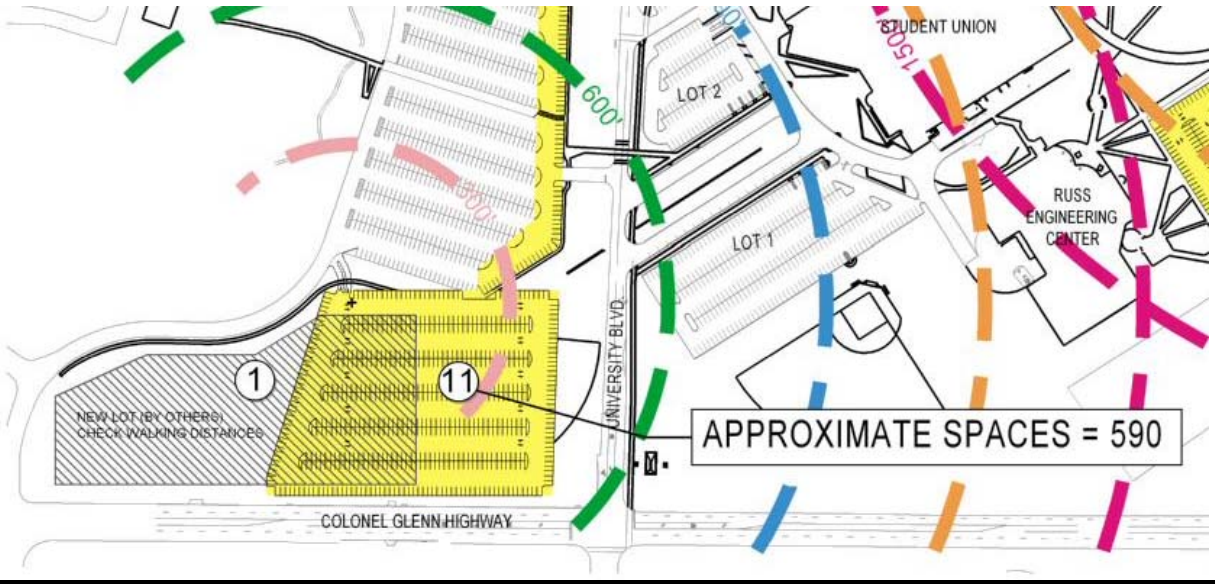
Source: Walker Parking Consultants

Figure 9: Alternative #10



Source: Walker Parking Consultants

Figure 10: Alternative #11



Source: Walker Parking Consultants

As noted in the Supply/Demand section of this study, we examined parking adequacy by area. The only area that is anticipated to have a parking supply deficit is the Main Campus Area. All other areas of the campus are predicted to maintain adequate parking throughout the next five and ten year periods.

The parking solutions presented assumes that the Master Plan will be implemented, which includes the loss of the Lot 13 and the relocation of University Boulevard. In addition to the changes in parking supply, the forecasted growth in the overall student and faculty/staff will impact the shortage of parking supply on the campus.

ALTERNATIVE DESCRIPTIONS

Alternative #1, Expansion to Lot 4 (Along Colonel Glenn Highway) - Construction of a new surface parking lot consisting of approximately 500 parking spaces. This improvement is an expansion to the southern portion of Lot 4. A major disadvantage to this expansion is the walking distance to the campus. The nearest University building is the Student Union Building, with a distance of approximately 1,200 feet. This represents an approximate five-minute walk, given good weather and a direct walk.

Estimated conceptual construction costs for comparison purposes only, for a new surface lot is approximately $2,200 per space, which equates to a total construction cost of $1.1 million (500 spaces x $2,200).

Alternative #2, Expansion to Lot 4 (Northwest corner), – This is a direct addition to the northwest corner of Lot 4. The addition has the potential to add approximately 280 parking spaces. Access to the area is through the existing Lot 4. This lot is very close to the Forest Lane Apartments and could be used by the residents.

Estimated conceptual construction costs for a new surface lot is approximately $2,200 per space, which equates to an approximate construction cost of $620,000.

Alternative #3, Expand Lot 11 – Expansion of the existing surface parking Lot 11 into the area directly across University Boulevard. This option would reduce green space in the area as well as require students to cross University Boulevard to reach their destination. We

estimate 145 spaces could be added to the system based on a two-bay parking addition.

Estimated conceptual construction costs for a new surface lot is approximately $2,200 per space, which equates to a total estimated construction cost of $320,000.

Alternative #4, Expand Lot 7B - Expand the surface parking Lot 7B into the area directly across Springwood Lane. This option would reduce the wooded area along Springwood Lane. It is our understanding that the area adjacent to this alternative may be developed into residential units in the future that will also impact the wooded area. We estimate 280 spaces could be added to the system based on a two bay parking addition along Springwood Lane.

Estimated conceptual construction costs for a new surface lot is approximately $2,200 per space, which equates to a total estimated construction cost of $620,000.

Alternative #5, Build Parking Deck on Lot 11 – Construction of a parking garage on a large portion of Lot 11. This alternative has the potential to provide a concentrated number of parking spaces conveniently located to the main campus. Preliminary drawings indicate that a typical level could accommodate approximately 190 vehicles. A downside to this alternative is that the garage would displace an estimated 325 existing parking spaces.

Estimated conceptual construction costs for a new parking structure is approximately $11,500 per space, which equates to a total estimated construction cost of $8.7 million. This would be for a four level structure with approximately 760 parking spaces. After subtracting the existing 325 surface parking spaces, the net gain is reduced to 435 parking spaces.

Alternative #6, Reconfigure Visitor Lot 16 – Based on changes in the surrounding building uses, the visitor parking can be significantly reduced in the short term and possibly eliminated within two years. By reducing the visitor parking supply to approximately 24 parking spaces, 54 parking spaces may be "re-designated" for either student or faculty use. (Current supply is 78 spaces - 24 visitor spaces = 54 parking spaces) This transfer of parking supply can be accomplished by signage and relocating bumper blocks (parking barriers) at minimal expense.

Alternative #7, Add new lot between Lots 16 and 17 – This option calls for the construction of surface parking between Lot 16 and Lot 17 on the current site of the Ohio Prairie grass field. By constructing a new separate surface lot at this location, we estimate the site has the potential to provide 220 new parking spaces.

If visitor parking in Lot 16 is eliminated and Lots 16 and 17 are combined with this new area, an even greater number of spaces may be gained. Under this scenario, we estimate that approximately 260 parking spaces could be added. This scenario is illustrated on the alternative map on page 30.

Estimated conceptual construction costs for a new surface lot and new layout is approximately $2,200 per added space, which equates to an estimated construction cost of $485,000.

Alternative #8, Increase Use of Remote Lot 20 – The current required users of remote lot 20 are resident freshmen. Based on occupancy counts, Lot 20 has the capacity to supply parking for a much broader user group. An inexpensive, although perhaps not popular, approach would be to require more students to park at the remote parking lot. Again, this approach is simple and utilizes the existing parking supply, however, this option may not be popular with the students that it will impact. Another option may be to provide an incentive to both students and faculty by offering the remote space at a discount.

Estimated costs to provide adequate transportation assets to handle the additional passenger volume, are based on providing larger capacity shuttles on Route 1. The current shuttle system utilizes 24 person shuttle buses. Costs are estimated to run about $10 per hour more than current rates for a larger capacity shuttle bus. This accounts for the reduced fuel economy, higher maintenance costs, and higher lease payment. Based on the current hours of operation, annual schedule, and number of buses, we estimate the annual increased operating cost to be about $87,000.

Alternative #9, Reconfigure Lot 4 – Reconfigure Lot 4 with end bay parking added to the east side of the parking lot. This reconfiguration has the potential to add approximately 57 parking spaces to the student parking supply. This addition, made by shortening each of the aisles by approximately 20 feet and using the space to add 90 degree parking stalls along the eastern edge of the parking lot. If Lot 4 were enlarged to accommodate the parking spaces in this area, the net gain would be approximately 140 parking spaces.

Costs to accomplish this reconfiguration would be minimal, as there are no concrete islands or barriers to relocate. One option is to seal coat and re-stripe the entire parking lot. Another option, as estimated, would involve seal coating and stripping only the changed area of the parking lot. This option is estimated, for conceptual purposes only, at about $11,200.

Alternative #10, Expansion to Lot 11 - Expand Lot 11 into the area leading to the library and Creative Arts Center. This option has the potential to add approximately 65 parking spaces to the system. A major benefit to this addition is the proximity to the campus. Because of the location, the additional spaces would be convenient for visitor parking.

Estimated conceptual construction costs for a new surface lot is approximately $2,300 per space, which equates to a total estimated construction cost of $149,500.

Alternative #11, Expansion to Lot 4; Relocate Athletic Field - Construction of a new surface parking lot consisting of approximately 590 parking spaces. This improvement is basically a twist on Alternative 1, with the expansion being closer to the campus, directly over an existing athletic field.

Estimated conceptual construction costs for comparison purposes only, for a new surface lot is approximately $2,200 per space, which equates to a total construction cost of $1.3 million (590 spaces x $2,200).

ALTERNATIVE COMPARISON

The following comparison of each of the alternatives includes evaluating added capacity, space width, type of change, cost, and number of displaced spaces. Costs are preliminary estimates only and not actual construction quotes. Cost estimates do not include soft costs or costs associated with relocating utilities, roadway improvements or unexpected problems with soils. Costs to redistribute the Visitor Lot 16 are considered minimal, and have already been completed, and thus are not calculated.

The following pages provide additional information to compare the alternatives. This includes a conceptual cost analysis based on the number of spaces as well as an estimated annual cost to maintain and or operate the new parking supply.

Table 18: Alternative Comparison

ID	Alternative	Space Width	New Spaces	Displaced Spaces[1]	Added Capacity	Cost Per Space[2]	Construction Cost[3]	Annual Cost of Operation[4]	Type
1	Expansion to Lot 4 (along Col Glenn HW)	9 foot	500	0	500	$2,200	$1,100,000	$25,000	Surface Parking
2	Expansion to Lot 4 (northwest corner)	9 foot	280	0	280	$2,200	$616,000	$14,000	Surface Parking
3	Expand lot 11	9 foot	145	0	145	$2,200	$319,000	$7,250	Surface Parking
4	Expand lot 7B	9 foot	280	0	280	$2,200	$616,000	$14,000	Surface Parking
5	Build deck on lot 11 site	9 foot	760	325	435	$11,500	$8,740,000	$249,750	Garage
6	Reconfigure visitor lot 16	9 foot	n/a	n/a	n/a	n/a	minimal	n/a	Transfer User Group[5]
7	Add lot next to visitor lot 16	9 foot	220	0	220	$2,200	$484,000	$11,000	Surface Parking
8	Increase use of remote lot 20	n/a	n/a	n/a	n/a	n/a	n/a	$87,000	Administrative[6]
9	Reconfigure lot 4	9 foot	140	83	57	$50.00	$11,200	$2,850	Reconfiguration[7]
10	Addition to Lot 11	9 foot	140	75	65	$2,300	$149,500	$3,250	Surface Parking
11	Addition to Lot 4; Relocate Athletic Field[8]	9 foot	590	0	590	$2,200	$1,298,000	$29,500	Surface Parking

[1] Spaces that are lost due to garage footprint.
[2] Preliminary conceptual cost estimate based Walker experience.
[3] Preliminary conceptual cost estimate based on number of added spaces.
[4] Surface Lot = $50 per space; Garage = $350 per space; Shuttle = $10/hour increase per shuttle hour for for 2 shuttles, 43 weeks x 71 hours per week x 2 buses.
[5] Visitor space supply would be reduced, while student or faculty/staff increase by 54 spaces.
[6] This would assign users to the remote parking lot by the University.
[7] Cost calculated at $50 per effected space to seal and re-stripe impacted area only. (rounded)
[8] Cost does not include cost to relocate the athletic field

Source: Walker Parking Consultants

WALKING DISTANCES

An important factor to consider in rating the alternatives is the relative walking distance from the lot to the destination. Walker has developed a Level of Service (LOS) rating system for evaluating appropriate walking distances.

Several factors impact the walking distance that a typical person will consider reasonable. These will vary with climate, covering, path of travel such as through a surface lot or through a parking structure, etc. LOS "A" is considered the best or ideal, LOS "B" is good, LOS "C" is average and LOS "D" is below average but minimally acceptable. A summary of walking distance by Level of Service is provided in the following table.

Table 19: Level of Service Conditions

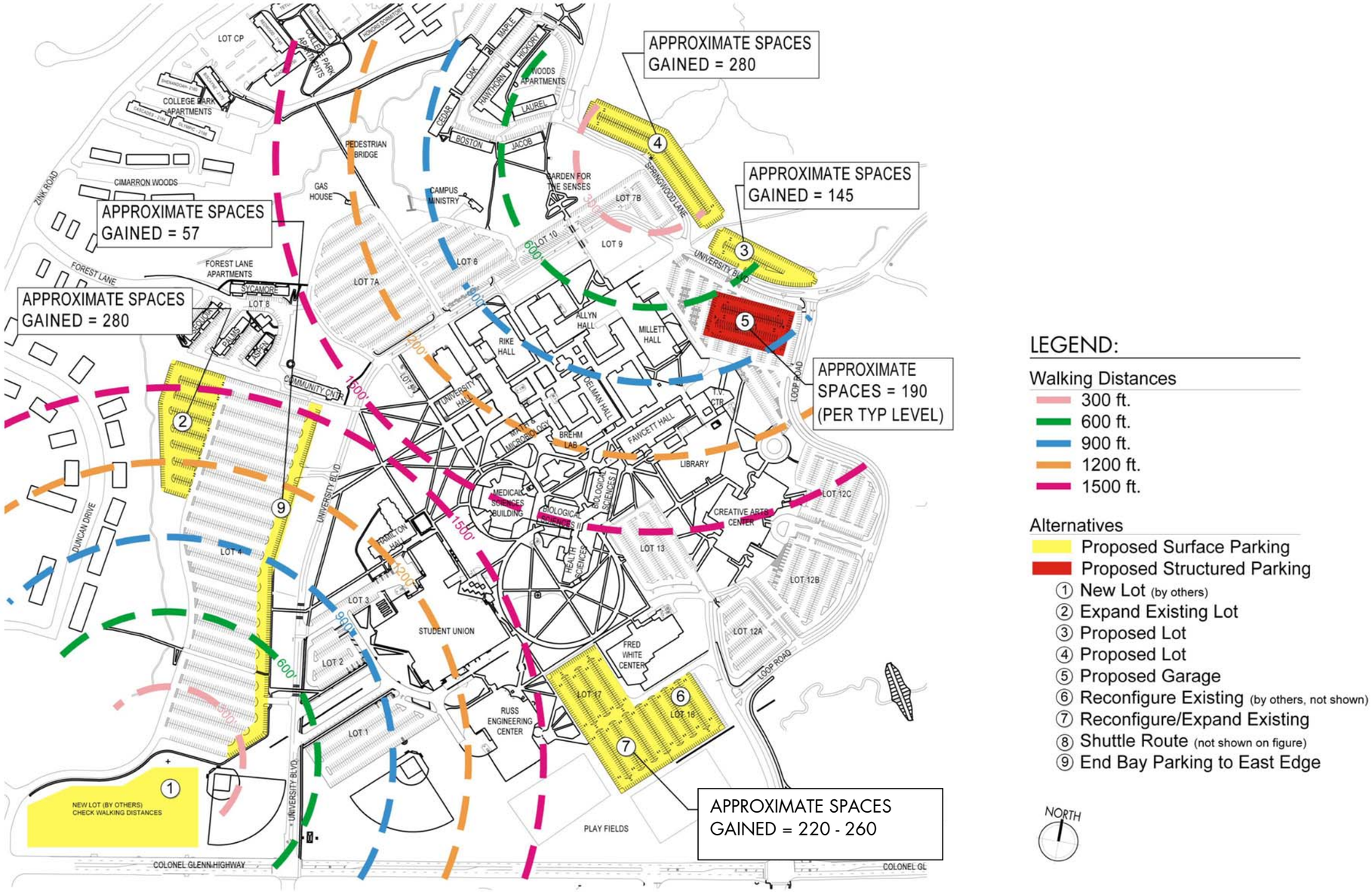
Level of Service Condictions	A	B	C	D
Climate Controlled	1,000 ft	2,400 ft	3,800 ft	5,200 ft
Outdoor/Covered	500	1,000	1,500	2,000
Outdoor/Uncovered	400	800	1,200	1,600
Through Surface Lot	350	700	1,050	1,400
Inside Parking Facility	300	600	900	1,200

Source: "How Far Should Parkers Have to Walk?", by Mary S. Smith and Thomas A. Butcher, *Parking* September 1994

Walker recommends providing a walking distance of not less than LOS "C" (average) to students of the Wright State University campus. Using the table above, it is suggested that to provide a walking distance LOS "C", the total walking distance should not exceed 1,050± feet from the destination door to the center of the parking facility.

The following map illustrates the walking distance from two of the furthest alternatives.

Figure 11: Walking Distances



RANKING OF THE ALTERNATIVES

The matrix shown in the following table evaluates the parking alternatives for WSU on the basis of nine criteria. A value of 5 = excellent, down to 1 = poor, have been awarded. Next, each criteria is weighted by assigning it points, the sum of which totals 100 points. These points have been reviewed by the University to be more consistent with their set of values. The criteria used to evaluate the alternatives are as follows:

Proximity to User Destination – This criterion considers the ability of each alternative site to accommodate a reasonable percentage of the unmet parking demand within an appropriate walking distance to a prospective site.

Conceptual Capital Cost – Estimated costs for construction of the alternative based on a reasonable per space conceptual cost estimate. This is intended to provide a relative cost within reasonable ranges and is not based on an actual estimate by a contractor.

Aesthetics – The compatibility of the alternative to blend in with the present and future campus environment.

Net Parking Space Gain – A measure of the number of parking spaces that are gained taking into consideration any spaces that are displaced in the construction process. This would account for existing spaces that are lost due to reconfiguration or construction on existing parking spaces.

Annual Cost/Added Space – The annual cost to own and operate the facility divided by the number of spaces added. The scores were assigned to each alternative based on the annual cost per added space with the most costly being 1 and the least costly being 5.

Security – The ability to safeguard the personal safety and property of potential users. The key to security is visibility; those facilities with the best internal and external visibility are ranked the highest. Surface lots provide good security, unless they are in remote locations, because of their lack of hiding places; however, high visibility from the activity centers in the campus is also a determining factor of security. Parking structures with flat levels above ground would be best from a security standpoint. Conversely, the more the facility is underground and/or the more complex the ramping system, the more difficult it is to provide security.

Construction Time – The time required to bring the alternative to fruition. This also includes the negative impact the construction may have on the existing parking supply during construction.

Pedestrian and Vehicular Access – This criterion involves the ability of vehicles and pedestrians to ingress/egress the parking facility without conflicting with existing and future pedestrian routes and traffic patterns.

Table 20: Ranking of Alternatives

Alt	Alternative	Proximity to User Destination	Estimated Capital Cost	Aesthetics	Net Parking Space Gain	Annual Operating Cost Per Space	Security	Construction Time	Future Versatility	Pedestrian and Vehicular Access	Un-Weighed Average Points	Un-Weighed Average Rank
Alt	Weight	25%	10%	20%	8%	3%	3%	3%	3%	25%		
1	Expansion to Lot 4 (along Col Glenn HW)	1	3	4	5	3	2	4	4	3	3.22	8
2	Expansion to Lot 4 (northwest corner)	2	3	4	5	4	2	4	4	2	3.33	7
3	Expand Lot 11	3	3	2	5	5	3	4	4	3	3.56	6
4	Expand lot 7B	3	3	3	5	5	3	4	4	3	3.67	4
5	Build deck on Lot 11 site	5	1	2	1	1	3	1	3	4	2.33	11
6	Reconfigure visitor Lot 16	5	5	5	5	5	4	5	5	4	4.78	1
7	Add lot next to visitor Lot 16	4	4	1	5	5	4	4	4	4	3.89	3
8	Increase use of remote Lot 20	1	3	5	5	1	2	4	4	2	3.00	10
9	Reconfigure Lot 4	4	5	4	5	5	4	5	4	4	4.44	2
10	Addition to Lot 11	5	3	2	4	3	5	4	4	3	3.67	4
11	Addition to Lot 4; Relocate Athletic Field	2	3	2	5	3	2	4	4	3	3.11	9

Scale

5 = Excellent
4 = Very Good
3 = Average
2 = Fair
1 = Poor

Source: Walker Parking Consultants

ALTERNATIVES RANKED

Based on our analysis and ranking of the alternatives, the first choice is the reconfiguration of the visitor parking in lot 16. In fact, this improvement was completed during the course of this study. Unfortunately the transfer of spaces will not satisfy the projected deficit. The alternatives, as ranked with estimated added parking supply and conceptual cost estimates, are detailed in the following table.

Table 21: Alternative Ranking

Rank	Alternative	Potential Added Capacity	Conceptual Construction Costs
1	Reconfigure visitor lot 16[1]	54	minimal
2	Reconfigure lot 4	57	$11,200
3	Add lot next to visitor lot 16	220	$484,000
4	Expand lot 7B	280	$616,000
5	Expand lot 11	145	$319,000
6	Build Deck on lot 11 site	435	$8,740,000
7	Expansion to Lot 4 (northwest corner)	280	$616,000
8	Expansion to Lot 4 (along Col Glenn HW)	500	$1,100,000
9	Increase use of remote lot 20	tbd	n/a
10	Addition to Lot 11	65	149,500
11	Addition to Lot 4; Relocate Athletic Field	590	1,298,000

[1] This is not added capacity, but a transfer from visitor to student or faculty/staff.

Source: Walker Parking Consultants

CONCLUSIONS AND RECOMMENDATIONS

The analyses of the current parking supply and demand indicate that the existing parking system is adequate throughout the campus, however the Main Campus Area is just barely adequate for students and faculty/staff.

Developments and anticipated student population growth within the next five years will decrease the parking supply in the Main Campus Area and push the adequacy for students and faulty/staff to negative levels. It is anticipated that the Main Campus Area will need to provide an additional ±533 parking spaces within the next five years to offset the impact of lost parking and to account for future growth on the campus.

Within the ten year planning horizon, the anticipated continued growth in the student population is forecasted to increase the number of parking spaces needed to ±736 in the Main Campus Area.

RECOMMENDATIONS

Based on the potential of each of the alternatives to increase the parking supply, and considering the number of parking spaces needed within five and ten years, we recommend implementing several of the alternatives. The top six alternatives are summarized in the following table along with the potential number of parking spaces that could be gained.

Table 22: Top Six Alternatives

Rank	Top Six Alternatives	Potential Added Capacity
1	Reconfigure visitor lot 16[1]	54
2	Reconfigure lot 4	57
3	Add lot next to visitor lot 16	220
4	Addition to Lot 11	65
5	Expand lot 7B	280
6	Expand lot 11	145
	Totals:	821

[1] This is not added capacity, but a transfer from visitor to student or faculty/staff.

Source: Walker Parking Consultants, Ranking of Alternatives

FIVE YEARS

As this report was being prepared, the first option, reconfiguring the Visitor Lot 16, has been accomplished, transferring parking supply from visitor to student user groups. This initial change satisfied 54 parking spaces of the recommended additional parking spaces in the Main Campus Area. By completing Alternatives #2 through #4 and #6, the five-year anticipated parking shortages would be addressed.

TEN YEARS

Within ten years, the required design capacity needed to provide adequate parking within the Main Campus Area is projected to increase to 736± parking spaces. These parking spaces should be designated for students and faculty/staff. If Alternatives #1 through #4 and #6 have been completed, completing the Alternative #5 will increase the total added parking supply to 821 parking spaces. If desired, the proposed expansion to Lot 7B and Addition to Lot 11 could easily be reduced to more closely match the desired parking supply level.

The following table shows the recommended alternatives and added parking capacity potential.

Table 23: Recommended Alternatives

Alternative	Rank	Added Spaces Within 5 Years	Added Spaces Within 10 Years
Reconfigure visitor lot 16	1	54	
Reconfigure lot 4	2	57	
Add lot next to visitor lot 16	3	220	
Addition to Lot 11	4	65	
Expand lot 7B	5		280
Expand lot 11	6	145	
Total Spaces:		541	280
Total Added Spaces:		821	

*Notes: The size of the expanded lots, 7B and 11, could be reduced to more closely match the total recommended parking supply increase.
Addition to Lot 11 is new lot across University Blvd.
Expand Lot 11 is in green space close to library and Lot 11.

Source: Walker Parking Consultants

FINAL OBSERVATIONS

The Wright State University campus will undergo significant change in the next 2 – 3 years. Within five years, one faculty/staff parking lot will be eliminated and several mixed-use lots will be reconfigured, resulting in the loss of approximately 200 parking spaces. Even without further growth in the student population, these parking spaces will need to be replaced. The obvious question is, where on the campus to replace them?

In determining the best location on the campus to construct the parking supply, we have provided our recommendations. It is clear that parking will be negatively impacted by the expansion of the Biological Science expansion and re-routing of the University Boulevard. Now is the time for the University to move forward and address the forthcoming parking supply deficit.

APPENDIX

APPENDIX

Parking Inventory Detail

Lot	Location	Commuter Students	Faculty/ Staff	Handicap	Reserved (Faculty)	Visitor	Resident Students	Commuter & Staff	Total Supply	Supply (1)
1	Main Campus	139	151	9					299	290
2	Main Campus			7	1	88			96	89
3	Main Campus		21	11	27				59	48
4	Main Campus	1,572	26	2	1	4			1,605	1,603
5	Main Campus			2	6				8	6
6	Main Campus		198	8	13	20			239	231
7	Main Campus	611	85	2					698	696
9	Main Campus		161	17					178	161
10	Main Campus	204							204	204
11	Main Campus	262	253	26	32	12			585	559
12	Main Campus	502	180	12	4				698	686
13	Main Campus		156	17	37				210	193
16	Main Campus	50	52						102	102
16V	Main Campus					78			78	78
17	Main Campus		171	7	4				182	175
Un/Blvd	Main Campus	27	64						91	91
Total -	*Main Campus*	*3,367*	*1,518*	*120*	*125*	*202*			*5,332*	*5,212*
18	Remote Lots	34	50	1	8				93	92
19	Remote Lots	65							65	65
20	Remote Lots		66	3	49		1,007		1,125	1,122
Total -	*Remote Lots*	*99*	*116*	*4*	*57*		*1,007*		*1,283*	*1,279*
8	Residential						130		130	130
CP	Residential						419		419	419
Honors	Residential						168		168	168
Village	Residential						152		152	152
Woods	Residential						421		421	421
Total -	*Residential*						*1,290*		*1,290*	*1,290*
NC1	Nutter Center							627	627	627
NC2	Nutter Center							449	449	449
NC3	Nutter Center							91	91	91
NC4	Nutter Center							70	70	70
NC5	Nutter Center							122	122	122
NC6	Nutter Center							122	122	122
NC7	Nutter Center							607	607	607
NC8	Nutter Center							817	817	817
NC9	Nutter Center							237	237	237
Total -	*Nutter Center*							*3,142*	*3,142*	*3,142*
Grand Total:		3,466	1,634	124	182	202	2,297	3,142	11,047	10,923

[1] Excludes ADA accessible parking spaces

APPENDIX

Effective Parking Supply Detail

Effective Supply Factor:		90%	90%	70%	70%	85%	90%	90%			
Lot	Location	Commuter Students	Faculty/ Staff	Handicap	Reserved (Faculty)	Visitor	Resident Students	Commuter & Staff	Total Supply	Effective Supply	Effective Supply (1)
1	Main Campus	139	151	9					299	267	261
2	Main Campus			7	1	88			96	80	76
3	Main Campus		21	11	27				59	46	38
4	Main Campus	1,572	26	2	1	4			1,605	1,444	1,442
5	Main Campus			2	6				8	6	4
6	Main Campus		198	8	13	20			239	210	204
7	Main Campus	611	85	2					698	628	626
9	Main Campus		161	17					178	157	145
10	Main Campus	204							204	184	184
11	Main Campus	262	253	26	32	12			585	514	496
12	Main Campus	502	180	12	4				698	625	617
13	Main Campus		156	17	37				210	178	166
16	Main Campus	50	52						102	92	92
16V	Main Campus					78			78	66	66
17	Main Campus		171	7	4				182	162	157
Un/Blvd	Main Campus	27	64						91	82	82
Total -	*Main Campus*	*3,367*	*1,518*	*120*	*125*	*202*			*5,332*	*4,741*	*4,656*
18	Remote Lots	34	50	1	8				93	82	81
19	Remote Lots	65							65	59	59
20	Remote Lots		66	3	49		1,007		1,125	1,002	1,000
Total -	*Remote Lots*	*99*	*116*	*4*	*57*		*1,007*		*1,283*	*1,143*	*1,140*
8	Residential						130		130	117	117
CP	Residential						419		419	377	377
Honors	Residential						168		168	151	151
Village	Residential						152		152	137	137
Woods	Residential						421		421	379	379
Total -	*Residential*						*1,290*		*1,290*	*1,161*	*1,161*
NC1	Nutter Center							627	627	564	564
NC2	Nutter Center							449	449	404	404
NC3	Nutter Center							91	91	82	82
NC4	Nutter Center							70	70	63	63
NC5	Nutter Center							122	122	110	110
NC6	Nutter Center							122	122	110	110
NC7	Nutter Center							607	607	546	546
NC8	Nutter Center							817	817	735	735
NC9	Nutter Center							237	237	213	213
Total -	*Nutter Center*							*3,142*	*3,142*	*2,827*	*2,827*
Grand Total:		3,466	1,634	124	182	202	2,297	3,142	11,047	9,872	9,784

[1] Excludes ADA accessible parking spaces

Occupancy by lot for Tuesday, May 25, 2004

Lot	Location	Capacity	8:00 AM	10:00 AM	12:00 PM	2:00 PM	4:00 PM	6:00 PM	8:00 PM	12:00 p.m. Occupancy
1	Main Campus	299	82	259	271	278	281	206	185	91%
2	Main Campus	96	8	30	51	69	77	44	52	53%
3	Main Campus	59	42	40	48	44	50	23	35	81%
4	Main Campus	1,605	202	580	1,028	869	672	323	217	64%
5	Main Campus	8	2	5	5	7	3	0	1	63%
6	Main Campus	239	50	163	179	199	197	136	154	75%
7	Main Campus	698	309	682	668	653	586	452	342	96%
9	Main Campus	178	106	162	166	160	138	124	82	93%
10	Main Campus	204	201	206	203	199	201	81	52	100%
11	Main Campus	585	491	580	568	577	549	527	390	97%
12	Main Campus	698	507	659	653	639	546	369	303	94%
13	Main Campus	210	189	202	183	196	178	163	105	87%
16	Main Campus	102	60	81	73	77	57	14	3	72%
16V	Main Campus	78	14	23	36	42	28	7	6	46%
17	Main Campus	182	124	160	158	159	134	98	95	87%
Un/Blvd	Main Campus	91	91	91	89	88	82	83	55	98%
Total -	*Main Campus*	5,332	2,478	3,923	4,379	4,256	3,779	2,650	2,077	82%
18	Remote Lots	93	57	54	47	70	46	7	4	51%
19	Remote Lots	65	0	0	1	0	0	4	0	2%
20	Remote Lots	1,125	301	363	349	314	245	227	200	31%
Total -	*Remote Lots*	1,283	358	417	397	384	291	238	204	31%
8	Residential	130	120	119	120	116	110	110	118	92%
CP	Residential	419	285	271	285	260	247	234	239	68%
Honors	Residential	168	139	141	149	129	132	130	122	89%
Village	Residential	152	88	63	63	63	74	77	80	41%
Woods	Residential	421	367	357	336	308	286	272	287	80%
Total -	*Residential*	1,290	999	951	953	876	849	823	846	74%
NC1	Nutter Center	627	53	57	47	49	35	17	4	7%
NC2	Nutter Center	449	0	0	0	0	0	0	0	0%
NC3	Nutter Center	91	4	6	5	4	3	1	1	5%
NC4	Nutter Center	70	0	2	2	3	2	2	1	3%
NC5	Nutter Center	122	8	10	11	4	2	1	1	9%
NC6	Nutter Center	122	4	4	2	0	1	1	0	2%
NC7	Nutter Center	607	0	1	1	0	0	0	0	0%
NC8	Nutter Center	817	0	1	0	5	10	3	1	0%
NC9	Nutter Center	237	94	72	134	98	74	82	60	57%
Total -	*Nutter Center*	3,142	163	153	202	163	127	107	68	6%
Grand Totals		*11,047*	*3,998*	*5,444*	*5,931*	*5,679*	*5,046*	*3,818*	*3,195*	

Occupancy by lot for Wednesday, September 15, 2004

Lot	Location	Capacity	10:00 AM	12:00 PM	12:00 p.m. Occupancy
1	Main Campus	299	263	285	95%
2	Main Campus	96	50	93	97%
3	Main Campus	59	44	48	81%
4	Main Campus	1,605	1,599	1,566	98%
5	Main Campus	8	6	4	50%
6	Main Campus	239	192	203	85%
7	Main Campus	698	696	681	98%
9	Main Campus	178	175	170	96%
10	Main Campus	204	172	193	95%
11	Main Campus	585	585	572	98%
12	Main Campus	698	680	685	98%
13	Main Campus	210	194	184	88%
16	Main Campus	156	69	74	47%
16V	Main Campus	24	22	22	92%
17	Main Campus	182	178	169	93%
Un/Blvd	Main Campus	91	93	88	97%
Total -	*Main Campus*	5,332	5,018	5,037	94%
18	Remote Lots	93	83	79	85%
19	Remote Lots	65	16	11	17%
20	Remote Lots	1,125	910	1,019	91%
Total -	*Remote Lots*	1,283	1,009	1,109	86%
8	Residential	130	128	127	98%
CP	Residential	419	333	330	79%
Honors	Residential	168	131	141	84%
Village	Residential	152	78	84	55%
Woods	Residential	421	377	352	84%
Total -	*Residential*	1,290	1,047	1,034	80%
NC1	Nutter Center	627	56	65	10%
NC2	Nutter Center	449	1	1	0%
NC3	Nutter Center	91	5	7	8%
NC4	Nutter Center	70	3	4	6%
NC5	Nutter Center	122	16	18	15%
NC6	Nutter Center	122	10	11	9%
NC7	Nutter Center	607	0	0	0%
NC8	Nutter Center	817	11	5	1%
NC9	Nutter Center	237	106	92	39%
Total -	*Nutter Center*	3,142	208	203	6%
Grand Totals		*11,047*	*7,282*	*7,383*	