APPENDIX B

PARKING & TRANSPORTATION

Report by VHB

1.0 Introduction

The long history of the Western Carolina University campus in Cullowhee has included changes to its transportation system that have been both gradual and dramatic. Over time, the automobile has become the dominant mode of travel for students, employees, and visitors. For decades, the automobile has provided safe, convenient, relatively affordable mobility in a predominantly non-urban setting. The car has been the obvious, and sometimes the only, choice for traveling to and from campus. Traffic congestion typically has been limited to brief periods at a few locations. Driving also has been good for getting around the campus and its sometimes challenging terrain. There is plenty of space for accessible and inexpensive surface parking.

With growing enrollment and expanding facilities, the need for additional, convenient parking spaces is going to conflict with available land and funding. Many desirable close-in parking spaces will be displaced by new or expanded facilities that generally attract more vehicle-trips, therefore requiring more parking. Locations for new lots that do not have excessive environmental impacts or high construction costs will be harder and harder to find, and will tend to be farther and farther from the core of campus. Many of these new lots will require shuttle service due to the distance involved, and people will be reluctant to pay as high a price for these parking spaces as for more convenient locations.

Already, the first parking deck on campus likely will be necessary within the next 10 years. The introduction of structured parking inevitably leads to higher parking fees, due to substantially higher construction, maintenance, and financing costs. Also, a deck constructed on an existing lot yields a reduced parking gain (and a higher cost/space), due to the loss of existing surface spaces. Yet if fees for deck permits are set too high, occupancy will be too low to generate necessary revenues.

As a result of these changes, Western Carolina University, like many comparable institutions, finds itself crossing into new territory with regard to the planning and management of its transportation and parking resources. A much more active role will be required, with ongoing monitoring and data collection, and making a wide array of travel options available to customers. Costs will inevitably rise, but at the same time, alternatives that had not previously seemed practical or necessary will start to seem much more reasonable.

Although parking is not the only aspect of these upcoming changes, it is the most obvious and manageable. Parking policy, location, and pricing directly or indirectly influence most individual travel choices; parking therefore affects all other travel modes on campus, both through infrastructure and operations.

Western Carolina University must continue to provide safe and convenient access, circulation, and parking while dealing with the loss of existing parking capacity. Realization of the long-term Campus Master Plan must consider more than just the capital investments leading to an “ultimate” end-state design. Effective management of transportation and parking during the interim stages of plan implementation (often lengthy and unpredictable periods) is just as important.

Critical issues to be considered include project phasing and staging, revenue streams, life-cycle costing (including operations, maintenance, financing, and opportunity costs), temporary parking spaces, and construction site management, just to name a few. Since many of these factors are difficult to predict with any reliability beyond a limited time horizon, effective tools and strategies consistent with the Campus Master Plan vision must be in place before implementation advances. Fortunately, most of these parking and transportation demand management strategies promote fiscal sustainability, for students and employees, as well as for the University and the taxpaying public. At the same time, they also promote environmental sustainability, and can be incorporated into the regional planning context of integrated pedestrian, bicycle, transit, and roadway systems.

Today, the campus could be described as “automobile-oriented,” largely because the demand for on-campus parking is satisfied by an adequate supply of parking spaces available at affordable prices. Western Carolina University’s ability to meet its campus parking demand is directly linked to the amount of surface parking spaces available on campus. Given the lack of suitable land

available for future inexpensive surface lots in convenient, accessible locations, this model will become increasingly difficult to sustain. Adding or replacing a significant number of parking spaces will require either construction of parking structures, or the use of remote, off-campus park-and-ride lots with the additional costs for shuttles and security. Combined with anticipated increases in the cost of owning and operating a car (as well as the cost of attending college), a new balance must be found between parking supply and demand.

A guiding tenant in the transportation planning for this Campus Master Plan has been to maximize the effective use of existing infrastructure capacity before committing to long-term investment in new transportation facilities or services. This approach is consistent with fiscal and social responsibility as well as environmental sustainability. Traditionally, much transportation planning has consisted of trying to identify travelers' desires, and then satisfy them by increasing capacity. This approach is no longer sustainable from physical and fiscal perspectives. The more resources that are devoted to a single mode of travel, the fewer resources are available to support and promote alternate modes. While this may not be a problem when conditions are constant, such a system can be very unstable, and possibly more susceptible to sudden, unanticipated failure. A balanced system is more robust, more adaptable to changing and unexpected conditions, and more stable.

There is another important transition facing Western Carolina University as it goes about planning and managing to meet its transportation needs—to an even greater degree, these needs are not confined to the campus. The decision to drive depends on many factors outside the University's control. Transportation and land use decisions made (or not made) by other entities influence the transportation needs that the University must address. Complicating the challenge at WCU is its location in an unincorporated area, eliminating a key partner for addressing these issues.

At the same time, increased competition for shrinking budgets limits the steps any entity can take to address growing transportation needs. Only by working collaboratively across jurisdictional and institutional boundaries can any of these groups hope to succeed. The University is uniquely situated to take the lead in working with local and state governments, community groups, and the private sector to develop innovative, cooperative solutions, such as teaming on grant applications, lobbying for transportation improvements, and developing appropriate public-private projects.

To address the challenges ahead, steps should be underway already to institute a comprehensive travel demand management (TDM) program. Such a program encompasses a set of coordinated incentives and disincentives – carrots and sticks – designed to provide attractive, affordable alternatives to driving a single-occupant vehicle to or on campus. The key to a successful TDM program is the creation of an environment in which the true cost of various transportation choices are made obvious, so that rational decisions by individuals result in desirable outcomes. These outcomes can include reduced travel expenses by individuals, lower infrastructure costs, preservation of limited campus land resources, benefits to the environment, and enhanced sustainability.

The transportation recommendations summarized in this report were developed as part of the Campus Master Plan with the intent of creating an efficient, resilient, and adaptable framework for dealing with a changing campus and an uncertain future. Emphasis is placed on staged implementation that maintains the functionality and livability of campus throughout all stages of implementation.

2.0 Existing Transportation Conditions

Campus Commuter Market

Geographic distribution of potential commuters is a critical factor in determining the transportation needs of a major college campus. Residential location is the most important information, since this determines the distance and direction traveled, likely routes followed, and the number and density of trips generated from a particular location. Knowing University affiliation (employee or student) is the most valuable distinction, although part-time/full-time status, graduate/undergraduate status, and class standing can also be helpful variables.

From this data, it is possible to identify likely commuter markets, which in turn can be used to help plan roadway improvements, transit service enhancements, bicycle and pedestrian facilities, rideshare programs, and other policies and investments. The more detailed our knowledge of relevant commuter characteristics, the more reliably we can forecast future travel and parking demands, and the more accurately we can predict the outcomes of various travel alternatives, such as ridesharing, bicycling, or bus patronage.

Western Carolina University students and employees were asked to complete a survey on transportation and commuting as part of the Campus Master Plan process. Over 800 responses to the survey were received, for a response rate of about 7 percent of the total campus population. Detailed, question-by-question results of the survey are included in the appendix. Based on the survey of commuting students and employees, approximately 95 percent of all campus commutes are via car – 85 percent driving alone and 10 percent carpooling. It is not surprising that the automobile is the dominant access mode considering (a) the distribution of residences (depicted in Figure 2-Figure 5); (b) the primarily low-density development in the region; (c) the availability of relatively convenient, affordable parking; and (d) the lack of reasonable alternatives to commuting by car.

There are, however, opportunities to shift to modes other than the automobile, particularly for commuting students. According to the survey, 37 percent of commuting students live within one mile, as shown in Figure 1. This means over one-third of commuting students live within a reasonable walking distance of campus. Based on survey responses, over 50 percent of commuting students live within two miles of campus. Thus, over half of all commuting students are within a reasonable distance to bicycle or walk to campus, and could be easily served with frequent transit for daily commuting or as an option for foul-weather days. The ability for employees to walk, bicycle, or take a bus to campus is more challenging, as only 12 percent live within two miles and 28 percent live within five miles; however, there are clusters of employee residences that create good opportunities for ridesharing (i.e. carpooling or vanpooling).

Figure 1 – Employee and Commuting Student Distance to Campus

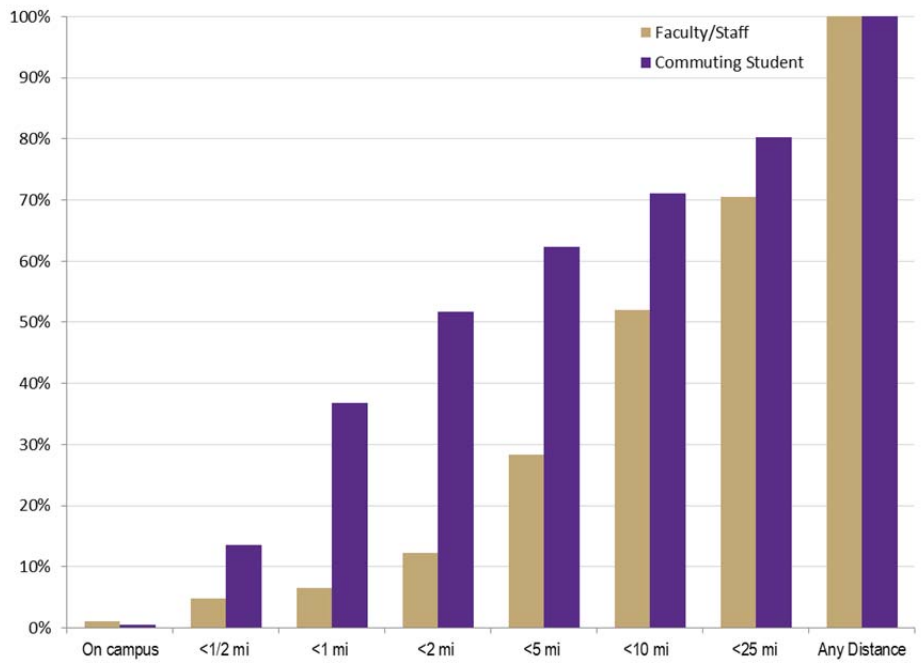


Figure 2 and Figure 3 are graphic representations of WCU employee residential locations, geocoded from address data received from the University.

Figure 2 depicts the general density and distribution of the bulk of employee residences. The greatest concentration of residences is immediately adjacent to campus in Cullowhee and in surrounding communities, such as Forest Hills, Webster, and Sylva. Figure 2 helps identify potential markets for local bus service, bicycling, walking, and ridesharing, though the weather and terrain can be challenging for some of these modes. Due to the rural nature of the area, the residential locations are fairly dispersed, though many of the residences are clustered around NC 107.

Figure 3 shows a regional view extending out to include Asheville, Franklin, Waynesville, and other communities. A series of concentric rings at 5-mile intervals from the center of campus are added to help display relative distances. From this figure, we can get an idea of the potential market for (and feasibility of) travel options such as ridesharing, express bus service, and park-and-ride lots.

Figure 2 - WCU Employee Residential Concentrations (Local)

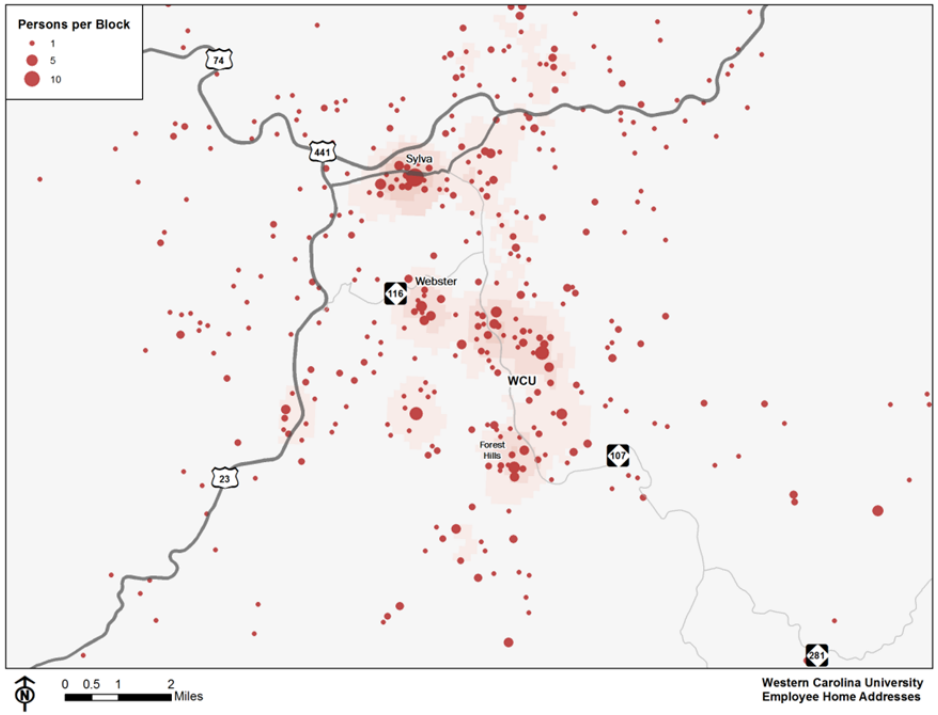
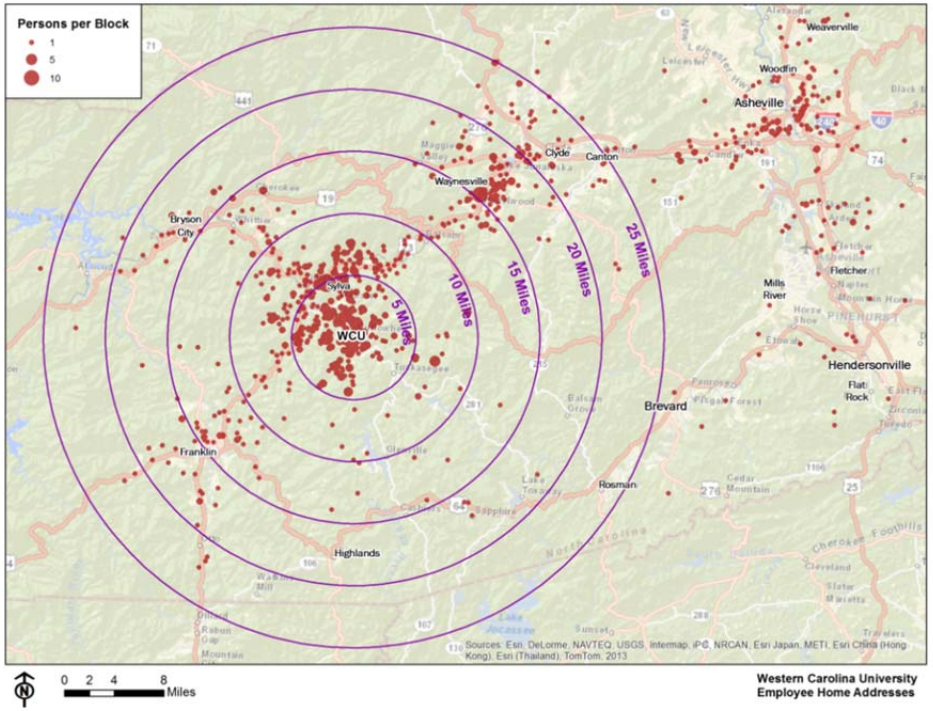


Figure 3 – WCU Employee Residential Concentrations (Regional)



The next two figures present similar residential location data for WCU students, again geocoded from address data received from the University. Since the data received from the University is a mix of local and permanent addresses and students tend not to live as far away as employees, a regional view is not included.

Figure 4 shows the same view as Figure 2, at the same scale, but with student residential locations. Relative to employee residences, the increased concentration of student residences immediately surrounding campus is obvious. Figure 5 shows an even more detailed view of the area within about two miles of campus.

Figure 4 - WCU Student Residential Concentrations (Local)

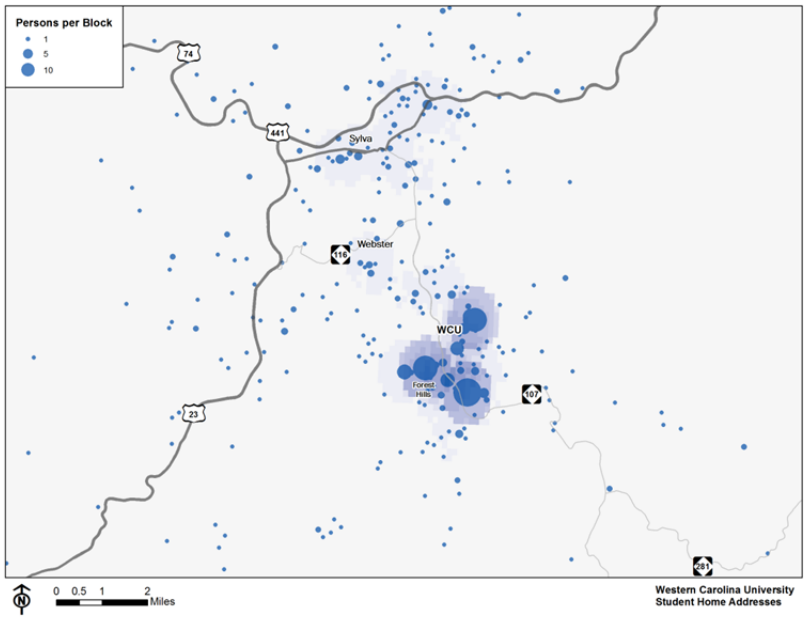
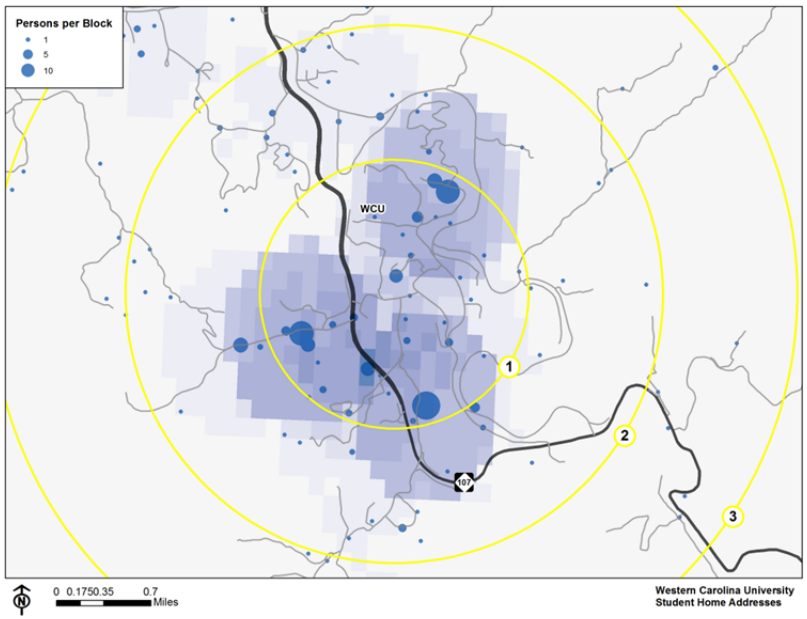


Figure 5 - WCU Student Residential Concentrations (Campus Vicinity)



External Road Network and Campus Gateways

NC 107

The primary access route to the Western Carolina University campus is NC 107, a four-lane expressway with partial access control. This Principal Arterial provides north-south connectivity between US 23/74 in Sylva, and US 64 in Cashiers.

Most traffic on NC 107 is oriented northward from the WCU campus. Volumes south of the campus (8,900 vehicles/day in 2012) are only about 60 percent of those to the north (17,000 vehicles/day in 2012), and this disparity has been slowly increasing over the last 10 to 15 years. Historically, traffic volumes along this portion of NC 107 correlate more closely with Jackson County population trends than with WCU enrollment. As such, volumes grew slowly between 1999 and 2007, before increasing dramatically in 2008 (from 14,000 vpd to 19,000 vpd). Traffic volumes then dropped again, bottoming out at 13,000 vpd in 2011, before increasing to 17,000 vpd in 2012.

There are no sidewalks along NC 107, and its high speeds and wide cross-section present a significant barrier to pedestrian travel. Two grade-separated pedestrian/bicycle crossings serve the WCU campus: a tunnel in the vicinity of the NCCAT facility and the Catamount Softball Complex, and an overpass immediately south of Little Savannah Road.

Bicycle lanes are present along this portion of NC 107; however, long grades, high traffic speeds, and a lack of connecting bicycle facilities serving major trip generators discourage more frequent use of this roadway by cyclists.

NC 107 serves several important WCU campus “gateways,” including the main entrance at Centennial Drive:

- Centennial Drive, the main campus entrance
- Little Savannah Road (SR 1367), connecting to West Campus and the new HHS facility
- Forest Hills Road (SR 1330), the southern entrance serving major athletic facilities and remote parking

While generally functioning at an acceptable level, the configuration of the Centennial Drive intersection severely limits potential for significant improvements to handle higher traffic and pedestrian volumes more safely and efficiently. The connection with Blackhawk Road/NCCAT Drive to the east is only about 50 feet long, allowing for the storage of only two cars, and requiring most traffic to negotiate two 90-degree turns in less than 100 feet. On the other side, Centennial Drive intersects at a skewed angle, on a significant grade. Less than 200 usable feet are available between NC 107 and the roundabout for vehicle storage; already, vehicle queues frequently extend beyond this limit during the PM peak.

Construction of new apartment complexes immediately west of this intersection raise concerns about additional pedestrian crossings and vehicular traffic. NCDOT recently has added sidewalks to the south side of the cross street, and plans to further modify the signal and intersection to enhance pedestrian safety.

Old Cullowhee Road (SR 1002)

Prior to construction of NC 107, Old Cullowhee Road was the primary route for reaching WCU, as reflected by the orientation of original campus buildings and roads. As on NC 107, traffic volumes on this road drop substantially south of Central Drive, the old campus entrance. In 2012, this rural two-lane Major Collector carried about 4,900 vpd north of Central Drive, and 1,000 vpd to the south. These volumes have remained relatively consistent over the past decade, dropping from their 2008 peaks of 5,500 vpd and 1,700 vpd, respectively. Historically, volumes on Old Cullowhee Road north of WCU have generally been about one-third of corresponding volumes on NC 107, although this ratio has been dropping slightly.

Old Cullowhee Road has a somewhat winding and hilly alignment, and is relatively narrow, with little or no paved shoulders. In the vicinity of the Tuckaseigee River and the WCU entrance, there are numerous driveways and some non-standard intersection configurations. The road lacks sidewalks, although worn footpaths indicate pedestrian activity to the north of Central Drive. NCDOT has programmed the existing bridge for replacement, and as part of that project (B-4159), a segment of Old Cullowhee Road and portions of several intersecting roads will be realigned and improved. Sidewalks will be installed along the west side of the project, and on both sides of the bridge. WCU is assuming responsibility for maintaining the new sidewalk connecting Central Drive with the southern terminus of the bridge project.

Little Savannah Road (SR 1367)

This winding, hilly local road ultimately connects with NC 116 to the northwest, and provides the only access to the Jackson County Airport. It also serves the Health and Human Sciences Building (HHS), the first facility completed on the West Campus as part of the Millennial Initiative. In 2012, daily traffic volumes at the eastern end of Little Savannah Road were 7,700 vpd. Historically, these volumes have tracked fairly consistently at about 45 percent of volumes on NC 107 to the north.

In response to construction of University-related apartments, completion of the HHS building, and in anticipation of further development, NCDOT recently constructed a sidewalk along the southern side of Little Savannah Road, ultimately extending from NC 107 westward to the HHS parking area.

On-Campus Roadways

The roadway network on the WCU campus has evolved over time to meet contemporary needs. However, the ultimate magnitude and direction of campus growth was not anticipated, particularly the dramatic changes triggered by construction of NC 107. Combined with constraints presented by steep topography, streams and watersheds, and other sensitive areas, the result is a confusing and somewhat inefficient road system that lacks a clear hierarchy or logical organization. Many routes are indirect and non-intuitive, with roads changing directions and/or names unexpectedly. Roadway cross-sections are not consistent, and wayfinding can be difficult, especially for campus visitors.

Several roadways are lined with perpendicular or angled parking on one or both sides; in some cases, the distinction between road and parking lot is

unclear, with cars, buses, service/delivery vehicles, pedestrians, and bicycles all sharing the same pavement.

The segment of Centennial Drive just south of the Central Drive intersection generates numerous conflicts. Pedestrian and traffic volumes are among the heaviest on campus, and the retail establishments generate high parking turnover, with many vehicles turning left across traffic to park, and all vehicles required to back into/across a busy travel lane to exit. Pedestrians cross at various locations, often emerging unexpectedly from between parked cars. Turning traffic entering/exiting Killian Building Lane adds to the confusion.

Although less extreme, similar conditions exist along longer segments of Memorial Drive and Norton Road, and all along Killian Building Lane. Lots 40, 35, and 34 are especially problematic in this regard. Several other parking lots are used as through routes by pedestrians and automobiles, including Lots 18A, 19B, 51, and 52.

The roads on Upper Campus present their own particular set of challenges. Dating back to some of the earliest days of the campus, these steep, winding narrow roads generally include several sharply angled intersections, and one-way travel restrictions that especially affect truck access and bus routing. These roads are not conducive to bicycle travel, and while sidewalks are limited, pedestrian crossings are numerous and sometimes unexpected.

Another challenge facing the on-campus roadway network is the need for off-campus traffic to use it for traveling east and west. Residents of Cullowhee and surrounding Jackson County generate a significant amount of travel between Old NC 107 (Old Cullowhee Road) and new NC 107. The distance between the northern and southern intersections of Old NC 107 and new NC 107 is approximately five miles. The only other connections between these two roads pass through the WCU campus, requiring travel on Central and Centennial Drives, at a minimum. Memorial Drive and Forest Hills Road may also be used for portions of such trips. This unavoidable need for travel through campus complicates efforts to reduce traffic and its associated impacts.

Transit

Jackson County Transit

Jackson County Transit provides local transit service within Jackson County, which includes trips between Cullowhee and surrounding locations for $3 with a 24-hour notice required. JCT also offers limited scheduled service from WCU to Asheville and Asheville Airport for $23 and $28, respectively. At one time, WCU contracted with Jackson County Transit to provide limited service to some residential and retail areas, but funding for this service was discontinued.

Campus Shuttle

The Catamount On-Campus Transportation System (CAT-TRAN) is operated through the University Police and funded with a $96 annual student fee (2013-2014 academic year). CAT-TRAN operates five fixed routes on weekdays during the academic year and one on Sunday evenings—three of the routes serve campus and two serve off-campus apartments. The All Campus Route operates from 7:30 a.m. until 2 a.m. Monday through Thursday, 7:30 a.m. until 11 p.m. on Friday, and 5 p.m. until 2 a.m. on Sunday. The Health & Human Sciences Route operates Monday through Friday from 7:30 a.m. until 9 p.m. The Village Express Route operates Monday through Friday from 8 a.m. until 5 p.m. The two off campus apartment routes (previously served by Jackson County Transit) operate Monday through Friday from 7:30 a.m. until 4 p.m. All routes are fare-free for WCU students, staff, and faculty.

Estimated ridership from a typical weekday during the fall 2012 semester is 2,000 trips per day, or approximately 31 passengers per service hour. The average was lowered by the two off campus routes, which averaged approximately seven passengers per service hour, while the on campus routes averaged 34 passengers per service hour. Figure 6 shows a comparison of average daily route ridership by line thickness. This metric is on the low end compared to similar university transit services, which typically range between 20 and 100 passengers per service hour. This variation is a product of specific conditions, such as total miles traveled, number of vehicles and routes, competing service agencies, or hospital/research campus ridership.

While the on-campus routes appear relatively efficient and cost-effective, the off-campus routes are far more expensive in terms of cost per passenger, making justification difficult in a budget-constrained environment. The large supply of low-cost parking on campus creates little incentive to use the bus.

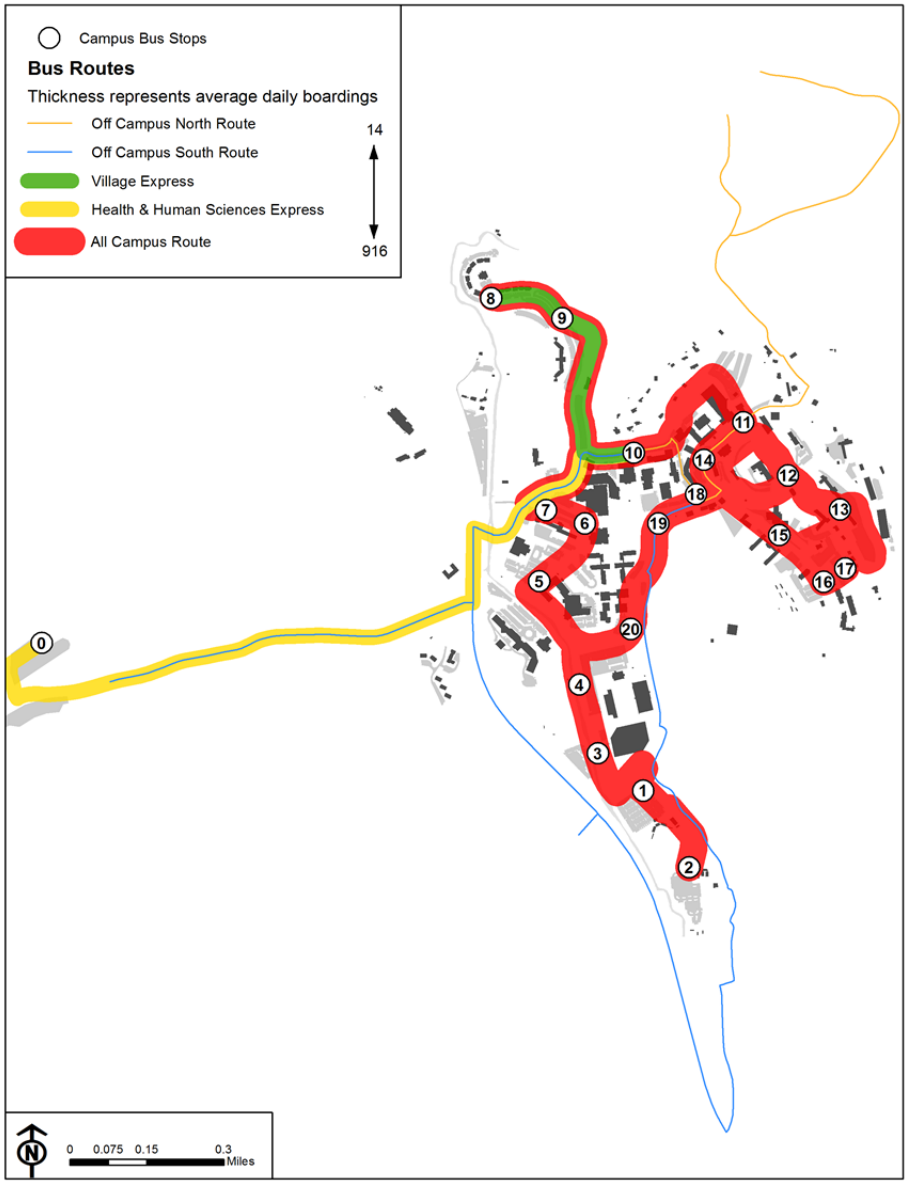
Due in large part to the terrain, CAT-TRAN bus routes may seem, at first glance, to be unusually long, convoluted, and redundant. The narrow lanes, steep grades, and tight turns of older portions of the road network (particular on the Upper Campus) restrict the size and maneuverability of buses. Combined with one-way segments, these factors prevent some routes from running in both directions, increasing travel times. Given the length of most routes, a short arrival trip can require a far longer return trip, an inconvenience that discourages consistent ridership.

In a similar vein, many existing bus stops appear to be unnecessarily close together, typically far less than a five-minute walk from each other. This could be justified with more frequent bus service, but in this case they add significant delays that lengthen bus trips. Without more detailed data on passenger boarding and alighting (by route, stop, time-of-day, and day-of-week), it is difficult to perform a detailed analysis to optimize routes and stops.

Deficiencies in the continuity, convenience, and coverage of the pedestrian network also contribute to the route-and-stop issues described above. Some routing and stop location decisions are necessitated by limited pedestrian connectivity. Better walk connections would make longer walks feasible, reducing the need for some stops and shortening some routes.

Finally, CAT-TRAN shuttle stops do not have consistent signage, shelters, and other amenities. Some locations are less than ideal for passenger capacity, comfort, and safety.

Figure 6 – Route Ridership Comparison



Pedestrian and Bicycle Facilities

There are few dedicated pedestrian or bicycle facilities in the area immediately surrounding the WCU campus suitable for commuting or other transportation needs. In fact, with the exception of the few instances described earlier, many roads are highly unsuited to pedestrian and bicycle travel, due to lack of shoulders, narrow travel lanes, steep grades, curvy alignments, and poor sight distances.

The Jackson County greenway system eventually is planned to extend southward along the Tuckaseigee River, then westward along Cullowhee Creek to the northwestern corner of campus, between The Village and NC 107.

While there are numerous sidewalks and crushed-rock trails on campus, there are also some specific and systemic deficiencies. Many of these deficiencies can be attributed – directly or indirectly – to natural features such as steep slopes and streams, which limit options for pathways that are direct, level, and cost-effective to construct and maintain.

Lacking suitable alternative routes, many pedestrians (and some bicyclists) weave their way through parking lots. In some cases (such as Killian Building Lane and Memorial Drive), these parking lots also serve as streets, carrying through traffic and buses in addition to parking vehicles. Numerous conflicts result, compounding the confusion generated by ambiguous paths and rights-of-way. As well as being visually unattractive, such situations are unsafe and uncomfortable for pedestrians and cyclists.

As on most campuses, the safety of pedestrian crossings is a significant concern. This concern embraces both designated crosswalks and uncontrolled crossing. Locations cited as being potentially dangerous include:

- Centennial Drive between Killian Building Drive and Central Drive
- Centennial Drive at University Way
- Centennial Drive in the vicinity of Forest Hills Road and parking lots immediately to the west
- Central Drive in the vicinity of Lots 54 and 63
- Memorial Drive at Norton Road
- Memorial Drive in the vicinity of Lots 19 and 20

Also identified as dangerous due to a lack of adequate sidewalks are Buzzard's Roost Road beside the library, and Central Drive between the campus entrance and Buzzard Roost Road

Some other general shortcomings of the campus pedestrian and bicycle systems include:

- Lack of continuity and consistency in facilities
- Steep grades and frequent stairways
- Indirect routing
- Limited wayfinding
- Inadequate lighting
- Lack of buffer between pedestrians and traffic for most sidewalks along streets
- Lack of dedicated bicycle routes, lanes, and paths
- Some maintenance needs and substandard facilities

ADA accessibility is also a significant concern on campus, a challenge exacerbated by the changes in elevation and the age of some facilities.

A multi-use recreational trail system recently was completed on West Campus, but this facility does not serve a transportation need.

Bicycle amenities are limited. Racks for bicycle parking are generally available, and appear to be used. Chaining of bicycles to objects other than racks does not appear to be widespread.

A "yellow-bike" bike-sharing program was initiated at WCU several years ago. After some initial success, participation dwindled, and the program was abandoned. Anecdotal explanations for the program's failure include a lack of adequate paths and lanes; difficult terrain and weather; poor bike quality and maintenance; inadequate marketing and education; and mistreatment of bikes due to lack of "ownership" or accountability.

Parking

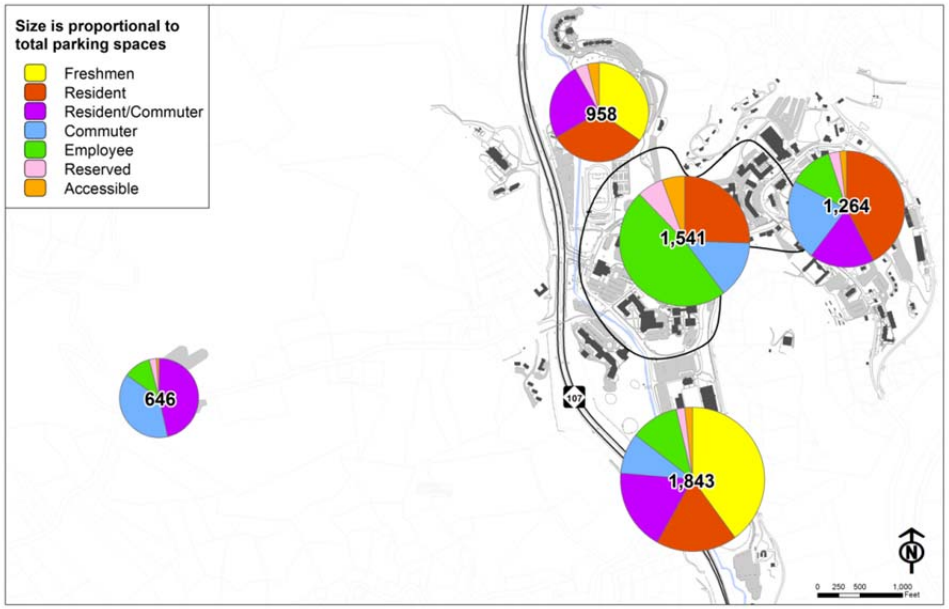
Travel by personal automobile is the dominant mode for the WCU campus, so the location and availability of parking is a primary concern. Based on consultant observations and conversations with University staff, there are several perimeter lots that are underutilized. However, vehicular occupancy counts would need to be conducted to determine more precisely where vehicle demand is highest and where opportunities exist to improve utilization of the current supply. Parking occupancy rates represent the parking demand of the campus population, given the amount of parking supply that is offered.

The ideal parking system from a user's perspective would be (a) inexpensive, (b) convenient to destinations, and (c) plentiful enough to guarantee an available space at any time. The reality is that any parking system makes trade-offs among these desired conditions, and the best possible outcomes achieve only two of the three goals.

Supply

The precise number of spaces available for parking on a campus is rarely fixed; construction and other activities can eliminate spaces from use, temporarily or permanently, and policy changes can shift spaces from one category to another. For this study, a parking supply of 6,253 spaces is used. Figure 7 shows the distribution of parking spaces by user group for different sections of campus.

Figure 7 – Existing Parking by User Group by Campus Location



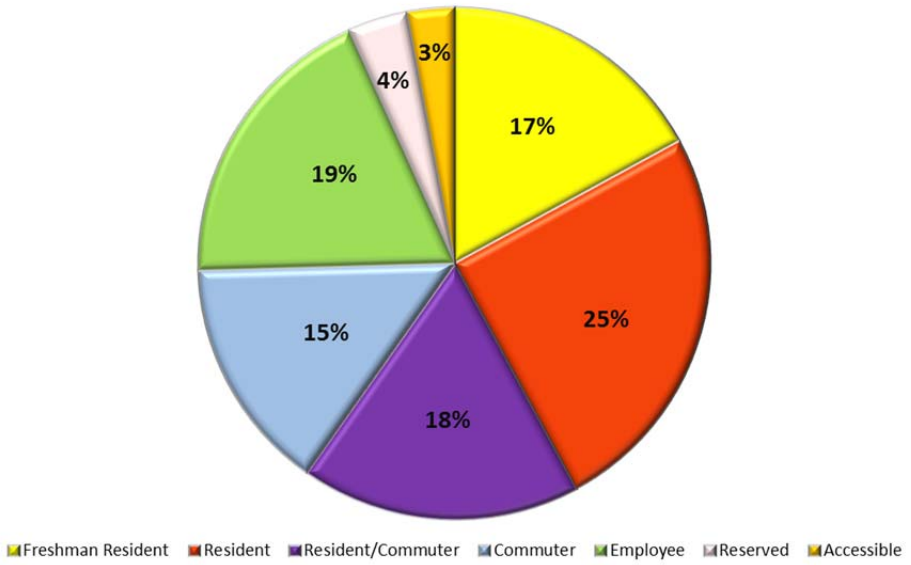
The number of resident students can fluctuate greatly between campuses, depending on policies regarding on-campus housing and parking privileges. Therefore, the resident student share of parking varies greatly from campus to campus. At WCU, resident students comprise the largest population group, with 62 percent of students living on campus. Resident parking represents 42 percent to 60 percent of total supply, depending on allocation of shared resident/commuter parking, as shown in Figure 8, which displays the overall distribution of parking spaces by user group. Unlike many schools, commuting students at WCU comprise only 38 percent of the population. Commuting parking represents 15 percent to 33 percent of the total supply, depending on allocation of shared resident/commuter parking. Commuter parking spaces have a higher turnover rate than resident parking spaces, typically enabling a university to sell significantly more commuter permits than there are parking spaces for commuters. Commuter parking oversell rates of two permits per one parking space are not uncommon. Resident parking, on the other hand, is typically sold at a rate much closer to one permit per parking space. Thus, with a higher percentage of resident parking on campus, the effective parking

supply at WCU (i.e. the number of permits than can be sold) is lower as a proportion of total parking spaces than a university with a large commuting population.

Although employees constitute a relatively small percentage of the total campus population, employee parking is usually perceived as an important part of employee satisfaction, and a significant amount of total parking inventory is usually reserved for employees. On some campuses, this goal is accomplished by allowing employees to park in student zones (cross-parking). At WCU, employees represent about 13 percent of the total campus population, while parking allocated to employees represents about 19 percent of the total parking supply.

On most campuses, between five and 10 percent of campus parking supply is typically reserved for other uses, such as service vehicles, special accessibility needs, visitors, or meters. WCU currently reserves seven percent of its inventory for reserved and accessible parking spaces.

Figure 8 – Overall Existing Parking Allocation by User Group



Occupancy Rates and Other Utilization Data

Parking occupancy counts for WCU were not available. Although not critical when parking is plentiful and permit systems are simple, such data becomes more important as a campus grows. Parking supplies become more constrained, and ever more expensive to increase, creating a need to actively manage parking operations. This requires accurate and timely data on parking utilization and turnover by lot, user group, time-of-day, and day-of week. Such information can help monitor the effectiveness of various policies, identify needs and surpluses, and determine appropriate parking fees based on market demand. Such data would have been valuable for this study, quantifying anecdotal and observational evidence that remote lots are underutilized, for example. Another useful application would be to understand the degree to which residential permit holders displace commuter parking in shared Residential/Commuter lots.

Permit Price

Parking permit price contributes to parking demand. The use of permit price as a parking demand control can be effective for universities looking to maximize the utilization of proximate or low-occupancy parking spaces. This approach requires hand-on operations to ensure that permit oversell rates do not produce occupancy counts exceeding 95 percent in the field.

The price of a standard WCU parking permit for all users (except motorcycle permits at $32 per year) is $96 per year for the 2013-2014 academic year. This represents an increase of $12 from last year's permit price. Visitors may obtain a free parking permit for the day, which allows them to park in any general use student or faculty/staff parking space.

Permit Oversell Rates

Permit oversell rate is the ratio of total permits issued for a particular user group compared to the total number of spaces available for that user group, or simply the permits sold divided by the number of spaces. The key to maximizing a parking system capacity (obtaining 90 to 95 percent occupancy is optimal) is to manage the oversell rates to achieve peak occupancy for all lots and user groups.

The WCU parking system included approximately 7,940 permits sold in 2012-2013 academic year, for 6,253 parking spaces campus-wide (including gravel lots). This represents an overall oversell rate of 127 percent, which appears to be reasonable, in aggregate. Oversell rates for each user group also appear reasonable.

The current parking system at WCU has some lots that allow for multiple user groups, such as Resident/Commuter (R/C). While such designations are popular because of their flexibility, they can become problematic as parking demand grows relative to supply. Since residents are always on campus, and their cars are moved less frequently, they tend to co-opt all of the R/C spaces they need, reducing the number of spaces available for commuters. This has the effect of lowering the residential oversell rate and raising the oversell rate for commuters.

Calculating the individual oversell rates for resident and commuter permits requires some assumptions that reflect the preceding discussion. Enough Resident/Commuter spaces are designated as resident to achieve a reasonable resident oversell rate of 110 percent. The remaining R/C spaces are allocated to commuters, yielding a Commuter oversell rate of approximately 163 percent. The Freshman oversell rate is 117 percent, and the Employee oversell rate is 109 percent.

The commuting student permit oversell rate is appropriate considering the higher turnover rate (shorter parking duration) of commuters, and the fact that not all permit holders come to campus every day. Graduate commuting students may only have evening classes, while others may arrive, leave, and return throughout the day. The employee permit rate is also appropriate, with employee permit oversell typically between 105 and 120 percent, since some employees will either be sick, on vacation, or working from home.

Peer Comparisons

To establish some context for parking conditions and policies at WCU, Figures 9-17 compare the quantity and pricing of parking among several peer institutions. All data is from 2011 unless stated otherwise. Parking data was obtained from university Web sites or correspondence with parking offices. Enrollment, employment, population, cost-to-attend, and salary data are from the National Center for Education Statistics online Integrated Postsecondary Data Systems (IPEDS).

Figure 9 and 10 compare peer institutions with respect to the ratio of total parking spaces to total campus population (students plus employees).

Figure 9 presents the results as a ratio, while Figure 10 shows the absolute values for both variables at each institution. The two figures demonstrate that there is wide variation in the relationship between population and available parking spaces. While WCU falls in the middle among peers in terms of campus population, it has the highest availability per capita parking. (WCU also has one of the highest per capita parking ratios among all UNC System schools.) As previously discussed in the section on parking supply, one factor contributing to this ratio is a high percentage of students living on campus (62 percent). This limits the effective parking supply available through overselling permits and requires more parking spaces per person than a school with mostly commuters.

Figure 11, Figure 12, and Figure 13 relate to the range of permit prices available at each institution for commuter, residential, and employee parking permits. The dollar amount in each rectangle represents the "typical" permit price, or what was deemed the most common or standard permit. The vertical bar represents the entire price range of permits available. Based on these graphs, it appears that WCU has just below the peer average price for "typical" parking, and that many other schools provide wider ranges of permit pricing choices, especially for employees. WCU is also in the minority of schools that charge the same rate for the typical resident, commuter, or employee permit (it should be noted, however, that among schools that do charge differentially, there is no apparent agreement as to which group should be charged either most or least).

Figure 14 and Figure 15 relate typical parking costs to the total cost of attending school, while Figure 16 relates average employee parking costs to average salaries. Due to limitations in data availability, "Total Cost to Attend" for both campus residents and commuter students assumes "In-State, On-Campus" rates. This value is suitable as a comparative surrogate for actual costs. While WCU falls in the middle in terms of the ratio of parking cost versus cost to attend, WCU is the third least costly institution to attend among peers.

Figure 17 ranks the institutions in order of 2010 town, city, or census designated place population in which the college/university lies. WCU falls towards the lower end of this scale, though all of the peer areas have fewer than 50,000 people and are thus not considered "urbanized areas" according to the U.S. Census definition. A comparison of these charts with the other charts related to parking costs reveals little correlation between population and costs, which could be attributed to all of the communities being fairly small.

Figure 9 – Per Capita Parking Supply

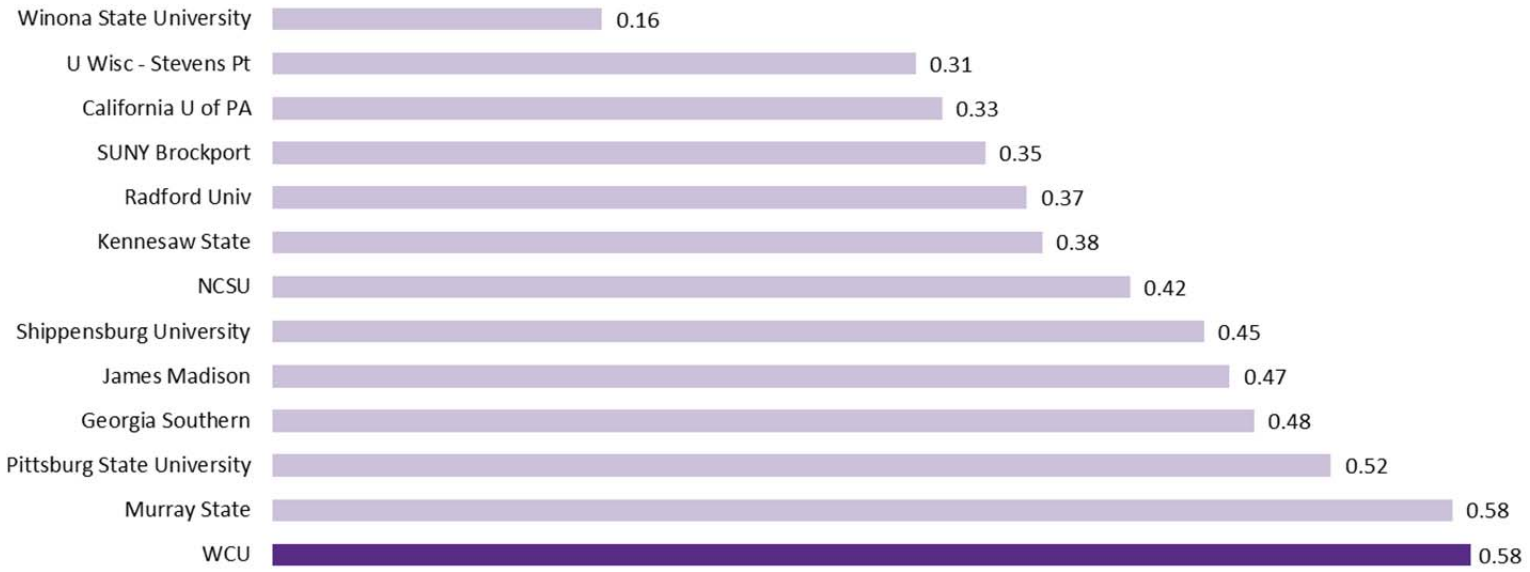


Figure 10 – Population and Parking Supply

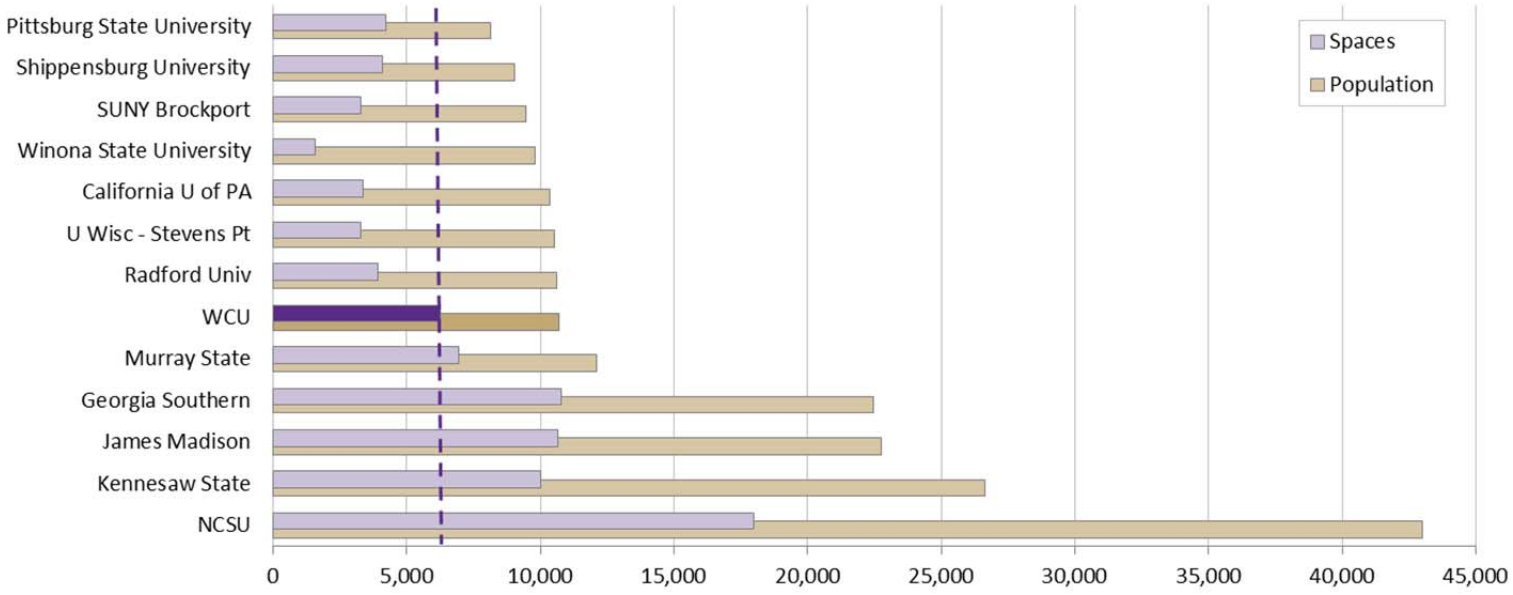


Figure 11 - Commuter Student Parking Fees (2012)

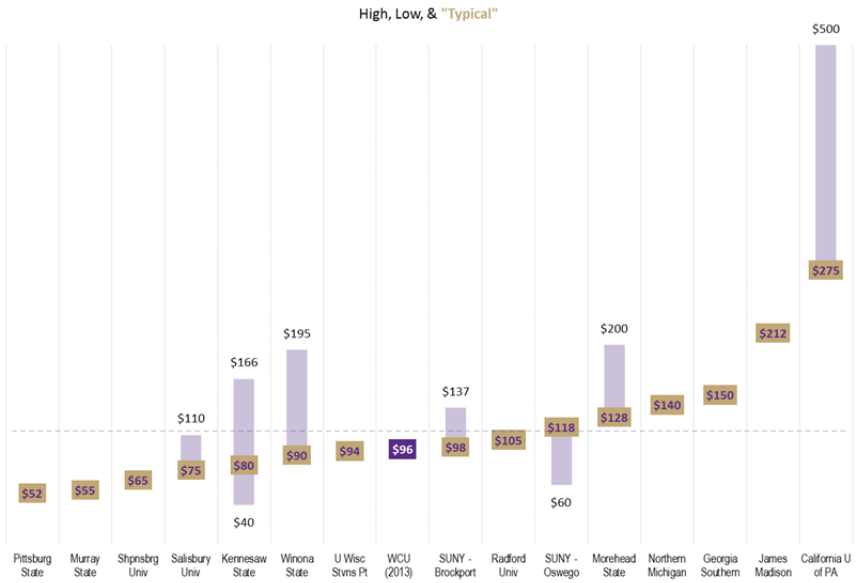


Figure 12 - Resident Student Parking Fees (2012)

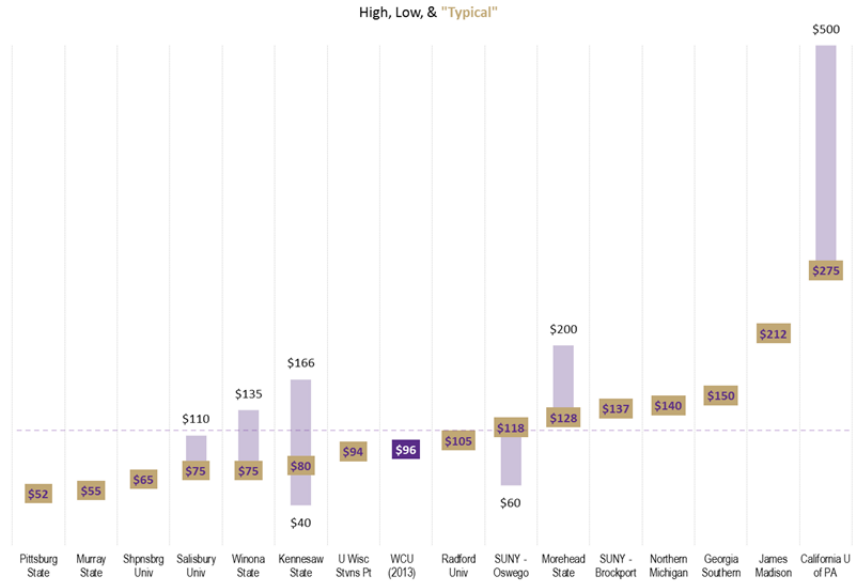


Figure 13 - Employee Parking Fees (2012)

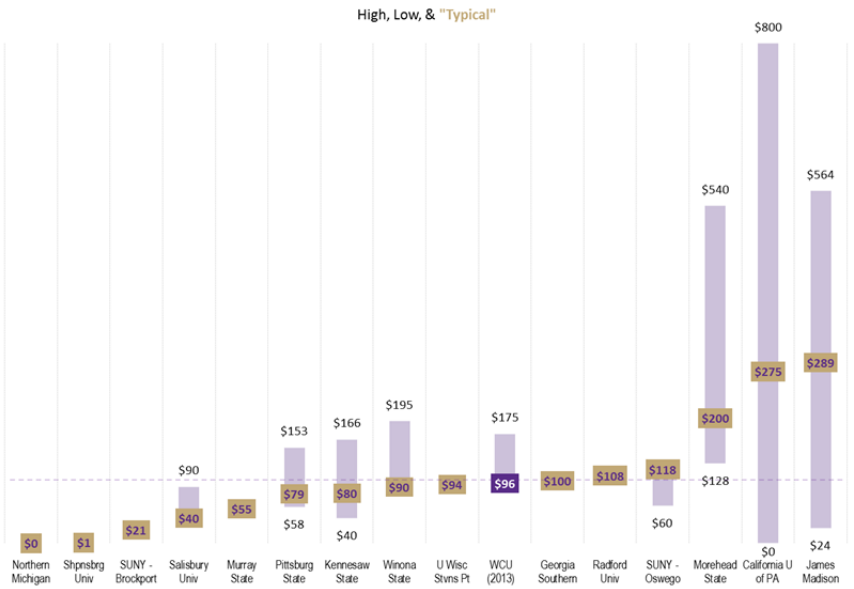


Figure 14 - Typical Commuter Parking Cost as Share of Cost to Attend (In-State, On-Campus)

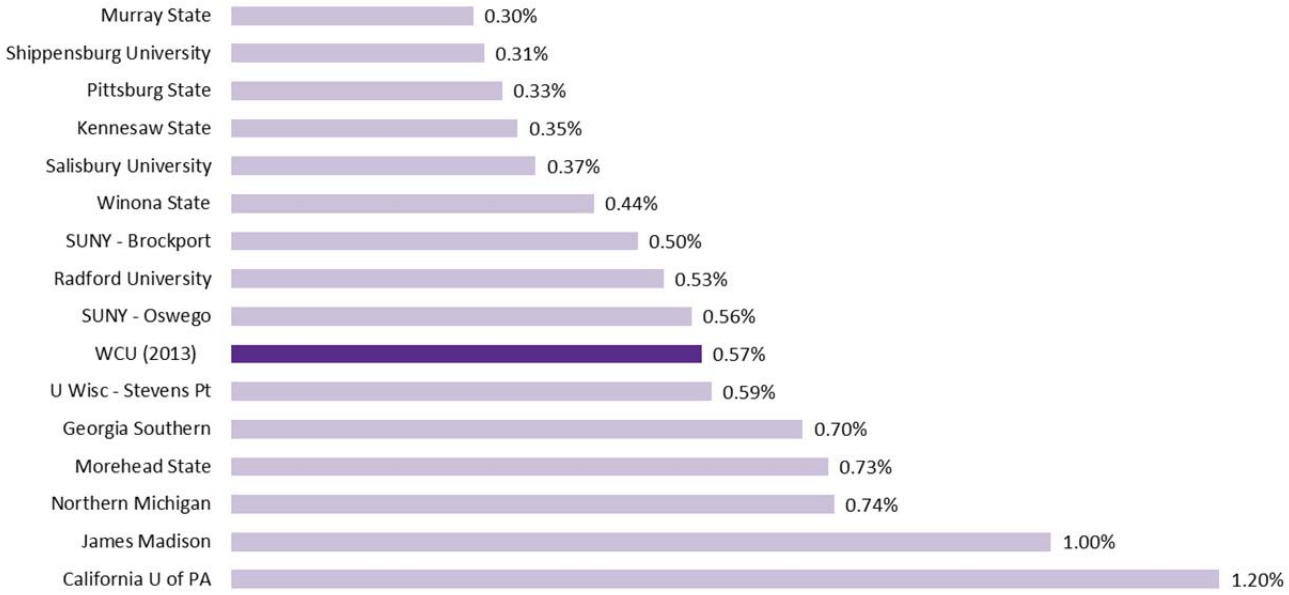


Figure 15 - Typical Resident Parking Cost as Share of Cost to Attend (In-State, On-Campus)

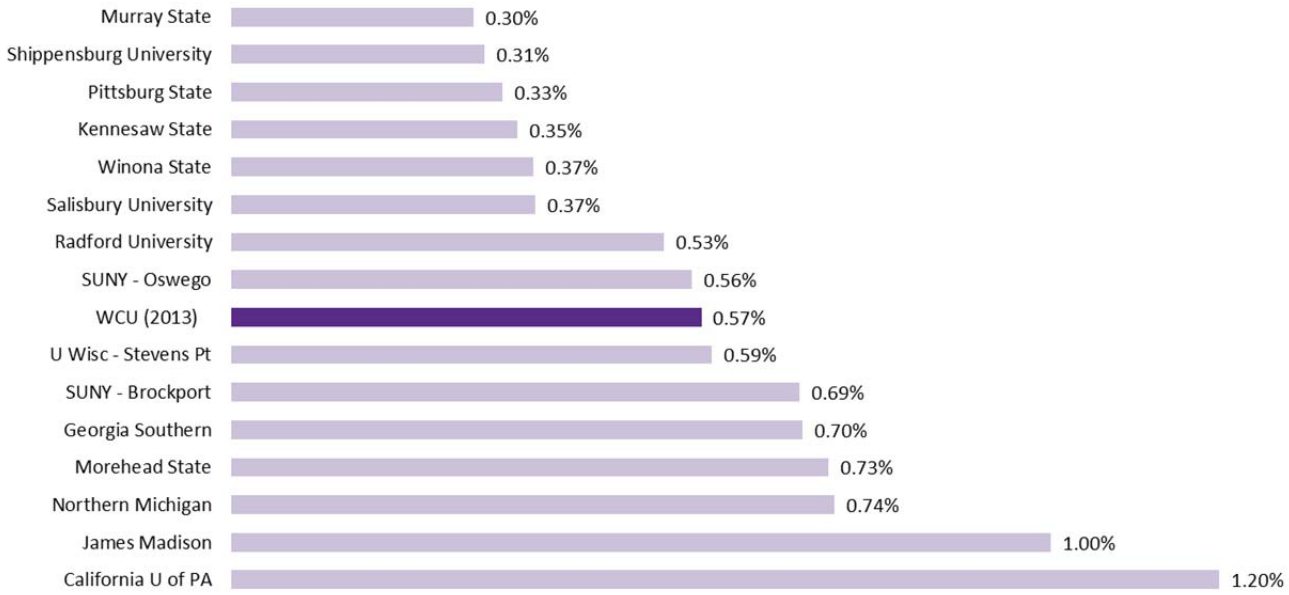


Figure 16 - Typical Employee Parking Cost as Share of Salary

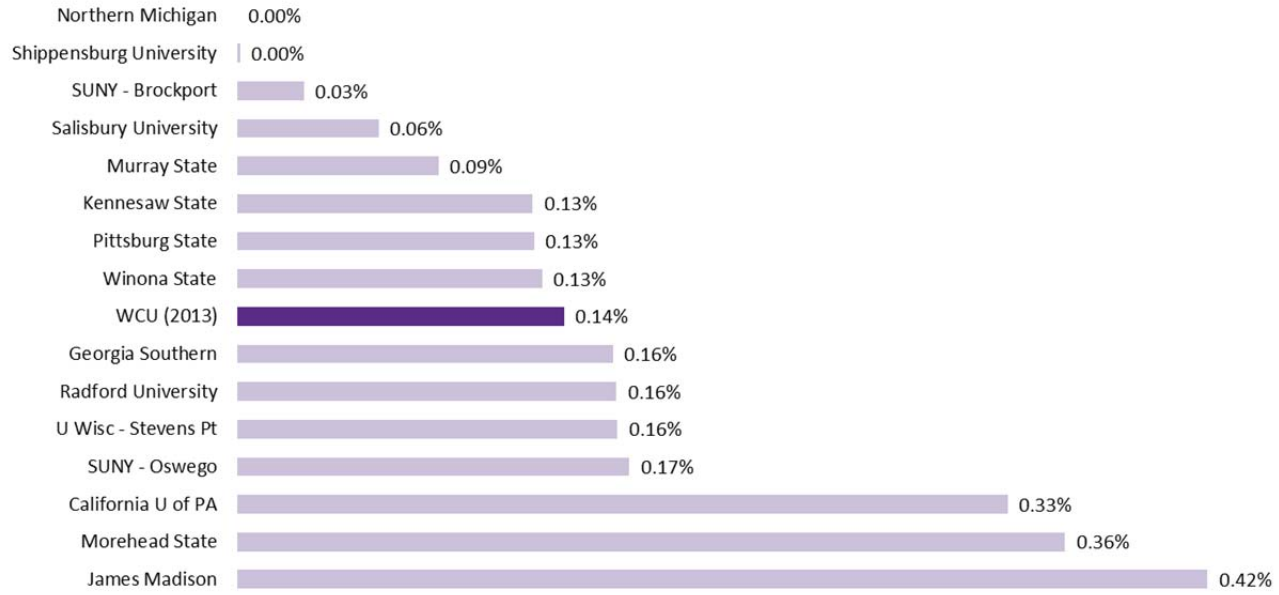
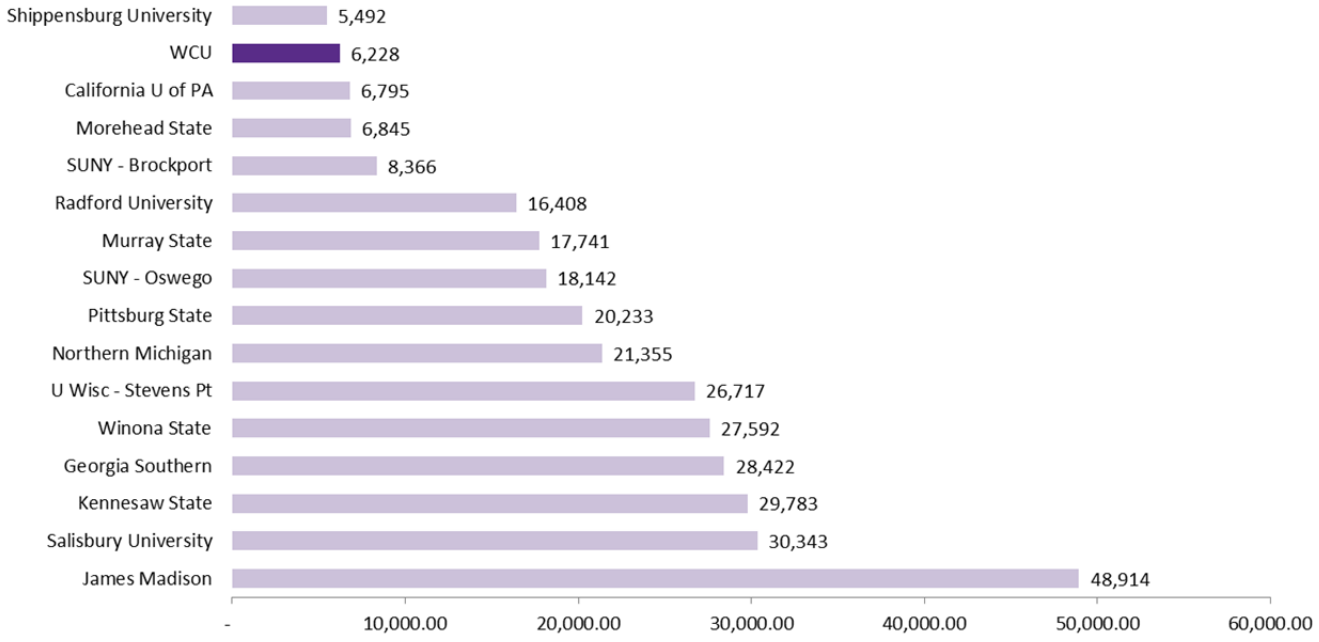


Figure 17 - 2010 Census Populations of Peer Institution Urban Areas



Parking Observations

The parking situation at WCU reflects a typical small to mid-sized university, with a traditional campus core and some satellite destinations.

- The current permit system is easy to understand, and is relatively simple and inexpensive to administer. Permits are sold by user type, with parking for each user type in various lots around campus.
- Parking spaces are generally available, even if not in the most desirable locations. It appears that more permits could be sold for the existing parking supply; however, additional data and monitoring is needed to quantify this assumption.
- Instead of allocating spaces for visitor parking, visitors to campus may obtain a visitor permit that allows them to park in any general, non-reserved space. In addition, wayfinding to parking and common destinations is not as consistent or effective as it could be.
- Parking for special events can usually be accommodated. However, it does not appear that the actual cost of providing this parking is consistently and fully captured. Providing special event parking will become more challenging, complicated, and expensive as the campus grows.
- Some students travel to campus three or fewer days per week, or only need to be on campus during evening or off-peak periods. The current permitting system does not take advantage of potential benefits of pay-per-use or part-time/limited-use permits or payment schemes.
- Parking is considered as an end unto itself; it is not treated as a tool for promoting other alternatives (via pricing policies or cross-subsidies) that could reduce traffic and parking demand.

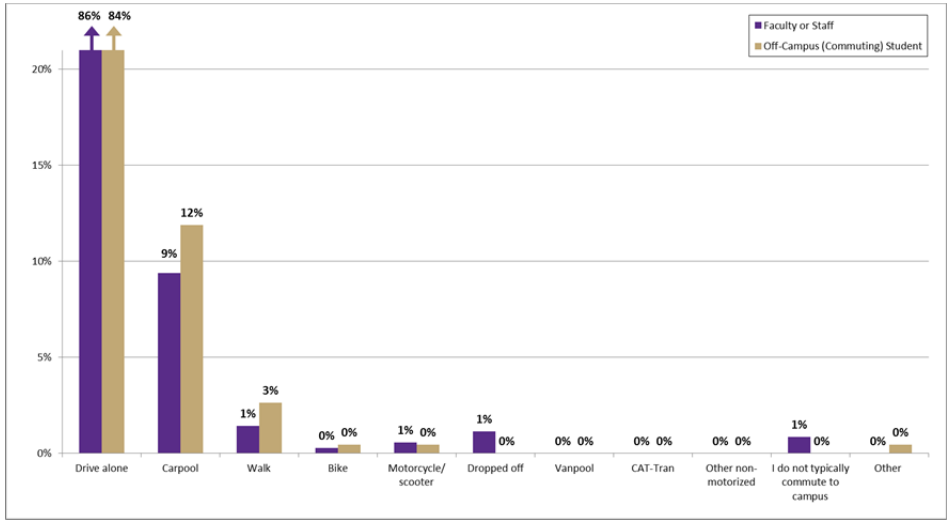
Overall, the parking fees and policies at WCU reflect a location where parking availability has not been difficult. Enrollment-induced parking supply shortages were addressed by constructing additional surface parking lots. This approach may not continue to be financially or environmentally sustainable.

3.0 Summary of Transportation Planning Issues

Access to Campus: How do people get to and from campus?

- The campus is automobile-oriented, due to plentiful parking, convenient access by car, and residential distance to campus: 95% of people commute via car—85% single-occupant and 10% carpool.
- There are limited bicycle and pedestrian facilities leading to campus, and the roadways surrounding (and serving) campus are barriers to safe and convenient walk and bike access. Weather, terrain, and barriers such as creeks, rivers, and roadways are also limiting factors.
- Ridership for off-campus bus routes has been low, due to the availability of inexpensive parking, fairly low density and dispersed residences, and a somewhat low frequency/coverage of transit service.

Figure 18 – Modal Percentages of Commuting Students and Employees



Circulation on Campus: How do people get around on campus?

- Auto circulation has few capacity constraints, other than parking and pedestrian conflicts. However, congestion can disrupt campus travel during critical AM and PM peak periods.
- Pedestrian and bicycle circulation is constrained by topography and physical barriers, as well as a lack of continuous facilities.
- Transit service is complicated by a roadway network that imposes circuitous routing due to geometric constraints. Convenience, reliability, and pedestrian accessibility are also perceived as deficient.

Parking

The existing parking system has evolved as a rational result of user needs and available resources. However, changes resulting from campus growth will exert increasing pressure for alternative management strategies.

- Parking spaces will be lost to the construction of new facilities, and replacement parking will be more expensive, and/or less convenient.
- Although there has been understandable resistance to increases in parking fees, survey responses suggest that a significant share of both students and employees would be willing to pay more for parking that better fit their needs (as defined by convenience, reliability, and security). However, having a low-cost parking option was also a clear priority.
- Current parking policies and fees will not yield sufficient revenues to fund parking expansions needed to accommodate anticipated growth and maintain existing facilities.
- The monitoring of permit sales in conjunction with available parking supplies and occupancy rates will be increasingly important to maximize utilization of available parking supply. This will become especially critical as some lots are removed for construction.
- A zone-based parking system, with tiered fees and/or other improvements to parking allocation, could improve utilization of existing parking supply.
- Supportive parking policies, especially related to the management of price and supply, are critical to reducing reliance on single occupant vehicles, as well as associated expenses.
- Combined with satellite parking lots and shuttles, could a comprehensive, integrated travel demand and parking management (TDM) program postpone the need for a parking deck for several years?

4.0 Transportation Plan

Most of the transportation challenges facing Western Carolina University, now and in the future, relate either directly or indirectly to parking. Most campus traffic problems result from interactions between class schedules and the parking system (supply, location, and policy). Most cars on campus roads, especially during peak periods, are traveling to or from a parking space. (Whether the driver knows the location of that space, or is driving around searching for the perceived best available space is another issue.)

Many of the pedestrian and bus trips made on campus also have a parking space as an origin or destination. Even those that do not often are affected by traffic in the form of delays due to traffic congestion, problems crossing busy streets, or safety concerns involving vehicles traveling at high speeds. Increasing enrollment has been assumed to require a proportional expansion in parking supply, which inevitably yields an increase in traffic volumes.

While incremental increases in road capacity usually can be achieved, and are often necessary, there are practical limits (particularly financial and environmental ones). While expanding capacity at traffic bottlenecks may provide localized relief, the problem often moves to another location downstream, a deficiency that didn't exist until the original choke point was "fixed," allowing more traffic to reach the new problem area faster. Over time, this cycle perpetuates itself, unless traffic problems are addressed from the demand side, and reasonable alternatives to automobiles are provided.

Planning elements critical to success include efforts to reduce traffic demand while providing attractive travel alternatives, as well as measures to spread traffic demand across different locations and times to take advantage of unused capacity. The goal is to provide a balanced transportation system. Several key strategies have been employed to achieve that goal:

- Provide and promote good pedestrian connectivity. This is essential to any efficient, robust, and sustainable transportation system, regardless of mode of travel.
- Encourage "parking once." To reduce traffic congestion and conflicts with other travel modes, driving between campus locations should be discouraged. Achieving this objective requires removing impediments to other modes, as well as investing in infrastructure and services to make walking, bicycling, and transit more attractive. Also implied in this strategy is a parking system that eliminates driving around to find the best space, and one that works with the road network to promote driving directly to a particular parking facility by the shortest route.
- Recognize differences in the value of parking spaces. Not all people place the same value on a parking space. Location, time-of-day, and purpose of trip affect the perceived value of a space. People will pay a price commensurate with their need and the value received, if they are given a choice. Appropriate pricing can be used to help manage demand by increasing occupancy in remote or inconvenient lots, and suppressing demand (while generating additional revenue) in more desirable and convenient facilities.
- Use strategies to reduce traffic and parking demand. In addition to increasing capacity where necessary and appropriate, make alternatives available, and provide incentives (and disincentives) to encourage their use.
- Consider the total costs of transportation investments. In addition to the costs of constructing, financing, operating, and maintaining transportation infrastructure projects, careful consideration should also be given to the opportunity costs (what else could be done with those funds, or that land?), as well as the often overlooked risks built into the assumptions justifying such projects. If fuel costs increase, and fewer people choose to drive, will parking permit sales and revenues be adequate to cover expenses, including debt service for structured parking? Does focusing on satisfying expectations for automobile travel create a situation where there is little choice for an institution (and its constituents) to do other than invest even more resources in support of automobile travel? Are roadway capacity improvements necessitated by a new parking deck captured in a rigorous benefit-cost analysis?

Increasing fuel and automobile ownership costs, combined with growing concerns about sustainability (not only environmental, but also social and fiscal), are encouraging interest in driving alternatives. Being able to attend a school where an active educational, recreational, and social life is possible without a car can lower the effective cost of attending that school, by eliminating car payments and costs for insurance, fuel, parking, and repairs. (In some cases, students appear to be caught in a viscous cycle of needing a car to get to a job so that they can earn money to pay for their car.)

Students have long considered the need for a car in their choice of a university; what appears to be changing is that a growing number are looking for campus experiences where they do not need to worry about the expense and hassles of bringing a car, where they have a range of transportation choices. Universities that continue to prioritize accommodation of the automobile at the expense of other travel options risk losing the opportunity to recruit this small but growing group of prospective students.

An important but often overlooked role of a Campus Master Plan is to maintain the functionality of the transportation system through all stages of implementation. Too often, a plan is adopted which, while it should ultimately perform well upon completion, functions poorly during extended interim phases, or presents major constructability problems. A transportation plan must also provide enough flexibility to deal with inevitable but unforeseeable changes in assumptions, plans, or forecasts.

The principles guiding development of the transportation recommendations include the following:

- Maintain balance. Avoid depending too much on a single facility or mode, and provide options or choices whenever practical.
- Promote safety among all modes of travel.
- Recognize and work with the strengths and limitations of the external transportation system.
- Anticipate and adapt to changing travel patterns, both on and off campus.
- Preserve and utilize existing capacity as efficiently as possible.
- Minimize the amount of driving on campus by providing the most direct routes possible to major trip generators, and by locating such facilities where they can be accessed effectively.
- Emphasize multimodal options. At the very least, do nothing to preclude or obstruct other modes of travel.

The remainder of this report describes the impacts of the Campus Master Plan on campus roadways and parking, as well as the roles of walking, bicycling, and transit. It concludes with a general discussion of strategies for reducing the demand for driving and parking on campus.

Campus Master Plan Changes to Roadways

The Campus Master Plan incorporates a series of changes to the existing campus road network. Some of these changes are needed to provide access to new facilities – West Campus, and the Millennial Initiative, in particular. Other projects result from conflicts with new buildings or other facilities that require roadway realignment or closure. Still others reflect changes in roadway function due to increased demand for pedestrian, bicycle, or bus traffic, or attempts to improve existing roadways to current standards. Finally, some roadway recommendations result from shifts in travel demand resulting from the expansion and relocation of parking facilities, as well as general growth and redistribution of traffic volumes, both on and off the campus.

The bottom line is that campus growth creates the need for most of the roadway improvements identified in the Master Plan. However, significant expansion of campus roadway capacity does not appear to be needed; this is fortunate since the mountainous terrain severely limits options, and makes them almost prohibitively expensive.

An important motivation behind this transportation planning effort is the objective of getting the most utility out of existing infrastructure before investing in additional capacity. To the extent practical, new parking facilities should be located so the traffic they generate can use available capacity on existing roadways, rather than being constructed where new road capacity would have to be added. This could include strategies such as locating high-turnover commuter parking close to campus entrances, while low-turnover

residential parking is placed in more remote parts of campus, reducing the amount of driving needed on campus roads.

The existing campus roadway network sometimes lacks clear and consistent organization, leading to confusion and inefficiency as unfamiliar drivers navigate to their destinations. The simplest, most direct route is not always obvious, especially when complicated by the need to find a parking space that may not be close to the destination. Better wayfinding could enhance the campus by reducing both traffic conflicts and overall vehicular travel.

A standard component of most campus transportation plans is the classification of roadways into a formal hierarchy, with typical cross-sections and design standards for each category. This does not seem to be a productive exercise for the WCU campus, where the system of roads has evolved almost organically over time, and where options are severely limited. The cost and disruption required to impose a uniform system on the existing infrastructure would probably exceed any tangible benefits.

Rather than taking a prescriptive approach, it may be more effective to employ the philosophies of "context sensitive" design to develop the most appropriate solution for each situation to achieve a particular set of objectives.

The following recommendations are intended to promote the broader goals of the proposed Campus Master Plan. These modifications typically involve suppressing traffic speeds; enhancing pedestrian and bicycle connectivity and safety; allowing construction of new or expanded buildings; or providing additional open spaces. Since the Campus Master Plan is not an absolute, these specific roadway changes may not be implemented precisely as described; they do, however, represent the types of concepts and strategies required to achieve the outcomes embodied in the Campus Master Plan.

The proposed Campus Master Plan includes a variety of modifications to the existing campus road system. These modifications fall into one or more of the following categories:

- *Modify road surfaces and/or cross-sections* – Recommendations could include narrowing travel lanes; adding textured or colored paving treatments for pedestrian crossings; raising pedestrian crossings or intersections; removing on-street parking; adding bicycle lanes; widening sidewalks; and enhancing streetscapes through planting, lighting, and other design elements. These modifications can be implemented separately or in combination, and may also be incorporated in restricting access to particular roads or road segments. The recommended "calming" of Central Drive in the vicinity of McKee is an example of this type of project.
- *Realign existing roads* – Most realignments associated with the Campus Master Plan entail shifting the location of an existing road to make room for a new or expanding facility, or to improve the safety, capacity, or appearance of a particular segment of roadway. The Centennial Drive and Joyner Drive/Chancellor's Drive/Young Drive realignments represent this type of project.
- *Restrict access to roads or segments of roads, or prohibit certain turning movements* – While no such restrictions are specifically recommended in this plan, they are described for future reference, and could include:
  - Managing accessibility for daily users and service vehicles (by time-of-day/day-of-week, or by permit)
  - Allowing access only for maintenance vehicles, public safety vehicles, and other approved administrative vehicles
  - Allowing general access only for special events, moving in/out, and other short-term situations
  - Permitting buses to use a restricted facility
- *Construct new roads, or extend existing roads* – These projects typically increase connectivity, providing a greater range of options for route selection, and reducing the total amount of vehicular travel on campus by providing more direct access to parking and other destinations. Their goal is to help balance the distribution of traffic both on-campus and on the surrounding street network, as well as providing alternatives in case of congestion or other delays on preferred routes. Examples include the reconstruction and extension of Young Drive to Central Drive; the new

entrance at Little Savannah Road, and all of the new roads proposed on West Campus.

Roadway Project Descriptions

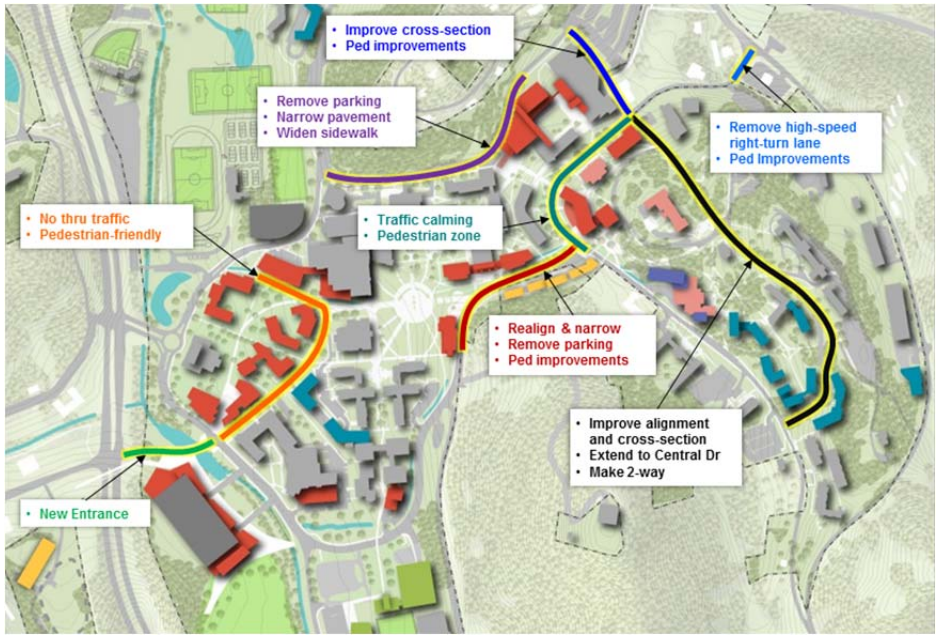
Figure 19 depicts the major roadway improvement recommendations described in this section.

Existing Centennial Drive Entrance

As West Campus builds out, and development around the NC 107/Little Savannah Road intersection intensifies, traffic between the Centennial Drive campus entrance and Little Savannah Road will increase. Trips to West Campus via Blackwater Road also will increase, but the potential for improving this route to accommodate higher traffic and pedestrian volumes safely and efficiently is limited. In fact, there are constraints on making any substantial improvements to this intersection. The connection with Blackhawk Road/NCCAT Drive to the west is only about 50 feet long, allowing for storage of no more than two cars, and requiring most traffic to negotiate two 90-degree turns in less than 100 feet. On the east side, Centennial Drive intersects at a skewed angle, on a significant grade. Less than 200 usable feet are available for vehicle storage between NC 107 and the roundabout; already, vehicle queues frequently extend into the roundabout during PM peak periods.

For these and other reasons discussed below, a key recommendation in this plan is construction of a new main campus entrance at Little Savannah Road and NC 107. Creating this new entrance yields opportunities to modify the existing entrance to enhance pedestrian and bicycle crossings, while also reducing crash potential and improving traffic flow along NC 107. While this recommendation is not essential, it could be considered as an option after the new entrance at Little Savannah Road is completed. Figure 20 is a conceptual rendering of this potential re-design, known as a restricted crossing U-turn (RCUT) intersection. An RCUT intersection has 18 conflict points, compared with 32 in the existing intersection, reducing critical traffic delays and yielding potential safety advantages relative to conventional intersections.

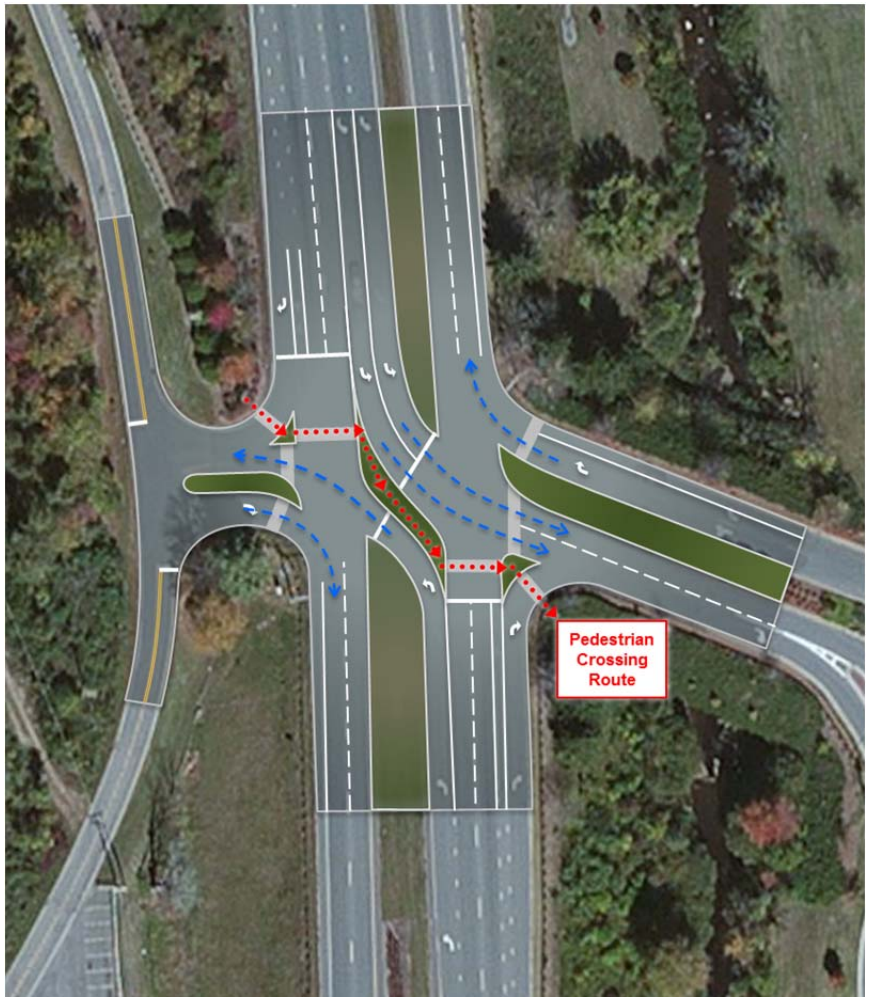
Figure 19 – Roadway Improvement Projects



The essential feature of this design is that side street traffic is prohibited from turning left or crossing NC 107; inbound left turns are still allowed. Only right turns would be permitted from Centennial Drive and Blackwater Road. Traffic from Blackwater Road wanting to head north on NC 107 would do so via a U-turn at the Little Savannah Road intersection, which would be modified, if needed, to accommodate this movement. Similarly, vehicles heading for campus would use the new entrance at Little Savannah Road. Vehicles wanting to turn left onto NC 107 from Centennial Drive would use the new entrance; those wishing to access Blackwater Road or NCCAT Drive would do so via the new entrance and Little Savannah Road. Alternatively, U-turns could be accommodated at a new median cut installed several hundred feet north of the existing entrance. Note that the heaviest traffic movements at this intersection (southbound left turns into campus and northbound right turns out of campus) can still occur under this reconfiguration, and actually benefit from it.

Another benefit of the RCUT intersection in this location is the improvement to bicycle and pedestrian crossings. Figure 20 indicates the diagonal crossing route between channelization islands; bicyclists would dismount and cross as pedestrians. The RCUT's simplified two-phase signal and reduced conflicts facilitate pedestrian crossings, and the channelization islands provide refuge in the unlikely event that a crossing cannot be completed in the allotted time.

Figure 20 - RCUTS Intersection Concept at Centennial Drive Entrance



New Campus Entrance at Little Savannah Road

Given constraints to improve the existing main campus entrance at Centennial Drive and NC 107, the feasibility of a new entrance was investigated. The most practical and effective option restores part of the original alignment of Little Savannah Road by extending it eastward across NC 107. This extension would intersect Centennial Drive at University Way, aligning with the existing bridge across Cullowhee Creek.

This new entrance relieves congestion at the Centennial Drive intersection, and substantially improves access between Main Campus and West Campus, eliminating one intersection and the left-turn/right turn routing required on NC 107. This is especially important for efficient bus routing. The new entrance also provides more direct access to parking for special events.

Over time, as existing parking near the campus is lost to new construction, replacement parking will be located farther south and west. This will move the "center of gravity" for campus parking (and traffic generation) closer to the new entrance. Locating the proposed parking deck in the southeast quadrant of this intersection allows commuters and visitors to be "intercepted" immediately, reducing the need to drive further into the campus. To accomplish this objective, the parking deck should incorporate visitor information and wayfinding; a transit hub; convenient pedestrian and bicycle connections and amenities; and other complementary services, such as a convenience store, coffee shop, commuter lounge, and public safety station.

Because the existing Centennial Drive entrance would still serve major traffic movements to/from the north, traffic demand will be divided between the two entrances, and the new entrance can be constructed as a two-lane road with left-turn lanes. Preliminary assessments suggest that the new entrance can be constructed without relocating the existing pedestrian bridge. However, if necessary, shifting the bridge slightly south should be a reasonable and feasible task.

Centennial Drive/Central Drive Intersection and Vicinity

Centennial Drive

This project advances several objectives critical to the Campus Master Plan, including development of a pedestrian- and bicycle-friendly campus core, as well as providing opportunities for mixed-use and retail development that reduce the need to drive off campus. Under the Campus Master Plan, this corridor becomes the "Main Street" of campus, attracting even more pedestrian traffic than it does today.

The Master Plan calls for the northern portion of Centennial Drive to be shifted slightly northward, to reduce the skew of the current intersection, and to provide room for commercial and residential redevelopment along the southern side of the street. Current perpendicular on-street parking would be relocated behind these new buildings, and the roadway narrowed as much as is reasonable to reduce pedestrian crossing distances and help moderate vehicle speeds. This will allow for wider sidewalks, landscaping, and other streetscape amenities. Properly designed, these features can help discourage random pedestrian crossings, channeling pedestrians to desirable crossing locations that incorporate highly effective crosswalk treatments. Such treatments may include raised crosswalks; colored and/or textured pavement; medians; and special signs, pavement markings, lighting, and warning signals.

As the Master Plan is implemented, bicycle accommodation should receive careful consideration to determine whether bike lanes, cycle tracks, or some other treatment is most appropriate, and to resolve critical design details. Similarly, transit operations must figure prominently in the design and planning of this project, especially with regard to pedestrian access, and the design, sizing, and placement of bus stops and any bus pullouts.

Central Drive

Immediately north of Centennial Drive, Central Drive will need to undergo a significant transformation to accommodate the heavy pedestrian crossing volumes expected to result from the Master Plan. The dilemma faced in this situation is an inherent conflict between these high crossing volumes and the need to maintain this portion of Central Drive as a critical route for traffic travelling to, from, and through campus.

Further complicating the situation is the desire to locate a transit hub in front of McKee. To accommodate all of these activities as safely and efficiently as possible, a traffic calming treatment is recommended for Central Drive, from Centennial Drive eastward to at least Breese Gymnasium, and possibly as far as Buzzard's Roost Road. While it is beyond the scope of this study to establish the precise nature of the traffic calming treatments, some general guidelines and options can be suggested.

The goal is to temper traffic speeds without generating lengthy delays, to maintain reasonable traffic throughput. Design elements should reinforce to drivers that this roadway segment is unusual, and requires special attention. Visibility between drivers, cyclists, and pedestrians should be emphasized, and crosswalks, bus stops, bike lanes, and traffic lanes clearly defined for all users. Possible measures for achieving these objectives are described below. More detailed design is needed to determine which of these are most appropriate, and how and where they should be installed.

- Raised crosswalks reinforce pedestrian rights-of-way by maintaining sidewalk levels across the roadway, forcing vehicles to adjust to elevation changes, similar to speed humps. These crosswalks are often wider than standard crosswalks, and may comprise a plaza-like area, or an entire intersection. Midblock crossings may incorporate curb extensions to narrow the roadway and crossing distance. Colored and/or textured pavement treatments may be combined with pavement markings for additional emphasis, especially at the perimeter.
- Speed tables, or speed cushions (rather than speed humps) can be used to suppress speeds. Speed cushions have the advantage of allowing buses, emergency vehicles, and other large trucks to pass unimpeded.
- Combined with well-designed and convenient pedestrian pathways, a variety of techniques can be employed to deter pedestrians from crossing at undesirable locations, effectively funneling them to intended crossing

locations. These techniques can incorporate plantings, bollards and chains, low decorative fences and walls, street furniture, and sculptural elements.

- Various signs and signals can be used to warn drivers and control movements. These include flashers, actuated signals, traffic signals, speed indicators, and variable message boards, as well as standard static signs.
- Effective street lighting will be critical for nighttime conditions.
- Bike lanes or cycle tracks may be appropriate in this setting.
- Bus stop design and location should be integrated carefully to reinforce other traffic calming elements. Bus pullouts or bus bulbs may also be appropriate.

Memorial Drive

The major changes recommended for Memorial Drive are limited to the segment between the WCU Bookstore and Hunter Library. These changes depend on the removal of perpendicular and angled parking along both sides of Memorial Drive. The removal of parking will reduce conflicts and congestion that generate delay and crash potential in this corridor. It will also reduce the volume of traffic using Memorial Drive.

Some ADA, metered, and other parking would be retained, preferably off-street, but possibly in the form of parallel parking along one side of the road at limited locations.

The proposed changes will enable sidewalks along the southern side of the street to be widened and improved, including landscaping and pedestrian amenities. Bus stops/pullouts could also be enhanced, and bike lanes or a cycle track could be implemented. The narrowing of Memorial Drive will also help suppress excessive travel speeds, which might otherwise increase with the removal of parking and associated traffic.

Killian Building Lane

This parking lot and roadway will be removed and converted to a greened pedestrian corridor.

Joyner Drive/Chancellor's Drive/Young Drive

A critical element of the transportation plan for the original eastern part of campus involves improving Joyner, Chancellor's, and Young Drives, and extending Young Drive to connect with Central Drive to create a continuous two-way road that yields several important benefits:

- Provides simpler, more direct access, especially for trucks and emergency vehicles
- Allows some existing roads (Circle Drive, Bird Building Lane) to be converted to multi-use pathways and/or service roads
- Consolidates roadways, reducing pavement impacts on hillside
- Allows Lots 51 and 52 to be reconfigured and enlarged slightly to increase parking supply
- Significantly shortens bus routes, and allows operation in both directions
    - Fewer stops
    - Less backtracking
    - Increased efficiency
    - Lower operating costs
    - Better service quality

The improvements required to accomplish these objectives include some roadway widening, and smoothing of vertical and horizontal alignments to reduce grades and curves and improve visibility.

Buzzard Roost Road

The segment of this road between Central Drive and Memorial drive is narrow, with tight corner radii at intersections, and no sidewalks. Some improvements to accommodate bicycles and pedestrians are needed, probably consisting of some combination of sidewalk, off-street pathway, and/or shared bike route.

Central Drive at Old Cullowhee Road

Consideration should be given to the elimination or reduction of the large-radius, high-speed, right-turn lane from southbound Old Cullowhee Road to Central Drive at the old east entrance to campus. Existing volumes do not appear to warrant this lane, and the relatively high speeds it promotes are not

consistent with the character of Central Drive immediately to the west. This curving segment of Central Drive climbs a short, moderately steep hill lined with vegetation. Sight lines are poor, and sidewalks are lacking or inadequate in places, especially in the vicinity of the crosswalk, which is not in a desirable location. Lighting could also be improved.

University Way

As part of the long-range vision of the Campus Master Plan, additional green space and new building construction will eliminate the intersection of University Way with Memorial Drive. University Way will serve remaining parking lots, and provide access for emergency, service, and delivery vehicles. It could also allow buses access to a stop close to the campus core. University Way would also act as a convenient pedestrian and bicycle corridor, possibly with bike lanes or cycle tracks, if not shared lane markings (sharrows).

New West Campus Roads

The Master Plan identifies a conceptual road network serving the long-term needs of the West Campus. Given the topographic constrains of the site, the basic alignments shown will probably not vary much from what is ultimately constructed. However, without knowing more about the size and nature of the facilities to be constructed, it is premature to make precise design recommendations.

However, a two-lane or three-lane cross-section would be adequate and appropriate for the roads shown in the Master Plan. A two-lane section with median should be considered if the required grading is not excessive. Given the steep terrain, potentially sensitive environmental and cultural sites, and limited buildable land on West Campus, roadway widths and design speeds should be minimized to reduce the amount of land disturbed by grading and clearing.

More important than completing prescriptive preliminary designs or standards is the definition and adoption of guidelines that support the goals of the Master Plan, while meeting the needs of the tenants and users of these sites. New roads built on West Campus should be consistent with “complete street” guidelines in accommodating bicycles and pedestrians. It is assumed that sidewalks and bicycle lanes will be included in any new roadways, unless off-street facilities or shared-use bicycle treatments are deemed more appropriate. Special consideration should be given to bus routing, stop locations, and pedestrian access, since shuttles will play an important role in travel between campuses.

Roadway Projects Considered but not Recommended

- Extending Memorial Drive eastward to connect with Old Cullowhee Road has been suggested as a way to improve access to campus. This extension would cut through Lot 37, and then follow the abandoned right-of-way from SR 1335 to its intersection with Old Cullowhee Road. This intersection would be about halfway between the end of the Tuckaseigee Bridge and the Central Drive entrance to campus. While this project may be a long-range option, there are several reasons it was not recommended as part of this plan:
    - The primary route for traffic access is via NC 107 to the west, and this tendency will likely grow over time. This connection would divert limited resources from other priorities, for limited benefits.
    - The intersection with Old Cullowhee Road would be less than 300 feet from Central Drive, and less than 200 feet from the intersection of Monteith Road and Casey Road (relocated as part of the bridge replacement project). This proximity is less than desirable, especially given the location of the new intersection in a curve on a hill.
    - The additional traffic resulting from this extension could disrupt the Cullowhee community more than it would benefit it.
    - Extending Memorial Drive through Lot 37 would eliminate a significant number of parking spaces in a part of campus that will already be losing parking capacity. There does not appear to be enough room to construct a reasonably-sized deck on the remaining land.
    - The Cullowhee Baptist Church Cemetery could be adversely affected by this project.

- The extension could encourage cut-through traffic on Memorial Drive.

- A roundabout was suggested as part of the proposed reconstruction of Centennial Drive and Central Drive. In addition to space constraints, the fact that roundabouts are not especially well-suited for heavy pedestrian and bicycle volumes caused this option to be discarded.

- Connecting Norton Road to NC 107 was proposed as a way to improve accessibility and reduce traffic congestion on campus. However, this project was deemed infeasible due to the elevation difference, stream crossing, and lack of a suitable intersection location along this portion of NC 107.

Pedestrian and Bicycle Facilities

Figure 21 and Figure 22 depict key elements of the pedestrian and bicycle networks recommended as part of the Master Plan. Figure 21 shows the complete bicycle network by facility type, and includes multi-use paths essential to the connectivity of the system. Figure 22 indicates critical crosswalk locations, as well as sidewalk projects needed to complete the pedestrian network.

On-Campus

Recommendations for pedestrian and bicycle improvements span a variety of facility types and treatments:

- **Multi-use path** – Paved or unpaved pathway for walking and biking.
- **Sidewalk** – Paved pedestrian-only facilities, both roadside and not.
- **Bike lane** – Portion of a road designated by striping, signage, and pavement markings as being for exclusive/preferential use by bikes.
- **Cycle track** – Exclusive bike facility physically separated from traffic and distinct from sidewalk.
- **Shared-use road** – Road designated by signs and shared-lane pavement markings (sharrows) as a bicycle route or bicycle boulevard
- **Bicycle "ramp" or "stairs"** – Specially-designed stairs incorporating "gutters" to guide bicycle wheels; used to traverse steep grades.
- **Crosswalk** – Location for pedestrians and dismounted cyclists to cross a roadway, designated by pavement markings, signage, and sometimes signals; may incorporate a speed table and or curb extensions to narrow the street and crossing distance.
- **Traffic calming** – A wide range of design treatments used to modulate traffic speeds; includes speed humps and tables, chicanes, curb bump-outs, and related measures.

Also necessary for a campus to promote and sustain bicycle travel are such critical amenities as

- Racks
- Lockers
- Repair/maintenance facilities
- Education and safety programs

Types and locations of such amenities are not specifically identified in this plan; however, they should be a reviewed as recommended bicycle facilities are designed and programmed. They also should be considered in the design of future facilities that could generate significant bicycle trips, including residence halls, recreation areas, classrooms, dining halls, libraries, and parking facilities.

While earlier attempts at bike-sharing were abandoned, advancements in the delivery and administration of these services by private contractors show promise, and bike-sharing programs continue to spread. The feasibility of bike-sharing at WCU should be revisited, especially as bicycle improvements are implemented.

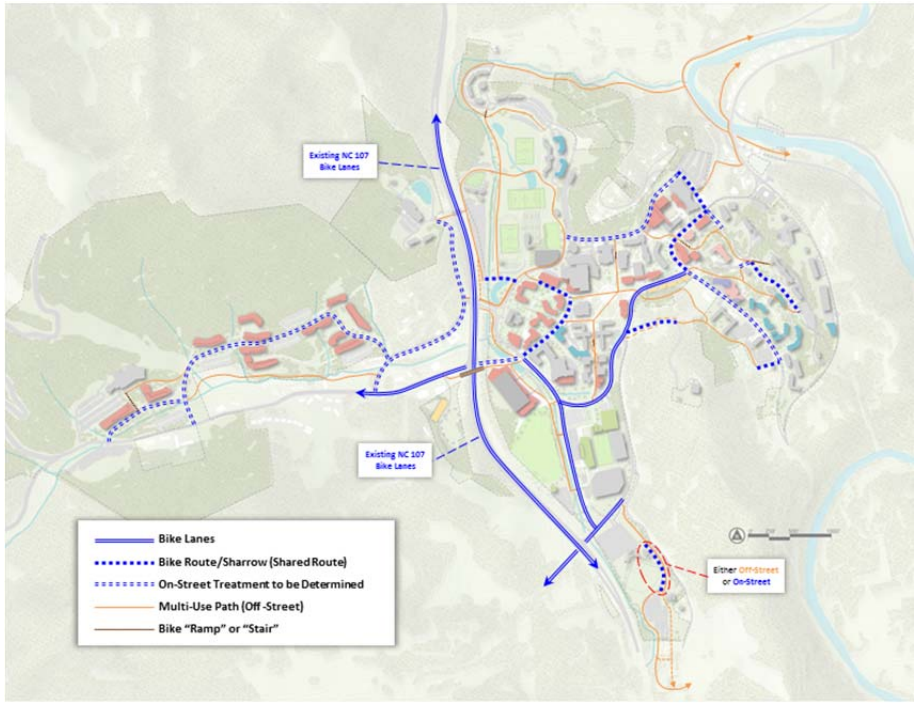
Conditions at WCU and the nature of the CAT-TRAN system do not suggest a need for a bikes-on-buses program at this time.

Although providing adequate facilities for pedestrian and bicycle travel is necessary to promote travel by these modes, this infrastructure alone is not enough to encourage substantial increases in walking and bicycling. For bicycling especially, ongoing educational and promotional activities are essential, as are convenient bike racks. Showers, storage lockers, and

maintenance assistance are also effective incentives. Good lighting and high-profile security programs also help increase both bicycle and pedestrian activity. Other programs for increasing travel by foot and bike are addressed under Travel Demand Management (TDM) strategies.

Specific bicycle and pedestrian facility improvements recommended as part of the Campus Master Plan are described in the next sections of this report.

Figure 21 - Recommended Bicycle Network



Bicycle Lanes

Roads where roadway width, alignment, and location appear most consistent with bicycle lanes include:

- Centennial Drive between University Way and Central Drive
- Catamount Road
- Forest Hills Road between NC 107 and south of Speedwell Road

Minor roadway improvements or widenings may be warranted before bike lanes can implemented in some locations. In some cases, restriping for bicycle lanes may result in narrower lanes for traffic, which can help reduce traffic speeds. Although specific recommendations for cycle tracks have not been advanced, such facilities should be considered in the planning and design process.

Bicycle "Ramps/Stairs"

There are several locations along potential multi-use paths where short, steep grades make bicycle use impractical, and stairways are required for pedestrians. Alternative routes may be infeasible or inconvenient. In such instances, dismounting and rolling a bicycle up/down a specially-designed channel may be the most convenient and cost-effective solution. Such locations could include:

- Along the corridor between Blue Ridge and Balsam Residence Halls
- Along the connection between Reynolds Hall and Joyner Plaza
- In the corridor between Breese Gymnasium and the Bird Building
- In the corridor between the UC and the Coulter Building
- Between The Village parking lot and the existing walking/jogging trails north of Schrader Soccer Field
- Connecting to future road south of HHS

Shared-Use Routes (Sharrows)

Some lower-speed, lower-volume roads may be suitable for bicycles to travel with traffic, or may not have adequate width for bike lanes. Such roads may be signed as bike routes, including shared-lane pavement markings (or sharrows). Although additional improvements may be required in some cases, roadways that appear well-suited for this type of treatment are listed below.

- University Way, north of Centennial Drive
- Central Drive between Centennial Drive and Buzzard's Roost Road
- Buzzard's Roost between Central Drive and Memorial Drive
- Driveway between Memorial Drive and Lot 19A

- Merlite Court
- Legacy Lane/Reservoir Ridge Drive between Centennial Drive and multiuse trail
- Improved Chancellor's Drive between Young Drive and Joyner Drive (optional)
- Driveway between Lot 8A and Lot 8B (optional)

On-Street Bicycle Treatment to be Determined

The following locations are candidates for on-street bicycle treatments, although further investigation is needed.

- University Way extension to new entrance at NC 107 and Little Savannah Road
- Central Drive between Centennial Drive and Merlite Court
- Memorial Drive between Norton Road and Buzzard's Roost Lane

The proposed roads on West Campus present a special case. As discussed in the roadway section of this report, designs for these roads should consider complete street guidelines in accommodating bicycles and pedestrians. Sidewalks and bicycle lanes should be included wherever appropriate and feasible, unless off-street facilities or shared-use bicycle treatments are available as convenient alternatives. In any case, pedestrian and bicycle travel must be reasonably accommodated.

Multi-Use Paths

Many of the multi-use paths identified in the Master Plan already exist, although some upgrades and additional wayfinding may be needed. Other instances involve filling in gaps between existing facilities. The functionality of several of the Plan's key paths depends on their connection to future off-campus greenways, which are discussed in the off-campus pedestrian and bicycle section of this report. Two critical recommendations for on-campus multi-use paths are described below.

Like most roundabouts, the Centennial Drive/Memorial Drive roundabout at the main entrance is not conducive to pedestrian and bicycle travel. Furthermore, Memorial Drive carries a considerable volume of traffic, and has numerous curves and driveways as it climbs the hill to Norton Road. For these reasons, it is recommended that off-road multi-use paths be used to serve pedestrian and bicycle traffic along Centennial and Memorial Drives between University Way and Norton Road. These new pathways will link to improved existing paths between Memorial Drive and The Village, and a variety of new facilities to the south.

Another significant recommendation for the campus bicycle and pedestrian network involves upgrades to the existing paths behind Harrill and Albright Residence Halls. By connecting the proposed shared-use upgrade to Merlite Court, with a similar facility along Legacy Lane and Reservoir Ridge Drive, this facility provides a reasonably convenient and competitive alternative to travel along Central and Centennial Drives. A new spur would extend behind Cullowhee Presbyterian Church and the relocated Centennial Drive commercial establishments, intersecting Centennial Drive across from the Forsyth Building in close proximity to two proposed bus stops. These pathways provide potentially faster, safer alternatives to using busy Central and Centennial Drives, roads that are more difficult and expensive to modify for safe and convenient bicycle and pedestrian travel.

Sidewalks

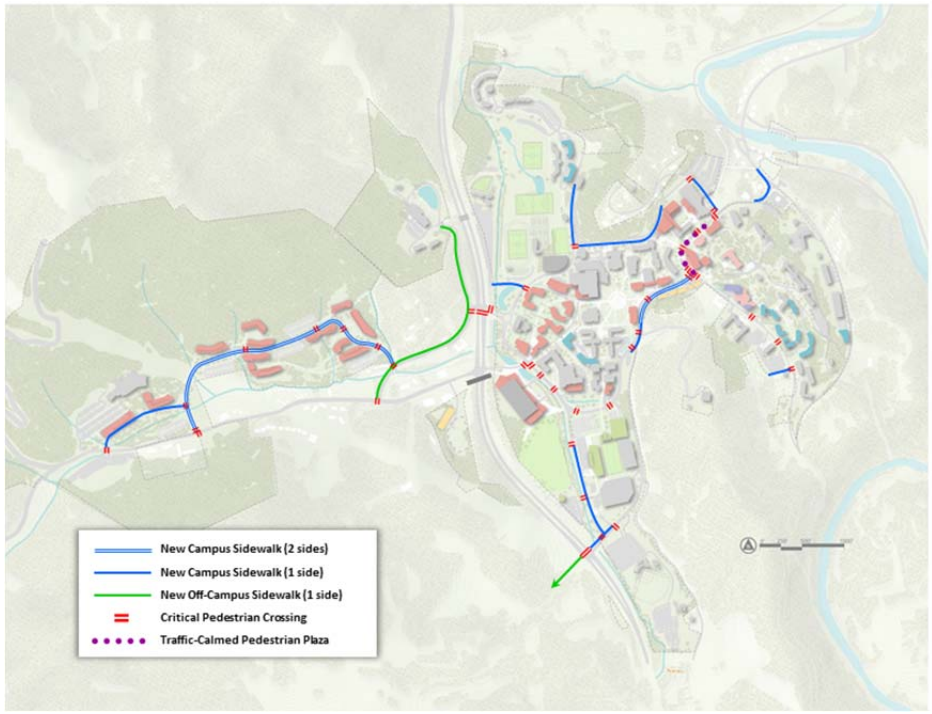
Figure 22 identifies sidewalk improvements recommended as part of the Master Plan. Some of these improvements are addressed in the description of the roadway projects with which they are associated. The remainder consists primarily of missing links in the existing sidewalk network.

For new roads on West Campus, sidewalks should be included wherever appropriate and feasible. When this is not the case, off-street facilities should be used to ensure pedestrian access is available.

Figure 22 also indicates the locations of critical crosswalks deemed because pf heavy vehicle/pedestrian conflicts or safety concerns. Although no single design solution can be applied to every situation, standard guidelines should be followed in installing and maintaining all crosswalks.

Due to the mountainous terrain, ADA accessibility remains a challenge. The situation is exacerbated on Main Campus by infrastructure that was constructed prior to the adoption of current standards.

Figure 22 - Recommended Sidewalk Projects



Off-Campus

The most critical off-campus facilities are those that link the WCU campus with the surrounding community. In some cases, a highway or river or other physical barrier must be overcome; in others, there is no external network to tie into. Active coordination and partnering with surrounding jurisdictions is needed to eliminate barriers to safe and convenient travel between logical destinations, and to provide a comprehensive bicycle and pedestrian network. Descriptions of key projects in that process follow.

Bicycle Lanes

- Extend lanes proposed on Forest Hills Road westward along Country Club Drive from NC 107 (off-road option could be considered)
- Add lanes to Little Savannah Road, from NC 107 westward to at least Blackhawk Road. Continuing further west could be problematic due to grades, alignment, and roadway width. HHS driveway would be the ultimate terminus.

On-Street Bicycle Treatment to be Determined

- Blackhawk Road and NCCAT Drive should be upgraded as appropriate for bike lanes or shared-use routing, providing continuity and access for West Campus and private development to the NC 107 underpass, the Centennial Drive entrance to campus, Killian Road, and Little Savannah Road.

Multi-Use Paths

One key recommended facility enhances connectivity with the Cullowhee Community to the north and east of Main Campus, doing so with minimal expense and disruption. This easily-constructed multi-use path starts out at Buzzard's Roost Road behind Hunter Library, following the alignment of Stedman Drive (the access road serving Cullowhee Baptist Church, Lot 37, and several residences). Just past the cemetery, the path turns right along the right-of-way easement for abandoned SR 1335. This 0.16-mile-long connection would terminate at the new sidewalk installed as part of the NCDOT bridge replacement project B-4159, providing convenient access to the Cullowhee community, the Tuckaseigee River, and proposed Jackson County parks and greenways. Grades are reasonable, and construction and right-of-way costs should be minimal.

Other critical connections include the segment of the Jackson County Greenway system proposed along Cullowhee Creek to the north of campus. Although the alignment has not been finalized, it ultimately would reach the WCU campus immediately north of The Village, from which point it could easily be extended to tie in with existing walking/jogging trails north of Schrader Soccer Field.

To the south, it may be possible to extend a multi-use path or greenway along Cullowhee Creek that could connect with a future county greenway. This route could provide access for residents of Catamount Peaks, an option superior to walking or biking on Speedwell Road, a facility that would be difficult and expensive to upgrade for safe and comfortable non-motorized travel.

Sidewalks

- Extend lanes proposed on Forest Hills Road westward along Country Club Drive from NC 107 (off-road option could be considered)
- Blackhawk Road and NCCAT Drive should be upgraded as appropriate for bike lanes or shared use routing, providing continuity and access for West Campus and private development to the NC 107 underpass, the Centennial Drive entrance to campus, Killian Road, and Little Savannah Road.

Transit Service

Campus Service

Historically, campus master plans do not address transit planning beyond identifying specific infrastructure improvements (such as transit hubs, dedicated bus lanes or busways). This omission is not surprising, since such plans tend to emphasize capital investments over management of operations. Because of the perceived flexibility (and uncertainty) of bus service, it is assumed that the details of transit operations can be worked out later, adapting to the master plan as it evolves.

This is not an optimal approach, since efficient, cost-effective bus routes and stops cannot always be superimposed "after-the-fact" on a street and pedestrian network that was not planned with buses in mind. Careful coordination among all modes and policies is needed to support and promote a successful, integrated bus service.

More important in the context of a Campus Master Plan is the ability for buses to operate safely and efficiently on the campus road network to provide the desired level of service to important destinations. At a minimum, no aspect of the Plan should preclude potential bus service. For the development of this Campus Master Plan, buses were one of the key components considered when planning for vehicle circulation in and around the WCU Campus, taking into account grades, turning radii, route efficiencies, connectivity, destinations, and stop locations.

Proposed connectivity improvements to the road network will benefit general traffic as well as transit, by reducing congestion delays, increasing efficiency, reducing operating costs, and improving flexibility of bus routes. For example, converting Joyner Drive to two-way operation, realigning the road, and extending it to Central Drive will increase efficiency and run-times by reducing the necessity for slow, circuitous routes and allowing the buses to operate in either direction, further improving service. The new entrance at Little Savannah Road and NC 107 also will improve transit and parking operations by providing a more direct link between the HHS/West Campus, remote parking, and Main Campus destinations. These improvements will allow for consolidation of the numerous and sometimes redundant bus stops, reducing costs for stop improvements and amenities, such as shelters, benches, signage, and lighting.

Pedestrian and bicycle improvements also will improve the accessibility of bus stops and potential future transit hub(s). A future parking deck at Cordelia Camp would provide a central transit hub with access to all of Main Campus and West Campus via the proposed bus routes, and would include seamless integration with the future pedestrian and bicycle networks. The McKee Building will also be an important hub.

As the campus and CAT-TRAN system grow, improved frequency and user convenience will become increasingly important in providing a robust, reliable system. When survey respondents were asked what improvements to CAT-TRAN would cause them to use it more often, the most frequent responses were (1) Greater reliability; (2) More frequent service; (3) Real-time location/time GPS data; and (4) Faster routes. Incorporating GPS tracking hardware into vehicles, accessible via computers and mobile devices, improves reliability and user convenience by removing the uncertainty of bus arrival times and enabling the user to choose an alternate bus stop based on vehicle

proximity. Bus frequency becomes somewhat less important when uncertainty is removed. In addition to the user interface, GPS systems typically include data collection and performance monitoring databases that enable the transit operator to improve on-time performance, reduce bunching, dispatch additional buses when necessary, and provide a more transparent system, resulting in more "active" transit planning.

The shuttle routes and stops shown in Figure 23, Figure 24, and Figure 25 should not be taken as specific or final recommendations; they are intended to illustrate the options provided by the Master Plan's roadway improvements. They also suggest shifts in travel patterns and transit demand that will occur as the Plan is implemented, and parking lots are relocated and new buildings constructed.

While the Campus Master Plan establishes a viable framework for transit service over the next 10 years, various policies, programs, and routes will need to be reevaluated frequently. These options depend on the type of service being provided, which can evolve over time. For example, as parking lots are shifted to the periphery of campus, it will be important to adjust routing and frequency of shuttle service. As parking costs and permit prices increase, transit becomes an important option for commuting to campus. It is also recommended to look for opportunities to partner with county services and the private sector, such as apartments and downtown merchants to coordinate funding and service between WCU and off-campus locations. Frequent off-campus bus service, in conjunction with other options, such as occasional-use parking permits and guaranteed rides home, would encourage bus use. Once high-frequency bus service is in place, the University could also consider restricting parking for those served by transit.

Figure 23 - Proposed Shuttle Route to HHS/West Campus

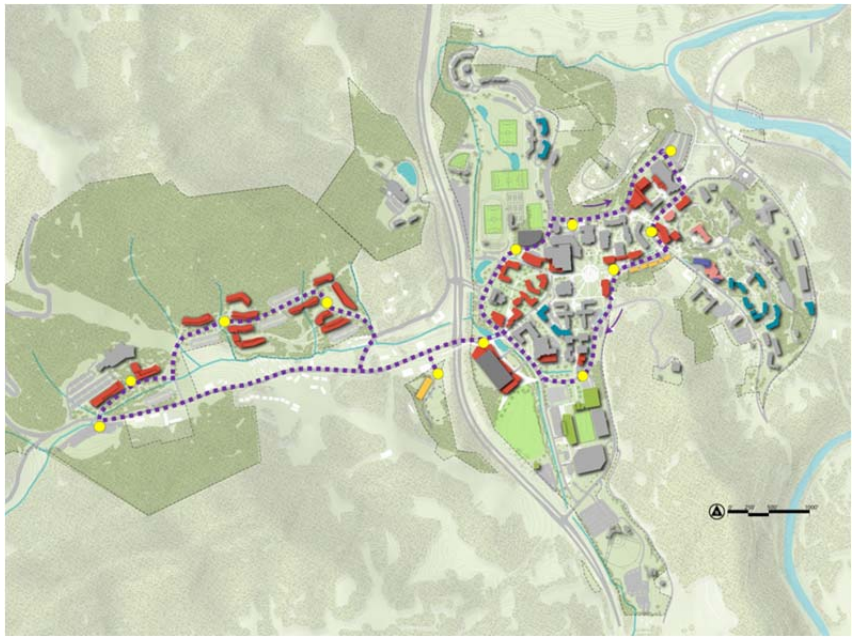


Figure 24 - Proposed North/South Shuttle Route

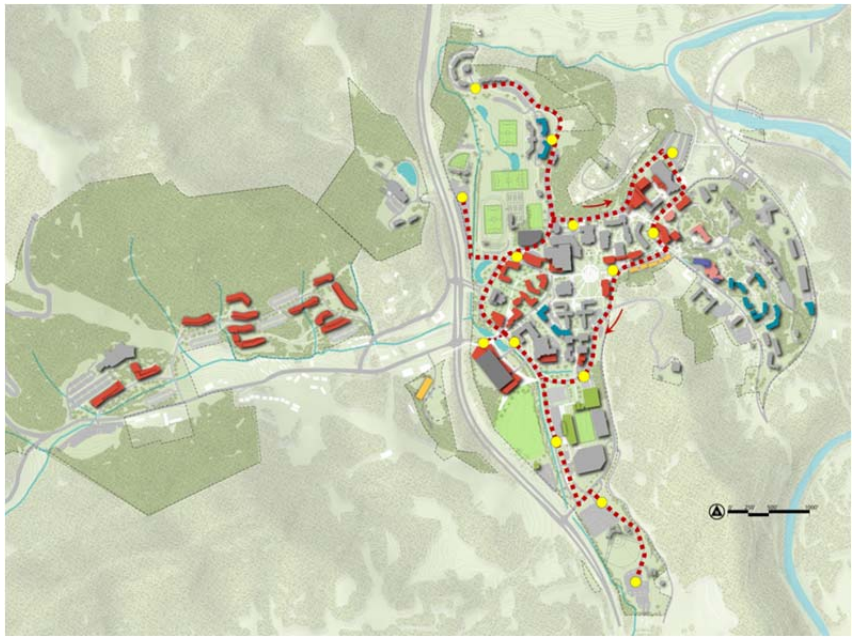


Figure 25 - Proposed Upper Campus Shuttle Route

Additional Transit Programs

Promotional and educational outreaches, especially those targeting new student (or employee) orientation can be very effective and are especially important when service changes are implemented. Ideally, input from both users and non-users should be obtained to help identify potential markets, and improve service. Strategies for continuous monitoring of ridership and improvements to existing routes should be in place, too.

One market that appears to have potential is the large number of students (and some employees) living in residential concentrations within a short bus ride of campus. While there are administrative hurdles, many public universities have negotiated mutually beneficial arrangements with apartment complex management and/or local transit providers to run apartment shuttles or neighborhood circulator routes with shared costs. Off-campus students with the option to ride a bus to campus will reduce the demand for new parking spaces as enrollment increases.

Many of the types of programs just described typically fall under the heading of TDM, since they cross boundaries between parking and the various modes of travel, and depend on sometimes complex inter-relationships. These details of transit service — along with pricing policies, cross-subsidies, and other operational details — while critical to a successful transit system, fall outside the scope of a Campus Master Plan. The Campus Master Plan can, however, provide a robust framework for implementing the appropriate elements of a successful transit system.

Impacts of Parking Supply Changes and Enrollment Growth

As the campus population grows, WCU's parking challenges will shift. The approaches it has been using to manage parking, while reasonable and appropriate now, will become less effective. The effects of an increasing driver population will be compounded by the displacement of existing parking by new facilities being constructed near the campus core. Not only must lost spaces be replaced, but additional spaces provided for new students and employees. As available land on main campus disappears and costs increase, it will no longer be possible to meet increasing demand by constructing new surface lots in convenient locations. A combination of remote surface lots and close-in structured parking will be needed.

Because of the longer distances involved, some of the more remote lots on West Campus near the Health and Human Sciences Building, and along Little Savannah Road, will require shuttle service. While this will increase expenses, users will not want to pay full price for a less convenient parking space. At the same time, higher parking fees will be needed to cover the costs of building, maintaining, and financing a parking deck or decks. These factors will strain the current permit system, introducing significant pressure for a range of permit fees and choices, depending on parking location and service.

Parking resources will need to be managed more actively, requiring regular and detailed monitoring and data collection. As parking costs increase, options that may not have seemed attractive or necessary previously will become more viable. Transit, walking, bicycling, and TDM measures can begin to reduce the automobile share of campus travel. To be effective, these programs must be in place before they are actually needed. This careful

coordination and monitoring of parking, alternatives to driving, and TDM measures are best undertaken under the auspices of a Transportation Department, with a single Transportation Director, to develop synergy.

The final build-out scenario of the Master Plan will have various qualitative and quantitative impacts to the parking supply. Some lots will be completely removed to make room for new facilities or green space, while other lots are partially impacted or reconfigured. Several large-capacity surface parking lots, as well as one parking deck, are proposed as well. The overall strategy is to:

- Selectively remove lots from the campus core that are difficult to access, do not inter-connect, or affect the ease of movement for pedestrians/bicyclists.
- Build or expand some of the large surface parking lots along the campus periphery, easily accessible to nearby thoroughfares to help reduce on-campus traffic and road capacity needs.
- Locate much of the visitor parking in the proposed parking deck.
- Maintain sufficient, reasonably convenient parking in the campus core for special needs and ADA access. Some short-term metered parking is also desirable.

Parking impacts, i.e. gains and losses, were analyzed on a lot-by-lot basis, as shown in Figure 26 and Figure 27 and summarized in Table 1 and Table 2. The cumulative impact on the parking supply is a gain of approximately 1,200 new parking spaces. Main campus has a net gain of more than 500 spaces with construction of the parking deck; more distant areas gain roughly 700 spaces.

Figure 28, Figure 29, and Figure 30 summarize the changing relationship between parking supply and demand over the next decade, and highlight the potential impacts of travel demand management (TDM), increased parking efficiency, and construction of a 1,200-space parking deck.

Long-Term Parking Supply Changes

The cumulative parking impact for The Master Plan development scenario is +1,200 spaces, which includes the construction of one parking deck (located at the current Cordelia Camp building and parking lot).

Combined with the new entrance proposed at Little Savannah Road, this location allows commuters and visitors to be "intercepted," reducing the need to drive further into the campus. To accomplish this objective, the parking deck should incorporate visitor information and wayfinding; a transit hub; convenient pedestrian and bicycle connections and amenities; and other complementary services, such as a convenience store, coffee shop, commuter lounge, and public safety station.

This location also offers excellent proximity and ease of access/egress for a variety of cultural, athletic, and other special events. With good pedestrian and bicycle connections, the parking deck could provide convenient access to future development west of NC 107.

In the future, it will be important for the WCU Parking Services department to manage the parking losses and gains each semester in accordance with the number of permits sold by each parking zone type. The number of parking permits issued for each zone will need to be correlated to the constantly-changing number of available parking spaces. Parking lots may need to be re-classified in order to maintain a balanced parking supply for all users.

Table 1 – Summary of Parking Losses

Parking Lot ID	Parking Lot Name	Spaces Removed
64A	Brown S Upper	28
54	Buchanan	64
61	Buchanan Central	105
38	Natural Science	35
42	McKee Circle	72
43	Bird	19

34	Killian Bldg Ln/UC Upper	152
33	Coulter	119
30	Reid Gym	71
17	Balsam	55
Total		**720**

Table 2 - Summary of Parking Gains

Reference ID	New Lot or Deck	Spaces Added
1	HHS Gravel Lot Expansion	100
2	West Campus Remote Surface	350
3	Natural Sciences Ground Floor	50
4	Faculty Housing Remote Surface	250
5 (a, b, c options)	Parking Deck	1200
Total		**1950**

Figure 26 – 10-Year Parking Losses

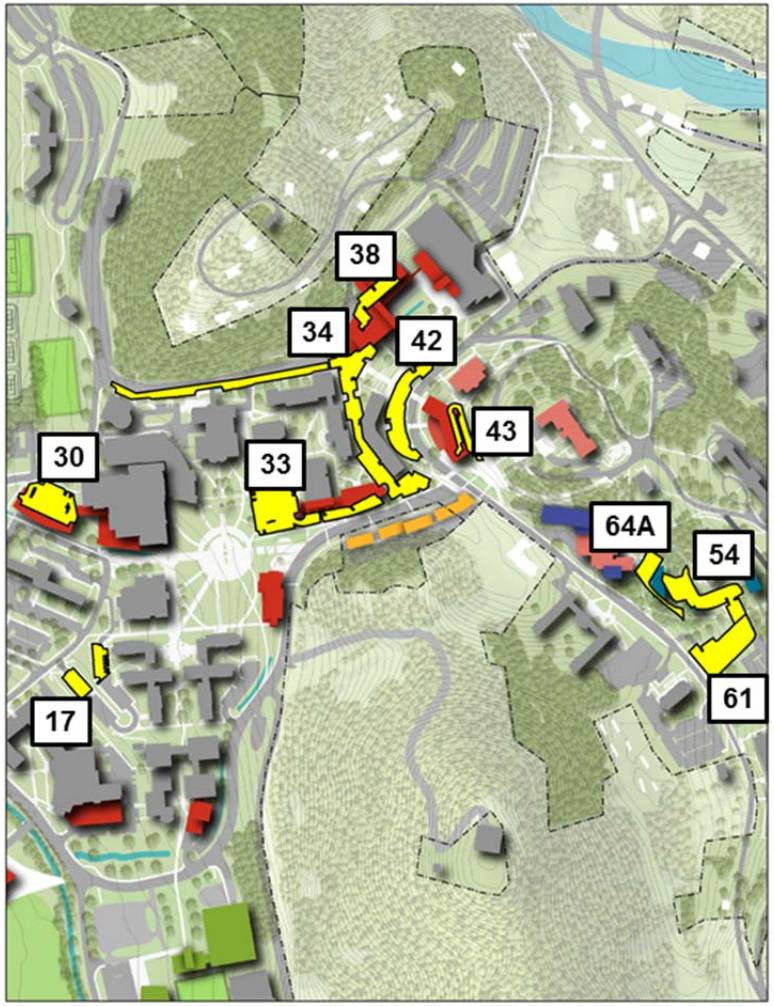
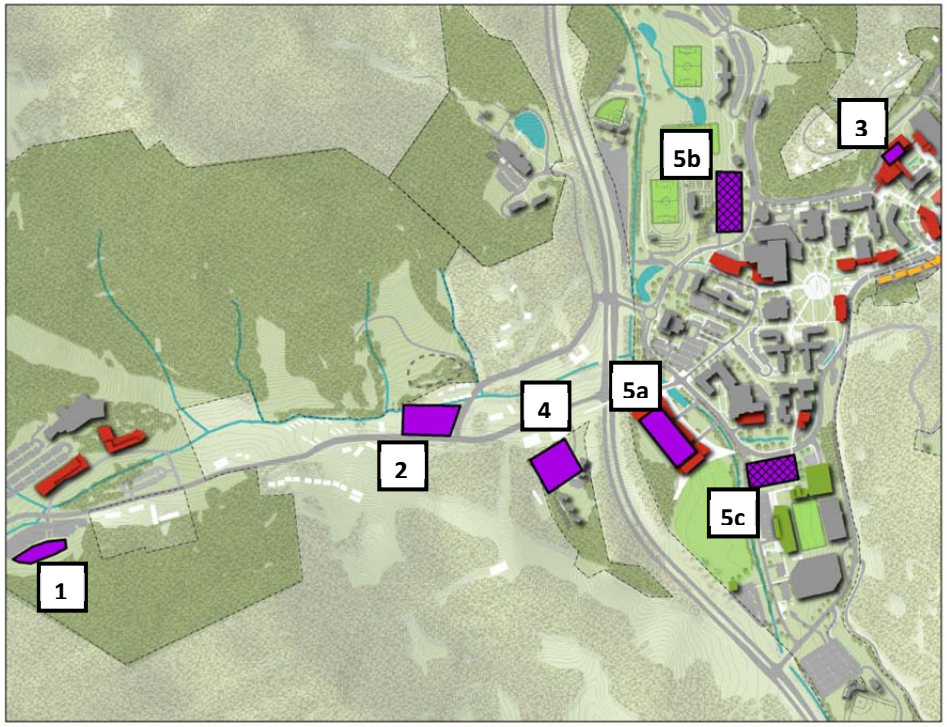


Figure 27 - 10-Year Parking Gains



Enrollment Influences on Parking Demand

Based on the assumptions and analysis described, the approximate cumulative change in parking supply is as follows:

- ~720 spaces removed
- ~1,950 spaces constructed
- ~1,230 net spaces gained

The demand for parking is assumed to grow in proportion with University enrollment and growth in faculty/staff. The current on-campus student enrollment is expected to grow by about 3,000 students over the next 10 years. Applying the same growth ratio to employees will translate to an increase of about 500 people, for a total of about 3,500 by 2023.

Assuming parking demands increase at the same rate, the construction of an additional 2,320 spaces is needed. Since 1,230 net cumulative spaces will be constructed per the Campus Master Plan, this leaves a balance of about 1,090 spaces to be offset or otherwise reduced through improved allocation and utilization of existing spaces, implementation of TDM, or other strategies (Table 3). The 1,090 space target represents 8 percent of the future total on-campus population and is a 13 percent reduction in the future parking demand compared to the "status quo" future parking demand of 8,573 spaces.

Table 3 – Summary of Future Parking Demand

	2013	2023
On-Campus Student Population	8,148	11,171
Student Spaces	5,000	6,855
Student Supply Ratio	0.61	0.61
Employee Population	1,426	1,955
Employee Spaces	1,253	1,718
Employee Supply Ratio	0.89	0.89
Total On-Campus Population	9,574	13,126
Total Parking Demand (Status Quo)	6,253	8,573
Total Supply Ratio	0.66	0.66
Cumulative Parking Demand Increase		+2,320
Cumulative Parking Added as Part of Master Plan		+1,230
Parking Demand Balance		**(1,090)**

Given the cost and difficulty of building additional spaces at a pace that precisely matches parking demand, the University will have to rely on parking policy changes, travel demand management, and alternative modes of transportation such as biking, walking, carpool, riding transit, or telecommuting to meet the travel needs of the campus community. Careful monitoring of parking supply and demand will also be necessary. In addition

to anticipating the parking lost to actual building sites, this process must also consider the temporary loss of parking spaces for construction staging areas and the need for swing space.

A total reduction in parking demand of 13 percent over a 10-year period is a reduction of just 110 spaces per year, which should be achieved through more efficient use of the existing parking supply and through a series of TDM programs that provide incentives for not driving to campus, opportunities for ride-sharing, more convenient bus, bicycle, and pedestrian access to campus, access to a short-term vehicle rental or ride home for emergencies, and other TDM policies that will be discussed in the TDM section of this document.

Parking Pricing Changes

Given some of the observed vacancies in certain lots, it is apparent that not all parking spaces are valued equally by drivers. Likewise, not all drivers place the same value on any given parking space. Some drivers will pay substantially more for parking locations they find desirable, while other drivers have a maximum parking budget they will not exceed. Current permit pricing is equal for all users (commuting students, resident students, and employees), and therefore does not take full advantage of the varied user's willingness to pay. By lowering the price for parking at under-utilized lots (typically on the edge of campus) and/or raising the cost of parking at prime (central) locations, it is possible to redistribute the demand for parking more uniformly across campus, without adversely affecting needed revenues.

To be most effective, this approach may need to be combined with an appropriate set of supportive policies that increase the certainty of finding a parking space, and which discourage hunting for a better space or re-parking throughout the day. Examples of such policies include zoned or gated parking, convenient metered short-term parking, and pay-as-you-go or pay-per-use permits. These policies enhance efficiency by increasing parking turnover rates, discouraging unnecessary parking/re-parking, and better matching supply to demand.

Figure 28 - Parking Supply and Demand Forecast

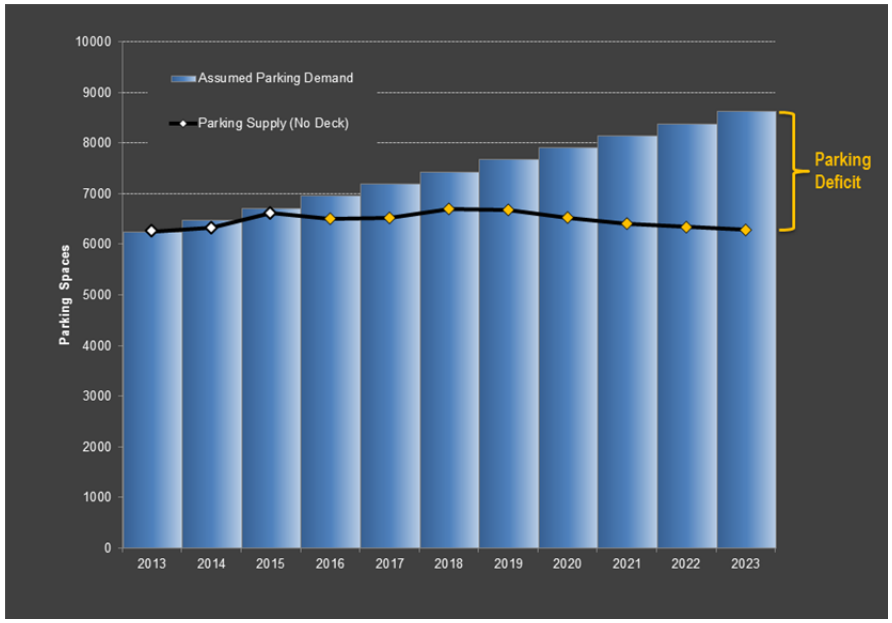


Figure 29 – TDM and Efficiency Impacts on Parking Supply and Demand

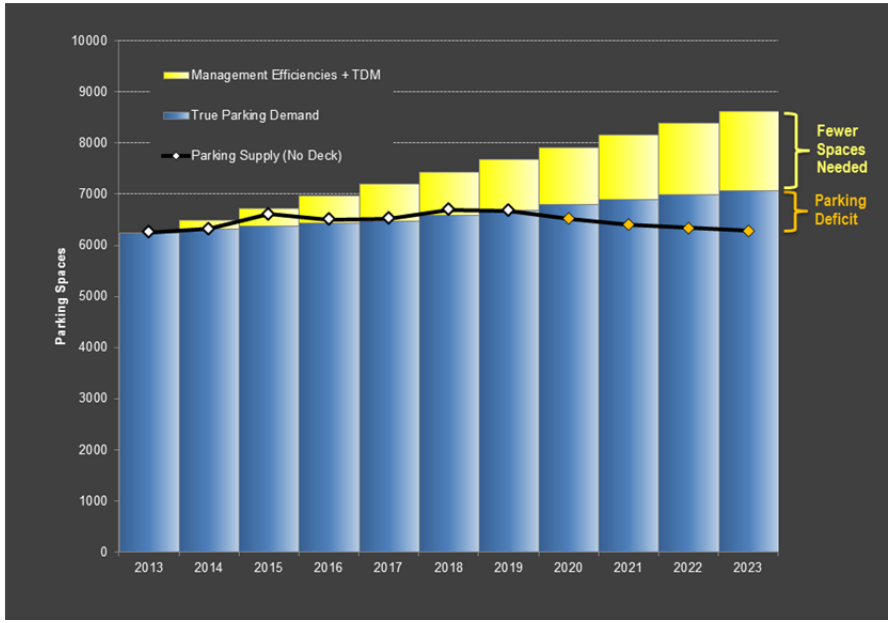
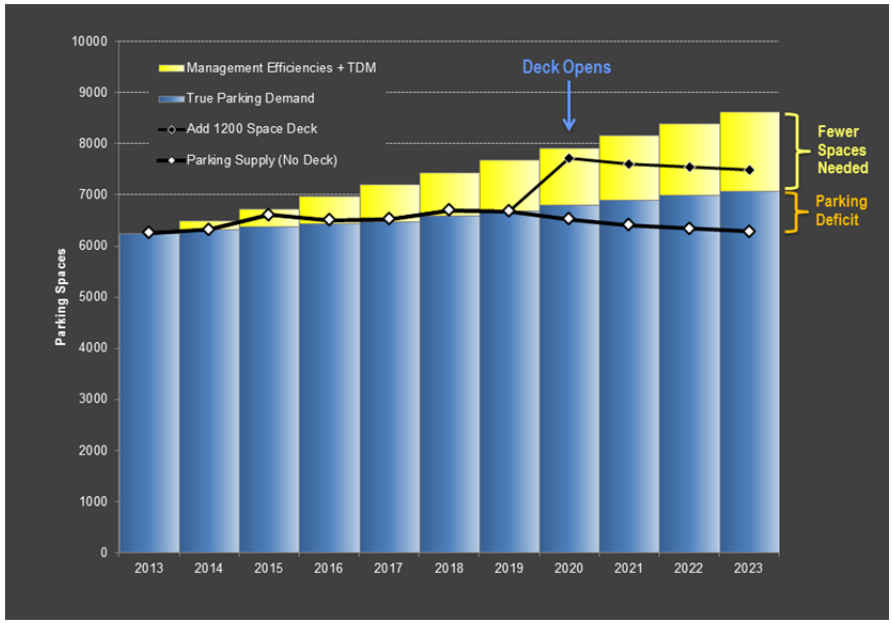


Figure 30 – Impacts of Parking Deck on Parking Supply



Construction of the first parking deck on the WCU campus will present a new administrative challenge. Structured parking requires higher per-space revenues, due to greater construction, maintenance, and financing costs. The higher parking fees needed to provide these revenues are typically too great to be assigned only to people parking in the deck. Unless some other revenue source is obtained, deck costs will need to be spread across all parking fees. While parking fees will increase, but the new fee structure will reflect a broader range of choices. Monitoring and managing these choices will become an important function for the parking and transportation departments.

The presence of safe, convenient, and efficient transit, pedestrian, and bicycle systems further supports these policies, encouraging drivers to park in locations that otherwise would be considered unappealing. Experience on other campuses demonstrates that many consumers are willing to pay more for improved service, while others prefer to trade convenience for reduced cost. The keys to success are providing value commensurate with cost, offering a range of choices, and ensuring dependable service regardless of price.

Since it is reasonable to expect parking costs to increase over time, efforts should already be underway to develop a package of integrated policies, programs, and other alternatives to reduce dependence on driving. Phased increases in parking fees can coincide with the initiation of new options to driving, so people can see that their money is providing a benefit.

Parking Proximity Changes

Many universities have policies that limit the number of residential parking permits, especially for underclassmen. While eliminating freshman parking on campus would alleviate the need to build a parking deck over the next 10 years, it may not be a viable option at WCU. Since residential parking tends to have a low turnover rate and access to these cars is less critical to University life, an argument can be made for locating these spaces in more remote locations, as long as security and shuttle access can be ensured. This suggests that some resident parking (freshmen, in particular) could gradually be shifted to the HHS gravel lot and additional lots on West Campus that could be constructed. The freed spaces on main campus could be used for commuters, effectively increasing the parking supply of those spaces as turnover is greater and permit oversell ratio can be higher.

Parking Demand Management

Other steps can be taken to reduce the demand for campus parking by increasing vehicle occupancy rates or shifting trips to alternate modes. Aggressive promotion of ridesharing, especially if combined with preferential parking and/or permit discounts, is the quickest and easiest step to implement. Parking, transportation, and TDM would be more easily coordinated as part of a Transportation Department with a single Transportation Director.

Guaranteeing a ride home for emergencies is another low-cost program that makes commuting by transit, car/vanpool, and even bicycle more attractive. Similarly, car-sharing can provide flexibility for both residents and commuters.

Recognizing there are times when driving alone is not just a convenience but a necessity (such as medical appointments, inclement weather, or the need to transport bulky project materials), the University can promote the use of occasional-use parking passes. Many students do not need to drive most of the time, but once they have invested in a parking permit, there is no incentive not to use it. In a properly priced system, an occasional-use permit, combined with car-sharing and guaranteed rides, can be a cost-effective solution.

Pay-as-you go parking is another tactic. Variations include metered parking, paying by cell phone, or using a debit system wherein a permit is purchased, but users are charged only when they park, and any unused balance is reimbursed at the end of the semester. In their most sophisticated applications, pay-as-you-go parking schemes incorporate dynamic pricing that adjusts rates by location, time-of-day, and day-of-week, allowing (and requiring) continuous monitoring and management of parking supply and demand.

While these programs should, on their own, be able to reduce peak parking demand by 2 to 4 percent, they are even more effective when combined with improvements to transit, bicycle, and pedestrian modes.

New Parking Construction

Parking needs will fluctuate over time, and the total number of parking spaces should be balanced during campus development. Parking that is removed by the construction of new buildings should be replaced prior to removal (mitigated) in a comparable location and quantity. Additional parking required for a new building should also be constructed in a comparable location, and should be available once the project is completed. It is important not to over-build parking facilities, especially structured parking, as the construction and maintenance costs will be significant. One strategy is to construct temporary surface parking lots as placeholders for future building projects. This strategy excludes project sites located within the core of main campus, which would be unsafe or otherwise impractical for temporary parking.

It is also important to consider how new parking facilities affect or interact with the rest of the transportation system. Although traffic impacts are typically the most obvious and significant, pedestrian and transit access should also be considered. Any additional costs incurred as a result of a new parking facility (such as expanding or replacing roads or walkways, or extending transit service) should be appropriately attributed to that parking facility. This is particularly important with respect to parking decks, due to their permanence, and the concentrating effect they have on vehicular and pedestrian traffic.

Other Parking Issues

- ADA Accessible Parking. Implementation of the Campus Master Plan will displace a number of existing surface parking spaces, especially in the campus core. Among these are a significant number of ADA accessible spaces. While accessible spaces will be provided in all new parking facilities, these spaces may not be as convenient to destinations in the campus core. The Campus Master Plan includes the flexibility to locate permanent or interim accessible parking spaces at various central locations. Careful monitoring of this situation will be needed throughout implementation of the Campus Master Plan, since available parking spaces and accessible routes will change due to ongoing construction. In addition, as a larger share of campus travel occurs on foot, bicycle, and bus, accessible transit options will need to be emphasized.
- On-Street and Metered Parking. Although on-street parking and metered parking are not synonymous, most metered parking is on-street, and on-street parking in urban settings is frequently metered. Like many campuses, WCU has little on-street and metered parking. However, there are instances where on-street and metered parking (implemented either separately or together) can provide significant benefits. On-street parking can create a buffer for pedestrians; help suppress travel speeds; provide room for service/delivery vehicles and bus stops; and reduce off-street parking needs. Combined with individual or multi-space meters that can accept payment by coins, bills, credit cards, smart cards, and even mobile phones, these spaces can provide convenient short-term parking for visitors, students, or employees. Off-street metered spaces can serve the same function. When operated in appropriate, high-turnover locations, metered parking can provide a significant revenue stream. Long-term or unmetered on-street parking is not recommended, except for special uses,

such as delivery or service, special events, handicap, or possibly vanpool or car-sharing.

- Special Event and Football Parking. As the supply and location of parking shifts over time, providing access and parking for special events, especially football games, remains an on-going challenge. In general, the Campus Master Plan appears to provide enough parking to handle most special events, given adequate notice and preparation time. In fact, all of the Campus Master Plan recommendations appear to provide potential benefits for game-day travel, by improving the quality of traffic, and quality and quantity of transit, parking, and walking infrastructure. In some cases, it may be necessary to reserve parking spaces in some facilities to ensure an adequate supply. However, a single definitive answer is not possible, since each event is unique, and since conditions will change as various parking facilities go offline and others come online. Fortunately, most major events occur outside of peak parking and traffic periods.

Conclusions

Given the high costs associated with financing, building, and maintaining structured parking spaces, the University has a chance to begin changing attitudes and behaviors with regard to driving and parking at WCU. This is a low-risk opportunity to dispel the automatic assumption that parking is a "fixed" demand that must be met in direct proportion to campus population.

In any case, a solution that reduces, or even delays, the need for construction of new parking supply also avoids associated capital and maintenance costs, as well as potential environmental impacts, especially those related to water quality and habitat disruption. A non-construction alternative that makes more efficient use of existing parking infrastructure (rather than unnecessarily increasing parking supply) also seems to better support the direction of ongoing campus master planning efforts. In fact, temporary parking losses associated with the construction of new buildings provide an excellent opportunity to introduce some of the parking policy changes and TDM strategies proposed during the master planning process, and to test their effectiveness on a small scale.

A range of viable alternative solutions are described below. In most cases, they are not mutually exclusive, but could be implemented either individually or in appropriate combinations.

Travel Demand Management (TDM)

Given the long-term nature of capital investment in parking facilities and the significant influence it has on the character of the campus, prudence requires consideration of other options that could reduce the demand for parking spaces, now and in the future. Techniques for reducing reliance on the single-occupant vehicle – and, consequently, parking demand – are grouped under the rubric of Travel Demand Management, or TDM.

As noted in the preceding discussion, parking, automobiles, transit, walking, and bicycling are interrelated (and land use, urban design, class and work schedules, and pricing policies could also be added to the mix). While it is convenient to discuss these elements separately, doing so risks overlooking the effects they have on each other. For example, a change in parking (say, increased permit fees and a strict park-once policy) could reduce traffic congestion and parking demand, while creating a dramatic surge in bus ridership, which in turn could lead to budget shortfalls in bus operations, and the need to improve sidewalks, streetlights, and bus stops.

TDM provides an overarching framework for addressing these complex and interdependent elements. However, TDM planning requires a very different view of the campus from that used in the Campus Master Plan. Infrastructure planning takes a broader, long-term, high level view of the campus. TDM, by its very nature, requires a much more detailed, close-up, short-range perspective. For TDM programs, the devil is often in the details, which can vary weekly. Therefore, it is difficult to provide a detailed TDM plan in conjunction with a Campus Master Plan. There are too many variables, too many unknowns.

To use a transportation analogy, the Campus Master Plan can be thought of as the design for a car, defining its characteristics and emphasizing its most desired features. Most of the transportation elements of the plan, especially those tied to infrastructure, form subsystems of that automotive design. TDM,

relates to how you drive the car. Extending the analogy, a TDM program falls somewhere between an owner's manual, a driving course, and a map for an important trip. Real TDM occurs in real time, or it is not effective. Therefore, specific TDM recommendations are not included in this report. Instead, a likely menu of options is described that is consistent with the assumptions and recommendations of the Campus Master Plan. Within the framework established by the Campus Master Plan, an ongoing series of detailed, short-range studies is needed to implement an effective TDM program. These studies should incorporate continuous feedback regarding changing conditions and performance measures.

TDM Policies, Measures, and Programs

Travel Demand Management (TDM) involves developing and promoting alternatives to reliance on the single-occupant vehicle – particularly alternative modes of travel:

- Transit (including buses and shuttles)
- Walking and bicycling
- Ridesharing
- Park and ride / remote parking

TDM is the best option for preserving and enhancing the campus environment and the resulting quality of life. While helping to reduce traffic volumes within and around campus, it means there is less pressure on land for parking, with potentially more green space or core academic buildings.

Institutional commitment is critical to success. TDM is most effective when 'carrots' – the positive inducements to use alternative modes of travel – are supported by 'sticks' – the factors that discourage people from driving alone.

The next steps to ensure continued growth and success involve promotion and marketing to increase awareness. This includes monitoring results (surveys and user feedback, as well as quantifiable performance measures) to learn what is working, and continuous coordination with both the campus community and with outside transportation agencies, service providers, and the surrounding community. Although developing a comprehensive action plan for parking and travel demand management is outside the scope of a Campus Master Plan, the following section provides an outline of a prototype TDM program for Western Carolina University.

Sample TDM Action Plan

A successful TDM Action Plan requires dedicated resources, and a commitment to effective involvement of the entire University community. A TDM Action Plan entails active management, continuing support, and two-way communication. Being "customer" driven, it requires a thorough understanding of the various travel "markets" associated with the University – their sizes, locations, and needs. As conditions change and the plan evolves, goals must be defined, priorities identified, performance monitored, and timely adjustments made. The following section identifies most of the elements to be considered in developing such a plan. Some of these elements are already in place at WCU, although in less ambitious or formalized versions. Most of these elements could be implemented with minimal expenditure or long-term commitment, making them relatively low-risk options.

- Transportation Manager/TDM Coordinator. This position leads, promotes, coordinates, and manages TDM efforts. The Transportation Manager acts as a liaison/advocate to government agencies, local neighborhoods, businesses, and non-profits to obtain support and/or funding for TDM programs.
- Permanent Transportation and Parking Committee. This group, comprised of students, faculty, and staff, work with the Transportation Manager to develop policies, programs, and priorities, and to communicate with other stakeholders.
- Optimal shuttle bus route and schedule. Develop a new brand and/or improved marketing.
- Convenient priority parking spaces as an incentive to carpools and vanpools.
- Occasional use parking vouchers. Such vouchers can be offered to students and employees who choose not to purchase a parking permit, providing these individuals with a limited number of single-use parking "passes" for occasions when a car is needed for a particular trip purpose.

These passes can be similar to general or commuter permits, or can be designed as premium passes for short-term use at especially convenient locations.

- Strategic placement of metered parking, which can complement occasional use and visitor parking to provide alternatives for people without permits for on-campus parking. This could also lay the groundwork for a "pay-as-you-park" system, which provides an incentive for permit holders not to park, by charging (or debiting) them only when they use a parking space. This system can also be implemented so that rates vary by time of day, with peak periods and premium locations costing more than remote locations and off-peak hours.
- Partnering on shuttle services to/from student-oriented apartment complexes. This is often partially or fully funded by property owners/managers as part of their market positioning.
- Bicycle/pedestrian group and minor improvements budget.
- A 'Commuter Alternatives Program' as framework for incentives below.
  - Provide Emergency Ride Home service, which provides discount rates for taxi service for those who do not have a car available, or in the event that a transit or rideshare commuter needs to return home due to illness or other family emergency. This eliminates one of the most frequently cited obstacles to not bringing/driving a car to campus.
  - Begin Neighborhood Ride Home service, which provides a ride home via shuttle to residents of designated neighborhoods who are willing to walk or bike to campus, but who may not want to return on foot or bicycle due to darkness or inclement weather. This helps address a frequently cited drawback to walking and bicycling.
- Parking zones to reduce on-campus traffic and to more efficiently manage oversell and occupancy rates. Zoned parking can justify charging higher parking rates for those who value and desire this benefit, while those who do not can pay less for non-premium parking. This creates a revenue source that can all be used as a cross-subsidy for other transportation needs.
  - A large supply of low-cost (but less convenient) parking guarantees access to anyone, regardless of willingness or ability to pay.
  - A smaller supply of parking in more desirable locations warrants premium pricing, which can be used to offset or cross-subsidize transit or TDM programs.
  - New technology enables more flexible pricing schemes, such as account debiting; variable pricing (by location, time-of-day, or day-of-week); or discounting for carpools or occasional users.
  - Ongoing monitoring and real-time management, increasing both staff and technical resource needs.
- Partnering with Jackson County, NCDOT, and others to improve bicycle and pedestrian access to the campus from nearby neighborhoods and retail/service centers.
- Applying for 'Best Workplaces for Commuters' status.
- Eliminating freshmen parking; move some residents' cars off campus and reduce cost.
- Investigating 'cash-out' or other alternative compensation for returning or declining a parking permit.
- Relocating resident parking to more remote locations (at discounted rates) served by scheduled or on-call shuttles.
- Priority parking for commuters living further from campus.

Hallmarks of a Successful TDM Program

Flexible – offers people a range of choices; responds to opportunities and changes

Comprehensive – provides options that meet a diverse range of needs

Complementary – involves synergistic measures, not conflicting/competing

Dedicated Resources – a firm funding stream and dedicated staff position(s)

Stakeholder Input – before, during, and after developing the program

Marketing & Education – active outreach to the University community

Carrots & Sticks – changing individual behavior and University culture

Targeted – market-based; data driven

Evaluated – monitor, assess, and update

Integrated – with campus plans (long- and short-range), and with the surrounding community (governments, businesses, and non-profits)

Key Performance Indicators for Measuring TDM Effectiveness

Mode split	(from travel survey)
Carpool participants	(from parking permit records)
Parking occupancy	(from sample counts)
Shuttle riders	(from sample counts)
Vehicle trips generated	(estimated from data)
Commuter carbon emissions	(estimated from data)

TDM and Parking Summary

In the long-term, a full TDM Action Plan should be able to reduce employee parking demand by 5 percent to 10 percent, and could reduce student parking demand by 10 to 20 percnet. However, it will take time to build programs to this level.

In the short-term, an overall commuter parking reduction of about 10 percent can be expected if initial TDM efforts are successful and combined with more active management of parking operations.

Remote/satellite parking could provide storage for all freshman resident parking, depending on site availability.

Summary of TDM Program

Realistic program in conjunction with more efficient use of parking could, over time, reduce future parking demand by >1,090 spaces (13%).

- Delays deck construction
- Requires enhanced shuttle service
- Depends on resource commitment and person-in-charge
- Partnering with outside entities required
- Program should start *before* it is really needed
- Must include reasonable parking fee increases

Summary of Transportation Element Goals and Strategies

Goals: / Strategies:	Increase percentage of trips on sustainable modes	Make getting around campus easier	Ensure Campus Master Plan can work
Roads			
Promote a balanced transportation system	●	●	●
Design roads for people, not just for cars	●	●	●
Focus on function		●	●
Parking			
Accept a lower parking ratio (fewer spaces per person)	●		●
Reduce parking demand	●		●
Treat parking as a strategic campus resource			●
Maintain effective parking capacity and occupancy levels		●	
Offer parking permit options that meet the needs of both users and the University	●	●	
Adjust parking fees	●		●
Transit			
Refine the focus of campus bus service	●	●	●
Improve reliability, efficiency, and travel times of campus bus system	●	●	●
Improve service quality of campus bus system	●	●	●
Enhance commuter transit options	●	●	●
Walking and Bicycling			
Improve pedestrian access and safety	●	●	●
Increase connectivity, facilities and amenities for bicyclists	●	●	●
Travel Demand Management			
Create a comprehensive transportation management position that integrates all aspects of campus transportation planning and operations	●		●
Recognize the role of transportation in campus life by proving relevant support and advice	●	●	●
Implement comprehensive, performance-based transportation and parking monitoring program	●	●	●