

# STREETSCAPES ON THE CAMPUS EDGE

by

RUOLIN GU

(Under the Direction of Georgia Harrison Hall)

## ABSTRACT

The campus edge, a transition zone between the university and cityscape, is key to the quality of spatial relationships between campus and neighborhood. Streets are the most common but easily overlooked boundary makers of the campus. The improvement of the streetscape on campus edges could potentially enhance both physical and community relationships between the campus and the city. This thesis undertook a study of the streetscape edge spaces of the University of Georgia in Athens as the research topic. Through the theoretical analysis, selection and analysis of representative study areas, application of Pedestrian Environmental Data Scan (PEDS), and proposed designs for study areas, the research compiled design guidelines for the campus edge streetscape. The design guidelines focused on enhancing the multipurpose uses of public space, increasing interactions of the town-gown community, improving multi-modal transportation, extending campus design features, and ameliorating the transition from campus to city.

INDEX WORDS: Landscape Architecture, Campus Edge Space, Streetscape Design, Walking Environment Audit Method, Pedestrian Environmental Data Scan (PEDS)

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by

RUOLIN GU

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by

RUOLIN GU

Major Professor: Georgia Harrison Hall  
Committee: Brad Davis  
Rosanna Rivero  
Lara Mathes

Electronic Version Approved:

Ron Walcott  
Vice Provost for Graduate Education and Dean of the Graduate School  
The University of Georgia  
August 2021

## DEDICATION

In dedication to my parents-- Zheng Zhang and Xianliang Gu, my grandparents--Lamei Di and Hanzhao Zhang, for unwaveringly supporting my education and all my bold decisions.

This work is in memory of my grandfather, Hanzhao Zhang, who had been tremendously encouraging of my lifelong interest in art and design.

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## CHAPTER ONE

### INTRODUCTION

#### **1.1 Research Intention**

The interactions between the university campus and surrounding areas are burgeoning with strong economies and cutting-edge transportation, housing, recreation, and education facilities, because of the continuous improvements in social outreach of the university. From 1990, universities no longer intend to buffer campuses creating sharp town-gown distinctions between the university and surrounding neighborhoods (Ehlenz 2019). Instead of keeping the defining characteristics of campuses, universities have started to embrace their neighborhood and pursue placemaking within the surrounding areas (Ehlenz 2019).

The campus edge is key to the quality of spatial relationships between campus and neighborhood, varying from complete separation to gradual integration. The ideal campus edge design should encourage some visual connection to the campus's presence, mediate the incongruity of the changes in circulation and functionality, and facilitate the common interests of members of the university community and the public (Dober 2000). Streets are the most common but easily be overlooked boundary makers of the university campus.

The streets on the campus edge involve frequent interactions—the daily commuters in private vehicles and public transit; the cyclists and pedestrians; parking egress and ingress for university members on weekdays and additional outside users on weekends and during special

events. The conflict between non-motorized travel and vehicles becomes more prevalent on the streets located at campus edge.

Streetscape is defined as “...a term used to describe the natural and built fabric of the street, and defined as the design quality of the street and its visual effect, particularly how the paved area is laid out and treated. It includes buildings, the street surface, and also the fixtures and fittings that facilitate its use – from bus shelters and signage to planting schemes.” (for Architecture et al. 2002; Torbay Council 2004). Streetscape design for the campus edge is full of possibilities to enhance the multipurpose uses of public space, to increase interactions of the town-gown community, to improve multi-modal transportation, and to extend campus design features and ameliorate the transition from campus to city.

Streetscapes on the campus edge are mainly composed of five elements: the road, pedestrians and cyclists, open space adjacent to the street, campus edge features and morphology, and planting. Detailed illustrations of these five elements and how these elements influence the design of streetscapes on the campus edge are shown in the following chapters.

As the home of the University of Georgia, Athens-Clark County, GA is deeply influenced by college town culture. The total population of ACC is 129,025 in 2021 (“Athens, Georgia Population 2021 (Demographics, Maps, Graphs)” n.d.). The travel time to work of ACC is lower than the US average. And the majority of commuters drive alone to work. The low percentage of the population using public transit/biking/walking to work indicates the need for streetscape improvements (Figure 1.1).

Transportation to work

**22.7** minutes

Mean travel time to work

about three-quarters of the figure in Georgia: 29.3

about 80 percent of the figure in United States:  
27.6

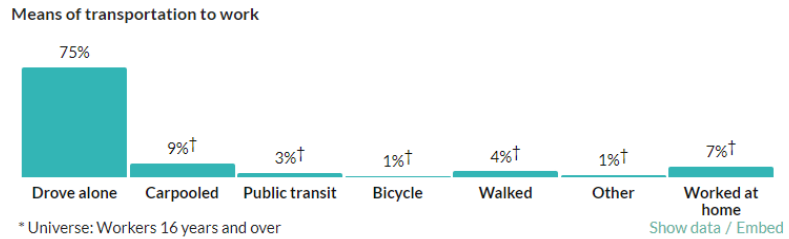


Figure 1.1 Transportation to work chart.

(<https://censusreporter.org/profiles/31000US12020-athens-clarke-county-ga-metro-area/>)

The University of Georgia Zoning Map shows that the academic campus of UGA is surrounded by several types of land—the north campus is adjacent to commercial and mixed density residential land, the south campus is adjacent to mixed density residential land and single-family residential (Figure 1.2). The study areas of this thesis include four sites in six streets--E Broad St, S Thomas St, Baldwin St, S Lumpkin St, E Campus Road, and Carlton St. These streets connect the academic campus of UGA to the neighborhoods and reflect the interactions between the UGA campus and its surroundings.

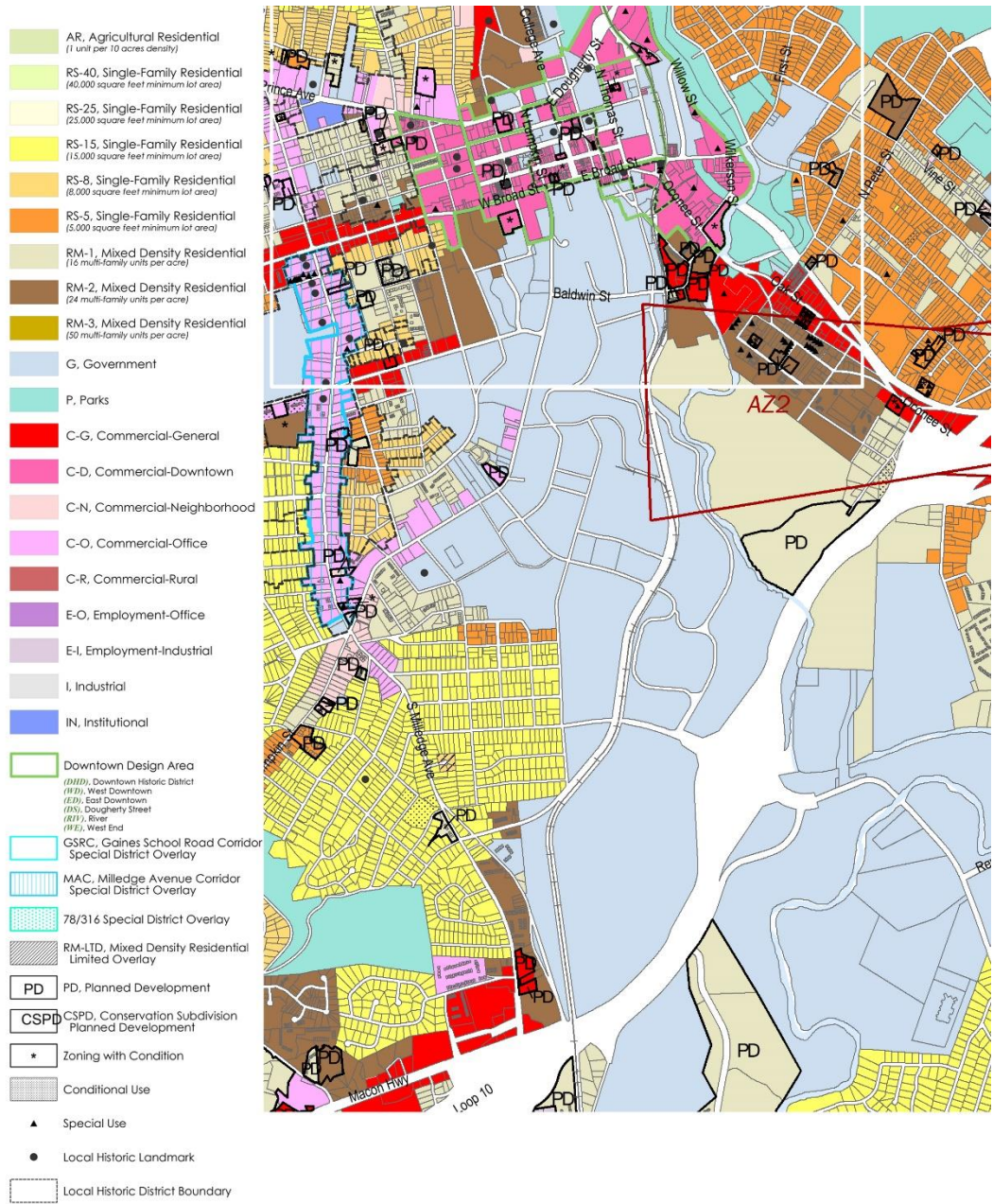


Figure 1.2 University of Georgia Zoning Map  
 (“ACC ZONING MAP” 2014)

This thesis examined edges of the University of Georgia campus in Athens, Georgia as the research focus. By exploring the existing conditions of four selected streetscapes at UGA, applying an established streetscape audit method--Pedestrian Environmental Data Scan (PEDS)

to analyze the selected sites, and studying representative design elements of the UGA campus, the thesis will put forward selected design guidelines for the improvement of campus edge streetscapes.

## **1.2 Research Questions**

What are the elements that affect the design and user experience of streetscapes on the campus edge? What features can provide a pedestrian and bicyclist-friendly environment on the streetscape?

## **1.3 Methodology**

The methodology of the thesis included a theoretical analysis of relevant case studies and literature, selection and analysis of representative study areas, and proposed design applications to improve existing conditions (Figure 1.3). **Chapter 2 Literature Review** introduces the key concepts related to the thesis and an established pedestrian environment audit tool. The theory and application of the Pedestrian Environmental Data Scan (PEDS) is described and applied to the evaluation of existing conditions in the analysis process. **Chapter 3 Case Study** focuses on three cases that emphasize various aspects of streetscape design: multi-functional open space, extension of campus design features, guidelines for the design for the convergence of intersection/bike lane/transit stops, an innovative design for a land bridge, and intermodal transportation coordination. **Chapter 4 Design Process** applies the Pedestrian Environmental Data Scan (PEDS) to analyze four selected sites on the UGA campus and inform the proposed designs. **Chapter 5 Conclusion** summarizes the elements that compose and influence the design

and improvement of the streetscape on the campus edge and provide design guidelines for future campus edge streetscape designs.

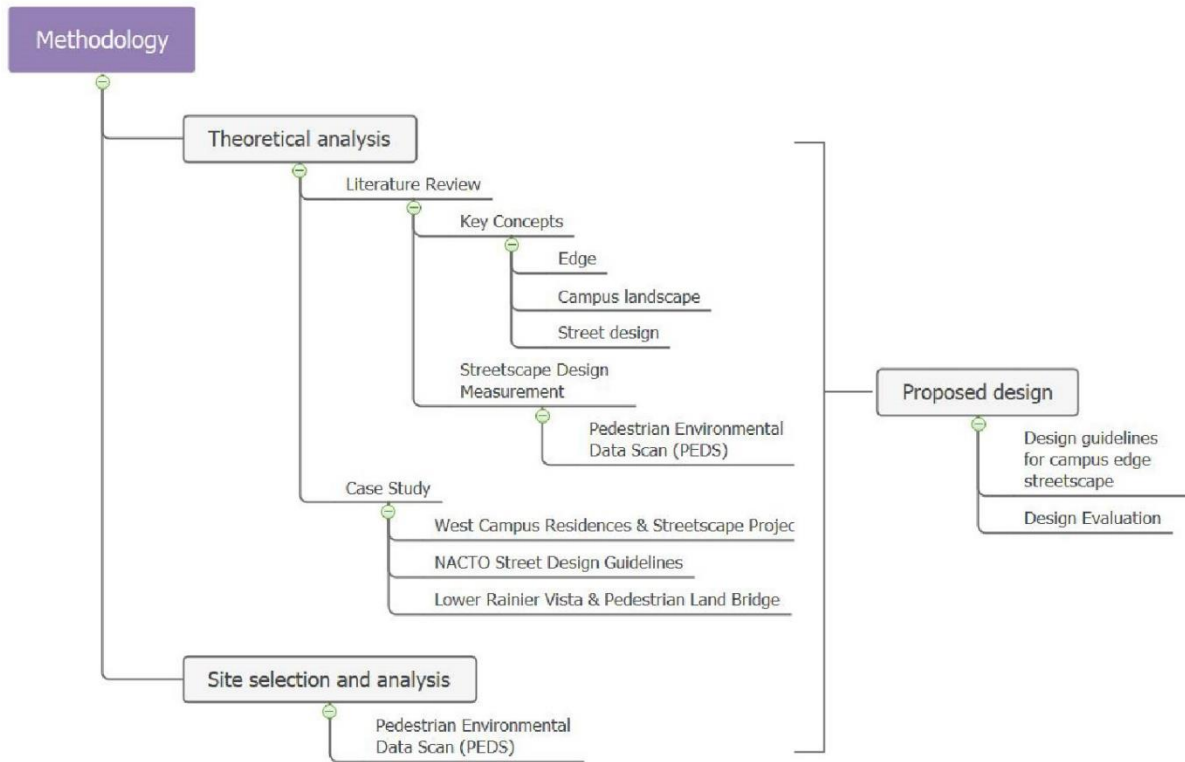


Figure 1.3 Methodology of the thesis. (by author)

### 1.4 Limitations and Delimitations

The thesis uses PEDS (Pedestrian Environmental Data Scan) to evaluate the walking and cycling environments of four sites on the UGA campus. Due to the limitation of research time, funds, and COVID pandemic, the survey was conducted by the author under the guidance of the PEDS protocol and training process from Oct 2020 to Mar 2021.

Users’ perceptions, municipal planning decisions, seasonal change, and the night campus could also be the factors that affect the design and improvement of campus edge streetscapes.

However, this thesis focused on five key elements: the road, pedestrians and cyclists, open space adjacent to the street, campus edge features and morphology, and planting.

The adopted PEDS audit methodology in this research is only applied in a college context--the University of Georgia. Amendment and testing are necessary for the audit instrument if it is applied to a campus located in the middle of a commercial area or other kinds of edge spaces, such as the edge between a residential area and commercial district.

## CHAPTER 2

### LITERATURE REVIEW

This chapter introduces the background information of the streetscape design on the campus edge. This comprehensive topic involves the knowledge of edge, campus landscape and campus design, streetscape, and streetscape evaluation. Through the literature review, the author aims to summarize the design guidelines for the future improvement of the streetscape on the edge of campus.

#### 2.1 Edge

In Merriam -Webster dictionary, the word "edge" is defined as *“a line or line segment that is the intersection of two plane faces”*. From the explanation of the dictionary, the edge does not exist independently, it highlights the interaction between two objects. Kevin Lynch defined that *“Edges are the linear elements not considered as paths. They are the boundaries between two phases...”* in his book *The Image of the City* (Lynch and for Urban Studies 1960). He also defined five elements that make a city easily identifiable--paths, edges, districts, nodes, and landmarks (Lynch and for Urban Studies 1960).

Edge has been discussed in various research fields includes Ecology, City Planning, and Architecture. One of the well-known concepts in Ecology is the *“edge effect”*. Levin claimed that *“Edge effects are changes in population or community structures that occur at the boundary of two or more habitats.”* (Levin et al. 2012). Similar to the edge effect that occurs at the overlap area of ecosystems, the edge that formed by the junction of different functional areas in city or

suburb not only reflect the characteristics of different functional areas but also create a corridor to connect these areas.

The discussion of edge in Architecture and City Planning is mainly focused on functionality, aesthetics, and spatial configuration. In the book *The Image of the City*, Kevin Lynch defined and explained the edges on large scale. As one of the elements of the city image, edge plays a role as a “lateral reference” in the city—it does not affect the layout of the city as coordinate axes, but defines the boundary of two kinds of areas (Lynch and for Urban Studies 1960). Lynch defined two categories of edges—strong edges and fragmentary edges. The characteristics of the strong edges include easy to recognize, continuity in form, and impenetrability (Lynch and for Urban Studies 1960). Lynch took the Charles River in Boston and as example to explain how this continuous and impenetrable water edge defined Boston (Lynch and for Urban Studies 1960). For fragmentary edges, Lynch said it is “*in the abstract continuous, but only visualized at discrete points*” (Lynch and for Urban Studies 1960). The Central Artery in Boston is a good case for the fragmentary edge. Although the Central Artery is a spatially prominent freeway, it is divided by a complicated traffic network into discrete points visually (Lynch and for Urban Studies 1960).

Specifically, Lynch explained how path and railway served as edges in the city. He gave an example of how Figueroa and Sunset Streets defined and reinforced the business district of Los Angeles (Lynch and for Urban Studies 1960). It is also worth mentioning that edges exist not only on the ground. The elevated bridges and railways could also be edges of two distinct areas, described as “*overhead edges*” (Lynch and for Urban Studies 1960).

Different from Lynch, Catherine Dee discussed edges from the morphology perspective in *Form and Fabric*. She focused on the structures, components, and functions of the edges. Dee

believed edges are not only physical components but also a spatial concept that have “*potential to support or detract from social activity in public places*” (Dee 2004). Dee provides broader definitions of edges that are shown in figure 2.1.

## Definitions

An edge can be defined as:

- the linear interface between two spaces or regions of a landscape that have different functions and/or physical characters
- a thickened permeable 'wall' plane
- a transitional or 'in-between' linear zone
- a seam of 'interlock' in landscape
- an ecotone
- a boundary
- a horizon.

Figure 2.1 Definitions of edge (by Catherine Dee)

The form of edges includes rugged edges, smooth edges, and their combinations (Dee 2004). To be specific, rugged edges could be represented by interlock, barriers, and sub-spaces (Dee 2004). Smooth edges are accomplished by gradients and transformation (rhythm, sequence, repetition) (Dee 2004). If classified by texture, edges could be divided into topographic edges, vegetation edges, built edges, and water edges (Dee 2004).

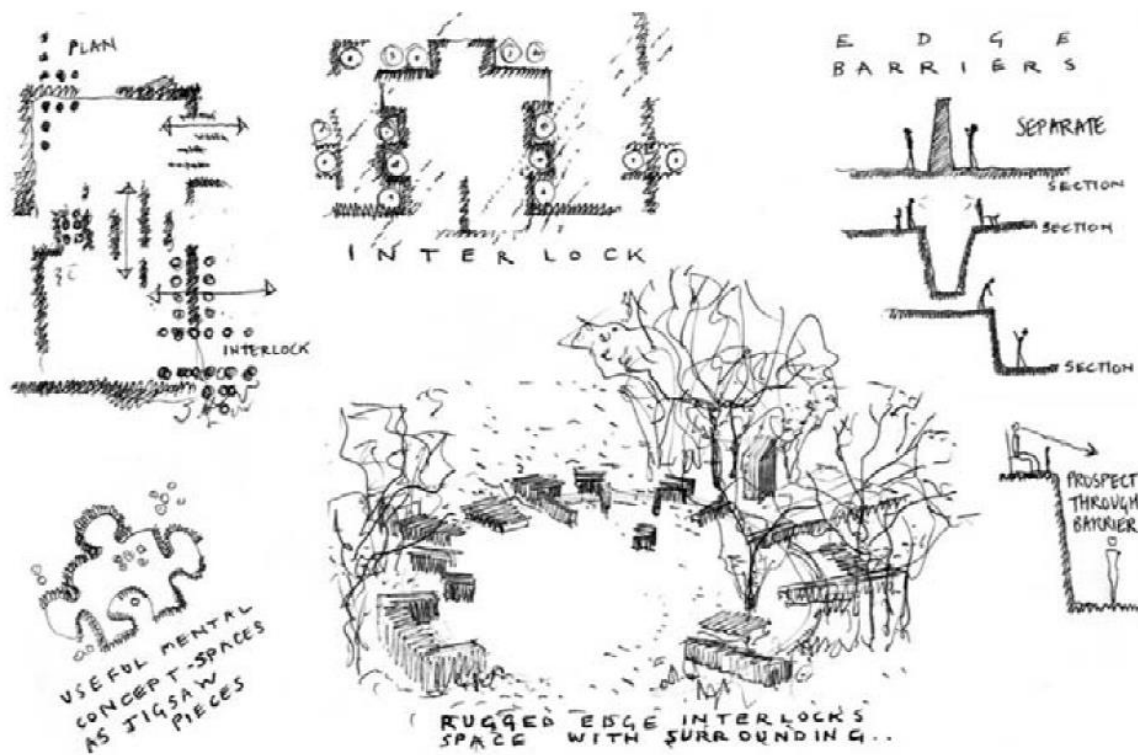


Figure 2.2 Rugged edges: Interlock and barriers. (By Catherine Dee)

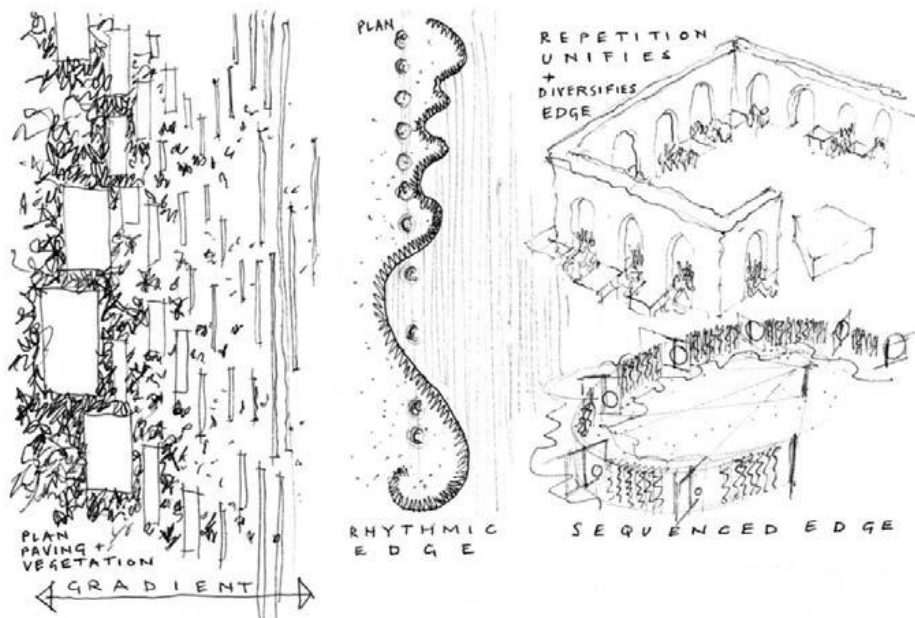


Figure 2.3 Smooth edges: gradients, rhythm, sequence, and repetition. (By Catherine Dee)

## 2.2 Campus Landscape

The research on the campus landscape mainly focused on campus planning and campus outdoor space. Richard Dober published a series of books that systematically introduced the principle and practical methods of campus planning. Those books include *Campus Planning* (Dober, for College, and University Planning (Ann Arbor 1964), *Campus Design* (Dober 1992), *Campus Architecture* (Dober 1996) and *Campus landscape: functions, forms, features* (Dober 2000). The book *Campus landscape: functions, forms, features* studies the restoration, renewal, and construction of campus landscape (Dober 2000). Combined with the analysis of campus landscape design examples, it puts forward suggestions and design guidance for the campus landscape and also provides a unified and effective assessment method for campus landscape planning and design (Dober 2000). Clare Cooper Marcus elaborated on the campus outdoor space in her book *People Places: Design Guidelines for Urban Open Space* (Marcus and Francis 1997). She primarily studied the behavior characteristics and psychology of campus space users from the aspects of campus space configuration, space functions, and how people use the space (Marcus and Francis 1997).

In Dober's latest book about campus, *Campus landscape: functions, forms, features*, he introduced campus landscape design from two perspectives—design determinants and campus landscape taxonomy. Figure 2.4 shows the impact factors that Dober mentioned in campus landscape design.

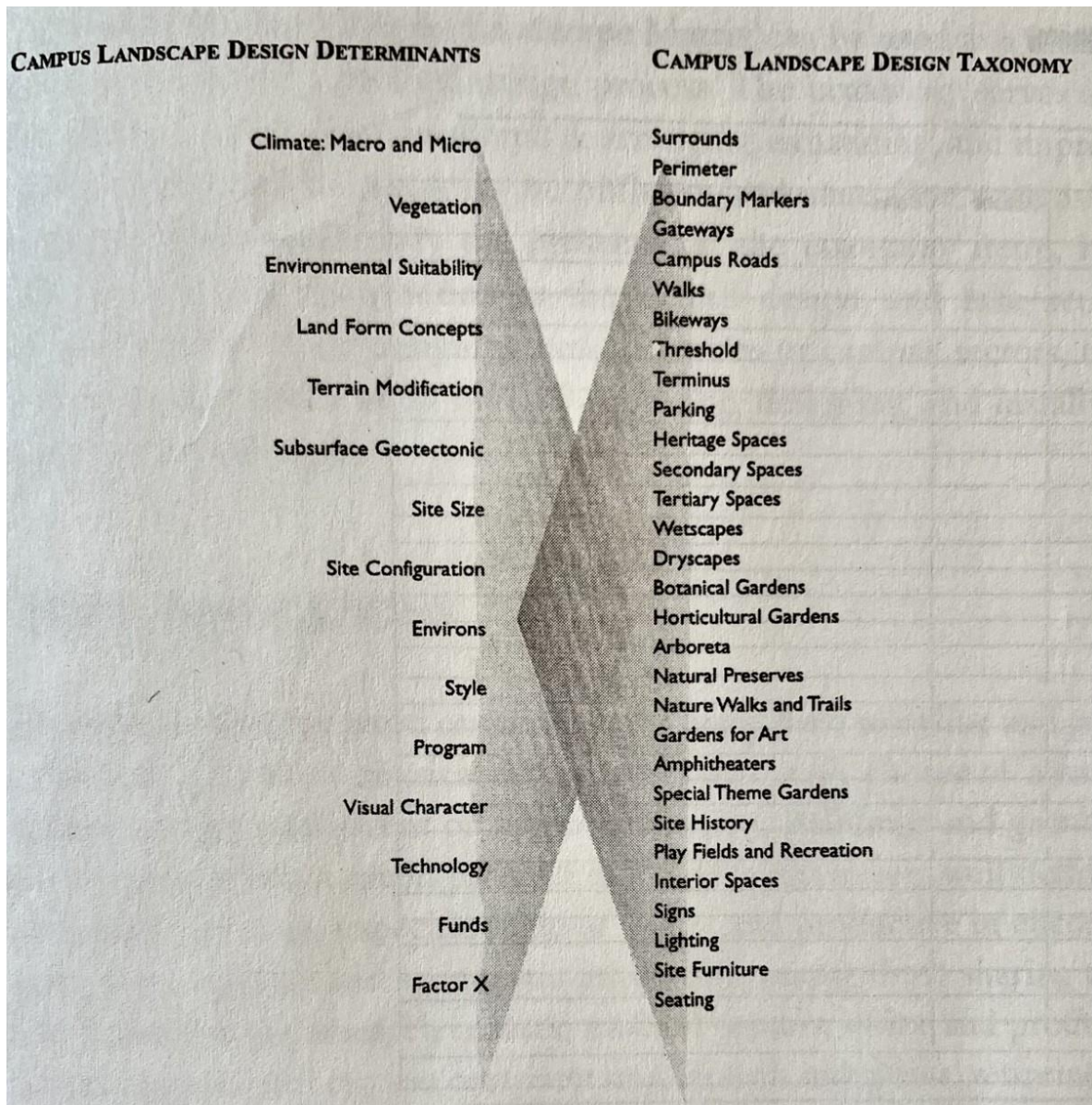


Figure 2.4 Impact diagram of campus landscape (by Richard Dober)

Dober defined the concept of campus edge and explained the design method for campus edges— *"Perimeter, periphery, edges—this is where campus is presumed to begin physically, and thus it may require demarcation."* (Dober 2000). He clarified the difference between perimeter, periphery and edges by noting that perimeter is the boundary that strictly demarcates land holdings, but edge and periphery represent the campus that is divided by streets or

intervening buildings, or lands and buildings located at the fringe zone of central campus (Dober 2000; 2012)

For the campus edge design, Dober compared two historical campus designs, Antioch College and Trinity College, to explain the basic design approaches for campus landscape—*"informal and transparent"* and *"formal and opaque"* (Dober, 2000). The common campus edge design concepts mentioned by Dober include buildings, sidewalks and planting strips, trees and lawns (for open edge design), and walls and fencings (for closed edge design). Also, he claimed the three key factors of a successful campus edge: (1) paths bounding the site, (2) planting defining the area, and (3) articulated and landscaped entry points (Dober, 2000).

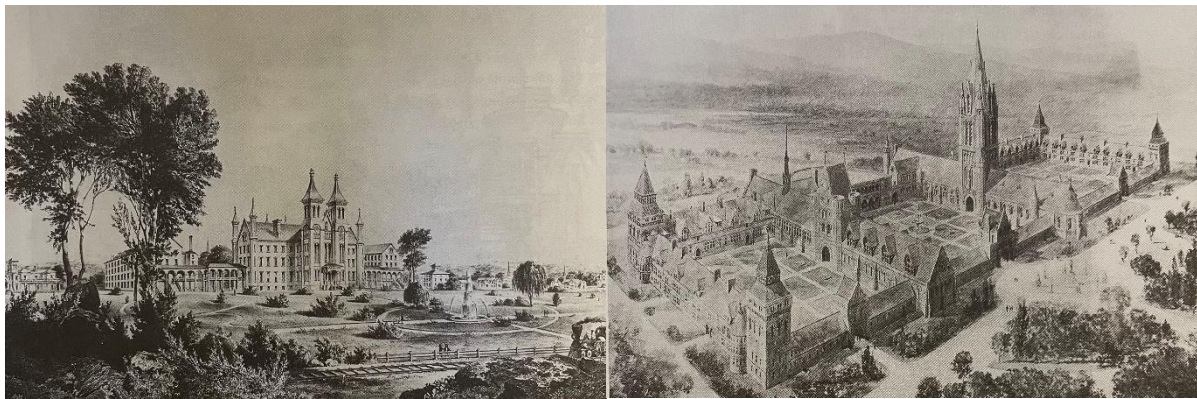


Figure 2.5 Antioch College with an informal edge and Trinity College with a formal edge.

(From Dober, *Campus Landscape: Functions, Forms, Features.*)

Dober emphasized the importance of a functional, convenient, and pedestrian-oriented campus walk system. The design requirements for walkways at different locations of campus are varied based on conditions. The walkway in the center of campus should be away from vehicle disruption, direct and continuous, linking the architecture together (Dober, 2000). Considering both aesthetic and recreational needs, Dober believed the walkway outside the central campus could be meandering (Dober, 2000). From the perspective of the pedestrian experience, Dober

explained how plants, slopes, lights, and paving of campus paths enrich people’s walking experience.

Other design factors that relate to campus edge streetscape mentioned by Dober are concluded in Table 2.1.

Design Factors Related to Campus Edge Streetscape
<p>Vegetation &amp; Suitability</p> <ul style="list-style-type: none"> <li>● Apply climate-related horticultural to show the uniqueness of campuses in different climates.</li> <li>● Aligned trees reinforce boundaries and clarify the location and direction of roads and paths.</li> <li>● Avoid grow young trees densely for immediate effects; consider all growth stages of trees.</li> <li>● Use trees to embellish the buildings that not in good size or lack interest.</li> <li>● Ground covers (wildflowers and grasses) could be the alternates of lawns that need extensive cultivation and water.</li> </ul>
<p>Five Types of Campus Landscape Styles</p> <ul style="list-style-type: none"> <li>● Function-oriented landscape design. (e.g., outdoor sitting)</li> <li>● Local ecology oriented. (e.g., The State Botanical Garden of GA)</li> <li>● Campus history-oriented. (e.g., Founders Memorial Garden)</li> <li>● Landscape designs emulate or extend existing styles (e.g., a continuation of a landscaped walkway)</li> <li>● Designs that express contemporary art styles.</li> </ul>
<p>Campus Roads</p> <ul style="list-style-type: none"> <li>● Pedestrian traffic and vehicle traffic should be separated.</li> <li>● Channel and control the traffic movement by right-of-way design.</li> <li>● Ensure the articulate and continuity of road experience by detailing all physical components of the road.</li> <li>● Roads should not dominate the campus scene.</li> </ul>
<p>Campus Walks</p> <ul style="list-style-type: none"> <li>● Width of campus walk: 6-15 ft</li> <li>● Slope of campus walk: 3%-5%</li> <li>● Change or mix surface materials of campus walks to guide directions or indicate special space.</li> <li>● Create visual sequences for campus walk.</li> </ul>
<p>Campus Bikeways</p> <ul style="list-style-type: none"> <li>● Minimum requirement for multi-use paths: 10 ft width and 5% slope.</li> <li>● Bike racks should be located near sittings and resting space.</li> </ul>

Table 2.1 Design Factors Related to Campus Edge Streetscape

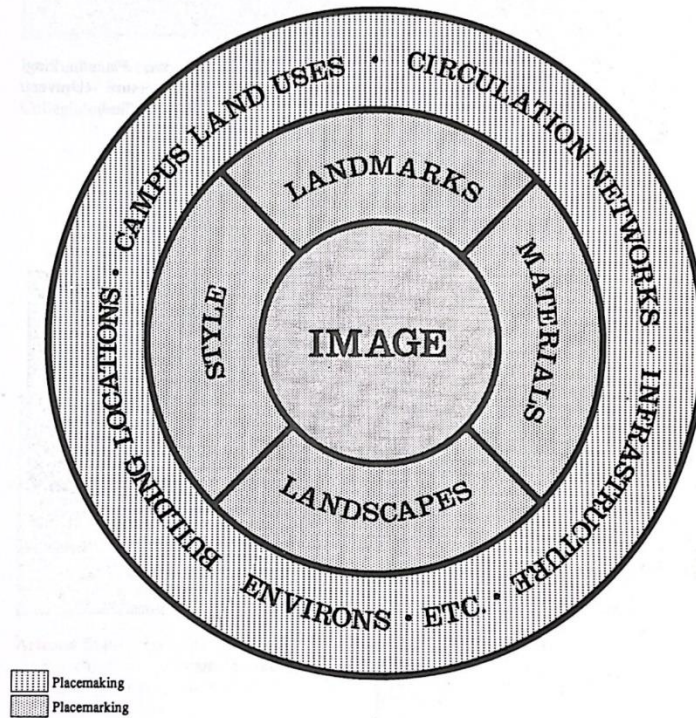
(From Campus Landscape: Functions, Forms, Features; concluded by author)

### **2.3 Campus placemarking**

Campus design should focus on creating a sense of place by encouraging the building of campuses for both function and aesthetics, while symbolizing the past and present of the university (Dober 1992). Dober put forward the concepts of placemaking and placemarking for campus design (Figure 2.7). He claimed that *"a placemaking plan creates the armature for the campus design, and placemarking techniques flesh out the concept."* (Dober 1992).

Placemarking not only helps the university campus to create a sense of place but also provides opportunities to infiltrate campus landscape design into the cityscape and help to bridge the town-gown divide. The four major factors that contribute to the placemarking of campus design are landmarks, materials, landscapes, and styles.

Conceptual Diagram  
Campus Design Factors



Bates College Campus Planning Studies 1990  
Dober, Lidsky, Craig and Associates, Inc.

Conceptual diagram, campus design factors. (Dober, Lidsky, Craig and Associates, Inc.)

Figure 2.6 Placemaking and placemaking (by Dober, 1992)

Iron fences, masonry/red brick pillars, and abundant plants are the placemaking elements that UGA uses to define the campus edges (UGA, n.d.). These boundary makers play the role of signifying the perimeter of the campus, meanwhile make the campus compatible with the surrounding areas (Dober 2000). The ideal design of the campus edge requires that the surrounding landscape should have some visual connection with the campus. Also, the university should generate landscapes on the campus edge that benefit the public.

The UGA campus gateway, the Arch, is another important element of placemarking. A campus gateway has four functions--providing access to the campus, linking land use areas physically and symbolically, creating a view corridor between campus and surroundings, and serving for events (Dober 2000). The iron Arch and the black iron fencing used on the perimeter of north campus are features that are representative of UGA's history and identity. These memorable features highlight frequently used campus materials and serve as a clue to remind people that they are entering the campus.



Figure 2.7 Cast iron fence and The Arch (UGA, n.d.)

#### **2.4 Allen Jacobs' Great Streets**

By studying and comparing various types of the world's best streets, *Great Streets* summarized the physical characteristics and criteria that make a street great. Jacob claimed that the physical characteristics include plants, cross sections, dimensions, details, patterns, urban contexts and etc. There are several criteria that a great street should follow: encouraging people's interaction and making community, providing a safe and comfortable environment, encouraging activity, being representative of the community, and a memorable experience (Jacobs 1993).

After systematically analyzing historical great streets, residential area streets, boulevards, and on large scale, city patterns and street network patterns, Jacobs concludes the physical qualities that make a great street. In his conclusion, Jacobs separated these physical qualities into two parts. The first part are qualities essential for the formation of a great street. Although the street that meets all these required qualities is not assured to be a great street, these qualities are necessary and directly related to the building of good cities from a socioeconomic perspective (Jacobs, 1993). Table 2.2 shows required physical qualities in Jacob's estimation. The second part is about the physical qualities that Jacobs thought would improve the streetscape but are not necessary for great streets. Table 2.3 includes these qualities.

<b>Required Physical Qualities</b>	
Leisurely walking environment for pedestrian	<ul style="list-style-type: none"> <li>● Ensure the sociability character of the street.</li> <li>● Create enough amount of and various walking space.</li> <li>● Protect the safety of pedestrian physically and psychologically.</li> </ul>
Physical Comfort	<ul style="list-style-type: none"> <li>● Climate-related characteristics: provide sunlight in cold weather and shade in hot weather.</li> <li>● Give shelter from the wind.</li> </ul>
Definition	<ul style="list-style-type: none"> <li>● Be defined vertically (building/wall/tree height) and horizontally (length, width, and shapes of streets).</li> </ul>
Quantities promote eye movement	<ul style="list-style-type: none"> <li>● Visual complexity with holistic context.</li> <li>● Use light and leaves of trees to encourage eye movement.</li> <li>● Moving people and cars attract eye movement.</li> <li>● Separate fast-moving cars with pedestrians.</li> <li>● Eyes become more focused at lower level than daytime (use of light).</li> </ul>
Transparency	<ul style="list-style-type: none"> <li>● Have transparency at the edges of the street—enable people to know what defines the street.</li> </ul>
Complementarity	<ul style="list-style-type: none"> <li>● Avoid standout or uniform architectural styles and encourage the buildings with similar height to make buildings get along with each other.</li> </ul>
Maintenance	<ul style="list-style-type: none"> <li>● Keep all the elements (trees, materials, buildings) that make up the street well-maintained.</li> <li>● Use material of good quality and easy to maintain to protect the street from frequent people use and natural erosion.</li> </ul>
Quality	<ul style="list-style-type: none"> <li>● High quality of materials, workmanship and design.</li> </ul>

Table 2.2 Jacobs' required physical qualities of Great Street (From Great Street, concluded by author)

<b>Optional Physical Qualities</b>	
Trees	<ul style="list-style-type: none"> <li>● Deciduous are more appropriate than evergreen—allows more sunlight to penetrate.</li> <li>● Street trees need to be planted close together.</li> <li>● Avoid planting trees at street corners.</li> <li>● Keep the same spacing between trees.</li> </ul>
Beginnings and endings	<ul style="list-style-type: none"> <li>● Design notable starts and stops for streets.</li> <li>● Special physical qualities like statues help define the starts and stops.</li> <li>● Make the entrances of streets open and inviting.</li> </ul>
Special design features: Detail	<ul style="list-style-type: none"> <li>● Streetlight: Limit the height under 20 ft; lighting space doesn't need to be regular; lights emphasize the linearity of streets.</li> <li>● Paving: Using normal and understood paving materials that can be done well and easy to maintain.</li> <li>● Benches help people stay on the street.</li> <li>● Overhead awnings provide intimate space along street.</li> </ul>
Places	<ul style="list-style-type: none"> <li>● Provide breaks (park/open space/plaza) for long or narrow street.</li> <li>● Breaks provide people space to meet, sit, talk and eat.</li> </ul>
Accessibility	<ul style="list-style-type: none"> <li>● Be accessible for public transit.</li> <li>● Pedestrians get to the street with ease.</li> <li>● Design for people with disabilities.</li> </ul>
Density	<ul style="list-style-type: none"> <li>● Density and land use are important to streets.</li> <li>● People activate street.</li> </ul>
Diversity	<ul style="list-style-type: none"> <li>● Promote the diverse use of the area.</li> </ul>
Length	<ul style="list-style-type: none"> <li>● Create focal points on long streets to sustain people's interests.</li> </ul>
Slope	<ul style="list-style-type: none"> <li>● Topography and slope increase the views and interests of streets.</li> <li>● Keep the elevation change of street unless it is too steep.</li> </ul>
Parking	<ul style="list-style-type: none"> <li>● Allow on-street parking with amount of parking space below demand.</li> <li>● Decrease the entrance of garage/driveway/large auto parking space.</li> </ul>
Contrast	<ul style="list-style-type: none"> <li>● Contrasting in shape/length/size/pattern with surrounding street makes the street noticeable.</li> </ul>
Time	<ul style="list-style-type: none"> <li>● Time is needed to make a great street.</li> <li>● Incremental building and change add diversity and sense of history to the street.</li> </ul>

Table 2.3 Jacobs' optional physical qualities of Great Street (From Great Street, concluded by author)

## 2.5 Streetscape Design Measurement

As one category of urban design characteristics, streetscape features could be measured in three levels of scale—macro, meso, and micro – according to Hao Zhang’s Research *Fostering Pedestrianism: Assessing Neighborhood Streetscape Features for Pedestrian Activity* (H. Zhang 2020). The research field has different methods that are suitable for the measurement of streetscape features in various scales both subjectively and objectively (H. Zhang 2020). The study of streetscapes in mesoscale is mainly related to spatial layouts that explained how planting, buildings, and other structures form public spaces (H. Zhang 2020). For the evaluation of streetscape on large scale, GIS is the major tool used by researchers. Chester Harvey claimed in *Measuring Streetscape Design for Livability Using Spatial Data and Methods* that GIS-based researches are mainly focused on the measurement of urban form (Harvey 2014). Harvey described the Five Ds' framework that explains the study trend of urban form on large scale (Figure 2.8) (Harvey 2014). The advantage of GIS-based analysis is that it uses direct data to measure the streetscape precisely compare with a field audit. However, this indirect observation tool also has limitations in streetscape analysis. Harvey said that “A chief limitation of GIS methods is exclusion of microscale design characteristics—materials, architectural styling, ornamentation, fixtures, cleanliness—activity, and non-visual sensations that contribute in important and nuanced ways to user experience.” (Harvey 2014).

Table 2.1: The Five Ds of macroscale urban form

Density	Household/population density Job density
Diversity	Land use mix (entropy index)
Design	Intersection/street density
Destination Accessibility	Job accessibility by auto Job accessibility by transit
Distance to transit	Distance to nearest transit stop

Adapted from Ewing & Cervero (2010)

Figure 2.8 The Five Ds of macroscale urban form (Harvey, 2014)

For the measurement of streetscape features in the micro-scale, a number of methods are used by researchers. This micro-scale streetscape evaluation mainly focuses on pedestrian activity (H. Zhang 2020). Harvey claims that a field audit with direct observations of the site using an audit protocol is the most established and straightforward strategy for the measurement of a streetscape (Harvey 2014). There are over five methodologies that apply diverse variables for streetscape measuring. Clifton, Smith, and Rodriguez compared the difference between these methods (Figure 2.9) (Clifton, Livi Smith, and Rodriguez 2007).

Table 1  
Audit Comparison Chart

	WSAF	WPS	SLU	SPACES	I-M	PBIC	PEPS
<b>Characteristics</b>							
Field protocol	✓	×	✓	✓	✓	×	✓
Training presentation	×	×	N/A	×	✓	×	✓
Training test segments	×	×	×	×	×	×	✓
PDA/tablet PC compatibility	×	×	✓	×	✓	×	✓
Tine required per segment or block	30 mn	N/A	10 mn	N/A	20 mn	5–10 mn	3–5 mn
<b>Items measured</b>							
<b>Land uses</b>							
Land uses (types, intensities, destinations)	×	✓	✓	✓	✓	✓	✓
<b>Walking path/sidewalks</b>							
Sidewalk presence	✓	✓	✓	✓	✓	✓	✓
Sidewalk qualities (materials, obstructions, uniformity)	✓	✓	×	✓	✓	✓	✓
Slope	×	×	×	✓	×	×	✓
Natural barriers (ditch, creek)	✓	×	×	×	✓	×	×
<b>Vehicle-pedestrian interactions</b>							
Street supports for walking (crosswalks, traffic lights)	✓	×	✓	✓	✓	✓	✓
Traffic volume	✓	×	×	×	×	✓	✓
Parking (on and off-street)	×	✓	✓	✓	✓	✓	✓
Speed limits	✓	×	✓	✓	✓	×	✓
Segment/road connectivity	×	×	✓	✓	×	×	✓
Road conditions (materials, uniformity)	✓	×	×	✓	✓	✓	✓
Traffic calming (chokers, chicanes)	×	×	✓	✓	✓	×	✓
<b>Safety and appeal</b>							
Lighting	✓	✓	✓	✓	✓	×	✓
View/surveillance	×	✓	×	✓	✓	✓	×
Aesthetics (incivilities, gardening, appeal)	×	✓	✓	✓	✓	×	✓
Unique markers/memorability	×	×	×	×	✓	×	×
Architectural variety	×	✓	×	✓	×	×	✓
Enclosure	×	✓	×	✓	×	×	✓
Tree presence	×	✓	×	✓	✓	✓	✓
<b>Subjective assessment</b>							
Perception of attractiveness/appeal	×	✓	×	×	✓	×	✓
Perception of safety	×	×	×	×	✓	×	✓

WSAF: Walking Suitability Assessment Form—University of North Carolina, Chapel Hill; WPS: Walkable Places Survey—Baltimore Metropolitan Council; SLU: Analytic Audit Tool—Saint Louis University; SPACES: Systematic Pedestrian and Cycling Environmental Scan—The University of Western Australia; I-M Inventory: Irvine-Minnesota Inventory—University of California, Irvine and University of Minnesota; PBIC Checklist: Partnership for a Walkable America; PEPS: Pedestrian Environment Data Scan—University of Maryland, College Park.

Figure 2.9 Streetscape audit method comparison chart. (Clifton, Smith & Rodriguez, 2007).

The most prevalent methods include Systematic Pedestrian and Cycling Environmental Scan, Irvine-Minnesota Inventory, and Pedestrian Environment Data Scan (Pikora et al. 2002; Clifton, Livi Smith, and Rodriguez 2007; Day et al. 2006). Pikora and his team developed Systematic Pedestrian and Cycling Environmental Scan (SPACES) to evaluate the physical factors that may influence people’s activity patterns (Pikora et al., 2002). By collecting data and testing the method over 1987 kilometers roads in Perth, Australia, the SPACES is verified to be reliable and feasible (Pikora et al., 2002). The Irvine Minnesota Inventory (I-M) was designed to

evaluated built environment factors that potentially affect active living--walking and bicycling (Day et al., 2006). The four aspects that the I-M method focuses on are “...*accessibility (62 items), pleasurability (56 items), perceived safety from traffic (31 items), and perceived safety from crime (15 items).*” (Day et al., 2006). Clifton, Smith, and Rodriguez developed the Pedestrian Environmental Data Scan method that focused on the measurement of build and natural environment and pedestrian experience on small scale (Clifton, Smith & Rodriguez, 2007).

## **2.6 Pedestrian Environmental Data Scan (PEDS)**

PEDS is a pedestrian environment audit tool that is designed for segments of a pathway network. Clifton defines segments as “... *a road or pedestrian path bounded by cross streets or intersections.*” (Clifton, Smith & Rodriguez, 2007). In comparison with other streetscape audit tools, PEDS has several advantages. Firstly, PEDS is the most time-efficient audit instrument among all the other audit methods. Clifton said that there is no evidence to prove that the amount of detailed information required in the audit has a positive correlation with the understanding of pedestrians' and bicyclists' behavior (Clifton, Smith & Rodriguez, 2007). On the contrary, too many extensive details in the audit, like the I-M method, increase the time and cost for the research. (Clifton, Smith & Rodriguez, 2007).

Second, the PEDS audit method is suitable for streetscape evaluation in the US and it was tested in a college town of the University of Maryland. Although PEDS was designed based on an Australian walking and cycling environment audit tool, SPACES, the researchers could adjust the audit questions to make it more adaptable for the built environment and streetscapes in the US (Clifton, Smith & Rodriguez, 2007). The PEDS Audit Instrument includes four subjective

questions to evaluate the attractiveness and physical difficulties of pedestrian environments and 31 objective questions that focused on four parts--environments, facilities, roads, and walking cycling environments. It is worth noting that the sum of the four sections is not able to fully represent the overall condition of a pedestrian environment. The four objective sections of the audit instruments and the subjective questions at the beginning represent the condition of a pedestrian environment from different aspects (Clifton, Smith & Rodriguez, 2007).

Name: _____		Date: _____		Study Area: _____	
Segment Number: _____		Time: _____		Weather: _____	

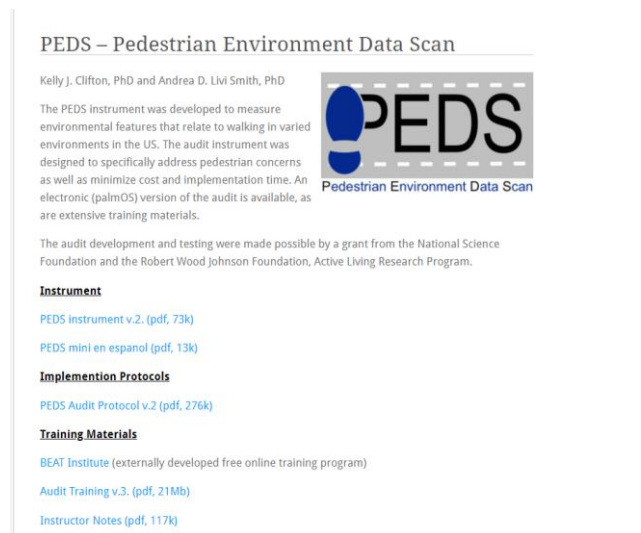
  

<p><b>Subjective Assessment: Segment...</b>  Enter 1, 2, 3, or 4 for 1=Strongly Agree 2= Agree, 3=Disagree, 4=Strongly Agree  ..... is attractive for walking. _____ 1  ..... is attractive for cycling. _____ 2  ..... feels safe for walking. _____ 3  ..... feels safe for cycling. _____ 4</p> <p><b>0. Segment type</b>  Low volume road _____ 1  High volume road _____ 2  Bike or Ped path - skip section C _____ 3</p> <p><b>A. Environment</b></p> <p><b>1. Uses in Segment (all that apply)</b>  Housing - Single Family Detached _____ 1  Housing- Multi-Family _____ 2  Housing- Mobile Homes _____ 3  Office/Institutional _____ 4  Restaurant/Café/Commercial _____ 5  Industrial _____ 6  Vacant/Undeveloped _____ 7  Recreation _____ 8</p> <p><b>2. Slope</b>  Flat _____ 1  Slight hill _____ 2  Steep hill _____ 3</p> <p><b>3. Cul-de-sac/Dead-end</b>  Segment has dead end _____ 1  Segment continues _____ 2  Road deadends but path continues _____ 3</p> <p><b>B. Pedestrian Facility (skip if none present)</b></p> <p><b>4. Type(s) of pedestrian facility (all that apply)</b>  Footpath (worn dirt path) _____ 1  Paved trail _____ 2  Sidewalk _____ 3  Pedestrian Street (closed to cars) _____ 4</p> <p><i>The rest of the questions in section B refer to the best pedestrian facility selected above.</i></p> <p><b>5. Path material (all that apply)</b>  Asphalt _____ 1  Concrete _____ 2  Paving Bricks or Flat stone _____ 3  Gravel _____ 4  Dirt or Sand _____ 5</p> <p><b>6. Path obstructions (all that apply)</b>  Poles or Signs _____ 1  Parked Cars _____ 2  Trees _____ 3  Garbage Cans _____ 4  Other _____ 5</p> <p><b>7. Buffers between road and path (all that apply)</b>  <b>Hard Buffer</b>  Fence _____ 1  Trees _____ 2  Hedges _____ 3  <b>Soft Buffer</b>  Landscape _____ 4  Grass _____ 5  Path distance from curb (feet): _____ 6  Path width (feet): _____ 7</p>	<p><i>If no sidewalk, skip now to section C.</i></p> <p><b>8. Sidewalk completeness/continuity</b>  Sidewalk is complete _____ 1  Sidewalk is incomplete _____ 2</p> <p><b>9. Sidewalk connectivity to other sidewalks/crosswalks</b>  number of connections _____ 1</p> <p><b>10. Sidewalk condition/maintenance</b>  Poor (many bumps/cracks/holes) _____ 1  Fair (some bumps/cracks/holes) _____ 2  Good (very few bumps/cracks/holes) _____ 3  Under Repair _____ 4</p> <p><b>C. Road Attributes (skip if path only)</b></p> <p><b>11. Condition of road</b>  Poor (many bumps/cracks/holes) _____ 1  Fair (some bumps/cracks/holes) _____ 2  Good (very few bumps/cracks/holes) _____ 3  Under Repair _____ 4</p> <p><b>12. Number of lanes</b>  # of lanes to cross _____ 1</p> <p><b>13. Posted speed limit</b>  None posted _____ 1  (mph): _____ 2</p> <p><b>14. On-Street parking (if pavement is unmarked, check only if cars parked)</b>  Parallel or Diagonal _____ 1  Go to Q17 - None _____ 2</p> <p><b>15. Off-street parking lot spaces</b>  If none go to Q17 - <table style="display: inline-table; border: none;"> <tr> <td style="border: 1px solid black; padding: 2px;">0-5</td> <td style="border: 1px solid black; padding: 2px;">6-25</td> <td style="border: 1px solid black; padding: 2px;">26+</td> </tr> </table></p> <p><b>16. Must you walk through a parking lot to get to most buildings?</b>  Yes _____ 1  No _____ 2</p> <p><b>17. Driveways</b>  There are driveways in segment _____ 1  There are no driveways in segment _____ 2</p> <p><b>18. Traffic control devices (all that apply)</b>  Traffic Light _____ 1  Stop Sign _____ 2  Traffic Circle _____ 3  Speed bumps _____ 4  Chicanes or chokers _____ 5</p> <p><b>19. Curb Cuts in segment</b>  Yes _____ 1  No _____ 2</p> <p><b>20. Crossing Aids in segment (all that apply)</b>  Cars Must Stop  Pavement Markings _____ 1  Yield to Ped Paddles _____ 2  Pedestrian Signal _____ 3  Crossing Aids  Median/Traffic Island _____ 4  Curb Extension _____ 5  Overpass/Underpass _____ 6  Warnings to Cars  Pedestrian Crossing Street Sign _____ 7  Flashing Warning _____ 8</p>	0-5	6-25	26+	<p><b>D. Walking/Cycling Environment</b></p> <p><b>21. Lighting</b>  None _____ 1  Poor _____ 2  Fair _____ 3  Good _____ 4</p> <p><b>22. Amenities (all that apply)</b>  Garbage cans _____ 1  Benches _____ 2  Water fountain _____ 3  Bicycle parking _____ 4  Street vendors/vending machines _____ 5</p> <p><b>23. Are there wayfinding aids?</b>  No _____ 1  Yes _____ 2</p> <p><b>24. Number of trees shading walking area</b>  None or Very Few _____ 1  Some _____ 2  Many/Dense _____ 3</p> <p><b>25. Degree of enclosure</b>  Little or no enclosure _____ 1  Some enclosure _____ 2  Highly enclosed _____ 3</p> <p><b>26. Powerlines along segment?</b>  No _____ 1  Low Voltage/Distribution Line _____ 2  High Voltage/Transmission Line _____ 3</p> <p><b>27. Cleanliness (is there litter, garbage, broken glass, or graffiti?)</b>  None or Almost None _____ 1  Yes Some _____ 2  Yes Lots _____ 3</p> <p><b>28. Articulation in building designs</b>  Little or no articulation _____ 1  Some articulation _____ 2  Highly articulated _____ 3</p> <p><b>29. Building setbacks from street</b>  At edge of sidewalk _____ 1  Within 20 feet of sidewalk _____ 2  More than 20 feet from sidewalk _____ 3</p> <p><b>30. Bicycle lane</b>  None or not marked _____ 1  Striped bicycle lane _____ 2</p> <p><b>31. Transit facilities</b>  No _____ 1  Yes _____ 2</p>
0-5	6-25	26+			

Figure 2.10 PEDS Audit Instrument. (Clifton, Smith & Rodriguez, 2007).

Finally, PEDS provides classroom and field training for the audit raters to ensure reliability and homogeneity (Clifton, Smith & Rodriguez, 2007). The contents of the training include videos and slides that give specific examples for each of the audit questions, PEDS protocols, and PEDS instruments.

Agreement among raters (the consistency of raters' answers for the same question on one segment) and the reliability of the PEDS audit (the consistency of the results obtained when the same question is asked repeatedly on the same segment) was tested at the University of Maryland. The survey studied 71.5 miles of pathways (995 segments) at the City of College Park, MD (Clifton, Smith & Rodriguez, 2007). Since the pilot tests were finished by undergraduates from different departments, Clifton claimed that “...raters who specialize may be better able to evaluate individual features of the environment, resulting in better reliability.” (Clifton, Smith & Rodriguez, 2007).



The screenshot displays the PEDS website with the following content:

- PEDS – Pedestrian Environment Data Scan**
- Authors: Kelly J. Clifton, PhD and Andrea D. Livi Smith, PhD
- Description: The PEDS instrument was developed to measure environmental features that relate to walking in varied environments in the US. The audit instrument was designed to specifically address pedestrian concerns as well as minimize cost and implementation time. An electronic (palmOS) version of the audit is available, as are extensive training materials.
- Funding: The audit development and testing were made possible by a grant from the National Science Foundation and the Robert Wood Johnson Foundation, Active Living Research Program.
- Instrument**
  - [PEDS instrument v.2. \(pdf, 73k\)](#)
  - [PEDS mini en español \(pdf, 13k\)](#)
- Implementation Protocols**
  - [PEDS Audit Protocol v.2 \(pdf, 276k\)](#)
- Training Materials**
  - [BEAT Institute \(externally developed free online training program\)](#)
  - [Audit Training v.3. \(pdf, 21Mb\)](#)
  - [Instructor Notes \(pdf, 117k\)](#)

Figure 2.11 PEDS training materials (<http://kellyjclifton.com/peds/>)

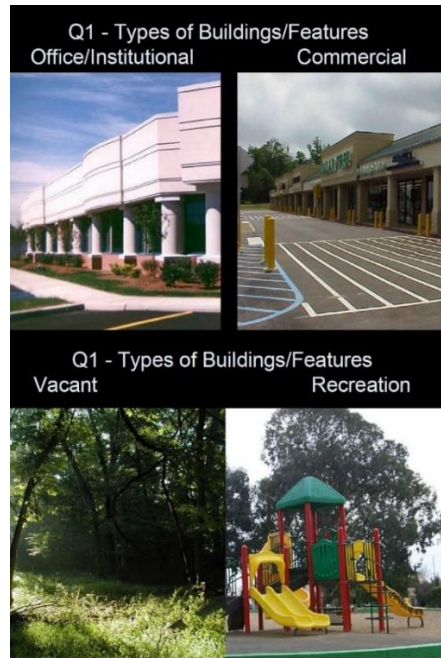


Figure 2.12 Part of PEDS training slides (<http://kellyjclifton.com/peds/>)

PEDS pedestrian environment audit has been applied in several studies objectively and subjectively. Adkins borrowed elements from PEDS to create an instrument to study how the individual physical features of streets and “green street” features (stormwater management infrastructure) influence the attractiveness of the pedestrian environment in Portland, Oregon (Adkins et al. 2012). Adkins concluded that “...*well-designed green streets, separation from vehicle traffic, pedestrian network connectivity, parks and ‘bounded openness’ contribute to attractiveness of walking environments.*” (Adkins et al. 2012)

Wimbardana adopted 13 variables from PEDS instruments to evaluate the walkability of 10 segments of 1.5 miles in length from 89 Springville Avenue to 4606 Bailey Avenue in Amherst, New York (Wimbardana, Tarigan, and Sagala 2018). The researcher used a smartphone ArcGIS application named Collector to conduct paperless surveys that contained 13 subjective and objective evaluation questions (Wimbardana, Tarigan, and Sagala 2018). With the

help of the PEDS method in field observation, Wimbardana analyzed the existing conditions of selected segments and proved their walkability. He recommended that the use of diverse pavement patterns, an increase of plantings, and the addition of bike lanes are essential for the improvement of pedestrian environments (Wimbardana, Tarigan, and Sagala 2018). Moreover, the researcher claimed consideration of timing and weather improved an audit (Wimbardana, Tarigan, and Sagala 2018).

In addition to using the PEDS method objectively by evaluating individual features in a pedestrian environment, the PEDS audit could also be used subjectively, such as in studying users' perception of a walking environment (Clifton, Livi Smith, and Rodriguez 2007).

This thesis is going to apply PEDS as a comprehensive audit method to collect pedestrian environment data of four selected sites at the University of Georgia. To ensure the objectivity of the field survey, the audit was conducted following the protocol and training materials of PEDS. The result of the PEDS audit for the four selected sites will be shown and analyzed in detail in Chapter 4 Design Process.

## **2.7 Reuse of abandoned railroads**

An abandoned railroad runs through the UGA academic campus from south to north. However, the rusting tracks and dense, unmanaged plants along the railway do not currently contribute to the campus functionally or aesthetically. Zhang concluded that there are three ways to reuse an abandoned railroad--upgrade it as a new transit route, convert it to a commercial or tourism place, or rebuild it as a greenway (C. Zhang, Dai, and Xia 2020). The thesis proposes to reuse the abandoned railroad as a light rail line that would benefit the circulation and public transit of the campus. Related studies introduced the advantages that light rail could bring. Light

rail has a comparatively low cost, good carrying capacity, and convenient articulation with pedestrian facilities (Cervero 1984). Cervero also claimed that light rail has a positive effect on the development of downtown areas (Cervero 1984). Besides, rail-based transit is an effective solution to reduce traffic congestion (Bhattacharjee and Goetz 2012; Garrett 2004)..

## CHAPTER 3

### CASE STUDY

This chapter proposes to study the existing landscape architecture projects that focus on the interactive space between the academic campus and the surrounding area. Campus edge spaces can be classified into four categories by function--transportation hubs, recreational spaces, commercial spaces, and green spaces. The three case studies below focus on campus edge landscapes with various functions. The varying conditions described below include the overlap of two or three functional edge spaces, such as a hybrid space at the seam of a transportation hub and commercial area; or the conversion and upgrade of one type of edge space to another, such as the redesign of a traffic intersection to recreational green space.

The first case study, West Campus Residences & Streetscape, provides an effective example of the improvement of a transportation hub and the transformation of a campus plaza to invite not only university members but also the public to use the campus landscape. The second case study is a series of street design guidelines published by the National Association of City Transportation Officials (NACTO). The NACTO design guidelines provide effective solutions for the study sites in this thesis including but not limited to the configuration of transit stations or bus stops, the improvement of intersections, the design of bus lanes and bike lanes, and the optimization of the street environment. The last case study is Lower Rainier Vista, a land bridge designed by GGN for the University of Washington. The construction of the Gothic Arch land bridge connected the UW campus to the city's new light rail station and Montlake Triangle.

Located at the nexus of inter-mode transit, the Rainier Vista land bridge promotes the circulation of pedestrians and bicycles.

The goals of the case study research include: capturing feasible design concepts and methods for the building and improvement of streetscapes on the campus edge space; observing how people use these streetscapes and what infrastructures are essential for users; and generalizing the design elements that are helpful for the creation of successful streetscapes on the campus edge. The conclusion of the case studies will provide inspiration and guidelines for the design and improvement of study sites on the University of Georgia campus.

### **3.1 West Campus Residences & Streetscape Project**

West Campus Residences & Streetscape is a campus design project designed by GGN in 2012. This project is located on the west campus of the University of Washington in Seattle, WA. There are three major aspects of the project-- the design of Elm Plaza and the design of the streetscape with the transformation of one major transportation hub (Figure 3.1). The project emphasizes a hybrid campus concept for urban universities in which university campuses should not only provide recreational and study space for students but also serve as urban landscapes that attract more public users.

To protect the purely academic atmosphere from the noisy city life, the University of Washington built the Campus Parkway in the last century. Serving as a gateway, the Campus Parkway was intended to be surrounded by academic buildings like Condon Hall and Schmitz Hall (Way 2016) (Figure 3.2). However, today high-rise dormitories instead of the academic buildings are built along the south side of the parkway (Way 2016). From 2000 onwards, the idea of the utopian university campus was replaced by the concept of a hybrid campus. The campus parkway

is no longer a strict line that divides the campus from the urban landscape but has become part of an innovative district that attracts users beyond the university.



Figure 3.1 West Campus Residences & Streetscape Project Plan View by GGN



Figure 3.2 University of Washington Campus Parkway by Google Map

### Multi-functional sharing landscape

Elm Plaza, a small park built around a heritage elm tree, is surrounded by grocery stores, restaurants, and other commercial facilities (“West Campus Streetscape — GGN” 2012). Extending the UW academic campus, Elm Plaza doesn’t follow the rule of traditional campus design that uses enclosure to create an exclusive space for academia (Figure 3.3). Instead, it improves public accessibility by interweaving the campus landscape into the urban landscape and providing various amenities and entrances to the plaza. Various pathways around the buildings and space and paths that fulfill different activities are built on the plaza (Way, 2016). Also, to maximize the function of the plaza, the design team not only designed facilities for a learning landscape, such as a courtyard but also provided amenities for neighborhood use (Way, 2016) (Figure 3.4).



Figure 3.3 Plan View of Elm Plaza and Streets by GGN



Figure 3.4 Elm Plaza Before and After by GGN

### Employing green and sustainable design

Green and sustainable design is one of the main concerns of the GGN. To ensure walkability and improve green commuting, plenty of bicycle racks are added, sidewalks are

broadened, and abundant vegetation is used to provide shade and amenity for pedestrians. Cooperate with the LEED-certified buildings of the UW, pervious paving, rainwater collecting equipment, and expanded planting areas are applied on the site.

Besides, another highlight of the green and sustainable design is the protection of a heritage elm tree. Instead of clearing all existing plants to make more space for new landscape design and construction, GGN chose to preserve the large American Elm that already grew on the site for over 100 years (Way, 2016). Way claimed that “...*the elm tree was preserved to become not only a landmark but also a defining element of the community of residential dormitories and the adjacent public space.*” The elm tree and the benches under the tree provide a nice recreational space for the neighborhood (Figure 3.5). More importantly, the unique large elm tree creates a genius loci for the west campus of the University of Washington.



Figure 3.5 Elm Tree as a Landmark for the Plaza by GGN

### **Extending the campus design features by using the same materials and elements.**

A transportation hub that links the UW west campus and downtown is located on the north of Elm Plaza. Before the transformation was made by the design team, the narrow pathway and bare planting area make the major bus stop vapid. The old bus stop just like any unimpressive bus stop was located at the corner of a city street. Seldom did the transportation hub have any direct link to the UW campus. Way claimed that the design of the campus landscape should “reach out” to the cityscape. Thus, the transportation hub became a transition zone from the campus landscape to the cityscape (Figure 3.6). The designers improved the bus stop by using the same materials and elements that are used in the campus design— “... *from the steel wall copings with industrial-looking finishes to solid brick walls and grey unit pavers, they are also similar to the materials used for the dormitories, plaza, and adjacent landscapes.*” (Way, 2016)



Figure 3.6 Transportation Hub Transformation by GGN

### **Creating a commuter-friendly environment**

The bus stop before the transformation was not a commuter-friendly transportation hub from many perspectives: no obvious design or pavement distinguished it from the streetscape;

sparse street trees and bare planting areas exposed commuters to high-speed traffic; no shelters or benches for people waiting for buses; and circulation impeded by a planting area at rush hour. By broadening the pathway and increasing the density of plants, the designers provided more active space and a greater sense of security for pedestrians at the bus stop. By adding seats, shelters and bike racks, GGN improved the walkability of the transportation hub, fulfilled the needs of commuters, and encouraged multi-modal transportation.

### **3.2 NACTO Street Design Guidelines**

As a leading transportation association, the National Association of City Transportation Officials (NACTO) was formed by 86 North American cities and transit agencies. The major goal of NACTO is to exchange the traditional transportation idea, practice and issue by building the movement for 21st-century mobility, promoting the street design, and prioritizing pedestrians, bicyclists and public transit users (“National Association of City Transportation Officials | National Association of City Transportation Officials” n.d.). Publications by NACTO include the Urban Street Design Guide, Urban Bikeway Design Guide, Transit Street Design Guide, etc. (Figure 3.7) These publications are important for both practice and academic research.



Figure 3.7 NACTO Design Guides (<https://nacto.org/>)

### Intersection design elements

An intersection is the busiest space on a street with complicated circulation where multi-modes of transportation interface. It is an enormous challenge to balance the conflicts among bus stops, bike lanes, light rail stations, and pedestrian crossings. Researchers from the University of California, Berkeley studied the safety of pedestrians and bicyclists on campus by analyzing police-reported crash data and gathering self-reported crashes by an online survey (Loukaitou-Sideris et al. 2014). They defined three types of danger zones for pedestrians and bike riders that are common on most American campuses--*campus activity hubs*, *campus access hubs*, and *through traffic hubs* (Loukaitou-Sideris et al, 2014). Through traffic hubs are defined as the area

on the edges or within campus used by vehicles to bypass or cut through the campus for activities that might not be related to the university (Loukaitou-Sideris et al, 2014). The intersection of a campus street and a city street is a typical example of through traffic hubs--the conflict between city buses and university shuttles, crowds of students and city commuters, and the involvement of drive-through campus vehicles make the traffic situation at the intersection complicated.

*Urban Street Design Guide* claimed that a successful intersection integrates safety concerns and circulation efficiency (“Urban Street Design Guide | National Association of City Transportation Officials” n.d.). The guide listed different intersections on major roads, minor roads, and roads with complicated intersections. Besides, the guide provides design solutions to calm the busy traffic of intersections, for example, raised intersections and mini-roundabouts (Figure 3.8). *Transit Street Design Guide* introduced principles of intersections—to maximize safety and minimize pedestrian delay, maintain reliability of signals, coordinate signals and dedicated lanes together, etc (“Transit Street Design Guide | National Association of City Transportation Officials” n.d.) (Figure 3.9). It also provided a guide for transit signals and intersection transit routes and turns.



Figure 3.8 Raised intersection. (<https://nacto.org/publication/urban-street-design-guide/intersections/minor-intersections/raised-intersections/>)



Figure 3.9 Intersection Principle (<https://nacto.org/publication/transit-street-design-guide/intersections/intersection-principles/>)

### Design for bicyclists

Bicycles are one of the key elements of green commuting and an essential tool to improve walkability of the city. Bike lanes and bicyclist-friendly facilities play an important part in a streetscape. The appropriate design for bike lanes, bike facilities, and bikeway networks not only ensure safety of bike riders but also improve overall circulation in the city. In 2016, 12.4% of Americans used bikes in their daily commutes (David Lange n.d.) (Figure 3.10). From the data of Bicycle Guider, in 2020, there were over 100 million bikes in the US (“100+ Bike Statistics & Facts of 2021 [E-Bikes Included]” n.d.). Public preference for bike commuting and

bike trips has greatly increased in the past two decades (“100+ Bike Statistics & Facts of 2021 [E-Bikes Included]” n.d.) (Figure 3.11).

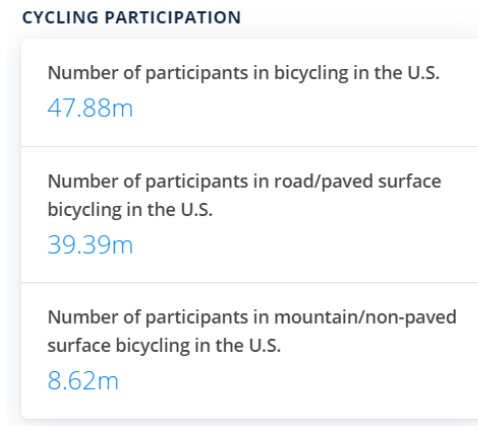


Figure 3.10 Cycling Participation (<https://www.statista.com/topics/1686/cycling/>)

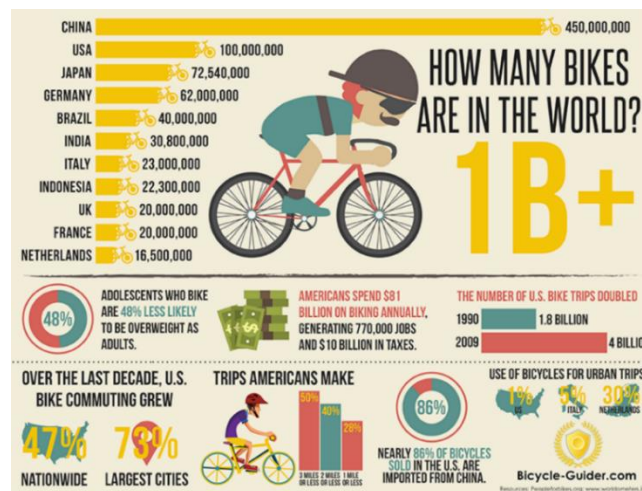


Figure 3.11 Bike Statistic and chart (<https://www.bicycle-guider.com/bike-facts-stats/>)

*Urban Bikeway Design Guide* by NACTO introduced the configuration of bike lanes based on different existing traffic conditions, design guide of the cycle track, intersection treatments to reduce conflicts between bikes and vehicles, the marking and signing of bike lanes or routes and

provision of bike facilities. In addition, the *Transit Street Design Guide* provides solutions for streets that do not have enough space to build bus lanes and bike lanes separately (Figure 3.12). NACTO claimed that when buses and bikes are competing for the curbside area, a good solution is to combine these two low-speed modes and provide shared lanes (“Urban Bikeway Design Guide | National Association of City Transportation Officials” n.d.) (Figure 3.13).

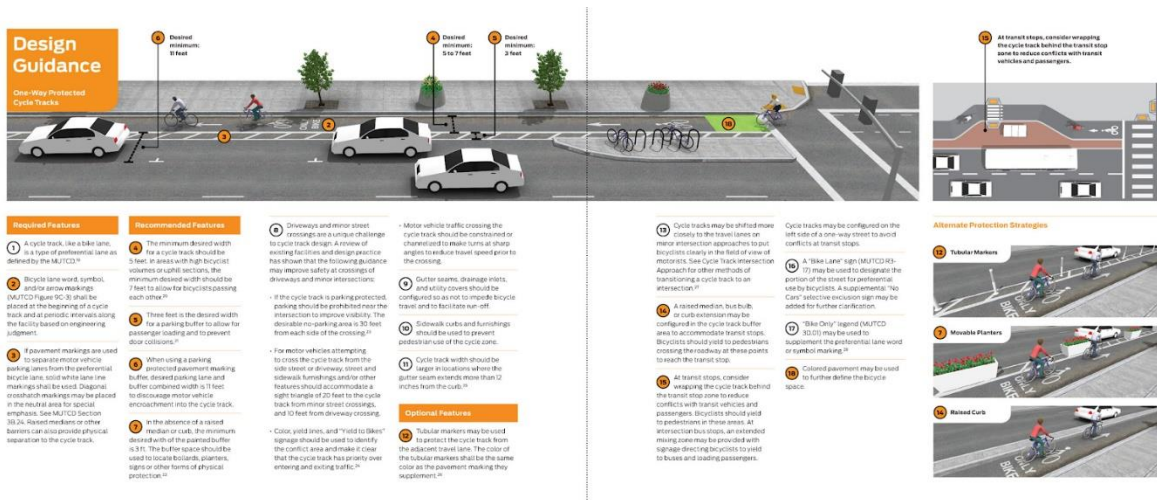


Figure 3.12 Design Guidance for One-Way Protected Cycle Track

(<https://nacto.org/publication/urban-bikeway-design-guide/cycle-tracks/one-way-protected-cycle-tracks/>)

## DESIGN GUIDANCE

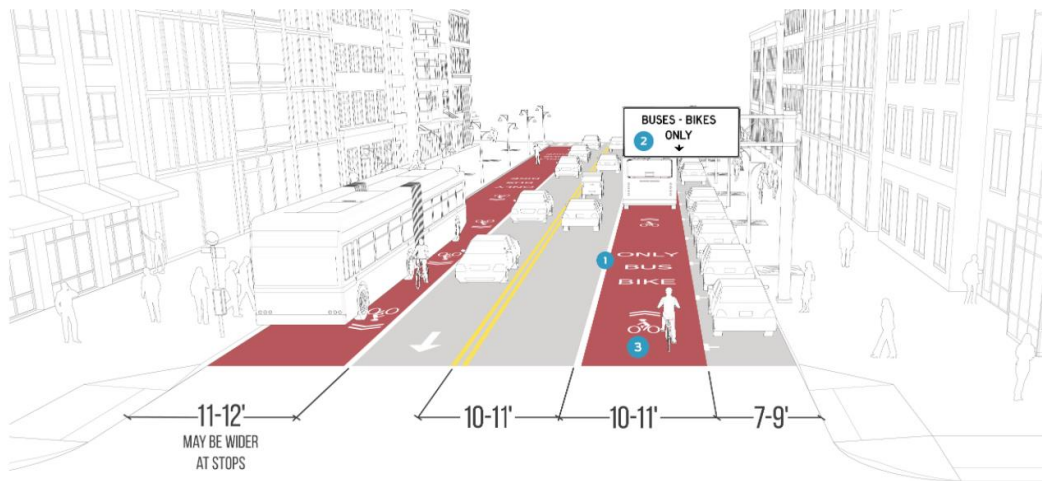


Figure 3.13 Design Guidance for bike and bus shared lanes.

(By NACTO)

### **Transit stop configuration and design guideline**

Transit stops located on the edge of campus serve not only students and faculty of the university, but also provide traffic convenience for public commuters. City bus routes, university shuttle routes, and city light rail connect the campus to the transit network of the whole city. However, it is hard to ignore the conflict and competition between city public transit and university transit. Commonly, city buses compete with university shuttles for boarding space and routes on the edge of the campus. *Transit Street Design Guide* intended to solve the conflict among multi-mode public transit by listing transit street design principles, providing solutions to improve street environments. Also, aimed at diverse street conditions, the *Transit Street Design Guide* has detailed design guidance for downtown streets, neighborhood streets, boulevards, etc. (“Transit Street Design Guide | National Association of City Transportation Officials” n.d.).

### **3.3 Lower Rainier Vista & Pedestrian Land Bridge**

Lower Rainier Vista & Pedestrian Land Bridge is a 6.3 acres site in the University of Washington that was designed by GGN in 2015 (“Lower Rainier Vista & Pedestrian Land Bridge — GGN” 2015). GGN revitalized a vehicle-dominant corner of the University of Washington by preserving the historic Olmsted vista of Mount Rainier and combining modern landscape design with the contextual design elements of the UW campus.

#### **Design from pedestrian scale**

To protect the spectacular view of the Mountain Rainier and create an enjoyable vista for the Land Bridge, GGN removed a bridge which intruded on the viewshed and created a coherent view by building a land bridge (“Lower Rainier Vista & Pedestrian Land Bridge | 2019 ASLA Professional Awards” 2019). Before the GGN design project, the grading of the site was not pedestrian-friendly. To ensure the passing of vehicles, pedestrians were separated from traffic by a monotonous, above ground pedestrian bridge (Figure 3.14). The new design emphasized the experience of pedestrians and bicyclists; circulation of pedestrians and bike riders were prioritized by regrading the site; the view of utility vehicles was weakened visually; and similar materials were used for paving and street furniture to enhance the coherence of the view (“160825 Wasla Lrv Project Images” 2016) (Figure 3.15). Besides, the regrading converted the site from a slope to several level landscapes that encouraged social activities and ceremonies (“160825 Wasla Lrv Project Images” 2016) (Figure 3.16).



Figure 3.14 Disused bridge interfered visitors' viewshed (ASLA, 2019)

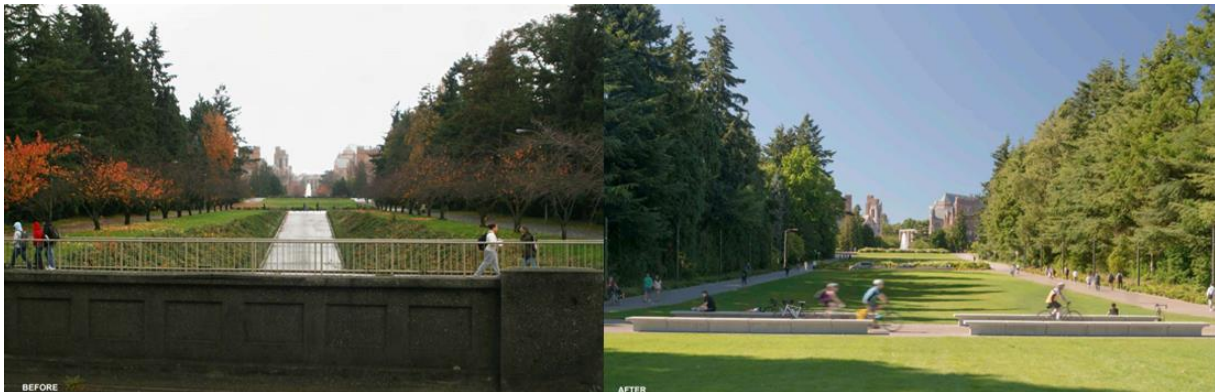


Figure 3.15 The regrading emphasized the experience of pedestrians (WASLA, 2016)

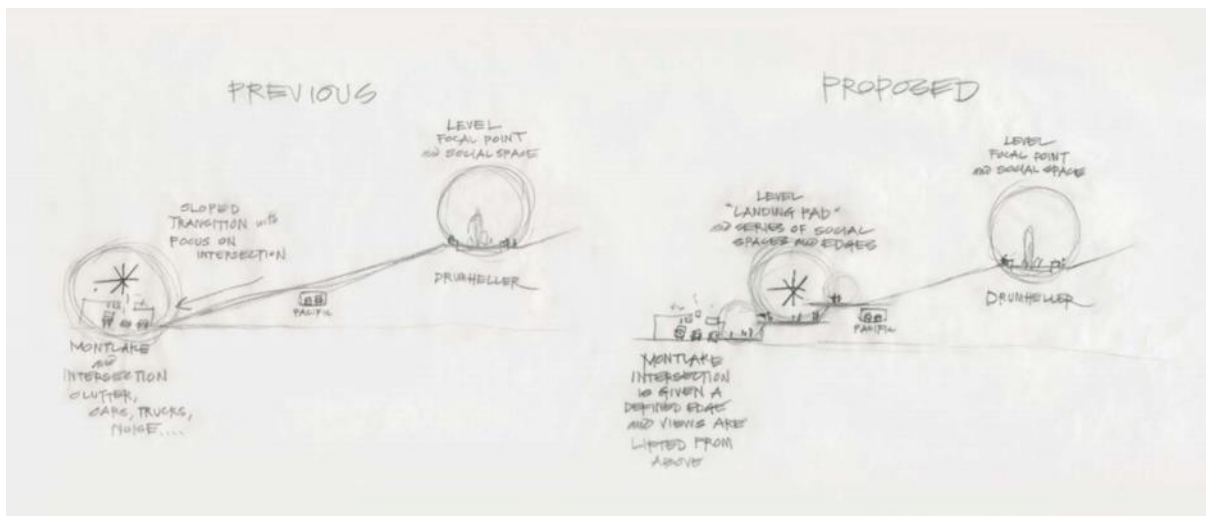


Figure 3.16 Draft Section View (WASLA, 2016)

## Borrowing Design Elements from campus

To ensure the new contemporary design fit into the University of Washington campus, GGN borrowed the gothic arch style that is typical for UW campus (“160825 Wasla Lrv Project Images” 2016). The axis has successfully framed the view of Mount Rainier and built up interaction among the university, natural reserve, and the city (Figure 3.17). The precast concrete benches also fit with the gothic style of the Rainier Vista (Porter, 2015). Plant selection of UW campus is another aspect that GGN referenced. The majority of the plants used on the site are natives (Phil Wood 2015). For canopy trees, Bigleaf Maple became the primary selection. According to Shannon Nichol, one of the founders of GGN, the cross branches of bigleaf maples repeat the Gothic arch pattern(Phil Wood 2015). The historic woods on both sides of the axis were well-protected during the construction of the project (“Lower Rainier Vista & Pedestrian Land Bridge | 2019 ASLA Professional Awards” 2019). Visual and natural connections have been realized by connecting the historic woods on the UW campus and the forests at the foot of the Mountain Rainier.

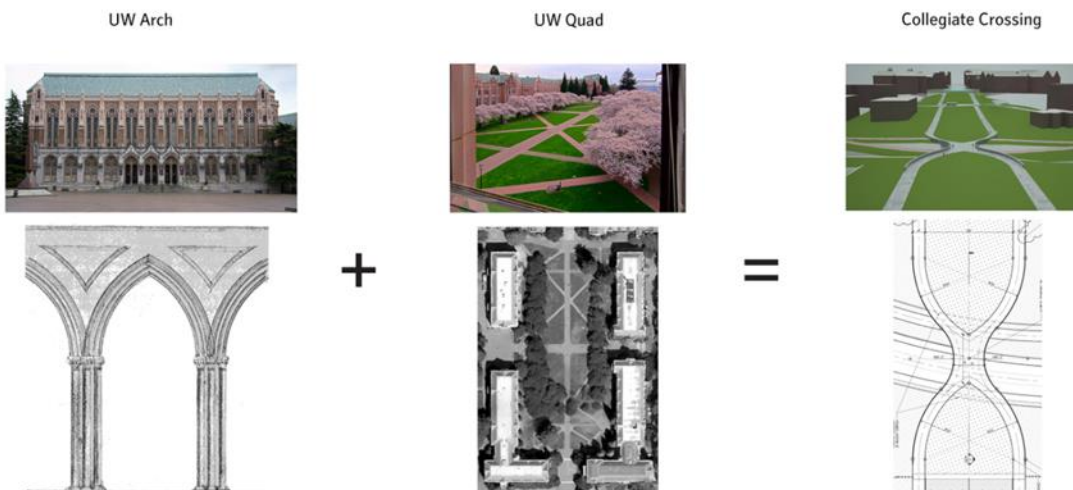


Figure 3.17 The design concept of Lower Rainier Vista (<https://www.ggnltd.com/lower-rainier-vista-and-pedestrian-land-bridge>)

## Coordinating Intermodal Transportation

The design of the pedestrian land bridge is now considered the intermodal transit on campus and between campus and city. Built at the nexus of multi-transportation, Rainier Vista served the public by connecting 6 bus stops and 2 parking garages, providing trails for pedestrians and bikes, and linking the UW campus with the city light rail station (Figure 3.18). Shannon Nichol claimed that “...*the project is about setting up a fitting, campus-quality bone structure for the place within an intersection of many transportation modes...*” (Phil Wood 2015). By reclaiming the original axis, the landbridge extends the UW campus to the UW Light Rail Station, facilitates commuters from the light rail station to have convenient access to the campus, improves pedestrian circulation, and enhances the bike trail network (Figure 3.19).

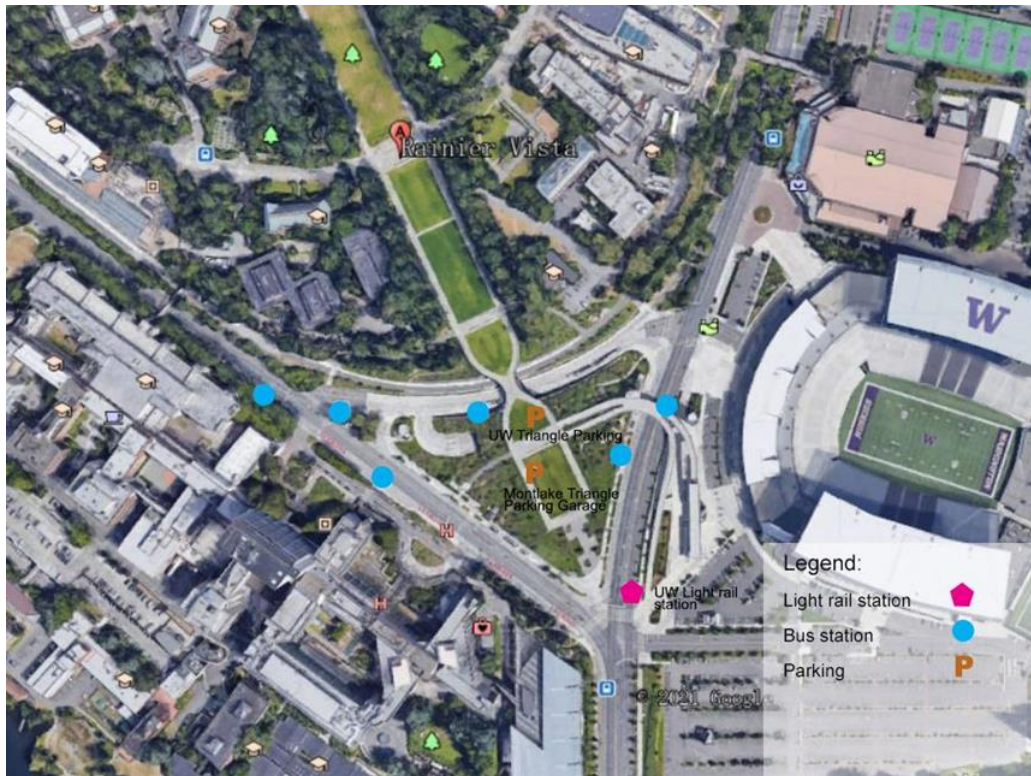


Figure 3.18 Intermodal Transit at Rainier Vista (map from Google Earth, edited by author)



Figure 3.19 Land Bridge supports intermodal transportation

([https://www.wasla.org/assets/docs/awards/160825%20%20wasla%20lr%20project%20images.](https://www.wasla.org/assets/docs/awards/160825%20%20wasla%20lr%20project%20images.pdf)

pdf)

## CHAPTER 4

### DESIGN PROCESS

The site selection is based on the PEDS audit method and Loukaitou's research on college campus walking and cycling safety. Loukaitou claimed that there are three types of danger zones on campus: *campus activity hubs*, *campus access hubs*, and *through traffic hubs*. (Loukaitou-Sideris et al. 2014). She also mentioned that campus edges have a higher potential for the occurrence of serious accidents (Loukaitou-Sideris et al. 2014). Following the studies mentioned above, the author selected four sites (including seven segments) on the UGA campus. Each site includes no more than two segments. Each segment is given a code to differentiate them. The site selection and road segments are shown in Figure 4.1 below. This chapter will introduce the design progress site by site.

Thirty-three out of forty total criteria from PEDS were chosen for the evaluation of the pedestrian environment to help in selecting the sites. The reasons for removing some evaluation criteria from the PEDS audit instrument are as follows:

- *Segment type*: PEDS protocol states that a segment with more than one lane is classified as high-volume. All segments of the four sites meet this criterion.
- *Uses in segment*: This criterion focuses on land use and zoning that is not within the research scope of this thesis.
- *Curb cuts, sidewalk completeness/continuity/sidewalk connectivity to other sidewalks/crosswalks*: The site selection process has ensured the selected sites have complete sidewalks that are well connected with the sidewalk system.

- *Must you walk through a parking lot to get to most buildings and the Presence of mid-high volume driveway: These criteria are not an issue in the selected sites.*

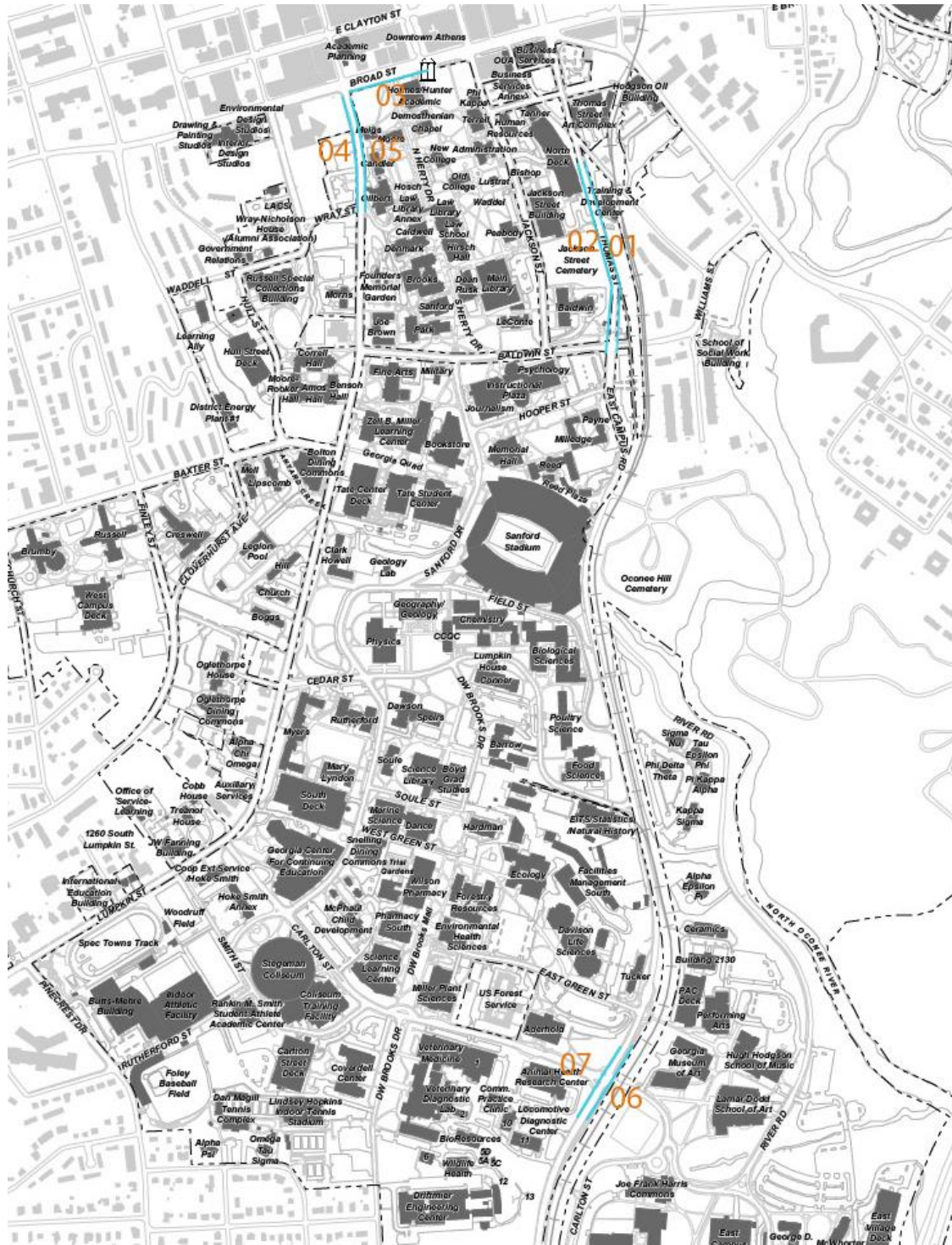


Figure 4.1 Selected Road Segments (From UGA Architects' Office, edited by author)

## **SITE 1**

### **Inventory and site analysis**

Site 1 is a linear space on South Thomas Street--the east edge of the UGA campus. It starts from the Training and Development Department on the north and ends at Baldwin Street on the south. Site 1 includes complicated topography change, two intersections with busy traffic, large impervious parking lots on the east, and a railway bridge on Baldwin Street. The site analysis diagram is shown in Figure 4.2.

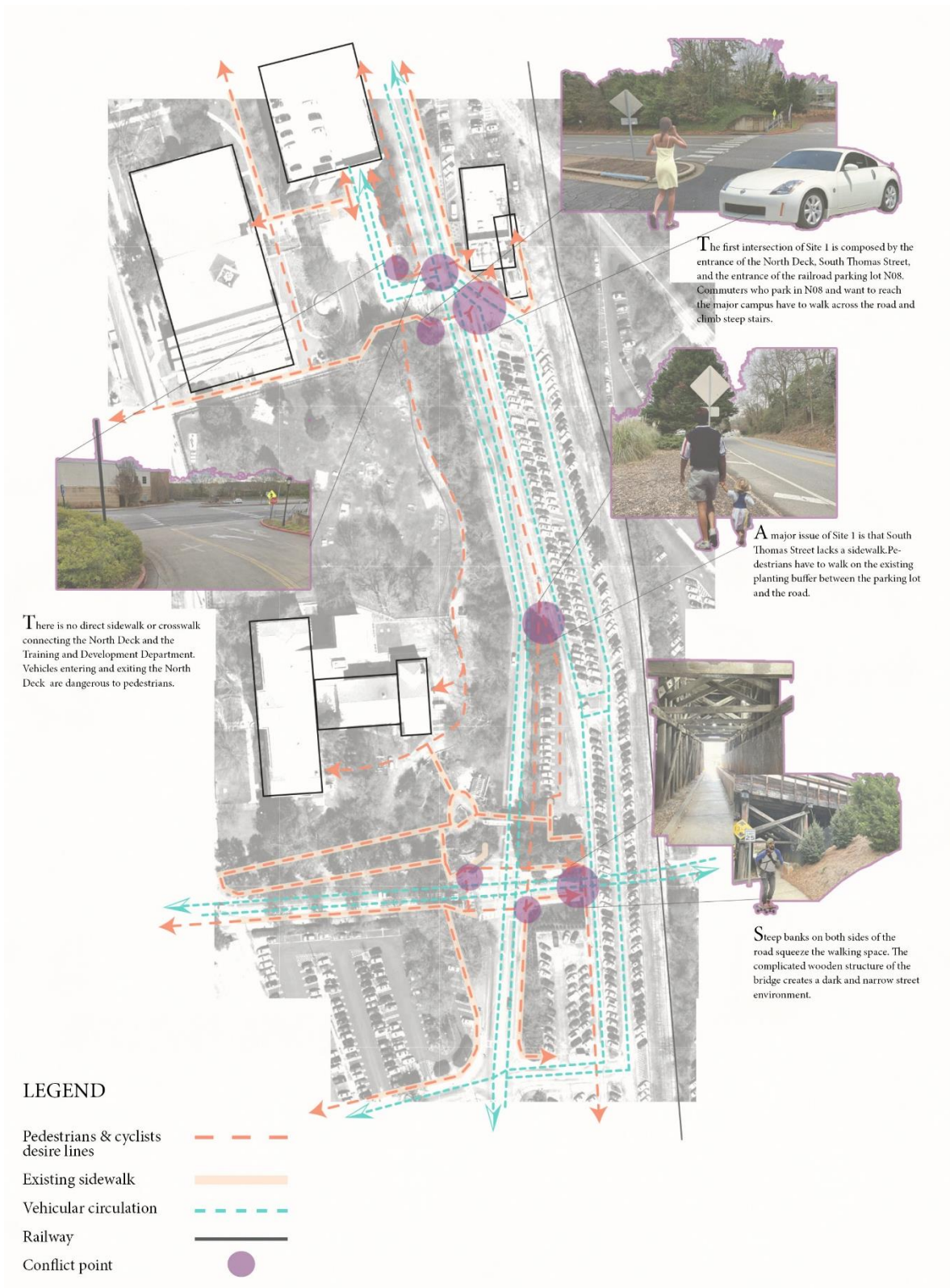


Figure 4.2 Site 1-Site Analysis by author

## Sub-areas within Site 1

### 1. Training and Development Department and North Deck

The first intersection of Site 1 is composed by the entrance of the North Deck, South Thomas Street, and the entrance of the railroad parking lot N08. A UGA bus stop is located at the entrance of the parking lot on the east side of Thomas Street. Commuters who park in N08 and want to reach the major campus have to walk across the road and climb steep stairs. Because of the elevation drop and lack of sidewalks on the west side of the street, the steep staircase provides the only campus entrance for this portion of South Thomas Street. Different from most linear approaches on the campus edge, such as sidewalks, or plane entrances like parking lots, the staircase to the Jackson Street Building on the west of S Thomas Street is a point entrance on the UGA campus edge. The fast traffic and complicated road conditions on S Thomas Street create a dangerous street environment for pedestrians: the entrance is narrow and close to the busy roadway; the high retaining wall and unmanaged plants seem to fall onto the narrow stairs and create invisible pressure as people pass by; the view of campus is blocked by dense evergreens and visitors are not able to peek into the campus from the campus edge. Besides, there is no direct sidewalk or crosswalk connecting the North Deck and the Training and Development Department.



Figure 4.3 Point Entrance on S Thomas Street. (From Google map)

## 2. Parking Lot N08

N08 is a linear parking lot following the direction of South Thomas Street. A major issue of this area is that South Thomas Street lacks a sidewalk. The west side of South Thomas Street is lined with two academic buildings and a cemetery. However, neither academic buildings nor the cemetery has direct access to Thomas Street since the continuous elevation drop makes the topography too steep to build a sidewalk. But the topography on the railway parking lot side is relatively flat. The existing planting buffer between the parking lot and the road provides potential for a sidewalk on the east side of Thomas Street.

Another disadvantage of the existing parking lot is low sustainability. The whole N08 parking lot is covered by impervious paving. The landscape islands are inadequate for collecting storm water on N08.



Figure 4.4 High mound on the west of Thomas Road and parking lot buffer on the east. (*Photo by author*)

### 3. Railway bridge and the intersection between Baldwin Street and East Campus Road

The intersection between Baldwin Street and East Campus Road is located on an uphill slope. According to *Urban Street Design Guide* by NACTO, curb extensions could effectively protect the safety of pedestrians at intersections. It said that “*Curb extensions increase the overall visibility of pedestrians by aligning them with the parking lane and reducing the crossing distance for pedestrians.*” (“Urban Street Design Guide | National Association of City Transportation Officials” n.d.). Currently, the intersection doesn't provide any curb extensions on both sides of the street. The curb is not distinct enough to be noticed especially for drivers. The intersection could be dangerous especially when pedestrians or bike riders meet the turning vehicles.

East of the intersection is a steep downhill road. A bridge spans the road supporting the N08 parking lot and railroad overhead. Although the bridge provides additional parking space for the campus, the street environment under the bridge is unpleasant. Steep banks on both sides of the road squeeze the walking space. Also, the complicated wooden structure of the bridge creates a dark and narrow street environment. The structure's age and shabbiness add to a feeling of insecurity when traveling underneath.



Figure 4.5 The sidewalk and curb on the intersection (*Photo by author*)



Figure 4.6 Bridge on Baldwin Street (*Photo by author*)

# Peds audit results--site 1 (segment 01 & segment 02)

## Segment 01

Name: Ruolin Gu Date: 10/30/2020 Study Area: S THOMAS EAST **PEDS**

Segment Number: Site 1 Segment 01 Time: 11:00 am Weather: \_\_\_\_\_

6. Segment type  
 Low volume road  1  
 High volume road  2  
 Bike or Ped path - skip section C  3

**A. Environment**  
 7. Uses in Segment (all that apply)  
 Housing - Single Family Detached  1  
 Housing - Multi-Family  2  
 Housing - Mobile Homes  3  
 Office/Institutional  4  
 Restaurant/Cafe/Commercial  5  
 Industrial  6  
 Vacant/Undeveloped  7  
 Recreation  8

8. Slope  
 Flat  1  
 Slight hill  2  
 Steep hill  3

9. Segment Intersections  
 Segment has 3 way intersection  1  
 Segment has 4 way intersection  2  
 Segment has other intersection  3  
 Segment deadends but path continues  4  
 Segment deadends  5  
 Segment has no intersections  6

**B. Pedestrian Facility (skip if none present)**  
 4. Type(s) of pedestrian facility (all that apply)  
 Footpath (worn dirt path)  1  
 Paved Trail  2  
 Sidewalk  3  
 Pedestrian Street (closed to cars)  4

The rest of the questions in section B refer to the best pedestrian facility selected above.  
 5. Path material (all that apply)  
 Asphalt  1  
 Concrete  2  
 Paving Bricks or Flat Stone  3  
 Gravel  4  
 Dirt or Sand  5

6. Path condition/maintenance  
 Poor (many bumps/cracks/holes)  1  
 Fair (some bumps/cracks/holes)  2  
 Good (very few bumps/cracks/holes)  3  
 Under Repair  4

7. Path obstructions (all that apply)  
 Poles or Signs  1  
 Parked Cars  2  
 Greenery  3  
 Garbage Cans  4  
 Other  5  
 None  6

8. Buffers between road and path (all that apply)  
 Fence  1  
 Trees  2  
 Hedges  3  
 Landscape  4  
 Grass  5  
 None  6

9. Path Distance from Curb  
 At edge  1  
 < 5 feet  2  
 > 5 feet  3

10. Sidewalk Width  
 < 4 feet  1  
 Between 4 and 8 feet  2  
 > 8 feet  3

11. Curb cuts  
 None  1  
 1 to 4  2  
 > 4  3

12. Sidewalk completeness/continuity  
 Sidewalk is complete  1  
 Sidewalk is incomplete  2

13. Sidewalk connectivity to other sidewalks/crosswalks  
 number of connections  1

**C. Road Attributes (skip if path only)**  
 14. Condition of road  
 Poor (many bumps/cracks/holes)  1  
 Fair (some bumps/cracks/holes)  2  
 Good (very few bumps/cracks/holes)  3  
 Under Repair  4

15. Number of lanes  
 Minimum # of lanes to cross 3 1  
 Maximum # of lanes to cross 3 1

16. Posted speed limit  
 None posted  1  
 (mph): \_\_\_\_\_ 1

17. On-Street parking (if pavement is unmarked, check only if cars parked)  
 Parallel or Diagonal  1  
 None  2

18. Off-street parking lot spaces  

0-5	6-25	26+
1	2	3

 3

19. Must you walk through a parking lot to get to most buildings?  
 Yes  1  
 No  2

20. Presence of med-hi volume driveways  
 < 2  1  
 2 to 4  2  
 > 4  3

21. Traffic control devices (all that apply)  
 Traffic light  1  
 Stop sign  2  
 Traffic circle  3  
 Speed bumps  4  
 Chicanes or chokers  5  
 None  6

22. Crosswalks  
 None  1  
 1 to 2  2  
 3 to 4  3  
 > 4  4

23. Crossing Aids (all that apply)  
 Yield to Ped Paddles  1  
 Pedestrian Signal  2  
 Median/Traffic Island  3  
 Curb Extension  4  
 Overpass/Underpass  5  
 Pedestrian Crossing Warning Sign  6  
 Flashing Warning Light  7  
 Share the Road Warning Sign  8  
 None  9

24. Bicycle facilities (all that apply)  
 Bicycle route signs  1  
 Striped bicycle lane designation  2  
 Visible bicycle parking facilities  3  
 Bicycle crossing warning  4  
 No bicycle facilities  5

**D. Walking/Cycling Environment**  
 25. Roadway/path lighting  
 Road-oriented lighting  1  
 Pedestrian-scale lighting  2  
 PARKING LOT LIGHTING  3  
 Other lighting  4  
 No lighting  4

26. Amenities (all that apply)  
 Public garbage cans  1  
 Benches  2  
 Water fountain  3  
 Street vendors/vending machines  4  
 No amenities  5

27. Are there wayfinding aids?  
 No  1  
 Yes  2

28. Number of trees shading walking area  
 None or Very Few  1  
 Some  2  
 Many/Dense  3

29. Degree of enclosure  
 Little or no enclosure  1  
 Some enclosure  2  
 Highly enclosed  3

30. Powerlines along segment?  
 Low Voltage/Distribution Line  1  
 High Voltage/Transmission Line  2  
 None  3

31. Overall cleanliness and building maintenance  
 Poor (much litter/graffiti/broken facilities)  1  
 Fair (some litter/graffiti/broken facilities)  2  
 Good (no litter/graffiti/broken facilities)  3

32. Articulation in building designs  
 Little or no articulation  1  
 Some articulation  2  
 Highly articulated  3

33. Building setbacks from sidewalk  
 At edge of sidewalk  1  
 Within 20 feet of sidewalk  2  
 More than 20 feet from sidewalk  3

34. Building height  
 Short  1  
 Medium  2  
 Tall  3

35. Bus stops  
 Bus stop with shelter  1  
 Bus stop with bench  2  
 Bus stop with signage only  3  
 No bus stop  4

**Subjective Assessment: Segment...**  
 Enter 1, 2, 3, or 4 for 1=Strongly Agree 2= Agree, 3=Disagree, 4=Strongly Disagree  
 .....is attractive for walking. 3 1  
 .....is attractive for cycling. 3 1  
 .....feels safe for walking. 3 1  
 .....feels safe for cycling. 3 1

Kelly J. Clifton, PhD - National Center for Smart Growth - University of Maryland, College Park

Figure 4.7 Segment 01 PEDS audit result.

Segment 01 is the east side of S Thomas St from the Training and Development Department to Baldwin Street. The segment starts from the intersection made by the North Deck entrance and S Thomas St and ends at the intersection of Baldwin St and S Thomas St. The topography is flat on the north end but becomes steep when approaching the overpass of the Latin American Garden. The steep hill makes the traffic at the intersection on the south of segment 01 increase speed. The pedestrian facilities for Segment 01 are inadequate. A paved sidewalk is missing. A narrow buffer with no planting is used by pedestrians as a makeshift sidewalk. The original purpose of the buffer is to separate parking lot N08 from S Thomas Street.

With appropriate traffic control devices, crosswalks, and crossing aids, Site 1 is functional; however, some changes are still needed at the intersection to improve safety. A new crosswalk should be built to connect the North Deck with the Training and Development Department. The curbs of the two intersections should be extended to provide a larger waiting area for pedestrians and cyclists. For the walking and biking environment, there are no pedestrian-scale lighting and amenities. Only two existing trees and several evergreen shrubs are within the site, none of them contributing to enclosure or shade.

Segment 02

Name: Quolin Gu Date: 10/30/2020 Study Area: S THOMAS WFC PEDS

Segment Number: Site 1 Segment 02 Time: 11:30 am Weather: \_\_\_\_\_

0. Segment type  
 Low volume road  1  
 High volume road  2  
 Bike or Ped path - skip section C  3

A. Environment  
 1. Uses in Segment (all that apply)  
 Housing - Single Family Detached  1  
 Housing - Multi-Family  2  
 Housing - Mobile Homes  3  
 Office/Institutional  4  
 Restaurant/Cafe/Commercial  5  
 Industrial  6  
 Vacant/Undeveloped  7  
 Recreation  8

2. Slope  
 Flat  1  
 Slight hill  2  
 Steep hill  3

3. Segment Intersections  
 Segment has 3 way intersection  1  
 Segment has 4 way intersection  2  
 Segment has other intersection  3  
 Segment deadends but path continues  4  
 Segment deadends  5  
 Segment has no intersections  6

B. Pedestrian Facility (skip if none present)  
 4. Type(s) of pedestrian facility (all that apply)  
 Footpath (worn dirt path)  1  
 Paved Trail  2  
 Sidewalk  3  
 Pedestrian Street (closed to cars)  4

The rest of the questions in section B refer to the best pedestrian facility selected above.  
 5. Path material (all that apply)  
 Asphalt  1  
 Concrete  2  
 Paving Bricks or Flat Stone  3  
 Gravel  4  
 Dirt or Sand  5

6. Path condition/maintenance  
 Poor (many bumps/cracks/holes)  1  
 Fair (some bumps/cracks/holes)  2  
 Good (very few bumps/cracks/holes)  3  
 Under Repair  4

7. Path obstructions (all that apply)  
 Poles or Signs  1  
 Parked Cars  2  
 Greenery  3  
 Garbage Cans  4  
 Other  5  
 None  6

8. Buffers between road and path (all that apply)  
 Fence  1  
 Tress  2  
 Hedges  3  
 Landscape  4  
 Grass  5  
 None  6

9. Path Distance from Curb  
 At edge  1  
 < 5 feet  2  
 > 5 feet  3

10. Sidewalk Width  
 < 4 feet  1  
 Between 4 and 8 feet  2  
 > 8 feet  3

11. Curb cuts  
 No sidewalk, skip now to section C.  1  
 None  1  
 1 to 4  2  
 > 4  3

12. Sidewalk completeness/continuity  
 Sidewalk is complete  1  
 Sidewalk is incomplete  2

13. Sidewalk connectivity to other sidewalks/crosswalks  
 number of connections  1

C. Road Attributes (skip if path only)  
 14. Condition of road  
 Poor (many bumps/cracks/holes)  1  
 Fair (some bumps/cracks/holes)  2  
 Good (very few bumps/cracks/holes)  3  
 Under Repair  4

15. Number of lanes  
 Minimum # of lanes to cross 3 1  
 Maximum # of lanes to cross 3 1

16. Posted speed limit  
 None posted  1  
 (mph): \_\_\_\_\_ 1

17. On-Street parking (if pavement is unmarked, check only if cars parked)  
 Parallel or Diagonal  1  
 None  2

18. Off-street parking lot spaces  

0-5	6-25	26+
1	2	3

19. Must you walk through a parking lot to get to most buildings?  
 Yes  1  
 No  2

20. Presence of med-hl volume driveways  
 < 2  1  
 2 to 4  2  
 > 4  3

21. Traffic control devices (all that apply)  
 Traffic light  1  
 Stop sign  2  
 Traffic circle  3  
 Speed bumps  4  
 Chicanes or chokers  5  
 None  6

22. Crosswalks  
 None  1  
 1 to 2  2  
 3 to 4  3  
 > 4  4

23. Crossing Aids (all that apply)  
 Yield to Ped Paddles  1  
 Pedestrian Signal  2  
 Median/Traffic Island  3  
 Curb Extension  4  
 Overpass/Underpass  5  
 Pedestrian Crossing Warning Sign  6  
 Flashing Warning Light  7  
 Share the Road Warning Sign  8  
 None  9

24. Bicycle facilities (all that apply)  
 Bicycle route signs  1  
 Striped bicycle lane designation  2  
 Visible bicycle parking facilities  3  
 Bicycle crossing warning  4  
 No bicycle facilities  5

D. Walking/Cycling Environment  
 25. Roadway/path lighting  
 Road-oriented lighting  1  
 Pedestrian-scale lighting  2  
 Other lighting  3  
 No lighting  4

26. Amenities (all that apply)  
 Public garbage cans  1  
 Benches  2  
 Water fountain  3  
 Street vendors/vending machines  4  
 No amenities  5

27. Are there wayfinding aids?  
 No  1  
 Yes  2

28. Number of trees shading walking area  
 None or Very Few  1  
 Some  2  
 Many/Dense  3

29. Degree of enclosure  
 Little or no enclosure  1  
 Some enclosure  2  
 Highly enclosed  3

30. Powerlines along segment?  
 Low Voltage/Distribution Line  1  
 High Voltage/Transmission Line  2  
 None  3

31. Overall cleanliness and building maintenance  
 Poor (much litter/graffiti/broken facilities)  1  
 Fair (some litter/graffiti/broken facilities)  2  
 Good (no litter/graffiti/broken facilities)  3

32. Articulation in building designs  
 Little or no articulation  1  
 Some articulation  2  
 Highly articulated  3

33. Building setbacks from sidewalk  
 At edge of sidewalk  1  
 Within 20 feet of sidewalk  2  
 More than 20 feet from sidewalk  3

34. Building height  
 Short  1  
 Medium  2  
 Tall  3

35. Bus stops  
 Bus stop with shelter  1  
 Bus stop with bench  2  
 Bus stop with signage only  3  
 No bus stop  4

Subjective Assessment: Segment...  
 Enter 1, 2, 3, or 4 for 1=Strongly Agree 2= Agree, 3=Disagree, 4=Strongly Disagree  
 .....is attractive for walking. 4 1  
 .....is attractive for cycling. 4 1  
 .....feels safe for walking. 4 1  
 .....feels safe for cycling. 4 1

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Figure 4.8 Segment 01 PEDS audit result

As with Segment 01, sidewalks are missing on both sides of Thomas St. For a street with a steep hill and busy traffic, it is clearly dangerous for people to walk on the edge of the street.

Because of the elevation drop from the academic buildings to the road, Segment 2 is too steep for people to walk on. Even the footpath is indistinct since pedestrians seldom choose to walk on the west side of S Thomas St. The driving attributes are the same as Segment 01. Since there is no space for a sidewalk on Segment 02, the attributes for walking and cycling environment are missing for Segment 02.

In conclusion, what is missing in Site 1 includes clear pedestrian circulation, extension of the curb at two intersections, pedestrian-scale lighting and amenities, and planting of buffers and shade trees.

## **Proposed design**

### **1. South Thomas Street Transit Hub**

The author proposes upgrading the existing bus stop that is located at the entrance of the parking lot on the east side of Thomas Street to a multi-functional transit stop (Figure 4.9). The abandoned railway that goes through the UGA campus may one day be reused as a light rail line that will encourage commuting from north to south campus. To promote multimodal transit on campus, decrease the stress of road traffic, and increase the efficiency of campus commuting, the proposed transit hub combines a bus stop and a light rail station. Connecting the transit hub with the parking deck, parking lot and academic building, the east edge of the UGA north campus becomes a key transportation hub for the north campus.

UGA campus recommendations are applied in the design of the South Thomas Transit Hub. The Jackson Street Building is the nearest academic building to the hub. The design of the iconic finned, white roof of the Jackson Street Building provides inspiration in the design of the transit

hub (Figure 4.10). Red brick is proposed as paving to make the new structure integrate with the campus.



South Thomas Street and  
Baldwin Street Streetscape  
Plan View (Part 1)  
Scale: 1" = 5'-0"

Figure 4.9 South Thomas Street and Baldwin Street streetscape plan view (part 1)

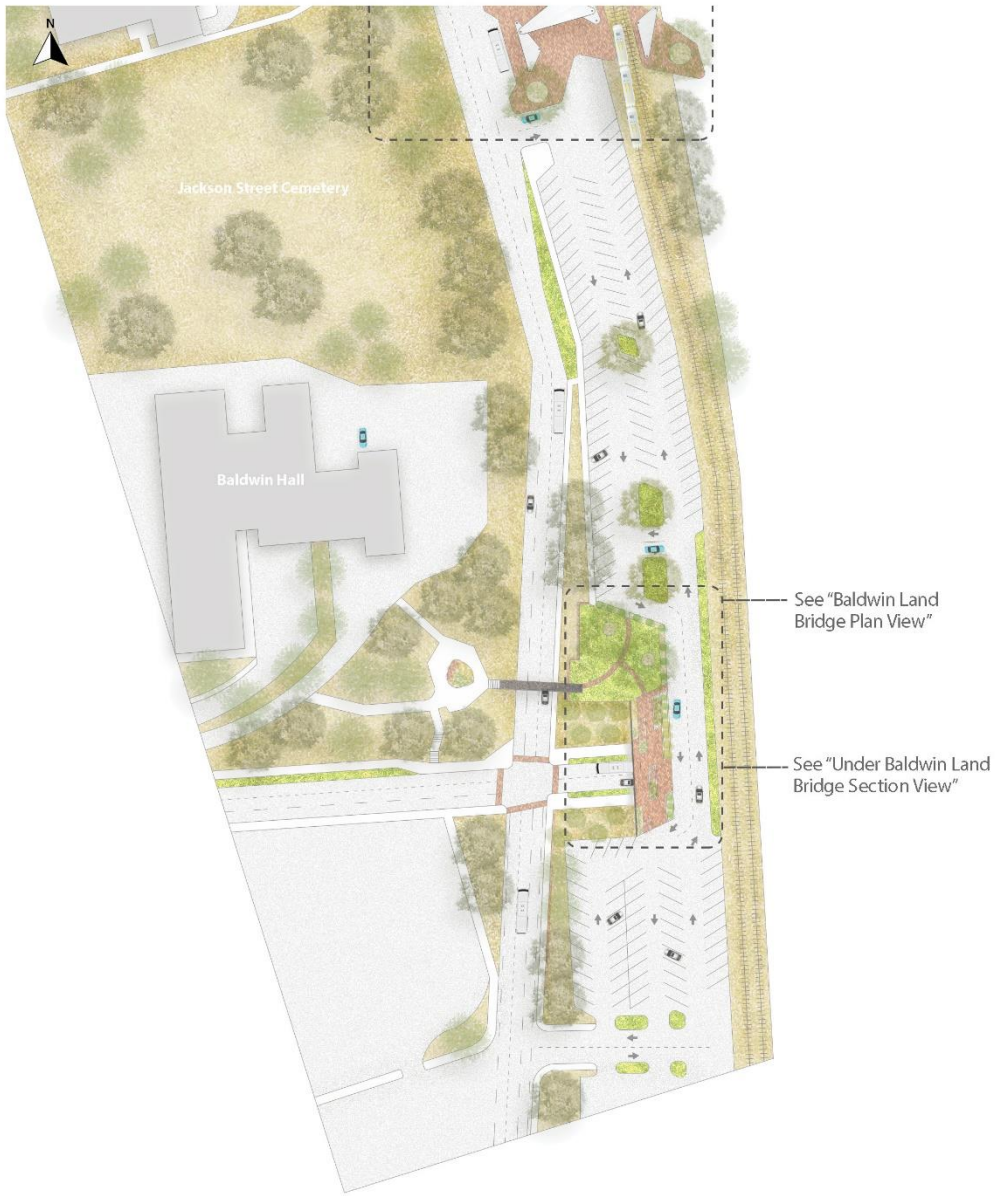


Figure 4.10 The design of S Thomas Street Transit hub

## 2. Pedestrian Circulation

A paved pedestrian plaza is proposed at the intersection to calm the busy traffic and ensure the safety of pedestrians. On the west of Thomas St, the pedestrian plaza is connected with a new sidewalk leading to the North Deck; on the east, the existing plant buffer that follows the shape of the N08 parking lot is replaced by sidewalks. Specifically, because of the elevation difference, the sidewalk is split into two paths--one sidewalk goes under the overpass and connects with the sidewalk on Baldwin St; the other sidewalk leads to an open space and a proposed Baldwin Street land bridge. The details of the sidewalk are shown in Figure 4.9 and Figure 4.11. In addition, the narrow access to the Jackson Street Building is expanded. By changing the direction of a few staircases, decreasing the height of the retaining wall, and pushing the retaining wall 5 feet to the west, the entrance is no longer a space that blocks the view into campus, creating discomfort for people who pass by. The construction of a new sidewalk system on Thomas Street promotes safer pedestrian circulation and ensures easy access from the east edge of the UGA north campus.

For the Baldwin Street intersection, curb extensions are proposed to decrease pedestrian's crossing distance at the intersection and increase turning drivers' attention to pedestrians.



South Thomas Street and  
Baldwin Street Streetscape  
Plan View (Part 2)  
Scale: 1" = 5'-0"

Figure 4.11 South Thomas Street and Baldwin Street streetscape plan view (part 2)

### 3. Baldwin Land Bridge

The Baldwin Land Bridge is a bridge that spans the road supporting the N08 parking lot and railroad. The existing bridge connects the linear parking space on the east campus edge and enables vehicle circulation. The proposed design intends to improve the function and sustainability of the bridge.

The proposed Baldwin Land Bridge not only provides greater convenience for vehicular traffic, but also builds a new open space for the public on the north campus edge. Thirty parking spaces on the land bridge are proposed to be replaced by two vehicular lanes to keep the connection between the two parking lots. Considering the conversion of the railway to campus light rail, a plant buffer is provided to block potential noise. Adding the plaza space on the edge of the bridge would capitalize on an appealing view of campus that could be an important orientation point for arriving visitors (Figure 4.13).

The land bridge includes both lawn and a plaza space. Plant and material selections are shown in Figure 4.15. Because of the thin soil layer on the land bridge, shrubs, grass, and perennials are planted in lieu of trees. All the plants and materials selected are frequently used on the north campus contributing to a sense of continuity. Red brick is proposed as the predominant paving material for the plaza space, but the paving style and pattern is proposed to be different from the traditional in order to create a contemporary look. Possible paving styles are shown in Figure 4.14.



Baldwin Land Bridge  
 Plan View  
 Scale: 1" = 2'-0"

Figure 4.12 Baldwin Land Bridge plan view



Figure 4.13 Baldwin Land Bridge view



Figure 4.14 Possible paving styles (“Madison Avenue Plaza - SCAPE” 2019; Gillespies n.d.)

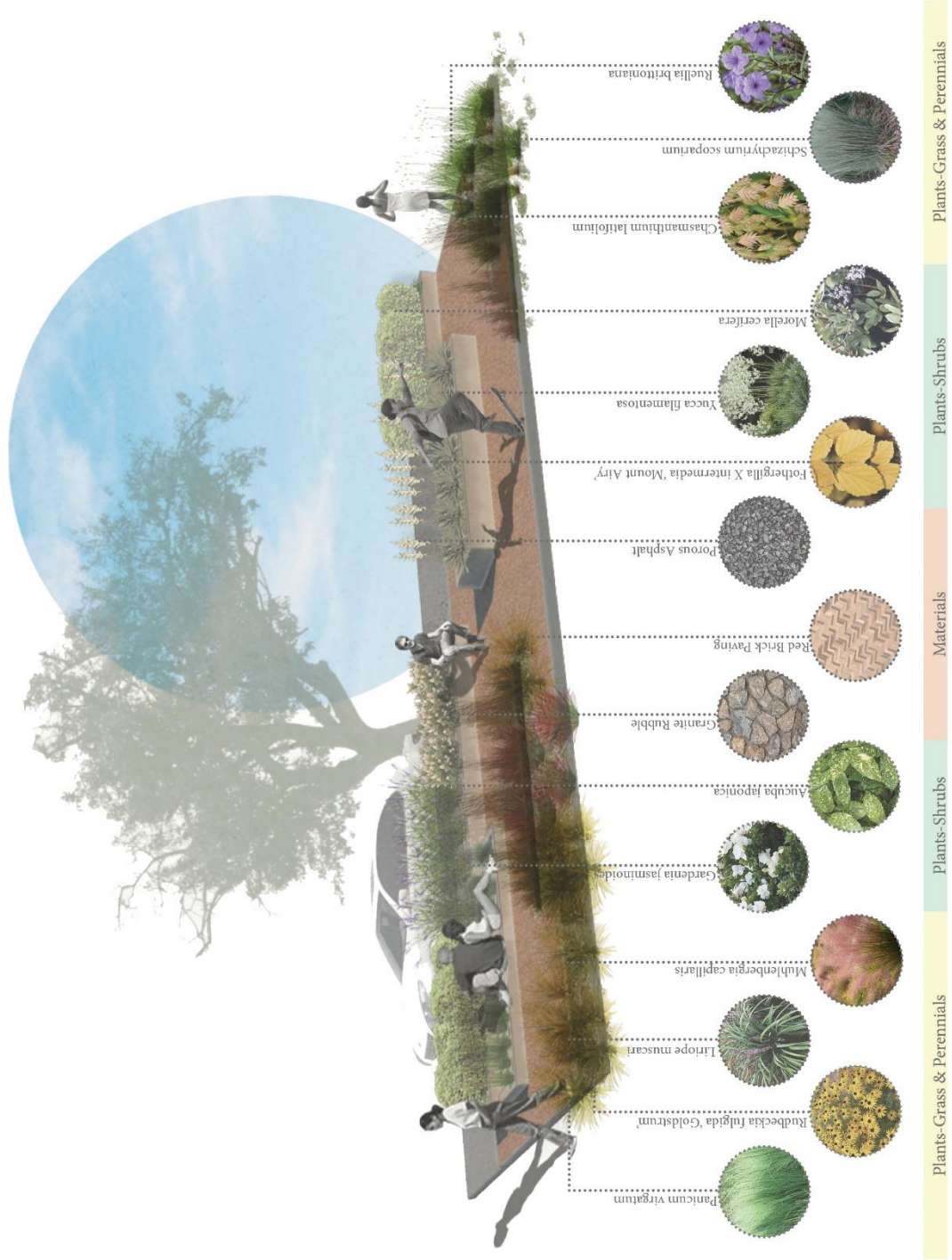
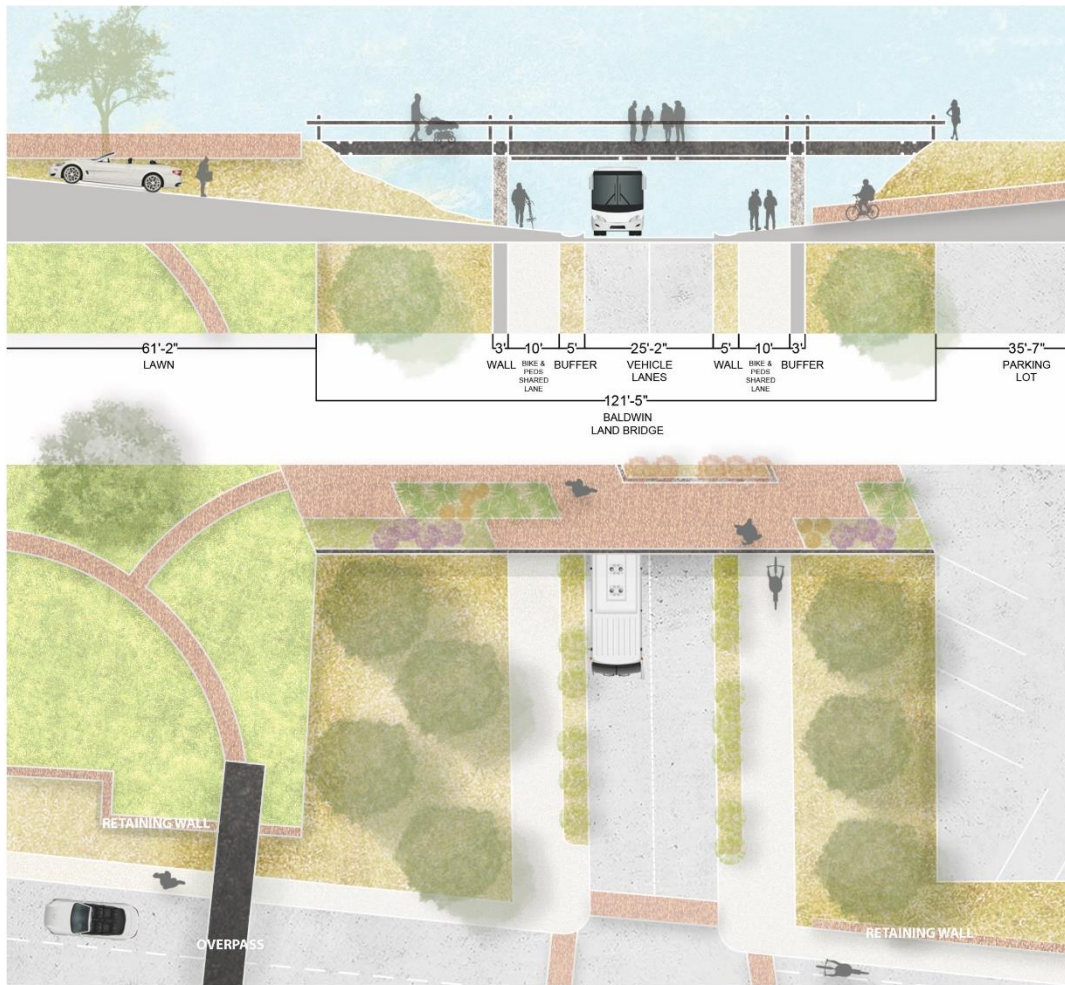


Figure 4.15 Perspective rendering and plant/material selection of Baldwin Land Bridge

Another change for the Baldwin Land Bridge is the proposed improvement of the space underneath the bridge. The design replaces the steep banks on both sides that uncomfortably constrict the pedestrian environment by adding concrete retaining walls. Also, the aging and visually distracting, complicated wooden structure of the bridge will be removed and replaced. Bridge structures with stronger bearing capacity and cleaner lines will be used. The replacement of the wooden structure and steep banks will provide space for functionally safer, wider shared lanes for pedestrians and cyclists. The dark, shabby look under the bridge will also be visually improved (Figure 4.16).

#### 4. Sustainable green parking lot

To improve the sustainability of parking lot N08, a green space with two canopy trees, an open space with native plants, three planting spaces, and plant buffers are designed in the parking lot area (Figure 4.17).



Under Baldwin Land Bridge  
Section View  
Scale: 1" = 1'-0"

Figure 4.16 Under Baldwin Land Bridge section view



Figure 4.17 Sustainable green parking lot

## SITE 2

### **Inventory and site analysis**

Site 2 is a segment of East Broad Street from the North Lumpkin Street intersection to the College Avenue intersection. It is a typical campus edge space that represents the interaction between commercial districts and the university.

Aligning with the Arch, College Avenue is the most populous commercial district with various restaurants and bars adjacent to the UGA campus. During the 2020 Pandemic, the block of College Avenue between East Broad Street and Clayton Street was temporarily switched from a one-way vehicular traffic road to a pedestrian plaza as a test of its viability as a public space. The range of the pedestrian plaza is labeled in Figure 4.18. The upgraded pedestrian plaza allowed College Ave to accommodate more people. But the configuration of the pedestrian plaza still needs improvements. Currently, there is only one sidewalk that connects the Arch to the pedestrian plaza. Diagonal parking has occupied the space that could be used to build a sidewalk and the parked cars block visitors' views from the Arch to the College Ave pedestrian plaza. A crosswalk plaza is needed to ensure the safety of the dense flow of people in the future. Another element that College Ave needs to improve is the paving materials. The pedestrian plaza and the E Broad St are only separated by planters. But the planters do not provide unity of design style or color with the pedestrian plaza nor demarcate the edge between the commercial district and the campus (Figure 4.19). The original asphalt road should be replaced by other paving materials, such as red brick, to distinguish the pedestrian plaza from the streets. A good example of a street to plaza conversion is shown in Figure 4.20.



Figure 4.18 The intersection of College Ave and E Broad St (from Google Map)



Figure 4.19 Pedestrian Plaza on College Avenue (*Photo by author*)



Figure 4.20 An example of street-to-plaza conversions (<https://www.deeproot.com/blog/blog-entries/the-rise-of-the-pedestrian-plaza-street-to-plaza-conversions-in-the-u-s>)

An existing plaza space on E Broad St is located west of the Holmes-Hunter Academic Building. There are two bus stops, a UGA bus stop, and an ACC bus stop, near the plaza, one of the pedestrian entrances to the UGA north campus. Two sidewalks leading different directions intersect here. Bus riders, cyclists, university members, and visitors use this space frequently. The existing condition of the space does not provide a well-managed environment for users either functionally and visually. For edge morphology, the space does not present a smooth transition from cityscape to campus landscape. While the cast iron benches and red brick paving blend with commonly used UGA campus features, the cracked sidewalks disrupt the overall shape of the space. Functionally, the three haphazard benches are not adequate to provide comfortable sitting space for the number of users.



Figure 4.21 Existing Condition of the Open space attached to E Broad St. (Photo from Google Map)

Site 2 is heavily used for bus circulation. Four UGA bus routes and 6 ACC bus routes stop at the Arch. Currently, three traffic lanes are shared by large numbers of vehicles and 10 bus routes in and out of the UGA campus, creating congestion. Bike lanes are lacking on E Broad St.

The median strip in the middle of E Broad St provides an opportunity to transform the street—a Confederate memorial obelisk was recently removed from the median. Moreover, the location of the median strip is not positioned on pedestrian crossings. Thus, people seldom use the median. Considering the congested bus routes and absence of bike lanes, a bus-bike shared lane could be built to relieve the traffic pressure of E Broad St. The site analysis diagram is shown in Figure 4.22.

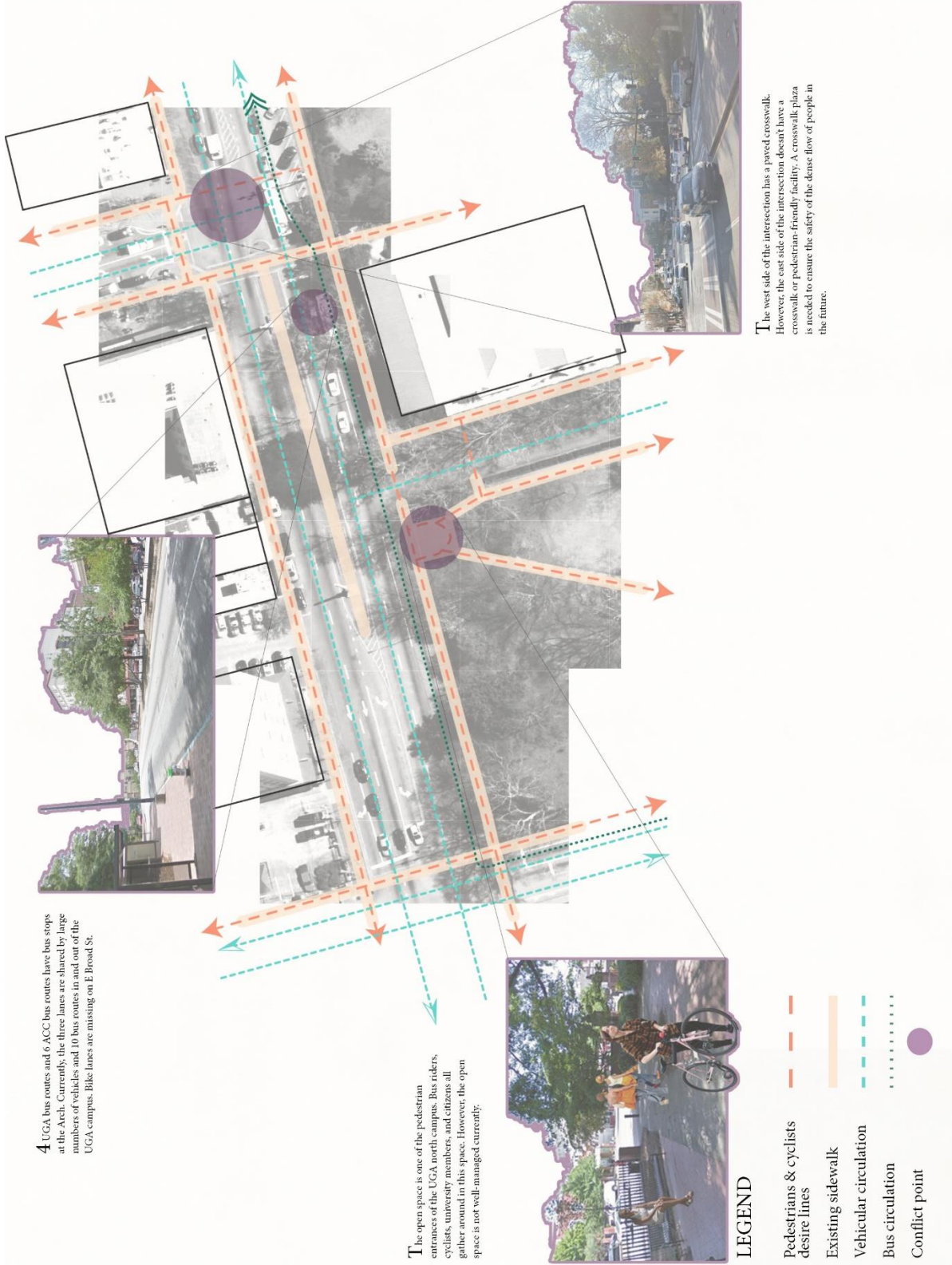


Figure 4.22 Site 2-Site Analysis by author

Peds audit results--site 2 (segment 03)

Name: Ruolin Gu Date: 11/20/2021 Study Area: E Broad St **PEDS**

Segment Number: Site 2 Segment 03 Time: \_\_\_\_\_ Weather: \_\_\_\_\_

**0. Segment type**  
 Low volume road  1  
 High volume road  2  
 Bike or Ped path - skip section C  3

**A. Environment**  
**1. Uses in Segment (all that apply)**  
 Housing - Single Family Detached  1  
 Housing - Multi-Family  2  
 Housing - Mobile Homes  3  
 Office/Institutional  4  
 Restaurant/Cafe/Commercial  5  
 Industrial  6  
 Vacant/Underdeveloped  7  
 Recreation  8

**2. Slope**  
 Flat  1  
 Slight hill  2  
 Steep hill  3

**3. Segment Intersections**  
 Segment has 3 way intersection  1  
 Segment has 4 way intersection  2  
 Segment has other intersection  3  
 Segment deadends but path continues  4  
 Segment deadends  5  
 Segment has no intersections  6

**B. Pedestrian Facility (skip if none present)**  
**4. Type(s) of pedestrian facility (all that apply)**  
 Footpath (worn dirt path)  1  
 Paved Trail  2  
 Sidewalk  3  
 College Ave Pedestrian Street (closed to cars)  4

*The rest of the questions in section B refer to the best pedestrian facility selected above.*

**5. Path material (all that apply)**  
 Asphalt  1  
 Concrete  2  
 Paving Bricks or Flat Stone  3  
 Gravel  4  
 Dirt or Sand  5

**6. Path condition/maintenance**  
 Poor (many bumps/cracks/holes)  1  
 Fair (some bumps/cracks/holes)  2  
 Good (very few bumps/cracks/holes)  3  
 Under Repair  4

**7. Path obstructions (all that apply)**  
 Poles or Signs  1  
 Parked Cars  2  
 Greenery  3  
 Garbage Cans  4  
 Fire hydrant  5  
 Other  6  
 None  6

**8. Buffers between road and path (all that apply)**  
 Fence  1  
 Trees  2  
 Hedges  3  
 Landscape  4  
 Grass  5  
 None  6

**9. Path Distance from Curb**  
 At edge  1  
 < 5 feet  2  
 > 5 feet  3

**10. Sidewalk Width**  
 < 4 feet  1  
 Between 4 and 8 feet  2  
 > 8 feet  3

**11. Curb cuts**  
 If no sidewalk, skip now to section C.  
 None  1  
 1 to 4  2  
 > 4  3

**12. Sidewalk completeness/continuity**  
 Sidewalk is complete  1  
 Sidewalk is incomplete  2

**13. Sidewalk connectivity to other sidewalks/crosswalks**  
 number of connections  1

**C. Road Attributes (skip if path only)**  
**14. Condition of road**  
 Poor (many bumps/cracks/holes)  1  
 Fair (some bumps/cracks/holes)  2  
 Good (very few bumps/cracks/holes)  3  
 Under Repair  4

**15. Number of lanes**  
 Minimum # of lanes to cross  1  
 Maximum # of lanes to cross  2

**16. Posted speed limit (mph)**  
 None posted  1  
 1  2  
 2-4  3  
 5-25  4  
 26+  5

**17. On-Street parking (if pavement is unmarked, check only if cars parked)**  
 Parallel or Diagonal  1  
 None  2

**18. Off-street parking lot spaces**  
 0-5  1  
 6-25  2  
 26+  3

**19. Must you walk through a parking lot to get to most buildings?**  
 Yes  1  
 No  2

**20. Presence of med-hi volume driveways**  
 < 2  1  
 2 to 4  2  
 > 4  3

**21. Traffic control devices (all that apply)**  
 Traffic light  1  
 Stop sign  2  
 Traffic circle  3  
 Speed bumps  4  
 Chicane or chokers  5  
 None  6

**22. Crosswalks**  
 None  1  
 1 to 2  2  
 3 to 4  3  
 > 4  4

**23. Crossing Aids (all that apply)**  
 Yield to Ped Paddles  1  
 Pedestrian Signal  2  
 Median/Traffic Island  3  
 Curb Extension  4  
 Overpass/Underpass  5  
 Pedestrian Crossing Warning Sign  6  
 Flashing Warning Light  7  
 Share the Road Warning Sign  8  
 None  9

**24. Bicycle facilities (all that apply)**  
 Bicycle route signs  1  
 Striped bicycle lane designation  2  
 Visible bicycle parking facilities  3  
 Bicycle crossing warning  4  
 No bicycle facilities  5

**D. Walking/Cycling Environment**  
**25. Roadway/path lighting**  
 Road-oriented lighting  1  
 Pedestrian-scale lighting  2  
 Other lighting  3  
 No lighting  4

**26. Amenities (all that apply)**  
 Public garbage cans  1  
 Benches  2  
 Water fountain  3  
 Street vendors/vending machines  4  
 No amenities  5

**27. Are there wayfinding aids?**  
 No  1  
 Yes  2

**28. Number of trees shading walking area**  
 None or Very Few  1  
 Some  2  
 Many/Dense  3

**29. Degree of enclosure**  
 Little or no enclosure  1  
 Some enclosure  2  
 Highly enclosed  3

**30. Powerlines along segment?**  
 Low Voltage/Distribution Line  1  
 High Voltage/Transmission Line  2  
 None  3

**31. Overall cleanliness and building maintenance**  
 Poor (much litter/graffiti/broken facilities)  1  
 Fair (some litter/graffiti/broken facilities)  2  
 Good (no litter/graffiti/broken facilities)  3

**32. Articulation in building designs**  
 Little or no articulation  1  
 Some articulation  2  
 Highly articulated  3

**33. Building setbacks from sidewalk**  
 At edge of sidewalk  1  
 Within 20 feet of sidewalk  2  
 More than 20 feet from sidewalk  3

**34. Building height**  
 Short  1  
 Medium  2  
 Tall  3

**35. Bus stops**  
 Bus stop with shelter  1  
 Bus stop with bench  2  
 Bus stop with signage only  3  
 No bus stop  4

**Subjective Assessment: Segment...**  
 Enter 1, 2, 3, or 4 for 1=Strongly Agree 2= Agree, 3=Disagree, 4=Strongly Disagree  
 ..... is attractive for walking.  1  
 ..... is attractive for cycling.  1  
 ..... feels safe for walking.  1  
 ..... feels safe for cycling.  1

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Figure 4.23 Segment 03 PEDS audit result.

Segment 03 is the south side of E Broad Street from the N Lumpkin St intersection to the College Avenue intersection. Compared to the rest of the selected segments, Segment 03 has a

more friendly pedestrian environment. It is a flat space with three intersections. One of the intersections, Herty Dr, is a low circulation intersection that connects to the driveways of academic buildings.

The pedestrian facility of Segment 03 is being improved. One of the intersections, College Ave, is converted from a two-lane road to a pedestrian street. The red brick sidewalk is over 10 feet wide and fulfills the passage needs of the crowd. However, the sidewalk is used by bus riders, cyclists, and walkers together. Circulation conflicts happen occasionally.

Additionally, there are no buffers between road and path; UGA and ACC buses, private vehicles, and even bicycles could threaten pedestrians' safety. Regarding road attributes, conflicts also occur. There are several diagonal parking spaces on the east of the UGA landmark--The Arch. These spaces not only occupy the space for the intersection crosswalk but also create conflict among vehicles that pass through the intersection and that enter or exit parking spaces. As for crossing aids and traffic control devices, the intersection has curb extensions, a median, and pedestrian signals to control the traffic. However, the existing crosswalk leads to one side of the College Ave Plaza is too narrow for large numbers of visitors. Bicycle facilities are not found on Segment 03.

Segment 03 has a pleasant walking environment with adequate road-orient lightings, dense shading trees and high enclosure, two bus stops with shelters, garbage cans, and a small open space with benches near the bus stop. The articulation between the open space and the campus buildings needs to be improved.

In conclusion, Segment 03 is attractive for walking. Several circulations conflicts need to be resolved by removing extra diagonal parking, adding a crosswalk, and separating bus lanes from private vehicle lanes. Also, bike lanes and bicycle facilities need to be built for Segment 03

for the convenience of bike riders. Since the Arch, the landmark of the UGA campus, is located on Segment 03, more articulations need to be shown among the intersection, the open space, bus stops, the plaza, and the campus.

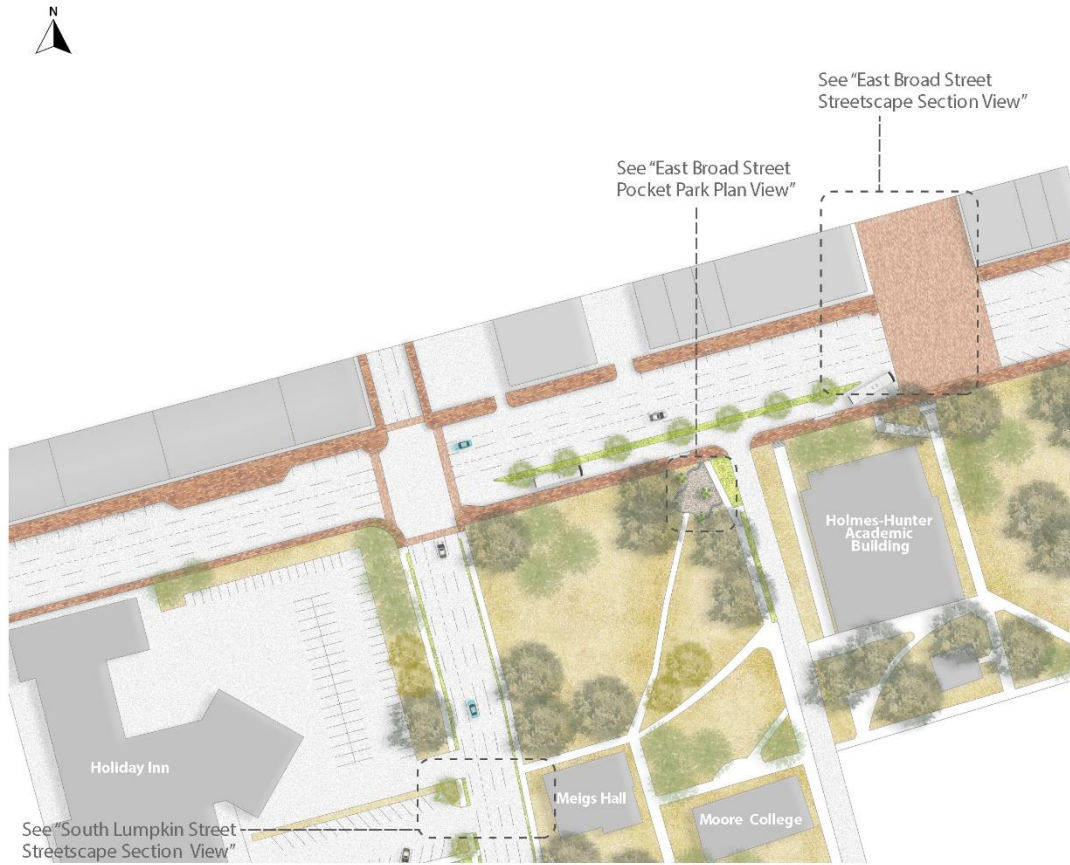
## **Proposed design**

### **1. College Ave pedestrian plaza.**

The existing College Ave Plaza is extended to the road curb of the Arch. The diagonal parking space that blocked the intersection is removed; the pedestrian crossing is widened by extending the College Ave pedestrian plaza. The new pedestrian plaza solves the issue of the narrow walking environment and the lack of a pedestrian crossing on the east side of the intersection. The red brick paving connects the pedestrian plaza with the sidewalk on the campus side. The coherence of the campus landscape is increased. The other advantage of extending the pedestrian plaza includes calming the traffic speed at the intersection and increasing the public gathering area near the landmark. The plan view in Figure 4.23 shows the new pedestrian plaza.

### **2. Bike-bus shared lane**

The construction of the bike and bus shared lane on the E Broad St resolved two conflicts--the circulation conflicts between pedestrians and cyclists and the confliction between private vehicles and buses (Figure 4.24). A buffer is built to partition the shared lane off from vehicle circulation. Shading trees are planted in the buffer to provide extra shading and sustainability for the road. Also, the buffer pushes the high-speed automobiles away from sidewalks to ensure the safety of pedestrians. Therefore, the build of bike-bus shared lanes balances the various transportations on E Broad St.



East Broad Street Streetscape  
 Plan View  
 Scale: 1" = 5'-0"

Figure 4.24 East Broad Streetscape Plan View

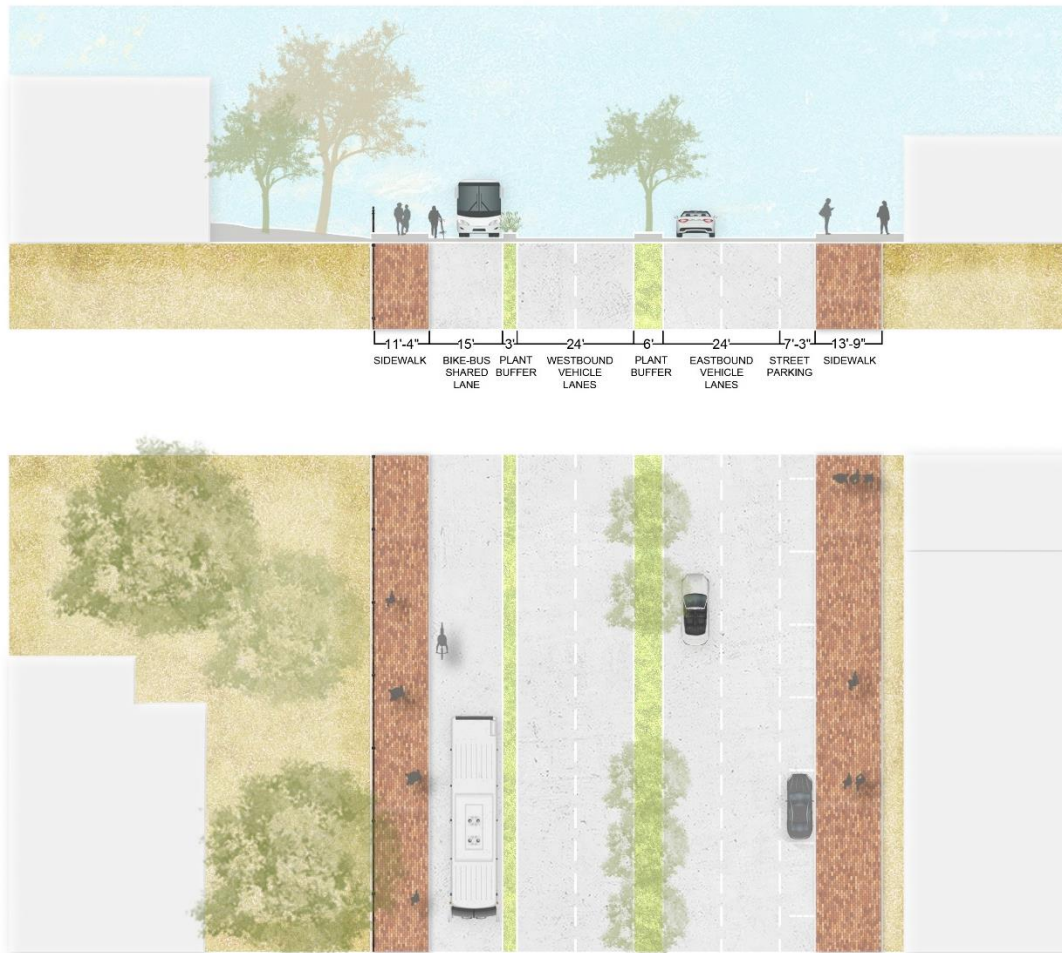


Figure 4.25 East Broad Streetscape Section View

### 3. On-street parking

Adjacent to the landmark Arch, over 10 diagonal on-street parking spaces are located on the south side of East Broad Street. Although several studies discussed that on-street parking should be decreased on major roads since it is recognized as side friction that diminishes the regular travel speed and occupies road capacity (Edquist, Rudin-Brown, and Lenné 2012; Biswas, Chandra, and Ghosh 2017), the advantages of on-street parking cannot be ignored, especially for activity centers and commercial districts. First, the parked cars along the curbs

play a role as a buffer between pedestrians and moving vehicles. Second, on-street parking decreases the occurrence of severe car accidents (Marshall, Garrick, and Hansen 2008). Last, but most significant, on-street parking benefits landmarks and activity centers by slowing down moving traffic and indicating to drivers that they are reaching a destination (Marshall, Garrick, and Hansen 2008). Therefore, the proposed design proposes removing only two parking spaces that block the entrance to the new crossing plaza. The rest of the diagonal on-street parking spaces to the east of The Arch are preserved.

#### 4. East Broad Street Pocket Park

The open space is served as one of the pedestrian entrances of the UGA north campus and was previously used by bus riders and drivers. The design of the new pocket park encourages the public to linger in this space. Universal design was considered by applying curvilinear benches and planters of different heights (Figure 4.28). The existing trees have sufficient canopies that build a green roof for the pocket park. Not only the canopy trees but also the curved retaining wall emphasize the enclosure of the space.

The proposed design of East Broad Street Pocket Park articulates open space design with campus landscape. The design of the pocket park references the patterns of two open spaces on the north campus (Herty Field and open space near the Old College). The common characteristic of these open spaces is embedding circular elements into the regular and rectangular campus space (Figure 4.26). The pocket park applied curvilinear elements to the rectangular site shaped by campus roads and added focal points (planters and a still pool) on the open space. The build of the still pool corresponds with the other two fountains on the north campus. Also, a still pool adds tranquility to the pocket park that is adjacent to the busy commercial district. The material

and plant selections of the pocket park also considered the coherence of the north campus. Redbrick retaining walls, cast iron seating, and gravel are the common features of the campus. The materials and plants lists are shown in Figure 4.28. Native plants that are familiar on UGA north campus are used. To follow the curvilinear shape of the pocket park, the bus stop is transformed into a cast iron parklet with native plants.

For edge morphology, rugged edges are applied on E Broad St Pocket Park by using curved retaining walls to create a transitional space from cityscape to the campus landscape. The pocket park builds redbrick retaining walls to connect with the existing entrance--redbrick pillars. By using the same paving and furnished materials as those used on E Broad St, the pocket park invites the public to enter the space. Meanwhile, the use of gravel and standing water indicates that users are accessing the campus.



Figure 4.26 Existing open spaces on UGA north campus (Form Google Earth)



East Broad Street Pocket Park  
Plan View  
Scale: 1" = 1'-0"

Figure 4.27 East Broad Street Pocket Park Plan View



Figure 4.28 Perspective rendering and plant/material selection of East Broad Street Pocket Park

## SITE 3



Figure 4.29 Site 3 Study Area Map (Base map from Google Earth; Graphic by author)

### Inventory and site analysis

Site 3 includes the intersection among South Lumpkin Street, West Wray Street, and Boccock Street, and the parking lot on the west of S Lumpkin Street. Lumpkin St is one of the major streets that connects the UGA campus from north to south. To decrease the conflict between bicycles and vehicles, NACTO recommends marking bike boxes and crossing markings at intersections. Defined by NACTO, a bike box is "*a designated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase*" (NACTO, 2020).

And intersection crossing markings intend to guide the bike path and separate the vehicle and bike lanes at the intersection for the safety of bike riders (NACTO, 2020). In 2020, UGA did streetscape upgrades for South Lumpkin Street by designating bike lanes, labeling bike boxes, adding defined intersection crossing markings, and adding crosswalks including the addition of diagonal pedestrian crossings at the intersection of Barber Street.



Figure 4.30 Bike Boxes and Intersection Crossing Markings (NACTO, 2020)

S Lumpkin St is a three-lane street that defines the edge of the UGA campus on the west. Bocoek St connects the parking space of Founder’s Memorial Garden with the S Lumpkin. W Wray St is a two-lane street that is in-between two parking lots. One ACC bus stop is located at the southeast corner of W Wray St. The north side of W Wray St lacks sidewalks. There are four planting areas in Site 3. Planting areas 1, 2, and 3 belong to parking lot W01. Planting area 4 is located at the intersection angle between Bocoek St and S Lumpkin St.



Figure 4.31 Diagonal pedestrian crossings, painted bike lanes in front of Bolton Dining Hall

(Photo by author)

### Sub-areas within Site 3

#### 1. Parking Lot W01

The W01 Parking Lot is labeled with an orange polygon on the Site 3 Study Area Map. As shown on the aerial map, the shape of W01 is irregular. The two reasons that make the irregular shape parking lot include sloping terrain and removal of a building on the site. The comparison maps show the conditions of the north part of W01 in 2012 and 2013. Before 2012, when the building still existed, the parking spaces surrounded the back of the building. The green area 1 served as a front lawn for the building. The removal of the building did not change the form of parking lot W01. And an underutilized green space was left adjacent to the parking lot.

Since W01 is located at the west edge of the UGA campus, the green space could be a potential area for a pocket park that would be inviting for both the public and the university community.

At this time, there are two rain gardens located at the eastern edge of the green space.



Figure 4.32 Part of W01 in 2012 and 2013. (Maps from Google Earth)



Figure 4.33 Vacant Green Space adjacent to the north of W01 (Photo by author)

The paving of parking lot W01 still needs improvement. The north part of W01 is upgraded by asphalt paving and clear parking striping. However, the paving on the south side of W01 is not organized clearly. An elevation change makes drivers who enter the parking lot from W Wray St need to drive uphill to get access to the parking lot. The zigzag shaped parking space, cracked road surface, and gravel paving degrade the user experience of W01.



Figure 4.34 The north part of W01 (Photo by author)



Figure 4.35 Drivers need to drive uphill from W Wray St to W01 (Photo by author)



Figure 4.36 Zigzag parking space and gravel paving on south W01 (Photo by author)

## 2. Streetscape of W Wray St and S Lumpkin St

W Wray St connects with one of the entrances of the W01 parking lot. The south side of W Wray St is well-managed with sidewalks, shading trees, and a buffer between the curb and sidewalk. One ACC bus stop is on the W Wray St. The north of W Wray St is occupied by a retaining wall of the parking lot. Missing sidewalks and sloping planting areas create a dangerous pedestrian environment.



Figure 4.37 Street View of W Wray St (Photo by author)

As the major road that links the campus on the west, S Lumpkin St has a friendly walking and biking environment. This three-lane road has bike lanes and sidewalks with paving buffers

on both sides. Bike boxes, intersection crossing markings and crosswalks are designated on the intersections of S Lumpkin St. Planting Space 4 on the Site 3 Study Area Map is the joint of Bocoek St and S Lumpkin St. Steep stairs run through the triangular space providing access to S Lumpkin St. Currently, a UGA bus stop is located at this intersection. However, the intersection is too narrow to provide a safe pull-over space for the UGA bus. Buses occupy at least one lane when they are parked at the bus stop. For a road that supports the circulation of the campus on the west edge, one vehicle lane is not enough for the busy traffic load. Another factor that could be improved on S Lumpkin St is the sidewalks on the east. The sidewalks are adjacent to historic black iron railings that compass the north campus. Paved buffers are built on the curb of the road. Redbrick paving and the black metal fencing integrate the sidewalk into the overall design style of UGA north campus. But the sidewalks haven't created a safe pedestrian environment. The black railings squeeze the walking space and make the sidewalk close to road curbs. Pedestrians have to be exposed to the busy traffic flow on S Lumpkin St.

Figure 4.40 is the site analysis diagram for Site 3.



Figure 4.38 Street View of Lumpkin Street (Photo by author)



Figure 4.39 The sidewalk on the east of S Lumpkin St (Photo by author)

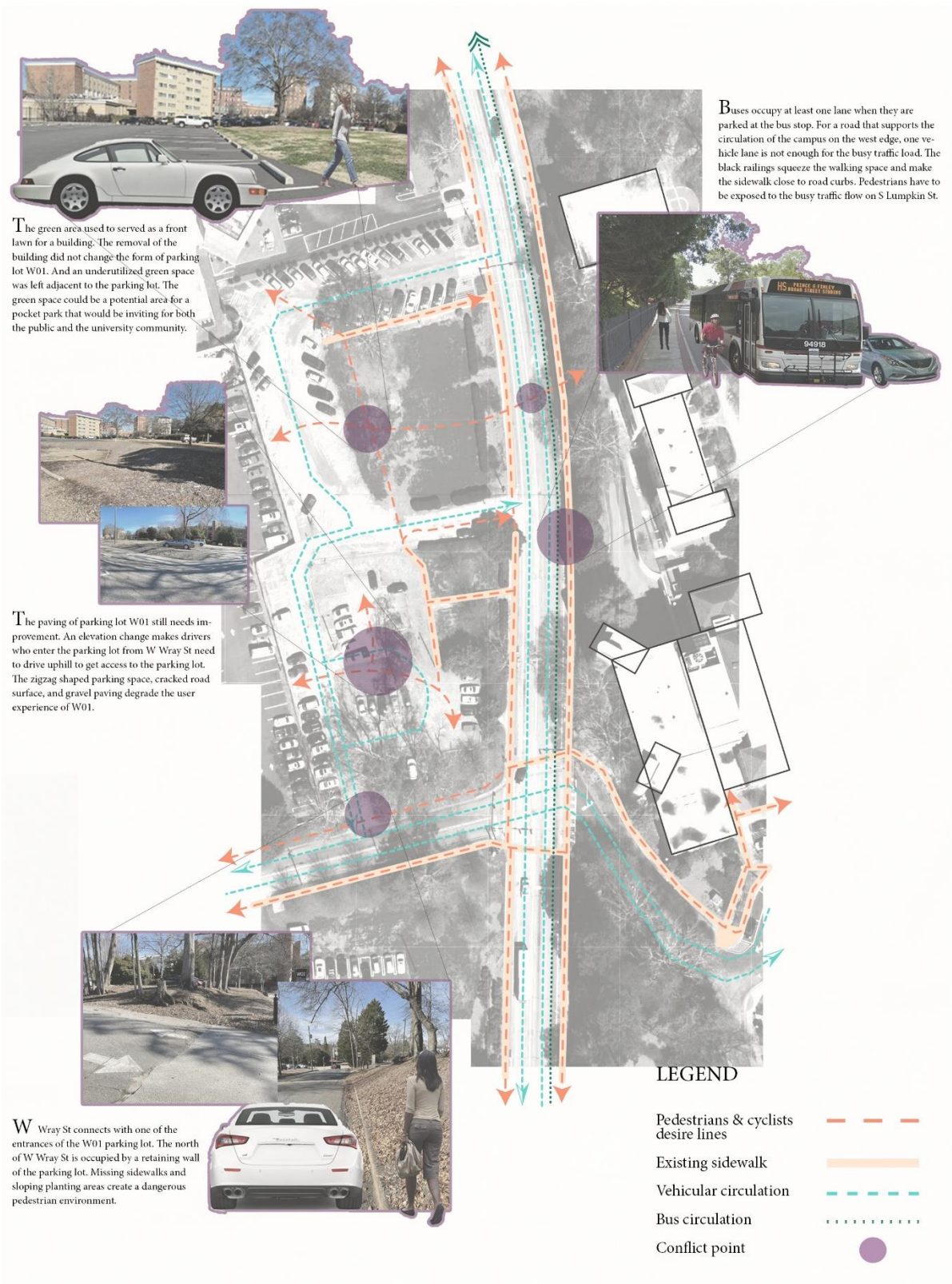


Figure 4.40 Site 3-Site Analysis by author

**Peds audit results--Site 3 (segment 04 & segment 05)**

Segment 04 and segment 05 are located at the opposite sides of S Lumpkin St. The segments start from the north edge of parking lot W01, end at the W Wray St intersection. There are two northbound and one southbound lane on the street. Bike lanes are found on both sides of the road.

# Segment 04

Name: Ruolin Gu Date: 02/01/2021 Study Area: S Lumpkin PEDS  
 Segment Number: Segment 04 Time: 10:00 am Weather: \_\_\_\_\_

**0. Segment type**  
 Low volume road  1  
 High volume road  2  
 Bike or Ped path - skip section C  3

**A. Environment**  
**1. Uses in Segment (all that apply)**  
 Housing - Single Family Detached  1  
 Housing - Multi-Family  2  
 Housing - Mobile Homes  3  
 Office/Institutional  4  
 Restaurant/Cafe/Commercial  5  
 Industrial  6  
 Vacant/Undeveloped  7  
 Recreation  8

**2. Slope**  
 Flat  1  
 Slight hill  2  
 Steep hill  3

**3. Segment Intersections**  
 Segment has 3 way intersection  1  
 Segment has 4 way intersection  2  
 Segment has other intersection  3  
 Segment deadends but path continues  4  
 Segment deadends  5  
 Segment has no intersections  6

**B. Pedestrian Facility (skip if none present)**  
**4. Type(s) of pedestrian facility (all that apply)**  
 Footpath (worn dirt path)  1  
 Paved Trail  2  
 Sidewalk  3  
 Pedestrian Street (closed to cars)  4

The rest of the questions in section B refer to the best pedestrian facility selected above.

**5. Path material (all that apply)**  
 Asphalt  1  
 Concrete  2  
 Paving Bricks or Flat Stone  3  
 Gravel  4  
 Dirt or Sand  5

**6. Path condition/maintenance**  
 Poor (many bumps/cracks/holes)  1  
 Fair (some bumps/cracks/holes)  2  
 Good (very few bumps/cracks/holes)  3  
 Under Repair  4

**7. Path obstructions (all that apply)**  
 Poles or Signs  1  
 Parked Cars  2  
 Greenery  3  
 Garbage Cans  4  
 Other  5  
 None  6

**8. Buffers between road and path (all that apply)**  
 Fence  1  
 Trees  2  
 Hedges  3  
 Landscape  4  
 Grass  5  
 None  6

**9. Path Distance from Curb**  
 paved (redbrick)  
 At edge  1  
 < 5 feet  2  
 > 5 feet  3

**10. Sidewalk Width**  
 < 4 feet  1  
 Between 4 and 8 feet  2  
 > 8 feet  3

**C. Road Attributes (skip if path only)**  
**11. Curb cuts**  
 None  1  
 1 to 4  2  
 > 4  3

**12. Sidewalk completeness/continuity**  
 Sidewalk is complete  1  
 Sidewalk is incomplete  2

**13. Sidewalk connectivity to other sidewalks/crosswalks**  
 number of connections  1

**14. Condition of road**  
 Poor (many bumps/cracks/holes)  1  
 Fair (some bumps/cracks/holes)  2  
 Good (very few bumps/cracks/holes)  3  
 Under Repair  4

**15. Number of lanes**  
 Minimum # of lanes to cross 3 1  
 Maximum # of lanes to cross 3 1

**16. Posted speed limit**  
 None posted  1  
 (mph) 30 1

**17. On-Street parking (if pavement is unmarked, check only if cars parked)**  
 Parallel or Diagonal  1  
 None  2

**18. Off-street parking lot spaces**  
 W01  

0-5	6-25	26+
1	2	3

**19. Must you walk through a parking lot to get to most buildings?**  
 Yes  1  
 No  2

**20. Presence of med-hi volume driveways**  
 < 2  1  
 2 to 4  2  
 > 4  3

**21. Traffic control devices (all that apply)**  
 Traffic light  1  
 Stop sign  2  
 Traffic circle  3  
 Speed bumps  4  
 Chicane or chokers  5  
 None  6

Parking sign

**22. Crosswalks**  
 lack of crosswalk to parking lot W01  
 None  1  
 1 to 2  2  
 3 to 4  3  
 > 4  4

**23. Crossing Aids (all that apply)**  
 Yield to Ped Paddles  1  
 Pedestrian Signal  2  
 Median/Traffic Island  3  
 Curb Extension  4  
 Overpass/Underpass  5  
 Pedestrian Crossing Warning Sign  6  
 Flashing Warning Light  7  
 Share the Road Warning Sign  8  
 None  9

**24. Bicycle facilities (all that apply)**  
 Bicycle route signs  1  
 Striped bicycle lane designation  2  
 Visible bicycle parking facilities  3  
 Bicycle crossing warning  4  
 No bicycle facilities  5

**D. Walking/Cycling Environment**  
**25. Roadway/path lighting**  
 Road-oriented lighting  1  
 Pedestrian-scale lighting  2  
 Other lighting  3  
 No lighting  4

**26. Amenities (all that apply)**  
 Public garbage cans  1  
 Benches  2  
 Water fountain  3  
 Street vendors/vending machines  4  
 No amenities  5

**27. Are there wayfinding aids?**  
 No  1  
 Yes  2

**28. Number of trees shading walking area**  
 None or Very Few  1  
 Some  2  
 Many/Dense  3

**29. Degree of enclosure**  
 Little or no enclosure  1  
 Some enclosure  2  
 Highly enclosed  3

**30. Powerlines along segment?**  
 Low Voltage/Distribution Line  1  
 High Voltage/Transmission Line  2  
 None  3

**31. Overall cleanliness and building maintenance**  
 Poor (much litter/graffiti/broken facilities)  1  
 Fair (some litter/graffiti/broken facilities)  2  
 Good (no litter/graffiti/broken facilities)  3

**32. Articulation in building designs**  
 NA  
 Little or no articulation  1  
 Some articulation  2  
 Highly articulated  3

**33. Building setbacks from sidewalk**  
 NA  
 At edge of sidewalk  1  
 Within 20 feet of sidewalk  2  
 More than 20 feet from sidewalk  3

**34. Building height**  
 NA  
 Short  1  
 Medium  2  
 Tall  3

**35. Bus stops**  
 Bus stop with shelter  1  
 Bus stop with bench  2  
 Bus stop with signage only  3  
 No bus stop  4

**Subjective Assessment: Segment...**  
 Enter 1,2,3, or 4 for 1=Strongly Agree 2= Agree, 3=Disagree, 4=Strongly Disagree  
 .....is attractive for walking. 2 1  
 .....is attractive for cycling. 2 1  
 .....feels safe for walking. 2 1  
 .....feels safe for cycling. 2 1

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Figure 4.41 Segment 04 PEDS audit result

For road attributes, the intersection has sufficient traffic control devices and pedestrian crosswalks. The two entrances of W01 that locate on the S Lumpkin St need parking signs and

crosswalk or warning signs to remind passing vehicles that pedestrians and vehicles could pass the area. The designated bicycle lanes on both sides of the road, bicycle route signs, and bicycle crossing warning make an attractive street view for cycling. But the street is not safe for cyclists because of the busy motor circulations.

Segment 04 has good condition sidewalks with redbrick paving that set the sidewalk 2 feet from the road curb. Path obstruction isn't found on the segment. Sidewalks end at the joint of S Lumpkin St and W Wray St, where downhill and a retaining wall present. The existing retaining wall and bank leave no flat space for walking. Missing sidewalk makes it hard for people to walk or cycle on the north side of W Wray St, especially when people meet vehicles that intend to enter or exit the parking lot.

The issues of pedestrian and cycling environment include lack of pedestrian-scale lighting, little enclosure and tree shading, and no public amenities. It worth mentioning that there are two rain gardens locate on the edge of sidewalks. The presence of sidewalks improves the sustainability of the site and adds more interest to the walking and cycling experience.

# Segment 05

Name: Ruolin Gu Date: 02/01/2021 Study Area: S Lumpkin St **PEDS**

Segment Number: 05 Time: 11:00 am Weather: \_\_\_\_\_

**0. Segment type**  
 Low volume road  1  
 High volume road  2  
 Bike or Ped path - skip section C  3

**A. Environment**  
**1. Uses in Segment (all that apply)**  
 Housing - Single Family Detached  1  
 Housing - Multi-Family  2  
 Housing - Mobile Homes  3  
 Office/Institutional  4  
 Restaurant/Cafe/Commercial  5  
 Industrial  6  
 Vacant/Undeveloped  7  
 Recreation  8

**2. Slope**  
 Flat  1  
 Slight hill  2  
 Steep hill  3

**3. Segment Intersections**  
 Segment has 3 way intersection  1  
 Segment has 4 way intersection  2  
 Segment has other intersection  3  
 Segment deadends but path continues  4  
 Segment deadends  5  
 Segment has no intersections  6

**B. Pedestrian Facility (skip if none present)**  
**4. Type(s) of pedestrian facility (all that apply)**  
 Footpath (worn dirt path)  1  
 Paved Trail  2  
 Sidewalk  3  
 Pedestrian Street (closed to cars)  4

*The rest of the questions in section B refer to the best pedestrian facility selected above.*

**5. Path material (all that apply)**  
 Asphalt  1  
 Concrete  2  
 Paving Bricks or Flat Stone  3  
 Gravel  4  
 Dirt or Sand  5

**6. Path condition/maintenance**  
 Poor (many bumps/cracks/holes)  1  
 Fair (some bumps/cracks/holes)  2  
 Good (very few bumps/cracks/holes)  3  
 Under Repair  4

**7. Path obstructions (all that apply)**  
 Poles or Signs  1  
 Parked Cars  2  
 Greenery  3  
 Garbage Cans  4  
 Other  5  
 None  6

**8. Buffers between road and path (all that apply)**  
 Fence  1  
 Trees  2  
 Hedges  3  
 Landscape  4  
 Grass  5  
 None  6

**9. Path Distance from Curb**  
 At edge  1  
 < 5 feet  2  
 > 5 feet  3

**10. Sidewalk Width**  
 < 4 feet  1  
 Between 4 and 8 feet  2  
 > 8 feet  3

**11. Curb cuts**  
 None  1  
 1 to 4  2  
 > 4  3

**12. Sidewalk completeness/continuity**  
 Sidewalk is complete  1  
 Sidewalk is incomplete  2

**13. Sidewalk connectivity to other sidewalks/crosswalks**  
 number of connections  1

**C. Road Attributes (skip if path only)**  
**14. Condition of road**  
 Poor (many bumps/cracks/holes)  1  
 Fair (some bumps/cracks/holes)  2  
 Good (very few bumps/cracks/holes)  3  
 Under Repair  4

**15. Number of lanes**  
 Minimum # of lanes to cross  1  
 Maximum # of lanes to cross  2  
 3  3

**16. Posted speed limit**  
 None posted  1  
 (mph): 30  2

**17. On-Street parking (if pavement is unmarked, check only if cars parked)**  
 Parallel or Diagonal  1  
 None  2

**18. Off-street parking lot spaces**  
 0-5  1  
 6-25  2  
 26+  3

**19. Must you walk through a parking lot to get to most buildings?**  
 Yes  1  
 No  2

**20. Presence of med-hi volume driveways**  
 < 2  1  
 2 to 4  2  
 > 4  3

**21. Traffic control devices (all that apply)**  
 Traffic light  1  
 Stop sign  2  
 Traffic circle  3  
 Speed bumps  4  
 Chicanes or chokers  5  
 None  6

**22. Crosswalks**  
 None  1  
 1 to 2  2  
 3 to 4  3  
 > 4  4

**23. Crossing Aids (all that apply)**  
 Yield to Ped Paddles  1  
 Pedestrian Signal  2  
 Median/Traffic Island  3  
 Curb Extension  4  
 Overpass/Underpass  5  
 Pedestrian Crossing Warning Sign  6  
 Flashing Warning Light  7  
 Share the Road Warning Sign  8  
 None  9

**24. Bicycle facilities (all that apply)**  
 Bicycle route signs  1  
 Striped bicycle lane designation  2  
 Visible bicycle parking facilities  3  
 Bicycle crossing warning  4  
 No bicycle facilities  5

**D. Walking/Cycling Environment**  
**25. Roadway/path lighting**  
 Road-oriented lighting  1  
 Pedestrian-scale lighting  2  
 Other lighting  3  
 No lighting  4

**26. Amenities (all that apply)**  
 Public garbage cans  1  
 Benches  2  
 Water fountain  3  
 Street vendors/vending machines  4  
 No amenities  5

**27. Are there wayfinding aids?**  
 No  1  
 Yes  2

**28. Number of trees shading walking area**  
 None or Very Few  1  
 Some  2  
 Many/Dense  3

**29. Degree of enclosure**  
 Little or no enclosure  1  
 Some enclosure  2  
 Highly enclosed  3

**30. Powerlines along segment?**  
 Low Voltage/Distribution Line  1  
 High Voltage/Transmission Line  2  
 None  3

**31. Overall cleanliness and building maintenance**  
 Poor (much litter/graffiti/broken facilities)  1  
 Fair (some litter/graffiti/broken facilities)  2  
 Good (no litter/graffiti/broken facilities)  3

**32. Articulation in building designs**  
 Little or no articulation  1  
 Some articulation  2  
 Highly articulated  3

**33. Building setbacks from sidewalk**  
 At edge of sidewalk  1  
 Within 20 feet of sidewalk  2  
 More than 20 feet from sidewalk  3

**34. Building height**  
 Short  1  
 Medium  2  
 Tall  3

**35. Bus stops**  
 Bus stop with shelter  1  
 Bus stop with bench  2  
 Bus stop with signage only  3  
 No bus stop  4

**Subjective Assessment: Segment...**  
 Enter 1, 2, 3, or 4 for 1=Strongly Agree 2= Agree, 3=Disagree, 4=Strongly Disagree  
 .....is attractive for walking. 2 1  
 .....is attractive for cycling. 2 1  
 .....feels safe for walking. 3 1  
 .....feels safe for cycling. 3 1

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Figure 4.42 Segment 05 PEDS audit result

Segment 05 is built with adequate pedestrian facilities to create a fair walking/cycling environment. The medium height academic buildings and dense evergreen trees create a high

degree of enclosure for Segment 05. Black railings and red brick pillars articulate the campus design style, in the meantime, separate the academic campus from its surroundings. Without landscape or plant buffer between the sidewalk and road, the shortcoming of a close setback from buildings and dense shading trees is exposed--pedestrians are forced to walk on the narrow sidewalk and have no extra space to hide from the high-speed traffic flow.

The common issue of Segment 04 and 05 is the lack of open space attached to streets which leads to the lack of public amenities. Therefore, the vacant space on W01 has the possibility to be built as an open space. Besides, there is no pedestrian-scale lighting nor road-oriented lighting on segment 05. The lighting of Segment 05 is relied on the lighting from buildings and the other side of the road. The road attributes of Segment 05 are already discussed in segment 04.

## **Proposed design**

### 1. Extra northbound lane

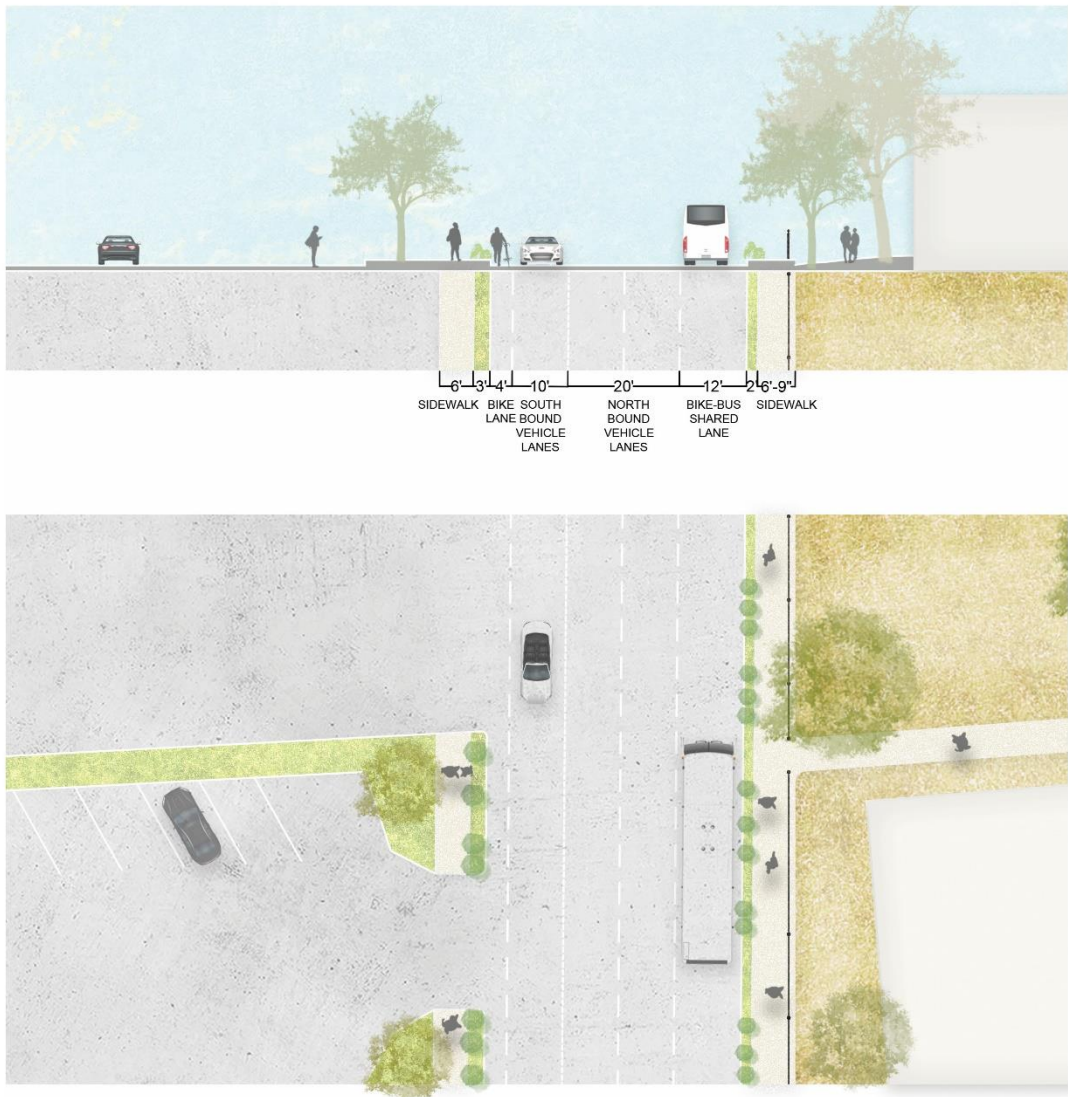
S Lumpkin St plays a role in connecting the campus west edge with its surroundings and supporting the circulation of the campus. The existing three lanes road (two northbound and one southbound) is not sufficient enough to support the complicated circulations and to fulfill the needs of pedestrians, cyclists, buses, and private vehicles. Following along S Lumpkin St, there are large parking lots and planting areas, that provide an opportunity for S Lumpkin St to expand the road and add an extra lane for northbound buses and bicycles.

The proposed design pushes the original curbs 12' to the west (Figure 4.43). The vacant space and planting areas are replaced by a vehicle lane. The improvement will not decrease the planting area of the parking lot nor remove the two rain gardens. The redesign of the parking lot

and the relocation of the rain gardens will be elaborated later. There are two advantages that the new bike and bus lane will bring: Ensure a safe pull-over space for northbound buses; provide a much wider bike lane-decrease the potential accidents between pedestrians and cyclists, or vehicles and cyclists. (Figure 4.44).



Figure 4.43 South Lumpkin Street streetscape plan view



South Lumpkin Street Streetscape  
 Section View  
 Scale: 1" = 1'-0"

Figure 4.44 South Lumpkin Street streetscape section view

## 2. Upgrade of parking lot and streetscape

The design tries to reorganize the original irregular shape W01 parking lot. One of the biggest challenges of the parking lot is topography. The parking lot is located on sloping terrain. Zigzag parking spaces and the uphill entrance make the parking experience of drivers unpleasant.

The new design reasonably maximized the parking space of W01; meanwhile, considered the sustainability of the space. The serpentine road makes the driver who enters W01 from the W Wray St (the lowest point of the parking lot terrain) get uphill easily. The retaining wall on W Wray St is moved 5 feet to the north to build a sidewalk.

The elements that promote the sustainability of a parking lot includes: *shadings and greens, naturalized drainage, permeable paving, pedestrian connections, community character*, etc. (Figure 4.45) (Shapiro, Arkoosh, and Kline 2015). For shadings and greens, the existing canopy trees on the site are kept. The previous rain garden is moved to the south of the S Lumpkin Open Space. More trees and shrubs are added to the open space. For naturalized drainage promotion, a large bioswale is built in the middle of the parking lot to solve the drainage problem and provide extra shadings. Three parking spaces are replaced by planting islands. The new parking lot uses porous asphalt as paving materials to increase permeability. The build of the open space also largely increases the permeable area on Site 3. Paths on the parking lot are built following pedestrians' desire lines. A new crosswalk connects the S Lumpkin St open space and the street.

## DESIGN ELEMENTS FOR GREEN AND SUSTAINABLE PARKING LOTS

Creating green and sustainable parking lots involves several design elements. These elements include maximizing shading and greening, incorporating naturalized drainage, utilizing paving that infiltrates, using energy-efficient lighting and renewable energy generation, adding safe pedestrian circulation, and successfully integrating and connecting parking in the community. Any combination of these elements can be used in new parking lots or the redevelopment of existing lots.

These elements provide many options to make our parking lots more sustainable. When natural drainage systems, including bioretention, are combined with permeable paving systems, extensive greening, and sustainable practices, a parking lot can be transformed into an environmental asset.



Figure 4.45 Design elements for sustainable parking lots.(Shapiro, Arkoosh, and Kline 2015)

### 3. South Lumpkin Street Open Space

The lawn in the middle of the W01 is the product of the removal of a building. The location and topography of the lawn make it show a good potential of being an open space that serves the surrounding neighborhoods and the university. The design of the open space utilizes the form of campus quads. The trails arrange to fulfill people's moving desire lines--from one parking area to another, from the parking lot to the street, or wander in the open space. The open space is a multifunction area that allows students to study, the public to amuse, drivers to unplug, and groups to organize an event (Figure 4.46).

Although the trails trimly partition the open space into six parts, the horsetails and sweet bay magnolia that planted on-site soften the boundaries--transform the rugged edges to gradient edges; meanwhile the shrubs create screens and make sub-spaces with various functions.

The paving materials used in the open space are random ashlar and crushed brick (Figure 4.47). Both of the materials are listed in UGA Campus Planning Principles (UGA, n.d.). The use of crushed brick in the open space makes a good connection with Herty Field that locates in the middle of the campus. The outdoor furniture and planters are made of cast iron to match the cast-iron railings on S Lumpkin Street. Besides, cast concrete seating and planter are used on the lawn. This geometric design blends modern landscape style into the traditional campus landscape design.

Specifically, a pedestrian crosswalk is built to connect the open space and the sidewalks on S Lumpkin St. The new crosswalk not only provides convenience for people who want to get access to the parking lot but also invites the public to the open space. This space will also serve the public and the university in special events, such as football games.



South Lumpkin Street Open Space  
Plan View  
Scale: 1" = 1'-0"

Figure 4.46 South Lumpkin Street Open Space Plan View



Figure 4.47 Perspective rendering and plant/material selection of South Lumpkin Street open space

## SITE 4

### Inventory and site analysis

Site 4 is the intersection of Carlton St and E Campus Rd. As one of the transit hubs of the UGA campus, the intersection is served by four bus stops and over 10 routes of UGA buses on weekdays and weekends (Figure 4.48). However, the intersection has taken big traffic challenges because of the complicated road conditions and the high volume of traffic. The elevation drop from north to south makes it harder for drivers to control their speed at the intersection. Especially for bus drivers that have more vehicle blind spots compared to private cars. And the existing pedestrian islands are not competent neither in protecting pedestrians nor controlling vehicles speed (Figure 4.49).

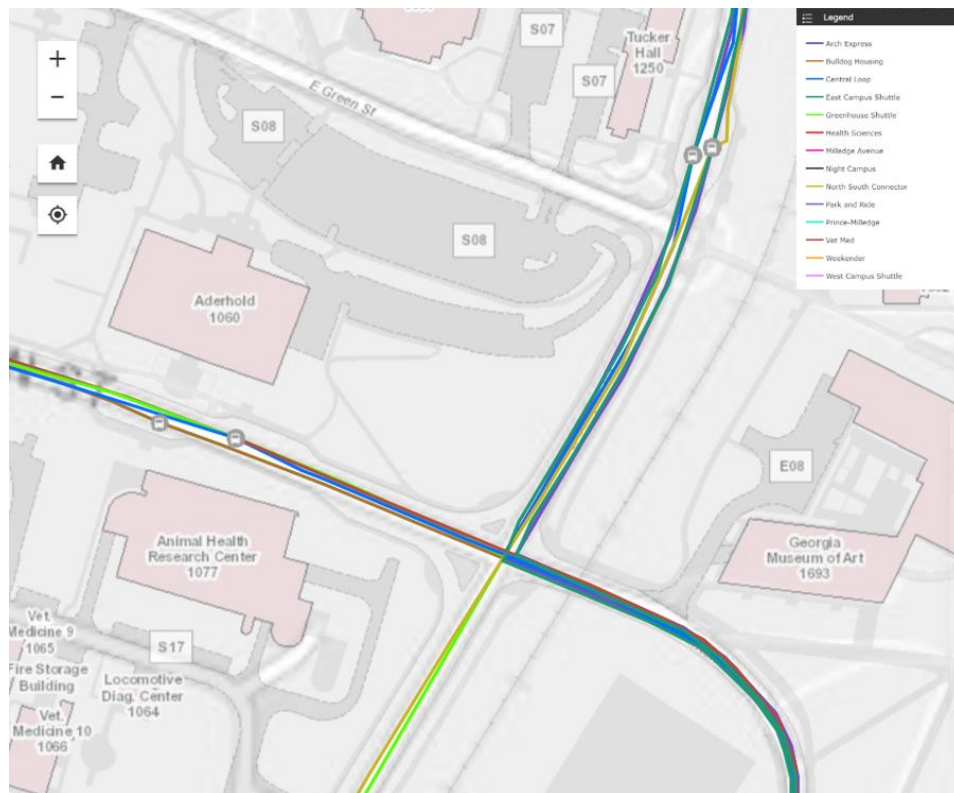


Figure 4.48 Weekday and weekend routes of UGA bus (<https://tps.uga.edu/maps/bus/>)



Figure 4.49 Existing pedestrian island on E campus St intersection (by author)

An abandoned railway was built between the intersection and GA Museum of Art. Currently, the space near the railway is overgrown with evergreen trees and weeds. The author found a path between the GA Museum of Art and the sidewalk on the East Campus Road. It indicates that the design of the existing sidewalk has not made a reasonable connection between the building and the street. The south of E Campus Road has fulfilled the commute needs of pedestrians and cyclists by providing a parallel sidewalk and bike lane. However, the discrepancy in elevation separates the sidewalk and the bike lane. Pedestrians are squeezed to the road curb because of the dirt bank (Figure 4.50).

More information about pedestrian and cyclists' desire lines, vehicle circulation, and conflict points could be found in the Figure 4.51 site analysis diagram.



Figure 4.50 Separated sidewalk and bike lane (by author)

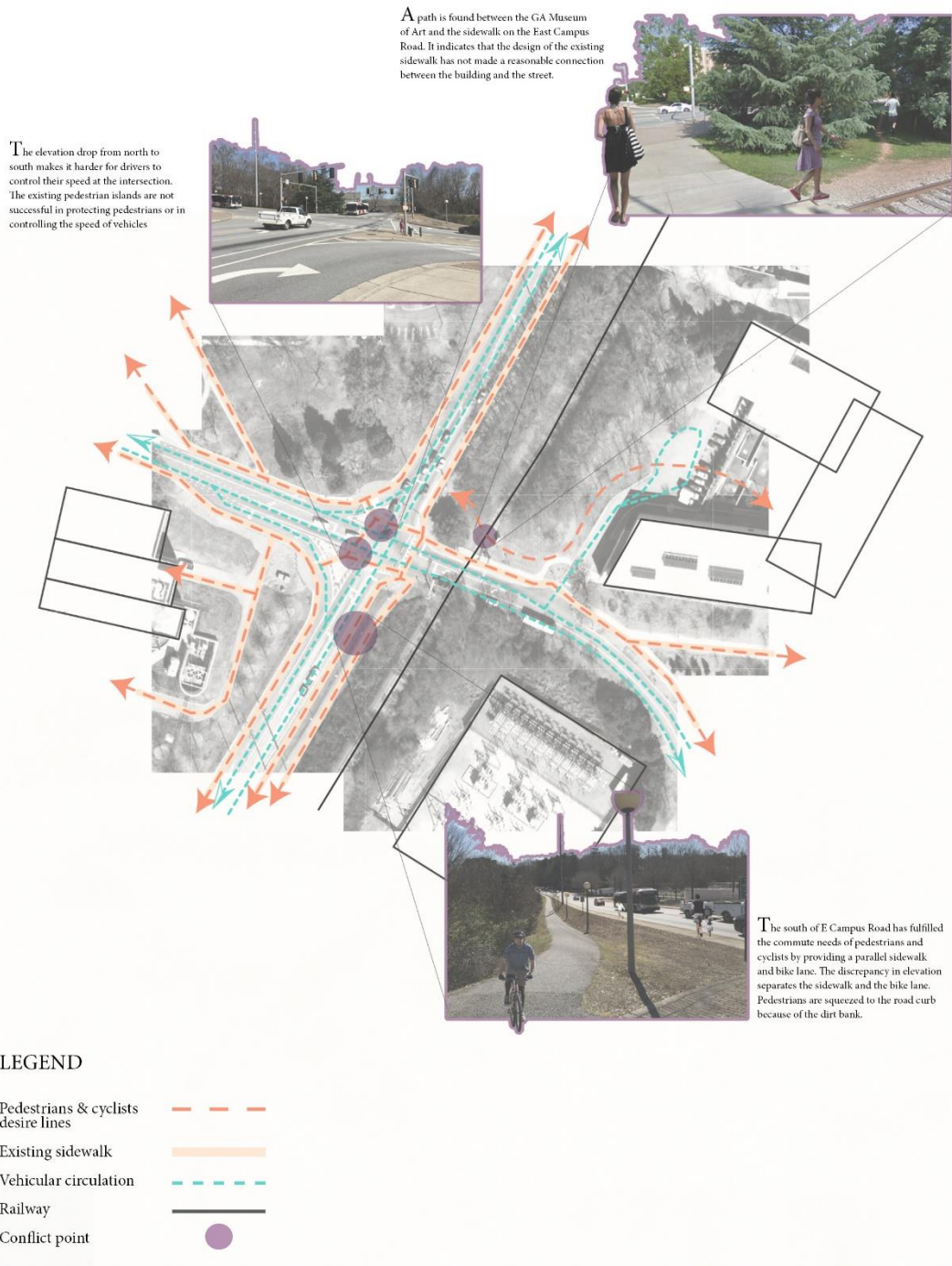


Figure 4.51 Site 4-Site Analysis by author

## **Peds audit results--site 4 (segment 06 & segment 07)**

### Segment 06

Segments 06 and 07 are located at a slight hill 4-way intersection between Carlton Street and East Campus Road. Segment 06 has two obvious downhills that appeared at the east and the south of the intersection. Although the concrete sidewalk of Segment 06 has good condition and maintenance with no path obstruction. The narrow sidewalk, steep bank between sidewalk and bike lane, missing distance/ buffer between sidewalk make the pedestrian facility of Segment 06 still need improvements.

The pedestrian-oriented lighting is the highlight of the walking and cycling environment in segment 06. The north part of the segment has dense shading trees and a high enclosure. For the south part of segment 06, the steep bank creates enclosure for the bike lane. But the sidewalk is exposed to the road with no shading trees and enclosure.

The road attribute of segment 06 is fair. Several bumps and cracks are found at the intersection. The intersection is assembled with pedestrian signals and Share the Road sign. Segment 06 has completed bicycle facilities includes bike route sign, paved bike lane, and bike cross warning sign.

EAST

Name: Ruolin Gu Date: 02/26/2021 Study Area: GA ART MUSEUM **PEDS**

Segment Number: Segment 06 Time: 14:00 Weather: \_\_\_\_\_

**0. Segment type**

Low volume road  1  
 High volume road  2  
 Bike or Ped path - skip section C  3

**A. Environment**

**1. Uses in Segment (all that apply)**

Housing - Single Family Detached  1  
 Housing - Multi-Family  2  
 Housing - Mobile Homes  3  
 Office/Institutional  4  
 Restaurant/Cafe/Commercial  5  
 Industrial  6  
 Vacant/Undeveloped  7  
 Recreation  8

**2. Slope**

Flat  1  
 Slight hill  2  
 Steep hill  3

**3. Segment Intersections**

Segment has 3 way intersection  1  
 Segment has 4 way intersection  2  
 Segment has other intersection  3  
 Segment deadends but path continues  4  
 Segment deadends  5  
 Segment has no intersections  6

**B. Pedestrian Facility (skip if none present)**

**4. Type(s) of pedestrian facility (all that apply)**

Footpath (worn dirt path)  1  
 Paved Trail  2  
 Sidewalk  3  
 Pedestrian Street (closed to cars)  4

*The rest of the questions in section B refer to the best pedestrian facility selected above.*

**5. Path material (all that apply)**

Asphalt  1  
 Concrete  2  
 Paving Bricks or Flat Stone  3  
 Gravel  4  
 Dirt or Sand  5

**6. Path condition/maintenance**

Poor (many bumps/cracks/holes)  1  
 Fair (some bumps/cracks/holes)  2  
 Good (very few bumps/cracks/holes)  3  
 Under Repair  4

**7. Path obstructions (all that apply)**

Poles or Signs  1  
 Parked Cars  2  
 Greenery  3  
 Garbage Cans  4  
 Other  5  
 None  6

**8. Buffers between road and path (all that apply)**

Fence  1  
 Trees  2  
 Hedges  3  
 Landscape  4  
 Grass  5  
 None  6

**9. Path Distance from Curb**

At edge  1  
 < 5 feet  2  
 > 5 feet  3

**10. Sidewalk Width**

< 4 feet  1  
 Between 4 and 8 feet  2  
 > 8 feet  3

*If no sidewalk, skip now to section C.*

**11. Curb cuts**

None  1  
 1 to 4  2  
 > 4  3

**12. Sidewalk completeness/continuity**

Sidewalk is complete  1  
 Sidewalk is incomplete  2

**13. Sidewalk connectivity to other sidewalks/crosswalks**

number of connections  1

**C. Road Attributes (skip if path only)**

**14. Condition of road**

Poor (many bumps/cracks/holes)  1  
 Fair (some bumps/cracks/holes)  2  
 Good (very few bumps/cracks/holes)  3  
 Under Repair  4

*at intersection*

**15. Number of lanes**

Minimum # of lanes to cross 3 1  
 Maximum # of lanes to cross 3 2

**16. Posted speed limit**

None posted  1  
 (mph) 35 2

**17. On-Street parking (if pavement is unmarked, check only if cars parked)**

Parallel or Diagonal  1  
 None  2

**18. Off-street parking lot spaces**

0-5	6-25	26+
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3

**19. Must you walk through a parking lot to get to most buildings?**

Yes  1  
 No  2

**20. Presence of med-hi volume driveways**

< 2  1  
 2 to 4  2  
 > 4  3

**21. Traffic control devices (all that apply)**

Traffic light  1  
 Stop sign  2  
 Traffic circle  3  
 Speed bumps  4  
 Chicanes or chokers  5  
 None  6

**22. Crosswalks**

None  1  
 1 to 2  2  
 3 to 4  3  
 > 4  4

**23. Crossing Aids (all that apply)**

Yield to Ped Paddles  1  
 Pedestrian Signal  2  
 Median/Traffic Island  3  
 Curb Extension  4  
 Overpass/Underpass  5  
 Pedestrian Crossing Warning Sign  6  
 Flashing Warning Light  7  
 Share the Road Warning Sign  8  
 None  9

**24. Bicycle facilities (all that apply)**

Bicycle route signs  1  
 Striped bicycle lane designation  2  
 Visible bicycle parking facilities  3  
 Bicycle crossing warning  4  
 No bicycle facilities  5

**D. Walking/Cycling Environment**

**25. Roadway/path lighting**

Road-oriented lighting  1  
 Pedestrian-scale lighting  2  
 Other lighting  3  
 No lighting  4

**26. Amenities (all that apply)**

Public garbage cans  1  
 Benches  2  
 Water fountain  3  
 Street vendors/vending machines  4  
 No amenities  5

**27. Are there wayfinding aids?**

No  1  
 Yes  2

**28. Number of trees shading walking area**

None or Very Few  1  
 Some  2  
 Many/Dense  3

**29. Degree of enclosure**

Little or no enclosure  1  
 Some enclosure  2  
 Highly enclosed  3

**30. Powerlines along segment?**

Low Voltage/Distribution Line  1  
 High Voltage/Transmission Line  2  
 None  3

**31. Overall cleanliness and building maintenance**

Poor (much litter/graffiti/broken facilities)  1  
 Fair (some litter/graffiti/broken facilities)  2  
 Good (no litter/graffiti/broken facilities)  3

**32. Articulation in building designs**

Little or no articulation  1  
 Some articulation  2  
 Highly articulated  3

**33. Building setbacks from sidewalk**

At edge of sidewalk  1  
 Within 20 feet of sidewalk  2  
 More than 20 feet from sidewalk  3

**34. Building height**

Short  1  
 Medium  2  
 Tall  3

**35. Bus stops**

Bus stop with shelter  1  
 Bus stop with bench  2  
 Bus stop with signage only  3  
 No bus stop  4

**Subjective Assessment: Segment...**

Enter 1, 2, 3, or 4 for 1=Strongly Agree 2= Agree, 3=Disagree, 4=Strongly Disagree

..... is attractive for walking. 2 1  
 ..... is attractive for cycling. 4 1  
 ..... feels safe for walking. 2 1  
 ..... feels safe for cycling. 4 1

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Figure 4.52 Segment 06 PEDS audit result

## Segment 07

The pedestrian facilities disadvantage of Segment 07 is similar to Segment 06. A power line pole is found on the segment as an obstruction. Cycling facilities and path is missing on Segment 07. Also, the walking environment needs to be improved. The lack of lighting and shading trees makes the sidewalk less attractive for walking.

For road attribute, the road condition of Segment 07 is same to Segment 06. Besides, pedestrians need to cross 4 lanes on Carlton St. The more complicated lanes promoted the build of two traffic islands. But the existing traffic islands are not conspicuous nor protective for pedestrians. Bicycle facilities are not found on Segment 07.

WEST MUSEUM

Name: Rwolin Gu Date: 02/26/2021 Study Area: GA ART Weather: \_\_\_\_\_

Segment Number: Segment 07 Time: 15:00

**0. Segment type**  
 Low volume road  1  
 High volume road  2  
 Bike or Ped path - skip section C  3

**A. Environment**  
**1. Uses in Segment (all that apply)**  
 Housing - Single Family Detached  1  
 Housing - Multi-Family  2  
 Housing - Mobile Homes  3  
 Office/Institutional  4  
 Restaurant/Cafe/Commercial  5  
 Industrial  6  
 Vacant/Underdeveloped  7  
 Recreation  8

**2. Slope**  
 Flat  1  
 Slight hill  2  
 Steep hill  3

**3. Segment Intersections**  
 Segment has 3 way intersection  1  
 Segment has 4 way intersection  2  
 Segment has other intersection  3  
 Segment deadends but path continues  4  
 Segment deadends  5  
 Segment has no intersections  6

**B. Pedestrian Facility (skip if none present)**  
**4. Type(s) of pedestrian facility (all that apply)**  
 Footpath (worn dirt path)  1  
 Paved Trail  2  
 Sidewalk  3  
 Pedestrian Street (closed to cars)  4

The rest of the questions in section B refer to the best pedestrian facility selected above.  
**5. Path material (all that apply)**  
 Asphalt  1  
 Concrete  2  
 Paving Bricks or Flat Stone  3  
 Gravel  4  
 Dirt or Sand  5

**6. Path condition/maintenance**  
 Poor (many bumps/cracks/holes)  1  
 Fair (some bumps/cracks/holes)  2  
 Good (very few bumps/cracks/holes)  3  
 Under Repair  4

**7. Path obstructions (all that apply)**  
 Poles or Signs  1  
 Parked Cars  2  
 Greenery  3  
 Garbage Cans  4  
 Other  5  
 None  6

*powerline*

**8. Buffers between road and path (all that apply)**  
 Fence  1  
 Trees  2  
 Hedges  3  
 Landscape  4  
 Grass  5  
 None  6

**9. Path Distance from Curb**  
 At edge  1  
 < 5 feet  2  
 > 5 feet  3

**10. Sidewalk Width**  
 < 4 feet  1  
 Between 4 and 8 feet  2  
 > 8 feet  3

**11. Curb cuts**  
 None  1  
 1 to 4  2  
 > 4  3

**12. Sidewalk completeness/continuity**  
 Sidewalk is complete  1  
 Sidewalk is incomplete  2

**13. Sidewalk connectivity to other sidewalks/crosswalks**  
 number of connections  1

**C. Road Attributes (skip if path only)**  
**14. Condition of road**  
 Poor (many bumps/cracks/holes)  1  
 Fair (some bumps/cracks/holes)  2  
 Good (very few bumps/cracks/holes)  3  
 Under Repair  4

**15. Number of lanes**  
 Minimum # of lanes to cross 3 1  
 Maximum # of lanes to cross 4 1

**16. Posted speed limit**  
 None posted  1  
 (mph): 40 1

**17. On-Street parking (if pavement is unmarked, check only if cars parked)**  
 Parallel or Diagonal  1  
 None  2

**18. Off-street parking lot spaces**  

0-5	6-25	26+
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3

**19. Must you walk through a parking lot to get to most buildings?**  
 Yes  1  
 No  2

**20. Presence of med-hi volume driveways**  
 < 2  1  
 2 to 4  2  
 > 4  3

**21. Traffic control devices (all that apply)**  
 Traffic light  1  
 Stop sign  2  
 Traffic circle  3  
 Speed bumps  4  
 Chicanes or chokers  5  
 None  6

**22. Crosswalks**  
 None  1  
 1 to 2  2  
 3 to 4  3  
 > 4  4

**23. Crossing Aids (all that apply)**  
 Yield to Ped Paddles  1  
 Pedestrian Signal  2  
 Median/Traffic Island  3  
 Curb Extension  4  
 Overpass/Underpass  5  
 Pedestrian Crossing Warning Sign  6  
 Flashing Warning Light  7  
 Share the Road Warning Sign  8  
 None  9

**24. Bicycle facilities (all that apply)**  
 Bicycle route signs  1  
 Striped bicycle lane designation  2  
 Visible bicycle parking facilities  3  
 Bicycle crossing warning  4  
 No bicycle facilities  5

**D. Walking/Cycling Environment**  
**25. Roadway/path lighting**  
 Road-oriented lighting  1  
 Pedestrian-scale lighting  2  
 Other lighting  3  
 No lighting  4

**26. Amenities (all that apply)**  
 Public garbage cans  1  
 Benches  2  
 Water fountain  3  
 Street vendors/vending machines  4  
 No amenities  5

**27. Are there wayfinding aids?**  
 No  1  
 Yes  2

**28. Number of trees shading walking area**  
 None or Very Few  1  
 Some  2  
 Many/Dense  3

*Far away from sidewalk*

**29. Degree of enclosure**  
 Little or no enclosure  1  
 Some enclosure  2  
 Highly enclosed  3

**30. Powerlines along segment?**  
 Low Voltage/Distribution Line  1  
 High Voltage/Transmission Line  2  
 None  3

**31. Overall cleanliness and building maintenance**  
 Poor (much litter/graffiti/broken facilities)  1  
 Fair (some litter/graffiti/broken facilities)  2  
 Good (no litter/graffiti/broken facilities)  3

**32. Articulation in building designs**  
 Little or no articulation  1  
 Some articulation  2  
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**33. Building setbacks from sidewalk**  
 At edge of sidewalk  1  
 Within 20 feet of sidewalk  2  
 More than 20 feet from sidewalk  3

**34. Building height**  
 Short  1  
 Medium  2  
 Tall  3

**35. Bus stops**  
 Bus stop with shelter  1  
 Bus stop with bench  2  
 Bus stop with signage only  3  
 No bus stop  4

**Subjective Assessment: Segment...**  
 Enter 1, 2, 3, or 4 for 1=Strongly Agree 2= Agree, 3=Disagree, 4=Strongly Disagree  
 .....is attractive for walking. 2 1  
 .....is attractive for cycling. 2 1  
 .....feels safe for walking. 3 1  
 .....feels safe for cycling. 3 1

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Figure 4.53 Segment 06 PEDS audit result

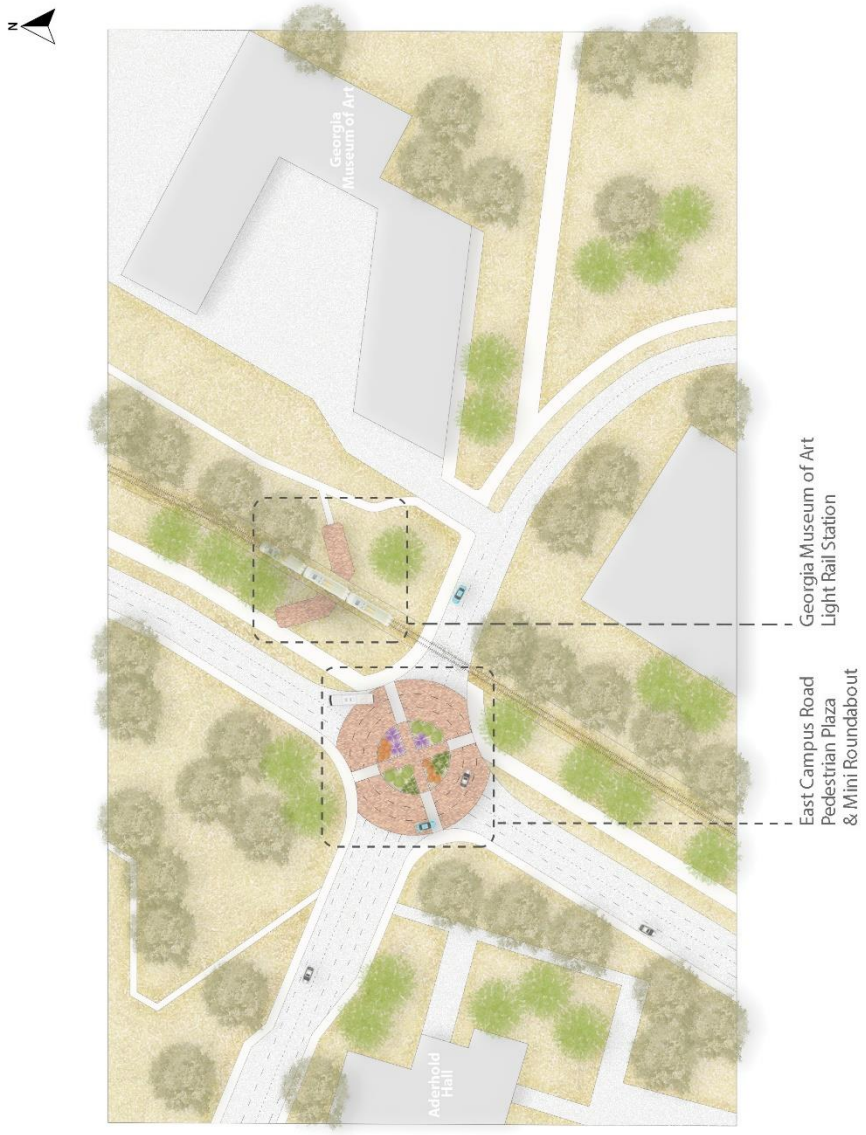
## **Proposed design**

### **1. GA Museum of Art Light Rail Station**

The proposed design tries to construct Site 4 as the transportation hub of the south campus. A light rail station is built near the GA Museum of Art. The shape of the light rail station is the miniature of the museum building. Redbrick paving is used to match the style of the S Thomas St Transit hub and UGA campus. The existing bike lanes are expanded 6 ft to the east to build bike and pedestrian shared lanes. The proposed light rail station in front of GA Museum of Art, the bus stops, the paved bike and pedestrian lanes on E Campus Road form a public transit network on the south campus. The build of public transit network would serve more campus members for smooth daily commuting. Meanwhile, the combination of multimodal transportations encourages the usage of public transportation and benefits the build of a sustainable campus.

### **2. East Campus Rd Pedestrian Crossing Plaza & Mini Roundabout**

Mini roundabouts are one of the ideal treatments for intersections with high vehicle speed and complicated pedestrian crossings (“Mini Roundabout | National Association of City Transportation Officials” n.d.). US Department of Transportation defined mini-roundabouts as “... a type of roundabout characterized by a small diameter and traversable islands.” (U.S. Department of Transportation 2000). The mini-roundabout of the East Campus Rd would benefit the intersection by calming the travel speed of the vehicles that drive uphill/downhill, providing a safe and convenient crossing for pedestrians, increasing the sustainability of the street, and enriching the streetscape aesthetically (Figure 4.54).



Georgia Museum of Art  
Light Rail Station

East Campus Road  
Pedestrian Plaza  
& Mini Roundabout

East Campus Road Streetscape  
Plan View (Part 2)  
Scale: 1" = 5'-0"

Figure 4.54 East Campus Road streetscape plan view

## CHAPTER FIVE

### CONCLUSION

#### **5.1 PEDS Audit Results**

Based on the PEDS' audit results for the four sites (seven segments) on the UGA academic campus, the author compiled the existing factors on campus that contribute to the configuration of campus edge streetscapes. Also, the author pointed out the factors that are neglected in UGA campus edge streetscape design. The rubrics are organized by three objective sections from the PEDS' instrument. They are Pedestrian Facilities, Road Attributes, and Walking/Cycling Environment (Table 5.1). The contributive factors and the neglected criteria of the streetscape on UGA campus that are mentioned in the PEDS' audit results could be representative of the campus edge streetscapes of many US universities in college towns.

	<b>Contributive Factors</b>	<b>Neglected Criteria</b>
<b>Pedestrian Facilities</b>	--Good sidewalk conditions --Few or no path obstructions --Appropriate sidewalk width	--Plant buffers between road and path --Distance between path and curb
<b>Road Attributes</b>	--Fair road conditions --Adequate off-street parking space --Proper speed limit signs --Appropriate traffic control device, crosswalk, and crossing aids --Majority of the roads have bicycle lanes and bike boxes.	--On-street parking blocks pedestrian circulations --Large areas of unmanaged and impervious off-street parking --Bicycle facilities, especially parking facilities
<b>Walking/Cycling Environment</b>	--Adequate road-orient lightings --Proper wayfinding aids --Good overall cleanliness and building maintenance --Bus stop with shelters	--Pedestrian-scale lighting --Public amenities (garbage cans; water fountain, benches, etc.) --Shading trees & enclosure --Articulation between open spaces and campus buildings

Table 5.1 PEDS Audit Results (By author)

## 5.2 Design Guidelines for Campus Edge Streetscape

Through the literature review, case studies, and site design process, the author has compiled typical design guidelines for campus edge streetscape designs (Table 5.2). The five elements that are considered essential for the campus streetscape will be evaluated separately based on five criteria for each section. The more criteria the site meets, the better the configuration the streetscape has. The comprehensive results of the five sections represent the overall quality of a campus edge streetscape.

These design guidelines could also be used to evaluate other streetscapes located at the edge of two different functional areas, such as a street between a commercial district and residential area; or to evaluate the configuration of a street that defines the boundaries of an area, such as waterfront trail.

Table 5.3 to Table 5.6 show the evaluation results of the proposed designs of the four selected sites. The charts aim to use the selected sites as an example to demonstrate how to use the design guidelines to evaluate streetscapes. Also, the charts show what elements of the site can be improved specifically and how these improvements could influence the overall quality of the site.

## DESIGN GUIDELINES FOR CAMPUS EDGE STREETScape

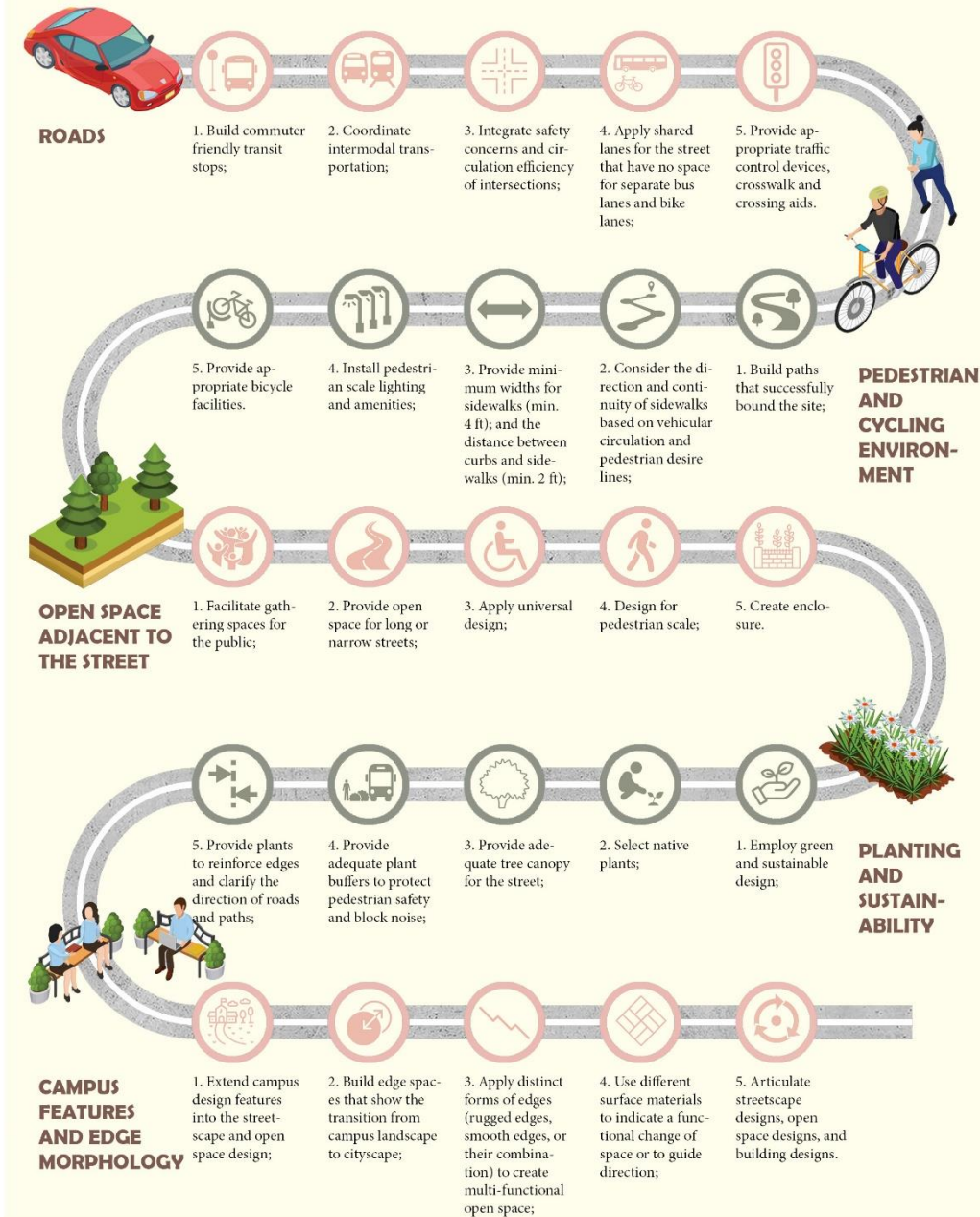


Table 5.2 Design Guidelines for Campus Edge Streetscape (By author)

SITE 1 PROPOSED DESIGN EVALUATION				
<b>Roads</b>				
1	2	3	4	5
<p>-South Thomas Street Hub combines a bus stop and a light rail station to promote multimodal transit on campus;</p> <p>-A paved pedestrian plaza is added at the intersection to calm the busy traffic and ensure the safety of pedestrians.</p> <p>-For the Baldwin St intersection, curb extensions are made to decrease people's crossing distance at the intersection and increase turning vehicles' attentions on pedestrians.</p> <p>-The replacement of wooden structures and banks provides wider pedestrian and cycling shared lanes.</p>				
<b>Pedestrian and cycling environment</b>				
1	2	3	4	5
<p>-The addition of a sidewalk system on Thomas Street promotes pedestrian circulation and ensures easy access from the east edge of the UGA north campus.</p> <p>-The replacement of aging wooden structures and steep banks provides wider pedestrian and cycling shared lanes.</p>				
<b>Open space adjacent to the street</b>				
1	2	3	4	5
<p>-The Baldwin Land Bridge not only provides clear circulation for vehicular traffic, but also builds a new open space for the public on the north campus edge.</p> <p>-The land bridge also provides a good overlook from which to view north campus.</p>				
<b>Planting and sustainability</b>				
1	2	3	4	5
<p>-To solve the low sustainability issue of parking lot N08, a green space with two canopy trees, an open space with native plants, three planting beds, and plant buffers are designed on the parking lot.</p> <p>-All the plants and materials are commonly used on the north campus.</p> <p>-Plant buffers are used on and under the land bridge.</p> <p>-In consideration of the thin soil layer on the land bridge, shrubs, grass, and perennials are planted to reinforce the edges.</p>				
<b>Campus features and edge morphology</b>				
1	2	3	4	5
<p>-The design of the iconic white roof of the Jackson Street Building is transformed and used in the design of the transit hub station.</p> <p>-Redbrick is used as the primary paving material to make the new structure integrate with the campus.</p> <p>-All the plants and materials that are used on the bridge are commonly used on the north campus.</p>				

Table 5.3 Site 1-Proposed design evaluation (By author)

SITE 2 PROPOSED DESIGN EVALUATION				
<b>Roads</b>				
1	2	3	4	5
<p>-The construction of the bike and bus shared lane on the E Broad St resolves the circulation conflicts between pedestrians and cyclists; and the conflicts between private vehicles and buses.</p> <p>-The advantage of extending the pedestrian plaza includes calming the traffic speed at the intersection and increasing the public gathering area near the landmark.</p>				
<b>Pedestrian and cycling environment</b>				
1	2	3	4	5
<p>-College Ave pedestrian plaza solves the issue of the narrow walking environment and the lack of a pedestrian crossing on the east side of the intersection.</p> <p>-The coherence of the campus landscape is improved by using the red brick paving connecting the pedestrian plaza with the sidewalk on the campus side.</p>				
<b>Open space adjacent to the street</b>				
1	2	3	4	5
<p>-Universal design was considered in applying curvilinear benches and planters in different heights.</p> <p>-Not only the canopy trees but also the curved retaining wall emphasize the enclosure of the space.</p>				
<b>Planting and sustainability</b>				
1	2	3	4	5
<p>-Shade trees are planted in the buffer to provide extra shading and sustainability for the road.</p> <p>-The buffer keeps the high-speed automobiles away from sidewalks to ensure the safety of pedestrians.</p> <p>-The material and plant selections of the pocket park also increase the visual coherence of the north campus.</p>				
<b>Campus features and edge morphology</b>				
1	2	3	4	5
<p>-The coherence of the campus landscape is increased by using the red brick paving connecting the pedestrian plaza with the sidewalk on the campus side.</p> <p>-Not only the canopy trees but also the curved retaining wall emphasize the enclosure of the space.</p> <p>-The design of the pocket park references the pattern of two open spaces on the north campus.</p> <p>-E Broad St Pocket Park applies complex 'rugged' edges by using curved retaining walls to create a transitional space from cityscape to the campus landscape.</p>				

Table 5.4 Site 2-Proposed design evaluation (By author)

SITE 3 PROPOSED DESIGN EVALUATION				
<b>Roads</b>				
1	2	3	4	5
<ul style="list-style-type: none"> <li>-The addition of an extra northbound lane ensures a safe pull-over space for northbound buses and provides a much wider bike lane - decreasing the potential for accidents between pedestrians and cyclists, or vehicles and cyclists.</li> <li>-The serpentine road helps the driver who enters W01 from the W Wray St (the lowest point of the parking lot terrain) get uphill easily.</li> <li>- A new crosswalk connects the S Lumpkin St open space and the street.</li> </ul>				
<b>Pedestrian and cycling environment</b>				
1	2	3	4	5
<ul style="list-style-type: none"> <li>-Paths on the parking lot and open space are built following pedestrians' desire lines.</li> <li>-The new crosswalk not only provides convenience for people who want to get access to the parking lot but also invites the general public to the open space.</li> </ul>				
<b>Open space adjacent to the street</b>				
1	2	3	4	5
<ul style="list-style-type: none"> <li>-The paths are arranged to follow pedestrian's moving desire lines.</li> <li>-The open space is multifunctional, allowing students to study, the public to visit, drivers to relax, and groups to organize an event.</li> <li>-The horsetails and sweet bay magnolia that are planted in the open space soften the boundaries--transforming the rugged edges to gradient edges; meanwhile the shrubs create visual screens and create sub-spaces for various functions.</li> </ul>				
<b>Planting and sustainability</b>				
1	2	3	4	5
<ul style="list-style-type: none"> <li>-The new design maximizes the use of parking lot W01, while also considering the sustainability of the space.</li> <li>-The existing canopy trees have been kept. More trees and shrubs have been added to the open space.</li> <li>-A large bioswale has been designed for the middle of the parking lot to solve the drainage problems and provide extra shade.</li> <li>-The new parking lot uses porous asphalt as its paving material to increase permeability.</li> </ul>				
<b>Campus features and edge morphology</b>				
1	2	3	4	5
<ul style="list-style-type: none"> <li>-The design of the open space utilizes the form of campus quads.</li> <li>-The paths of the open space partition it into six subspaces; the horsetails and sweet bay magnolia that are proposed would soften the boundaries.</li> <li>-The use of crushed brick in the open space makes a connection with the path material of Herty Field that located in the middle of the campus.</li> <li>-The outdoor furniture and planters are made of cast iron to match the cast-iron railings on S Lumpkin Street.</li> </ul>				

Table 5.5 Site 3-Proposed design evaluation (By author)

SITE 4 PROPOSED DESIGN EVALUATION				
<b>Roads</b>				
1	2	3	4	5
<p>-A light rail station is built near the GA Museum of Art.</p> <p>-The proposed light rail station in front of GA Museum of Art, the bus stops, the paved bike and pedestrian lanes on E Campus Road form a public transit network on the south campus.</p> <p>-The mini-roundabout of the East Campus Rd calms the travel speed of the vehicles that drive uphill/downhill and provide a safe and convenient crossing for pedestrians.</p>				
<b>Pedestrian and cycling environment</b>				
1	2	3	4	5
<p>-The combination of multimodal transportation encourages the usage of public transportation and benefits the building of a sustainable campus.</p> <p>-The existing bike lanes are expanded 6 ft to the east to create bike and pedestrian shared lanes.</p>				
<b>Open space adjacent to the street</b>				
1	2	3	4	5
N/A				
<b>Planting and sustainability</b>				
1	2	3	4	5
<p>-The combination of multimodal transportation encourages the usage of public transportation and benefits the building of a sustainable campus.</p> <p>-The mini-roundabout of the East Campus Rd increases the sustainability of the street, and enriches the streetscape aesthetically.</p>				
<b>Campus features and edge morphology</b>				
1	2	3	4	5
<p>-The shape of the light rail station is inspired by the museum.</p> <p>-The red brick paving of the mini-roundabout defines the intersection and articulates the street design with the overall campus paving style.</p>				

Table 5.6 Site 4-Proposed design evaluation (By author)

### 5.3 Future Research Questions

This thesis focuses on determining and compiling the elements that affect the design and users' experience of streetscapes on the campus edge and proposing improvements and features that could provide a pedestrian and bicyclist-friendly environment. Due to the limitation of time, the research was conducted on the campus edge streetscapes during the daytime. A study of the

campus streetscape at night could be pursued in future research. Potential nighttime related research topics include campus streetscape lighting and campus streetscape crime prevention through environmental design.

The preference of users from both town and gown communities is also important for campus streetscape design. The PEDS' audit method is used in the thesis to evaluate individual features in the walking environment. However, the audit tools could also be used to evaluate perceptions and preferences of different types of users. Research of user preferences improves the quality and usability of design of pedestrian-oriented streetscapes. Building a pedestrian-oriented environment and creating community spaces on the campus edge could effectively improve the town-gown relationship.

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