Step By Step:
Suburban Active Transportation Planning in Spring Hill, Tennessee

by
Keili A. Tucker

Submitted to the Department of Urban Studies and Planning
in partial fulfillment of the requirements for the degree of

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ABSTRACT

Suburban form produces car dependency with its circuitous routes, segregated land uses, and sprawling development. Active Transportation (AT), defined as non-motorized travel modes such as walking and cycling, has the potential to provide suburban residents with alternative mobility options. In 2015, Spring Hill, Tennessee, a city with suburban form and no dense urban core, adopted a *Bicycle and Greenway Plan* (BGP) to develop an AT network. This thesis seeks to understand how AT network plans are institutionalized, maintained, and expanded through policy and other implementation tools in order to accelerate progress on the expansion of AT infrastructure in Spring Hill. The thesis begins with four case studies: Spring Hill, Tennessee; Jefferson County, Alabama; Apex, North Carolina; and Mississippi Mills, Ontario, Canada. The case studies revealed that infrastructure, policy-making, and social programs must go hand in hand for a successful network. The thesis continues with sixteen one-on-one interviews of municipal staff, elected officials, and local developers in Spring Hill. The interviews addressed perspectives on walkability, experiences with AT implementation, and ideas for improving citywide pedestrian accessibility. The interviews reinforced that separated land uses and sprawling development limit the potential for walkability. Additionally, they revealed that greenfield development has been responsible for the majority of the BGP build-out thus far. BGP implementation would benefit from more buy-in from the city through dedicated funding streams and better use of existing programs that target pedestrian infrastructure. This work contributes to Active Transportation research by investigating the unique challenges of establishing walkability in rapidly growing suburban places.

Thesis Supervisor: Eran Ben-Joseph, Professor of Landscape Architecture and Urban Planning
Thesis Reader: Kayce Williams, Director of Parks & Recreation, City of Spring Hill

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I deeply appreciate the support of my friends and family throughout this process. In particular, I thank Melissa, Emily, and Gabriel in my cohort who were there every step of the way. We got through MIT as a team. Finally, I would like to thank my partner, Ari, who constantly motivated me and provided a second set of eyes. I truly could not have done it without him.

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Chapter 1: Introduction

Active Transportation (AT), defined as human-powered mobility such as biking, walking, and rolling (U.S. Department of Energy), is a critical element of thriving, healthy communities. The ability to get around safely without a car is essential for those who cannot or do not want to drive. In car-dependent neighborhoods, children below the driving age and older adults who can no longer drive safely must rely on others to access most, if not all, of their destinations (Duany et al, 2000). If all people deserve freedom of movement, cities must provide alternative mobility options.

Dense cities seeking to expand their mobility options might have ubiquitous sidewalks but struggle with a lack of space to add cycling infrastructure. Sprawling, suburban places, however, might struggle with too much space and are not guaranteed to have connected sidewalks at all. In their 2021 book, *Retrofitting Suburbia: Urban Design Strategies for Urgent Challenges*, June Williamson and Ellen Dunham-Jones define suburban form as having separated land uses, residential neighborhoods with wide streets and cul-de-sacs, and parcels containing a single building surrounded by a lawn or parking lot. Separated land uses and large lot sizes make it difficult to provide suburban residents with car-free access to daily necessities such as schools and grocery stores.

Spring Hill, Tennessee is a prime example of suburban form. Spring Hill is a car-dependent, sprawling city 35 miles south of Nashville that has grown rapidly over the last few decades, from a small agricultural town to a city with nearly sixty thousand residents. Many Spring Hill residents would probably be resistant to the idea of giving up their cars since the current infrastructure heavily relies on car usage and this dependency is likely to continue in the future. However, the city can still aim to make short-distance trips possible without a car. When it comes to public transportation, Spring Hill contains one stop on a neighboring town's trolley service, Mule Town Trolley which connects several critical locations such as medical facilities and grocery stores (The Daily Herald, "Mule Town Trolley expands routes"; The Daily Herald, "Mule Town Trolley"). Unfortunately, Spring Hill itself does not maintain a comparable service.

In 2015, Spring Hill adopted a *Bicycle and Greenway Plan* (BGP), and it was most recently updated in 2021. The BGP identifies key destinations in the city and proposes a network that provides city-wide access to them. Spring Hill provides an interesting case of a suburban AT plan because the city neither has a dense downtown nor sits on the periphery of a more urban and walkable city. The Plan appears to provide significant connectivity to commercial centers across town, and it is a promising step for the city's accessibility and quality of life.

Methods and Objectives

I want to understand how the Bicycle and Greenway Plan is used by city staff and developers. My goal is to contribute to Active Transportation in my hometown by uncovering social and infrastructural limitations and opportunities in the city's current approach to transportation.

This thesis begins laying the groundwork for understanding AT plans by conducting case studies analysis of plans from Alabama, North Carolina, and Ontario, Canada. I seek to understand how suburban spatial patterns inform the placement of AT connections by interrogating the goals and constraints of their plans. Additionally, I attempt to understand how network plans are institutionalized, maintained, and expanded through policy, design, and other implementation tools.

The thesis becomes grounded in actual practice through interviews with city staff, elected officials, and individuals from the local development community in Spring Hill, Tennessee. The interviews address perspectives on walkability, experiences with AT implementation, and ideas for improving citywide pedestrian accessibility. The thesis concludes with recommendations for strengthening Spring Hill's approach to expanding pedestrian access. This work also provides lessons and tools to similar municipalities facing rapid development and lacking pedestrian infrastructure.

Chapter 2: Literature Review

Transforming Suburbs

Suburbs offer the potential for impactful climate solutions. A 2021 article argued for dominant sources of emissions and vulnerability to be identified on a local scale. The authors urged governments to reconsider how they subsidize suburbs, offering building retrofitting and AT networks as potential opportunities for positive environmental change (Teicher et al).

Yet retrofitting is not a simple matter. A 2022 article on suburban retrofitting highlighted arterials as important for improving walkability in suburbs because they are the main source of connectivity. The analysis concluded, in part, that the areas with the most retrofit potential were generally the least walkable places, such as large commercial lots, because of their single ownership and "non-static urban form," meaning formats flexible for change (Hess et al).

The Impact of Active Transportation

Active Transportation has positive impacts on health (Giles-Corti et al, 2010; Sallis et al, 2004), social interaction (Berg et al, 2017), climate, and more. In fact, investment in AT has the potential to support at least nine of the seventeen United Nations Sustainable Development Goals (SDGs): no poverty (1); good health and wellbeing (3); quality education (4); gender equality (5); decent work (8); climate action (13); life on land (15); peace, justice, and strong institutions (16); and partnership for the goals (17). Additionally, investment in walking and cycling can help meet a wide range of SDG targets at once. However, it is noted that isolated infrastructure improvements will not be sufficient for a substantial mode shift, so larger-scale partnerships will be necessary (Macmillan et al, 2020).

The Factors of Active Transportation

Elements such as separation from vehicle traffic, pedestrian network connectivity, and parks make walking more attractive (Adkins et al 2012). Additionally, Active Transportation network usage rates high enough to produce a safety-in-numbers effect can often only happen after the proper infrastructure is installed (Lee et al, 2019). Public transportation is difficult to implement in sprawling places (Cervero and Buetler, 1999). When it is used, a targeted approach of providing bus service along critical corridors may be preferable to fixed routes that loop through residential areas to minimize walking (Mobility Lab, 2018).

However, when does one decide to walk in the first place? Alfonzo's (2005) hierarchy of walking needs suggests that factors such as safety, comfort, and pleasurability are only influential for walking if walking is first feasible and accessible. Intersection density, destination density, land use diversity, and street design are closely associated with users' choice of Active Transportation (Cervero et al, 1997; Ewing et al, 2010). While cyclists can legally use the same infrastructure as cars in many places, it is often very dangerous to share the road (Pucher and Buehler, 2016).

As it stands, cycling in the suburbs is often understood as a recreational activity. A qualitative analysis of the impact of cycling infrastructure on real estate value found that realtors reference the infrastructure very differently depending on the spatial context. In urban cores, it is a valuable utility, whereas, in suburban areas, it is a recreation if mentioned at all. The authors argued that this dichotomy contributes to an unequal investment in infrastructure which leaves lower-income folks without access to mobility alternatives (McDougall and Doucet 2022).

However, this recreational focus is still hopeful. An article surveying utilitarian and recreational cycling in an auto-oriented suburb of Toronto found that the frequency of recreational cycling, among other factors, is a strong predictor of utilitarian cycling. The authors argue that increasing utilitarian cycling requires a well-rounded approach that addresses access and social factors as well as infrastructural factors, such as community bike hubs that provide repairs, training, and group rides (Ledsham et al, 2022).

Greenway Planning

Greenway planning in the United States dates back to Frederick Law Olmstead's Emerald Necklace in Boston in the late 19th century (Fabos, 2004). Fabos (2004) found that three of the most significant benefits of greenways have been the protection of ecologically significant natural systems, recreational opportunities, and the preservation of historical heritage and cultural values.

In a review of twenty-nine greenway planning documents, Chin and Kupfer (2019) show that nearly all of the plans mentioned human benefits such as recreation and health, but rarely cited biodiversity. Additionally, the plans rarely discussed methods to be used for measuring long-term success.

Greenways often require a collaborative approach due to their regional scale. A study addressing the challenges of multi-jurisdictional greenway planning listed common barriers as private property rights, uncoordinated laws and regulations, and lack of funding, among other things (Ryan et al. 2006). Some elements of successful greenways are involving the public, protecting natural resources, securing long-term management, and completing the entire greenway (Ryan et al. 2006).

Beyond Greenways: The Next Step for City Trails and Walking Routes by Robert Searns (2023) makes a case for the next generation of greenways to prioritize connected loops over linear paths. Using examples of existing greenway networks, Searns proposes grand loop trails and town walks. These paths encompass metro areas and lie within metro areas, respectively. Searns argues that loops suit the needs of more types of users as they expand access to pedestrian infrastructure and provide unique experiences.

Chapter 3: Case Studies

This chapter will commence by outlining the key components of Spring Hill, Tennessee's Active Transportation (AT) plan. Additionally, three case studies of comparable plans will be analyzed, with a particular focus on identifying shared aspects with Spring Hill.

Spring Hill, Tennessee
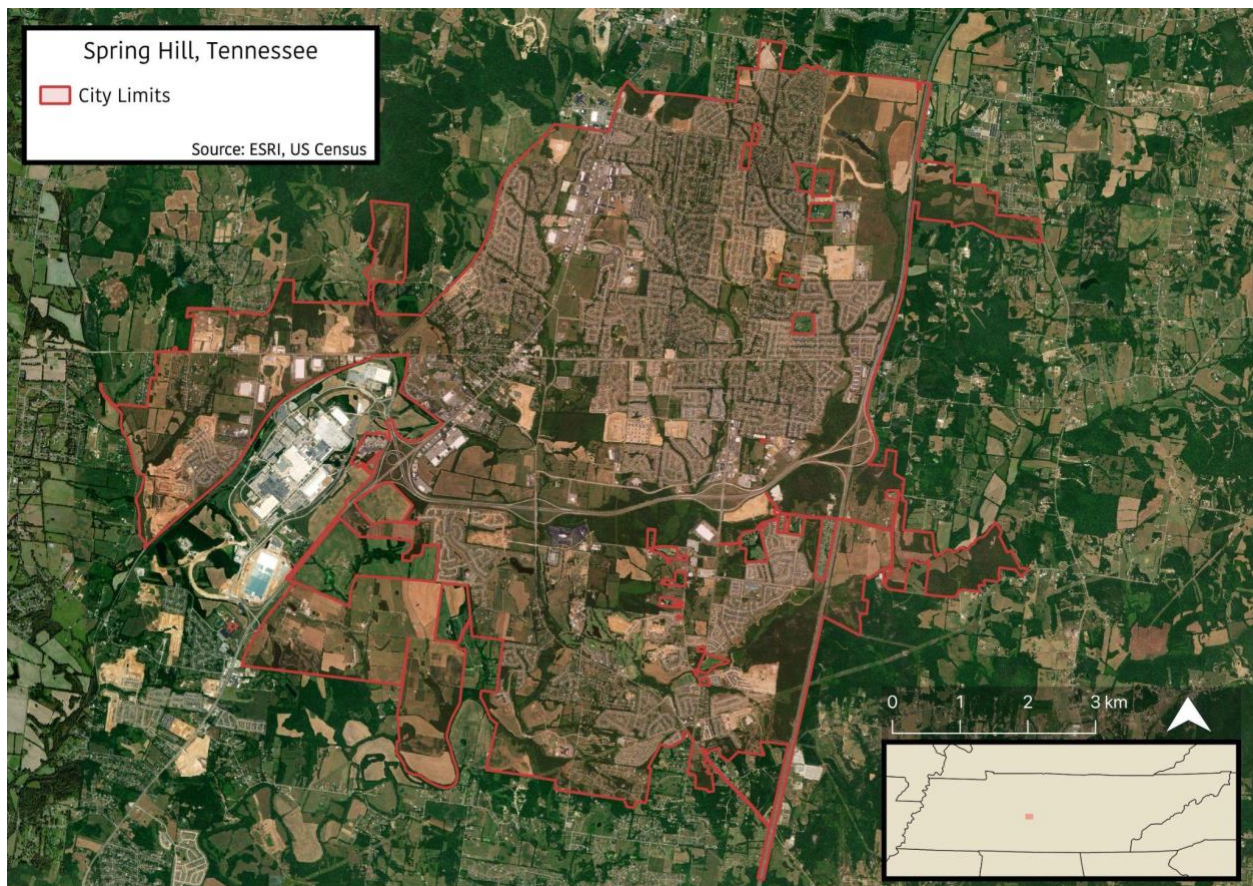
Figure 1: Satellite map of Spring Hill, Tennessee with city limits. [Data sources: ESRI, US Census]

Spring Hill, Tennessee adopted a *Bicycle and Greenway Plan* (BGP) in September 2021. The BGP was prepared by Volkert, a professional services firm that focuses on both natural and built environments (Volkert, "About"). The BGP is described as an important step toward addressing national issues such as transportation costs, environmental concerns, and health (3). The BGP is consistent with and builds upon the City's 2012 *Master Parks and Recreation Plan* (MPRP) and 2015 *Major Thoroughfare Plan Update* (MTP).

The BGP names the Peter Jenkins Walking Trail (PJWT) as a past trail project that it aims to replicate the success of. The PJWT is a trail within the community open space of a residential subdivision called Wyngate Estates (Figure 2). A public-private partnership in 2012

was able to construct a 700-foot connection between the original trail and the nearby Allendale Elementary School, granting approximately a third of the students the newfound ability to walk to school (Wynd 2013).
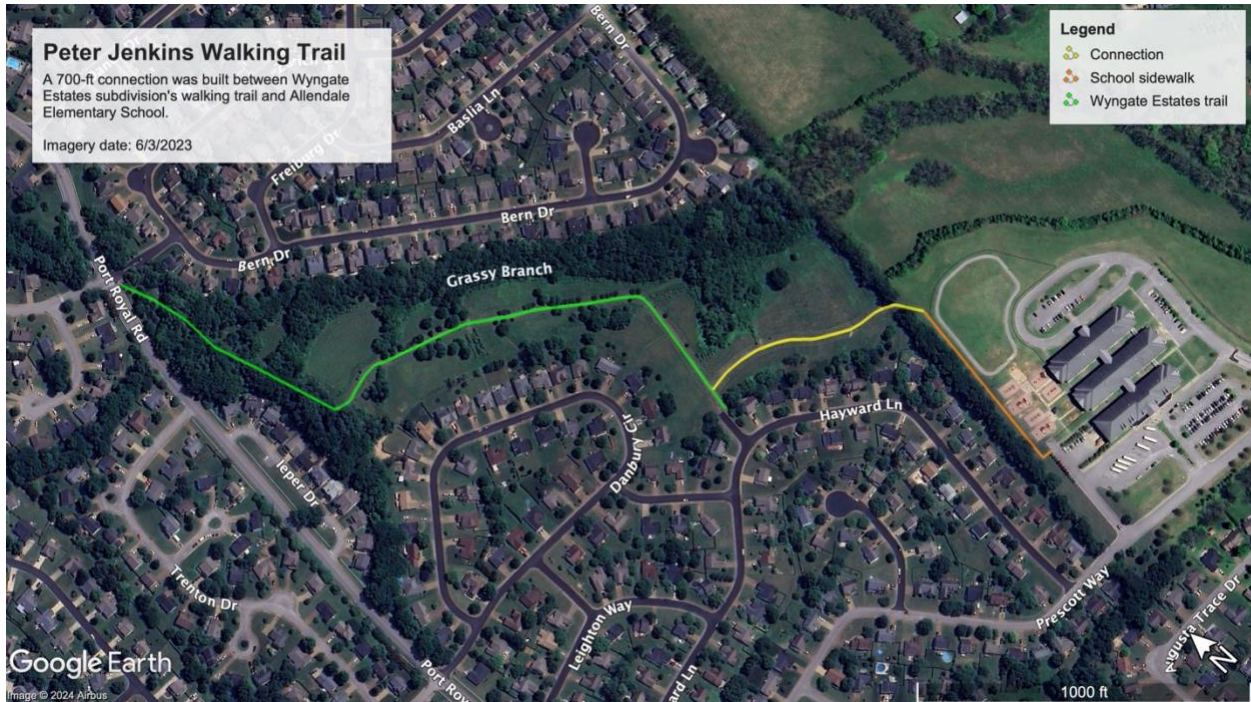
Figure 2: The Peter Jenkins Walking Trail connects a neighborhood common space to a nearby school, providing safe pedestrian access to local children.

The introduction of the BGP specifies that it represents a commitment to a network of safe, continuous, and attractive bike and pedestrian facilities for both commuting and recreational purposes. The proposed benefits listed include improved community image, expanded tourism opportunities, increased property values, reduced commuting costs, enhanced local economy, nature preservation, and opportunities for people unable to drive, among others. Given these benefits, the BGP's vision is to "create an easy and safe environment to travel by foot and bicycle in and around the City of Spring Hill" (4). Towards this end, the BGP goes on to identify prioritized AT connections, ensure their inclusion in future development, and develop programs to promote their usage.

To justify the expense of the proposed development, the BGP spends two pages outlining the proven benefits of AT networks. The three categories presented are reduced congestion, increased mobility, and improved public health. For congestion, the BGP mentions that some streets "carry more vehicular traffic than was originally intended" (7). Spring Hill has experienced rapid population growth over the past decade, and infrastructural development has not kept pace. While a shift to AT is unlikely to reduce vehicular congestion, says the BGP, it will ultimately save the city a lot of money on transportation-related projects and maintenance (7). For mobility, the BGP positions an AT network as a necessity for the part of the population that, for whatever reason, cannot or chooses not to drive. This population includes people such as young children, elderly adults, and people with low incomes. Finally, public health impacts range from human-based to nature-based. First, the BGP notes that automobile trips create air and

water pollution, while greenways can preserve the environment and protect wildlife (8). Then, the BGP mentions the human health impacts of AT, such as decreased rates of heart disease and obesity.

The methodology of the BGP includes public involvement and several rounds of data analyses. The first round of analysis reviewed planning documents, including the MPRP, MPT, the city's *Comprehensive Plan*, *Subdivision Ordinance*, and *Municipal Planning Ordinance* (p5). They also reviewed demographic data and existing facilities. The public involvement stage included a public workshop in March 2015 and a public meeting in June 2015. Next, the BGP writers analyzed land uses in Spring Hill to identify potential generators of bike and pedestrian traffic. Finally, they brought it together with population distribution data to identify a prioritized list of proposed AT facilities.

The demographic analysis found that Spring Hill contains many families with young children and concluded that special attention must be paid to their AT needs (11). The BGP does not offer a summary of the public input gathered. Generators of AT traffic, such as employment centers, parks, and schools, were chosen using "the help of City staff, combined with local knowledge" (11).

The city's MPRP found about 5 miles of existing bike and greenway trails in 2012 and proposed an additional 42 miles for development. The BGP (2021) expands upon the MPRP, recommending a total of 91.5 miles of AT facilities for development (Figure 3). The routes are intended to be considered preliminary as exact placement details have not been confirmed.

For implementation, the BGP offers five policies to guide the city's decisions (17-19):
1. "An Interconnected Network": Provide connectivity with special attention to schools, historic sites, and public institutions. Prioritize facilities in the Capital Improvement Plan and include them in the annual budget.
2. "Complete Streets Policy": Adopt a policy that will ensure the inclusion of AT in all future roadway projects, both public and private.
3. "Land Use and Development": Require future development to incorporate the routes in this plan. Review and amend the Subdivision Regulations and Zoning Ordinance.
4. "Safety": Maintain a safe network by designing with Crime Prevention Through Environmental Design (CPTED) and implementing vehicle allowance guidelines. Amend the Subdivision Regulations and Zoning Ordinance.
5. "Comfort and Enjoyment": Encourage artistic, historical, and natural elements. Include landscaping and public art in the planning and design process.

The project priority section addresses funding constraints and strategies. It includes extended tables denoting the preferred time range (e.g., short-term, mid-term, long-term) of each segment of the proposed infrastructure. The BGP states that "short-term projects are intended to be implemented by 2020," mid-term by 2030, and long-term by 2040 (24). Given that the BGP was last updated in 2021, the time ranges are likely an artifact in need of revision.

The BGP offers the following potential funding sources:
1. "Non-Profit Groups": Replicate the success of the PJWT.
2. "Corporate Sponsorships": Team with businesses in exchange for public recognition.
3. "Fund Raising/Community Involvement": Adoption programs for construction and maintenance.

4. "Property Tax/Sales Tax Increase": Allow city residents to vote on a parks allocation of their taxes.
5. "Partnerships with Maury/Williamson Counties or Neighboring Municipalities": Partner with counties, neighboring municipalities, and school systems to pool money for funding and connecting projects.
6. "Grant Funds": Apply for Active Living grants, Land and Water Conservation funds, Surface Transportation Program (STP) funds, Safe Routes to Schools, etc.
7. "Bond Issue": Issue tax-exempt bonds to fund projects.
8. "Usage Fees": Charge for access to facilities. This is not preferred.
9. "Adequate Facilities Tax / Impact Fees": Institute a tax or fee, allowed by the state in high-growth communities.
10. "State Street Aid Fund": Access the state gas tax for use on municipal streets.

The BGP concludes by noting the potential to become a leader in quality of life among peer cities. Finally, the appendix includes forty-three pages of design guidelines, providing best practices for greenways, bike lanes, multi-use trails, trailheads, and origins/destinations (called generators and attractors). Users are urged to supplementally consult established guidelines such as the American Association of State Highway and Transportation Officials (AASHTO), the current edition of the Manual on Uniform Traffic Control Devices (MUTCD), the Americans with Disabilities Act (ADA), and the National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide.

A major project which has made progress since the release of this document is the Harvey Park Greenway. Spring Hill was awarded a grant from the Transportation Alternatives Program to develop a 1.3-mile greenway connecting several residential subdivisions to big-box retailers, a park, and more. This project was listed under the Nashville Area Metropolitan Planning Organization's (Nashville MPO) Transportation Improvement Plan (TIP) for fiscal years 2020-2023. The Nashville MPO includes both Williamson and Maury County, the two counties that encompass Spring Hill. This makes it a critical partner and resource in both regional and local connectivity projects. The Harvey Park Greenway construction is tentatively set to begin in September 2023 and will take two years to complete (City of Spring Hill, "Harvey Park Greenway Plan").

Notably, the BGP does not address AT connections to the currently unincorporated land adjacent to the Spring Hill city limits. Most of this land is under the jurisdiction of Maury County. The BGP briefly mentions that any land annexed into Spring Hill should be integrated into the network (18). Additionally, the BGP only mentions partnerships with counties or neighboring municipalities under the funding opportunities section. There is no focus on regional partnerships for designing long-range connectivity.

In sum, the BGP seeks to create a safe environment for walking and biking because it will reduce congestion, enhance mobility for non-driving folks, and improve public health. Added benefits include improved quality of life for residents, expanded tourism, and an enhanced local economy. Community engagement included approximately two public meetings. Recommended implementation techniques include a Complete Streets policy and a requirement for future development to build AT connections.
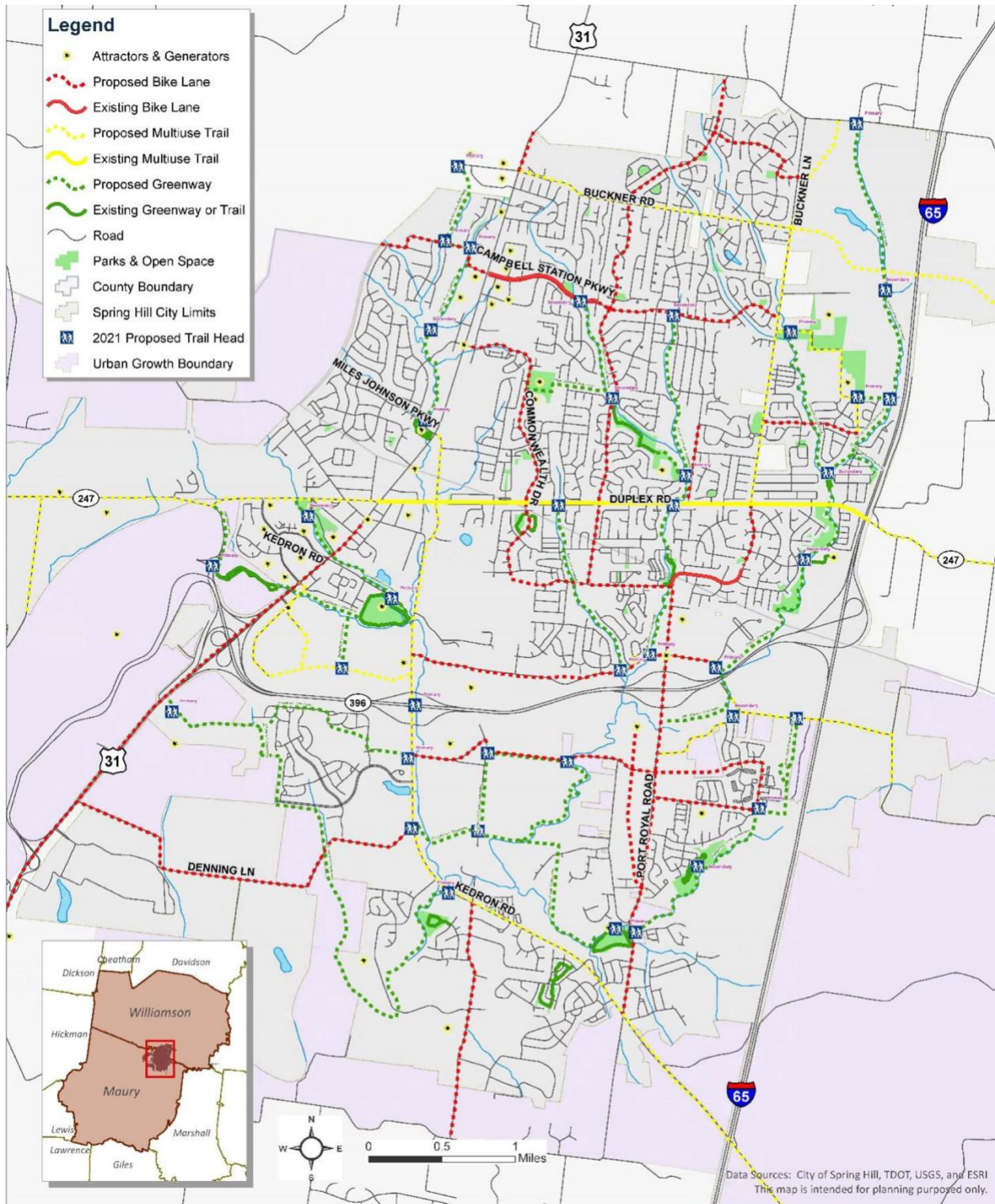
Figure 3: Combined Improvements Map, which depicts Greenways, Trailheads, Bike Lanes, and Multi-use Trails. [Source: Spring Hill Bicycle and Greenway Plan 2021]

The following sections describe in detail the three case studies: Jefferson County, Alabama; Apex, North Carolina; and Mississippi Mills, Ontario.

Case	Spring Hill, Tennessee	Jefferson County, Alabama	Apex, North Carolina	Mississippi Mills, Ontario (Canada)
Study Area (sq km)	46	2,910	131	500+
Year Adopted (or plan finalized)	2021	2022	2019	2015
Population	36,530 (2016) 53,339 (2021)	660,507 (2016) 667,820 (2021)	43,893 (2016) 62,911 (2021)	13,163 (2016) 14,740 (2021)
Key Characteristics	- Rapid population growth - Almost no existing AT infrastructure	- Focus on county-owned roads in unincorporated areas	- Rapid population growth - Existing Complete Streets policies	- Rural - Strong existing AT culture

Table 1: Key information on Spring Hill, TN and the three case studies.

Jefferson County, Alabama
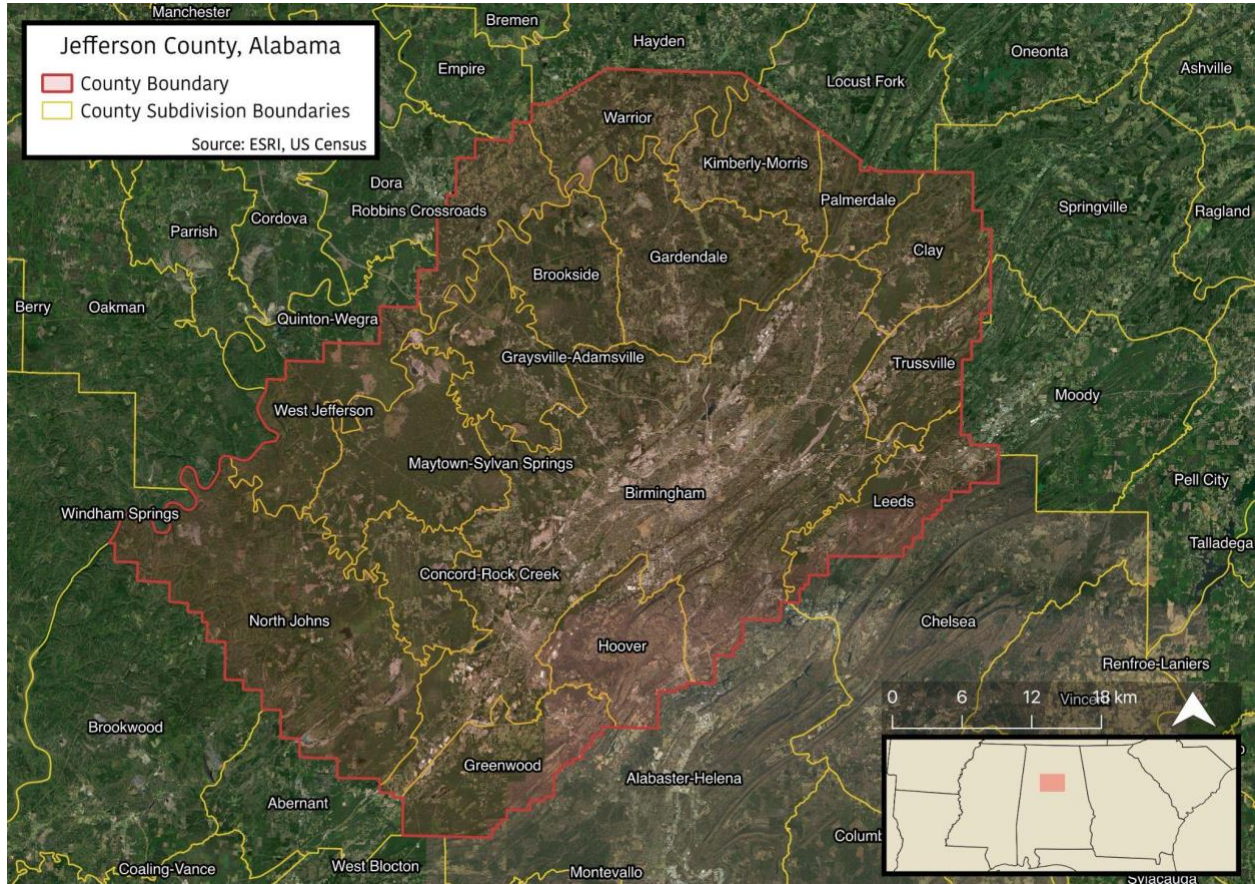
Figure 4: Satellite map of the Jefferson County, Alabama boundary and surrounding county subdivision boundaries [Data sources: ESRI, US Census]

Jefferson County is the most populous county in the state of Alabama (AL). It encompasses most of Birmingham, one of the top three most populous cities in AL, with the rest being a part of Shelby County. The Greater Birmingham Region adopted an AT plan called *B-ACTIVE* in March 2019, and Jefferson County itself released a *Bike & Pedestrian Plan* Public Review Draft in April 2022. This case study will focus on the latter document.

While *B-ACTIVE* provides guidance to local municipalities under the Birmingham MPO, the *B&P Plan* specifically studies county-owned roads and unincorporated areas in Jefferson County. It also builds on the 2012 *Red Rock Ridge and Valley Trail System Master Plan*'s countywide trail system. This Plan serves as a guide for AT infrastructure, policy, and program improvements. Its guiding principles are the following (6):

1. "Connect the Region": Bridge gaps between existing networks.
2. "Safety First!": Address areas of concern around destinations such as parks and schools.
3. "Walking and Bicycling are for Everyone": Ensure opportunities for those who use active transportation out of necessity.
4. "Economic Impact": Prioritize creating a higher quality of life and vibrant economy.

The methodology of this Plan includes public engagement, a thorough evaluation of existing conditions, and a demand analysis to produce a prioritized list of recommendations (9). The existing facilities section notes that bike and pedestrian facilities are currently minimal and disconnected. Additionally, county roads often do not feature shoulders, sidewalks, or bicycle lanes at all (12).

Through an equity analysis, the Plan identifies concentrations of folks who would most benefit from AT improvements using factors of age, income, English proficiency, race, and vehicle access (14). In a demand analysis, the Plan identifies areas of potentially high bike and pedestrian traffic using the locations of generators such as residences and workplaces. Then, both analyses are combined to produce one measure of priority areas.

Using the *B-ACTIVE* Plan's Bicyclist Level of Comfort analysis, it is concluded that most county roads are uncomfortable for cyclists due to "high traffic speeds, volumes, and minimal to no space in the form of shoulders, bike lanes, or shared use paths dedicated to bicyclists." (20). Collision data is also used to identify safety risks in unincorporated areas. The Plan calls for improved collision recording processes, as the existing data is often incomplete, inaccurate, or contradictory. The collision analysis is complemented by a thorough analysis of bike and pedestrian crash risk, including factors of vehicle speed, light levels, and intersections (24).

During the public involvement stage, strong efforts were made to engage folks living in unincorporated areas. However, the onset of COVID-19 made outreach efforts nearly impossible, as residents were not gathering in person and were often unresponsive otherwise. Instead, the Plan opted to utilize survey data collected for the *B-ACTIVE* Plan. Respondents mostly thought of biking and walking as recreational activities but thought favorably of improved AT infrastructure. Interestingly, 43% of respondents reported a commute distance within a distance considered bikeable (33). Finally, the project team produced an interactive map to solicit feedback from residents. The map was extensively advertised through both traditional media and social media. The document notes that another round of public engagement was still in progress at the time of publishing.

The recommendations section begins with an overview of types of AT infrastructure, in line with the *Small Town and Rural Multimodal Networks Guide* published by the Federal Highway Administration (FHWA) (38). The Plan goes on to conduct a thorough Safe Routes to Schools (SRTS) analysis to aid in project prioritization (54-67).

The Plan includes a "Facility Selection Guide" which utilizes standards from organizations like NACTO, AASHTO, and FHWA to aid implementors in context-sensitive design (68-74). The Guide presents a graphic from the FHWA Bikeway Selection Guide which uses vehicle volumes and operating speeds to decide what type of facilities to build (Figure 5).

Further deciding factors include the following (72):

1. "Unusual motor vehicle peak hour volumes": Include more separation when peak vehicle volumes overlap with peak cyclist volumes.
2. "Traffic vehicle mix": Include more separation at intersections when heavy vehicles are present.
3. "Parking turnover and curbside activity": Include more separation when parking and curbside loading is present.
4. "Driveway/intersection frequency": Take additional measures to provide visibility when frequent driveways are present.

5. "Direction of operation": Take the wider network into account when deciding the placement and direction of bike facilities.
6. "Vulnerable populations": Include more separation in areas with high populations of children and older adults.
7. "Network connectivity gaps": Utilize separated roadway-adjacent facilities to connect recreational opportunities.
8. "Transit considerations": Do not allow transit boarding facilities to interfere with bikeway facilities.
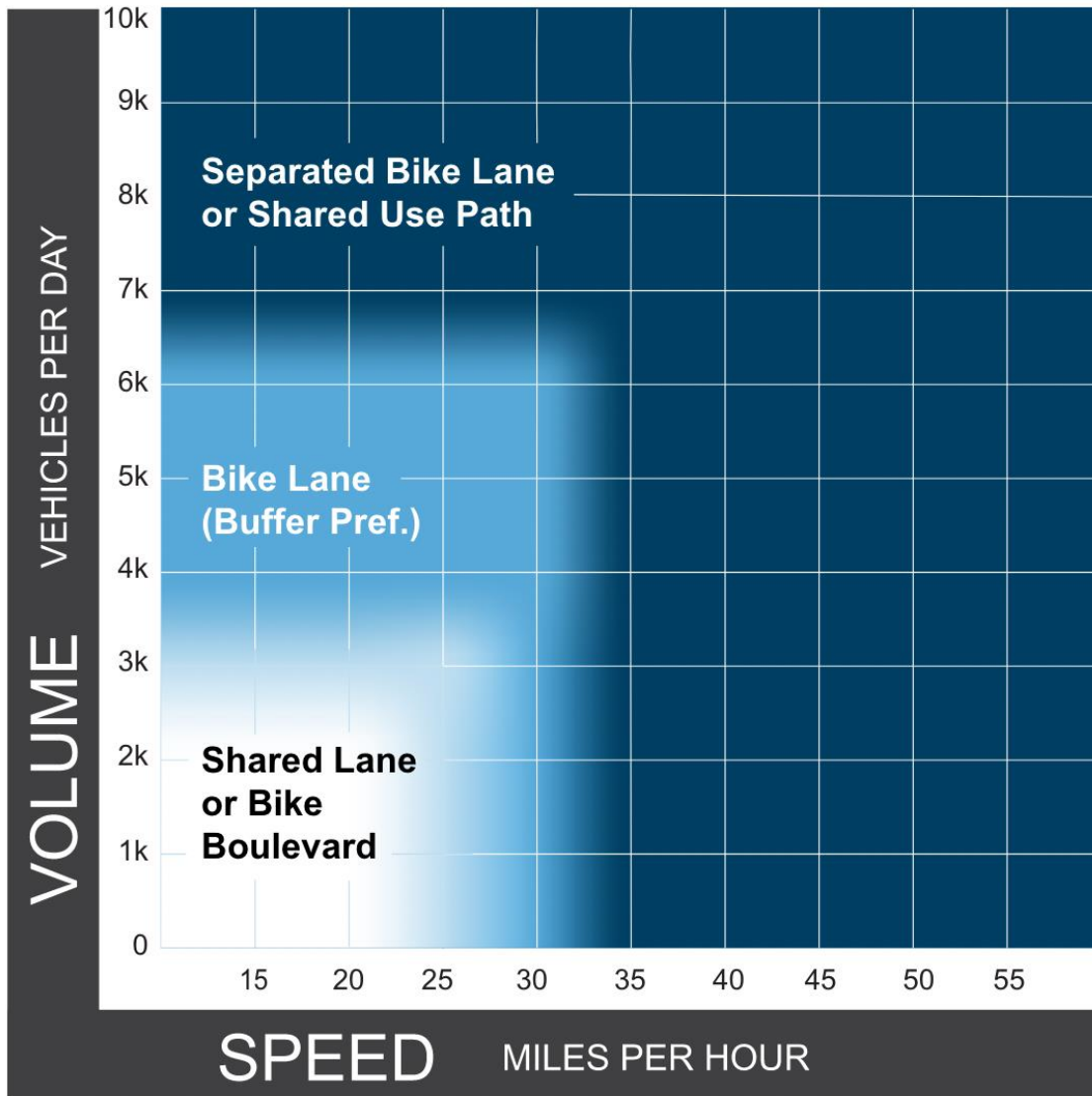
Notes

1 Chart assumes operating speeds are similar to posted speeds. If they differ, use operating speed rather than posted speed.

2 Advisory bike lanes may be an option where traffic volume is <3K ADT.

Figure 5: Preferred Bikeway Type for Urban, Urban Core, Suburban, and Rural Town Contexts. [Source: FHWA Bikeway Selection Guide]

Beyond infrastructure recommendations, the Plan includes several program and policy recommendations to create a more AT-friendly culture and aid implementation (75-92). The program recommendations include a traffic safety campaign, an SRTS program, an AT data collection program, and a wayfinding program. The policy recommendations are quite extensive. The policy section begins by calling for a basic update every 5 years and a full update/replacement every 10. The Plan then states that the County has a good Complete Streets Policy, but AT is not adequately integrated into the design and development regulations.

To remedy this gap, the project team reviews the County's zoning, subdivision, and engineering standards and proposes improvements based on "appropriate model regulatory and policy language from around the southeastern U.S." (78). The County already has a "Smart Code" which aims to create more compact, walkable, and mixed-use environments, but it is strictly optional. Identified as the most prioritized improvements are the following:

1. "Update development regulations and engineering standards to include and reflect best practices for pedestrian, bikeway, and greenway design"
2. "Revise and update connectivity requirements to promote comprehensive, low-stress pedestrian, bikeway, and greenway networks"
3. "Develop a policy to require all projects by the County and regional partners review the recommendations of this plan to ensure that implementation of publicly-funded capital projects include recommended pedestrian or bikeway treatments."

Additional interesting policy recommendations include the following:
1. "Require dedication, reservation or development of greenways": Require or incentivize the construction of greenways through private development.
2. "Require new sidewalks, greenways, etc., to connect to existing facilities": Require new development to extend existing facilities to promote connectivity.
3. "Adopt traffic calming programs, policies, and standards": Increase the safety and comfort of all road users.
4. "Require connectivity/cross-access between adjacent land parcels": Provide multiple points of access, short block sizes, and many crossings.
5. "Limit dead-end streets or cul-de-sacs": Limit dead ends and require AT connections between cul-de-sacs.

Finally, the Plan concludes with funding recommendations. Municipalities will implement most of the projects presented in the Plan, but federal funding should be able to cover most of the costs. More public-private partnerships are desired to fill in the gaps. Other potential funding sources or alternative implementations include crowdsourcing, local taxes, low-cost projects, and citizen-led demonstration projects.

Summary

The primary principles of this plan are providing regional connections between existing AT networks and addressing safety concerns around parks and schools. Community input was highly sought after in this process– visits were planned in unincorporated areas and an interactive web map was created. However, due to the COVID-19 pandemic, many of these plans were either canceled or did not receive significant response volumes. Implementation

techniques included social programs, such as traffic safety campaigns, and more technical programs, such as data collection. The County already has several Complete Streets policies, but many of the most powerful requirements are optional. The Plan proposes that regulations be revised to encourage and/or require AT connectivity and greenway development.
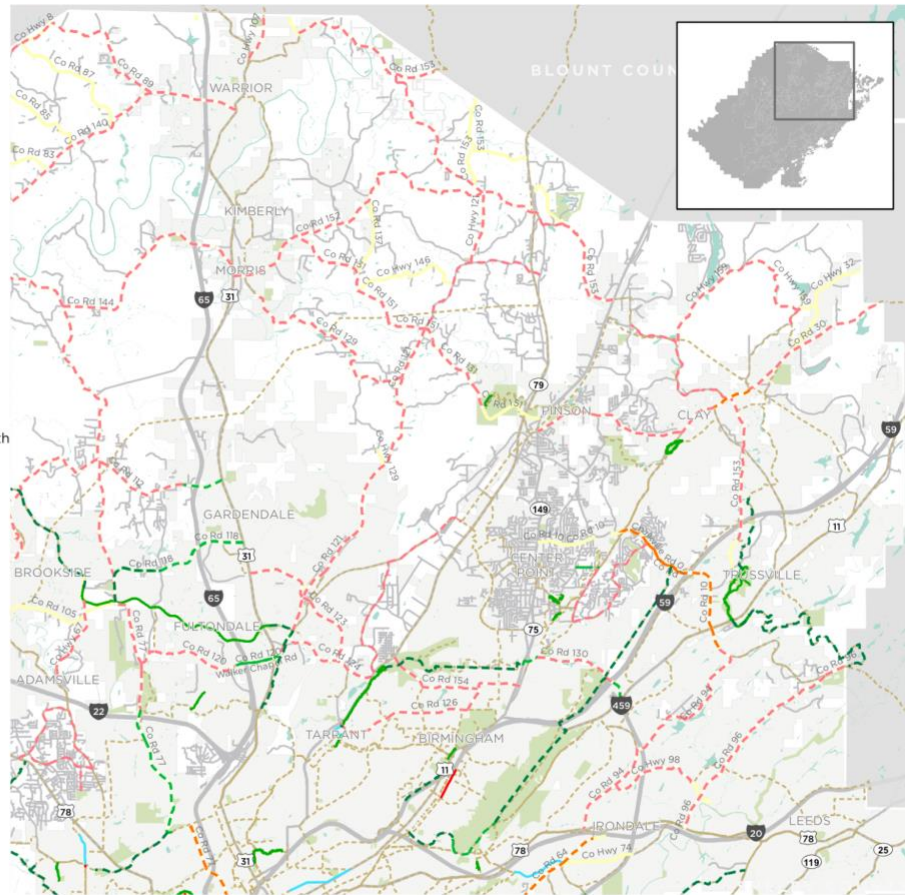
Figure 6: Northeastern portion of the proposed Jefferson County bike network [Source: Jefferson County Bike and Pedestrian Plan]

Apex, North Carolina
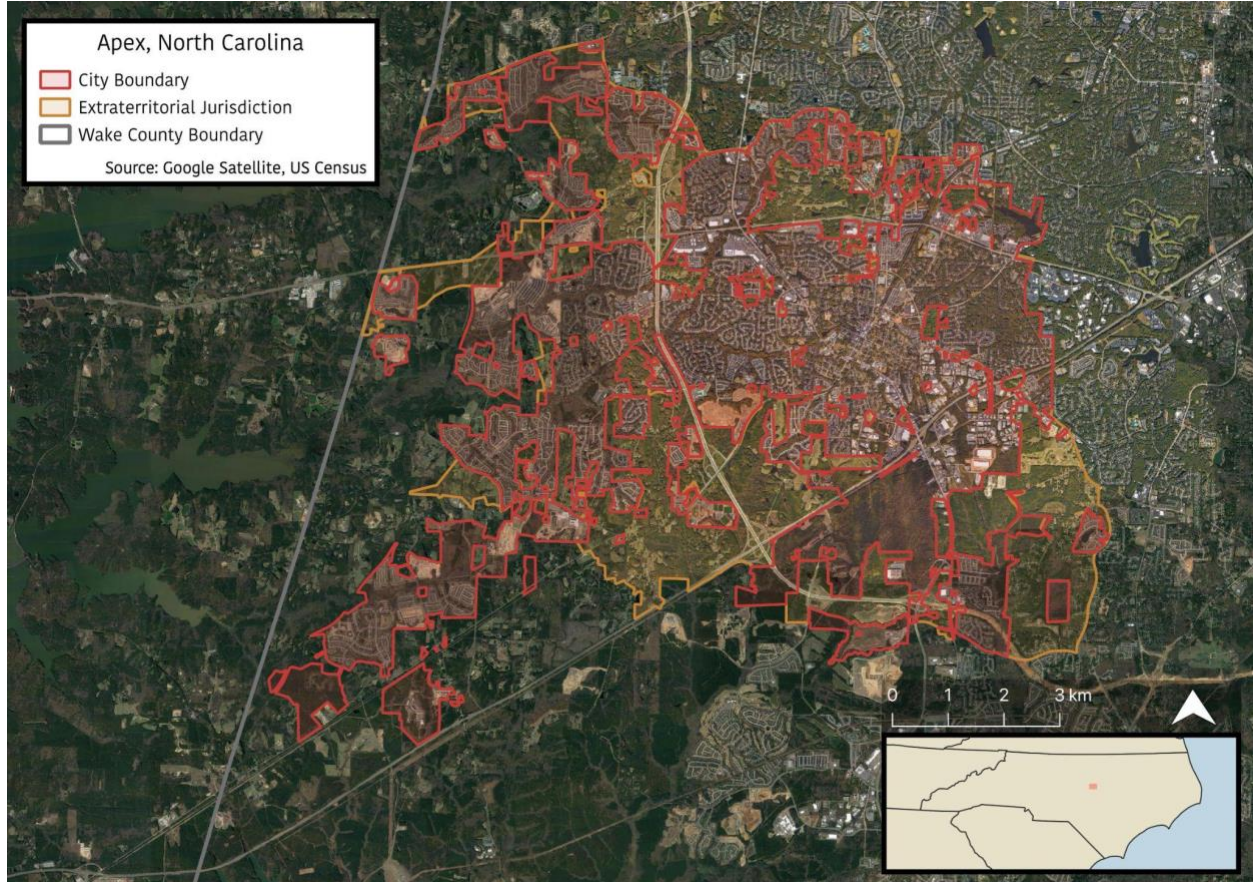
Figure 7: Satellite map of Apex, North Carolina city limits and extraterritorial jurisdiction [Data sources: Google Satellite, US Census]

Apex is a suburb of Raleigh in Wake County, NC. It has experienced rapid growth in the last few decades–growing from about 5000 in 1990 to a predicted 62,911 in 2021 (US Census). Apex has a historic downtown and is primarily a residential community.

In February 2019, Apex adopted a comprehensive transportation plan prepared by Kimley-Horn, Inc. called *Advance Apex: The 2045 Plan (*further referred to as AA*)*. It is an update to the 2011 comprehensive transportation plan, created in response to changes such as the adoption of a *Parks, Recreation, Greenways, and Open Space Master Plan*. AA's study area includes not only the town proper but also 9,111 acres of extraterritorial jurisdiction and several thousand acres of Wake County jurisdiction which lies within the Town's planning boundary (12). AA is meant to be a living document that guides Apex's vision for both transportation and land use. AA addresses all forms of transportation, not just walking and cycling, but this case study will focus on the AT elements.

AA was produced through an integrated process that also updated Apex's Future Land Use Map. This process took eighteen months and included a demographic analysis, a review of existing documents, and an assessment of existing conditions. Public involvement was sought out at different stages of the process, and the feedback seems to have heavily informed the guiding vision. Public involvement included focus groups, workshops, an online survey, an open

house, and a well-maintained website. Key takeaways from these engagements are the following (p9):

1. "Preserve small-town feel": Maintain the charm that originally drew many to the town.
2. "Integrate transportation investments and land use decisions": Ensure sustainable growth by keeping development and transportation improvements on pace with each other.
3. "Prioritize active transportation connections": Provide on-street connections to the many existing local and regional greenways.
4. "Address congestion issues on major roadways": Address chokepoints during peak periods.
5. "Focus on safety needs for all modes, particularly around schools": Improve the safety of AT facilities surrounding schools.
6. "Enhance transit accommodations": Enhance local transit and provide connections to regional transit.

These takeaways are reflected in the following planning themes of the document (p10):

1. "Downtown": Preserve and enhance the character of the historic downtown.
2. "Integrated Growth": Coordinate transportation improvements with development.
3. "Mobility and Connectivity": Create a balanced network for all users.
4. "Safety": Enhance safety and access near schools.
5. "Sense of Place": Maintain the community's existing identity.
6. "Quality of Life": Encourage healthy lifestyles and enhance public space.

The existing development patterns in Apex favor single-family homes in an owner-dominated market, but the percentage of renters is increasing year by year (15). Though the town's median age was 35.9 in 2016, Apex is thought of as a family-friendly community (18). AA calls for Apex to pay special attention to the transportation limitations of very young citizens who must rely on others for rides (19). However, most households in Apex do have at least one vehicle, so AA acknowledges that alternative transportation options must be exceedingly attractive and provide recreational benefits to attract users (22).

Most residents of Apex do not work in Apex. Additionally, job opportunities within Apex are generally concentrated in a few select areas, creating widespread vehicle dependency (24). Given the diverse yet segmented land uses, AA provides a thorough breakdown of context-sensitive design (25-37). The four context types defined are rural, suburban, transit-oriented development, and town center. Each context type includes a ranked list of modal and street design priorities. Finally, the context-sensitive design section advises implementers on space allocation within the right-of-way.

Chapter Five presents specific roadway improvements. Areas of concern were identified through public input and data analysis. The analysis included not only past crash and congestion data but also projected future demand. While the analyses in this chapter are primarily focused on motor vehicles, it is noted that any improvements should aim to support additional transportation modes. In particular, the chapter recommends a connected street network, both to reduce motorist congestion and better serve pedestrians and cyclists. The

implementation of complete street solutions is among the policy recommendations of this chapter.

Chapter Six thoroughly examines Active Transportation. A bicycle plan, *Bike Apex,* was developed concurrently with AA, and the recommendations provided in that document are reflected in AA as well. At the time of AA's release, Apex had over ten miles of maintained greenways and several more miles under construction (54). However, on-street cycling facilities were minimal, creating critical gaps in the network (Figure 8). When asked why they don't walk, 50% of survey respondents said that there aren't enough sidewalks or greenways (57). Additionally, 23% were concerned about safety. Most respondents only used AT recreationally.
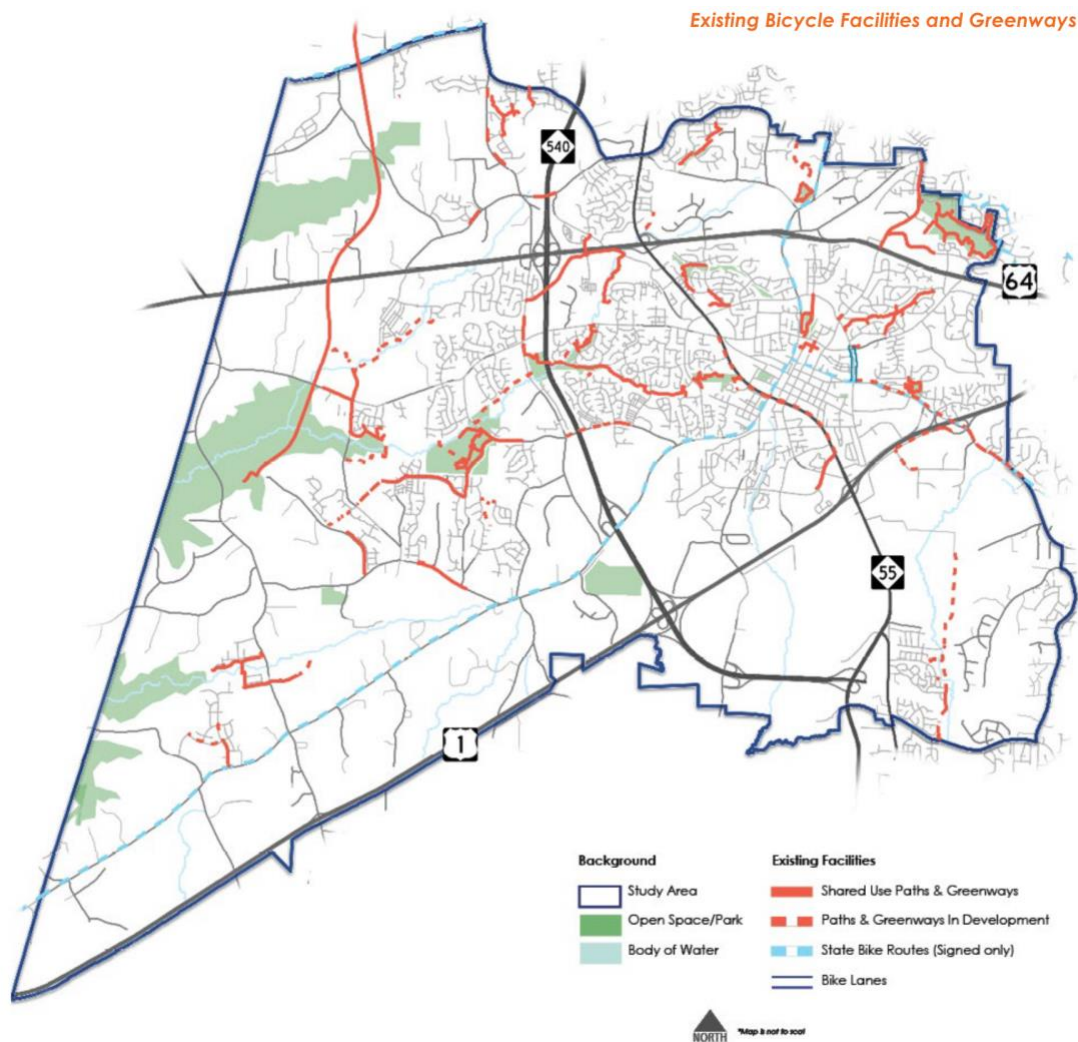
Figure 8: Existing bicycle facilities and greenways in the Town of Apex in 2019 [Source: Advance Apex, adopted 2019]

The proposed cycling facilities in Chapter Six range from greenways to bike lanes and shared shoulders, depending on the context (Figure 9). AA does not directly recommend any specific sidewalk projects, but it does state that all new roadway projects should take complete street guidelines into account (60). These types of projects are prioritized in school zones, the town center, and transit-oriented development zones. The policy recommendation section

proposes a few opportunities for strengthening AT provisions in Apex's *Unified Development Ordinance* (UDO), but it also highlights places where the UDO is already strong. For example, the UDO requires that new development provides an internal pedestrian network and connections to adjacent networks. Additionally, it is noted that AT improvements are most cost-effective when pursued as part of a larger roadway project (81).

Finally, funding sources are identified. These include federal funds, state funds, bonds, and grants from non-profits. The most promising for greenway development appears to be the North Carolina Clean Water Management Trust Fund (CWMTF), which focuses on addressing water pollution (73).

Summary

This plan relied on community input to define its guiding principles, through workshops, focus groups, and a survey. The objectives of the plan include the preservation of small-town character, integration of development and transportation investments, and enhanced safety. Because the Town of Apex and the encompassing Wake County already have strong complete streets policies, project recommendations primarily focused on prioritizing specific road segments in need of AT enhancement. Apex is similar to Spring Hill in that the job centers are quite concentrated and separated from residential areas. This may help guide implementation because AT infrastructure investment can be prioritized in areas that have the potential to serve many people.
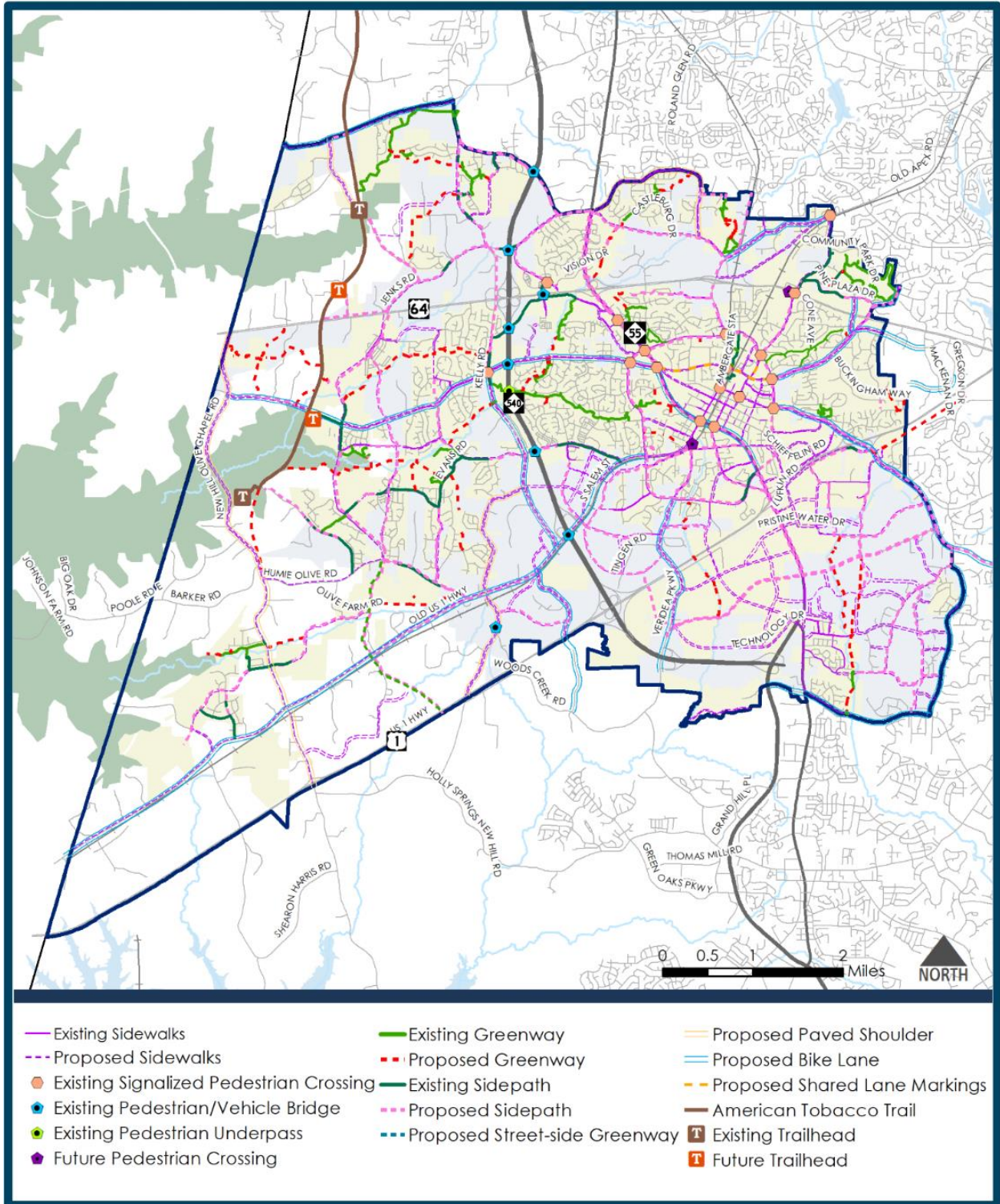
Figure 9: Draft Bike, Pedestrian, and Equestrian Plan for the Apex, North Carolina planning area [Source: Advance Apex: The 2045 Plan]

Mississippi Mills, Ontario, Canada
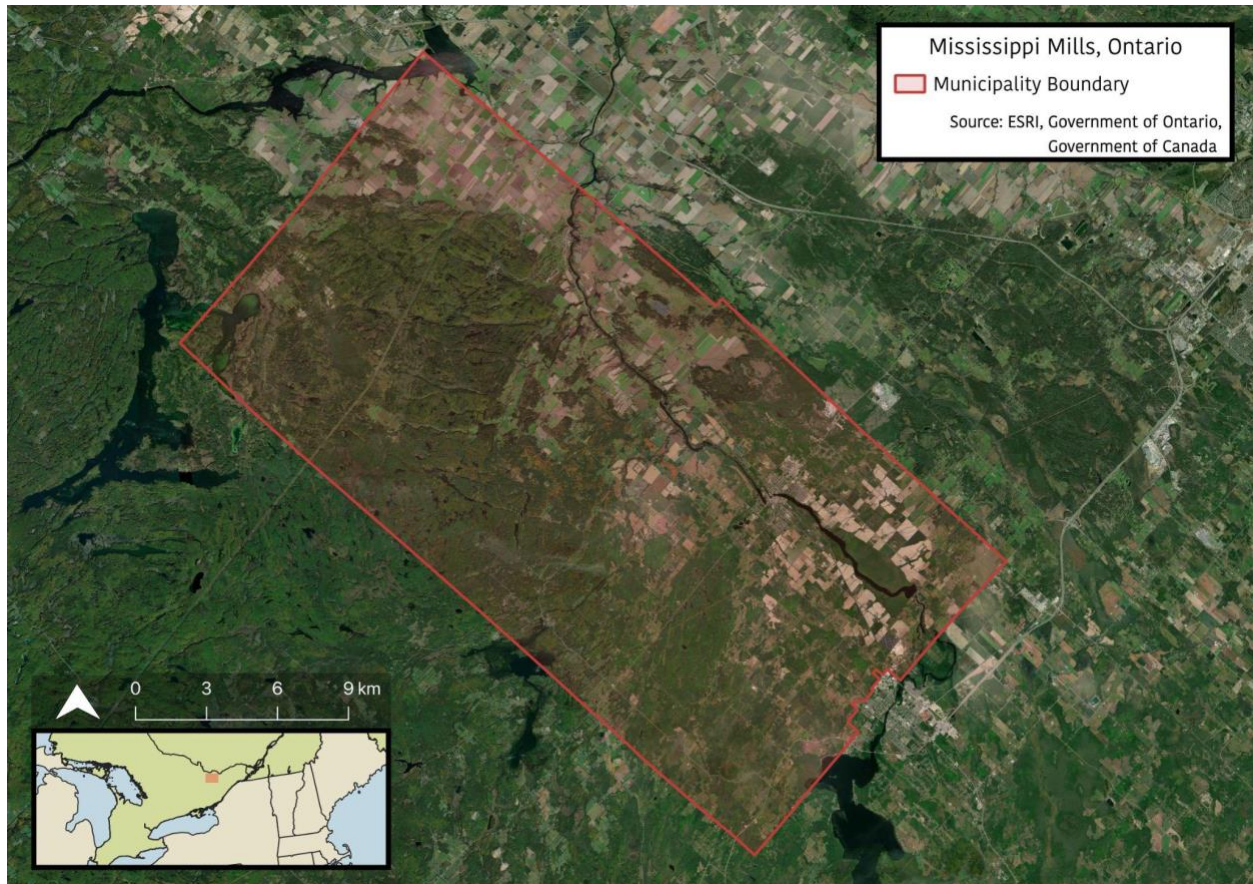
Figure 10: Satellite map of the Municipality of Mississippi Mills boundary in Ontario, Canada [Data sources: ESRI, Government of Ontario, Government of Canada]

The Municipality of Mississippi Mills is a Canadian community consisting of large rural areas, four small village centers, and one small urban area. Mississippi Mills has a growing population of residents seeking rural lifestyles within an easy commuting distance of Ottawa, the country's capital.

As part of its *Comprehensive Transportation Master Plan* (CTMP), Mississippi Mills produced an *Active Transportation Plan* in 2015. Both plans were prepared by Dillon Consulting. The AT Plan aims to make cycling and walking easier, whether for recreational, utilitarian, or tourism purposes. It focuses on municipal and county roads, as private land is not considered for projects. The Plan has the following objectives (2):

1. Conduct a needs assessment by reviewing existing facilities and consulting with stakeholders.
2. Develop a prioritized list of achievable, impactful, and cost-effective recommendations.
3. Include action items to create a safe and accessible environment for people of all ages and abilities.

The Plan seems highly motivated from a human health point of view, but it also mentions the economic and environmental benefits of AT. For instance, the Municipality shows an interest

in celebrating the community's history and promoting local tourism. The Municipality has been invested in AT since at least 2006 when it encouraged a balanced and connected transportation system in the *Official Plan.* Lanark County, which encompasses Mississippi Mills, already recommends paving shoulders when rehabilitating roads and designating bike lanes in urban areas. Additionally, there is an existing trail that connects to Mississippi Mills from Ottawa (9).

In the review of existing facilities within the Municipality, the Plan notes that formal infrastructure is minimal, yet the AT culture is strong. For instance, the Municipality holds a Bicycle Month every year to promote cycling (9). Community engagement revealed a strong desire for more investment in this area (6). 65% of respondents to a 2014 survey said that they would be willing to see an increase in municipal taxes to support this investment (10). The same survey found that residents are most likely to choose to walk when the route has sidewalks, crosswalks, and/or off-street alternative paths (7). Similarly, residents are most likely to cycle if there are paved shoulders, bike lanes, and/or bike parking (8). The Municipality currently only maintains a single, 700m stretch of bike lane. The key issues identified throughout the study process include but are not limited to:
1. Network discontinuity
2. Lack of rest locations
3. Lack of winter sidewalk maintenance
4. Lack of crossings
5. Lack of cycling infrastructure safe enough for children

Given the priorities of the community, the Municipality's vision is for it to be "easy for people to choose active modes in favour of their private automobiles." (13) Furthermore, the goal is to improve AT connectivity and create an even more AT-friendly environment, not necessarily to restrict the use of motor vehicles. To become a regional recreational destination, connectivity should both connect communities within the Municipality and reach beyond its borders. Proposed potential solutions include the following (15-16):
1. Require existing sidewalks to connect directly to new development.
2. Design crosswalks that minimize the amount of time pedestrians spend on roadways.
3. Provide sidewalks around schools.
4. Use programs such as a Walking School Bus to promote students' physical activity.
5. Require pathways within subdivisions to minimize circuitous pedestrian routes.
6. Provide rest amenities at key locations.
7. Update the winter maintenance policy.
8. Provide bicycle parking and encourage businesses to do so as well.

In a breakdown of types of AT infrastructure, greenways are not mentioned. The closest replacement is multi-use paths, which occasionally have their own rights-of-way (17). Path recommendations were designed based on stakeholder-identified points of interest (19). The Plan recommends that a "Warranted Sidewalk Program" is implemented. This program would score proposed facilities so that funding can be allocated appropriately year by year. As for cycling infrastructure, it is recommended that proposed facilities be included in roadway resurfacing projects. For proposed facilities that do not overlap with upcoming roadway maintenance, additional funding should be investigated.

The Plan recommends that an AT Advisory Committee be established (32). This committee should include stakeholders from school representatives to leaders of the bicycle community to youth and seniors. Potential responsibilities of the committee include setting annual targets, providing comments on new developments, developing indicators to measure progress, and periodically assessing the need to revise the AT Plan.

The Plan includes an extensive list of policies that should be implemented to operationalize the AT Plan. These policies include (33-36):

1. Update the Community Official Plan's transportation policies to reflect the goals and vision presented in the AT Plan. The Community Official Plan is important for guiding land use and development decisions. Updates should include the following:
   a. Formal recognition of the benefits of AT.
   b. Support for pedestrian connectivity.
   c. Guidelines for new development network connections.
   d. Accessibility and street lighting policies.
2. Include accessibility in future infrastructure projects.
3. Update the Winter Maintenance Policy. All pedestrian facilities and other strategic AT facilities should be cleared in the winter. Prioritization includes arterial roadways, collector roadways, links to community facilities, and facilities within a certain radius of schools.
4. Develop a street lighting policy.
5. Develop a budget for AT improvements.
6. Work with the county to improve the AT network. Many of the proposed upgrades are on county roadways. Additionally, they could assist with acquiring and converting a rail line to a multi-use trail.

Beyond infrastructural improvements, educational programming is offered as a necessary tool for implementation. Education is important both for encouraging folks to choose AT and promoting awareness among motorists. Strategies include the following (37):

1. Develop online fact sheets about safety concerns and local destinations.
2. Work with the health department to provide resources on health benefits.
3. Work with schools to communicate safe walking practices, potentially through a Walking School Bus program.
4. Increase driver awareness through signage and campaigns.
5. Support groups that already provide educational programs.
6. Host "Cycling 101" classes.
7. Enlist "AT ambassadors" to work in their own communities.
8. Encourage AT during local festivals and events.

Finally, potential funding sources are offered (37-38). These include national funds, county funds, non-profit organizations, local business donations, charitable events, and developer contributions. Additionally, the Plan mentions parkland dedication as a way to raise money for facilities such as linear parks.

Figure 11: Long-distance connections proposed in Mississippi Mills, Ontario [Source: Municipality of Mississippi Mills Active Transportation Plan]

Summary

This plan aims to develop an AT network that reflects many community members' appreciation of walking and cycling. It does this by proposing policies to enhance infrastructure and programs to reduce animosity between motorists and AT users. Community engagement in this project included a survey and partnerships with existing AT community/advocacy groups. The Plan even proposes that an AT advisory committee be established to set AT goals and metrics to measure progress.

Takeaways

The Active Transportation (AT) plans explored in this chapter were very similar, but each had its own strengths relative to Spring Hill, TN. Apex, NC was the most similar. Both Spring Hill and Apex are experiencing extreme population growth that has misaligned transportation investment and the frequency of new development. Additionally, both highly value their "small town feel" despite their still growing populations. Jefferson County, AL offered important insights into AT development on unincorporated land surrounding a larger city (in this case, Birmingham). Spring Hill should partner with its encompassing counties to take a similar regional approach. There are many people living just beyond the city limits of Spring Hill who use the infrastructure daily. Finally, Mississippi Mills, Canada names an interest in tourism. While Mississippi Mills is nature-focused and Spring Hill is history-focused, the Plan still offers lessons in connectivity to key locations for the sake of visitors.

The similarities among the AT plans reveal some implementation best practices. All of the AT plans included public involvement in their methodologies, though the extent to which feedback was integrated varied. Similarly, the Plans emphasized the importance of social programs to promote an AT-friendly culture. This type of programming is critical not only for reducing animosity between AT users and motorists but also for encouraging motorists to utilize AT when they can. The role of recreation is a powerful tool for the latter mission. An AT network that is attractive for recreational purposes will draw people in, and a well-connected AT network will keep people coming back more regularly.

One plan that truly embodied the importance of community engagement is the Municipality of Mississippi Mills. This Plan directly acknowledges and celebrates existing community efforts to expand AT. The infrastructural recommendations proposed are incremental, but educational and social campaigns are immediate. The Plan specifically lifts up AT advocates in the community and advises the Municipality of Mississippi Mills to support those people.

Another similarity is that none of the plans seem to go into detail about greenway placement decisions. For example, Jefferson County provided a detailed breakdown of AT separation/protection levels based on vehicle volumes and speeds but did not explore any design choices for proposed greenways. Greenways are generally proposed opportunistically when there is a railway or public land available. Mississippi Mills does not even include greenways, only a single multi-use path.

For the most part, all of the plans operationalize network implementation using policy recommendations that require private development and public roadway maintenance to include AT facilities. This is except for Mississippi Mills which focuses on regular road maintenance with some supplementary opportunities on high-priority segments. It is common among these plans to recommend that new development is required to connect to the existing network.

Unexpectedly, none of the plans directly explored the topic of private land constraining AT facility development opportunities. However, all of the plans discuss funding availability as a significant constraint. Generally, federal funds are positioned as the most common and most attractive source of funding. Other funding opportunities include public-private partnerships and local tax increases.

Finally, none of the plans seem to directly name a measure of success. Instead, they provide a prioritized list of project recommendations and say that they will revisit the plan in a few years to recalibrate. The closest mention is in the Mississippi Mills Plan, which recommends that an advisory committee be established with the potential responsibility of setting success indicators. Ultimately, these Plans are reference documents produced to guide implementors and to prove a government's commitment to diversifying its transportation system.

In conclusion, greenway placement is usually opportunistic (i.e., a rail corridor or large park already exists), but once recreational facilities are placed, their presence will warrant utilitarian connections. School zones are highly prioritized for AT facilities. Infrastructure, policy-making, and social programs must go hand in hand for a successful network. Partnerships are crucial for implementation.

Chapter 4: Interviews

I interviewed sixteen professionals about their perceptions of walkability and pedestrian infrastructure in Spring Hill. The one-on-one interviews were each about an hour long and conducted over Zoom. In one exception, the interviewee responded to several questions over email. Interviewees included city staff, a city consultant, elected officials, appointed officials, and members of the local private development community. The names and roles of interviewees on the public sector side can be found below. The three private sector interviewees included a developer, an engineer who works with developers, and a landscape architect who works with developers. In no particular order, these interviewees will be referred to as D/C 1, D/C 2, and D/C 3, for "Developer/Consultant."

Name	Title
William Ballard	Planning Commissioner
Gerald Bolden	On-Call Traffic Consultant from The Corradino Group
Pam Caskie	City Administrator
Jason Cox	Alderman, Transportation Advisory Committee Chairman and BOMA Rep
Matt Fitterer	Alderman, Budget & Finance Advisory Committee Chairman, Planning Commission Mayoral Designee
James Golias	Planning Commissioner, Transportation Advisory Committee Vice-Chairman and PC Rep
Jim Hagaman	Mayor, Board of Zoning Appeals BOMA Rep
Dwayne Hicks	Interim Development Services Director, Chief Building Official
Lance Holdorf	City Engineer
Jackson Reid	Associate Planner
Tyler Scroggins	Public Works Director
Missy Stahl	Capital Improvement Project Director
Kayce Williams	Parks and Recreation Director

Table 2: Municipal interviewees

What does Spring Hill mean by walkability?

Walkability is a stated goal for Spring Hill. The Bicycle and Greenway Plan (BGP) vision statement is "Create an easy and safe environment to travel by foot and bicycle in and around the City of Spring Hill." Spring Hill Rising 2040, the comprehensive plan, lists the following as a primary transportation issue: "Many streets, especially those primary roads like US 31, are unsafe for pedestrians and bicycles and need enhancements to provide safety." Additionally, Rising 2040 lists the following as a primary opportunity for land use and community character: "Future developments within Spring Hill should focus on supporting and integrating multi-modal transportation options (examples include integration of sidewalks, bicycle lanes, bicycle paths, multi-use paths, and greenways)." Elected officials adopted both of these documents, indicating that the ability to walk and bike safely is a priority for Spring Hill.

The BGP addresses greenways, multi-use trails (MUTs), and bike lanes (Figure 12-Figure 14) but not sidewalks. This is indicative of an apparent division over whether walking is considered recreational. City Administrator Caskie described these as two different categories of pedestrian infrastructure: "recreational" (multi-use trails and greenways) and "commercial" (sidewalks). She said that ultimately, "They should work in concert to get you anywhere you want to go in the city." Public Works Director Scroggins echoed this divide with slightly different logic, "When I hear greenways, I think of long connectivity, not through homes and businesses, but often with parks or city facilities. Sidewalks are usually used for people in that community, not from other communities." Clearly, city staff understand that sidewalks and greenways are both important for walking, but existing classification and semantics create barriers to unified planning.

Figure 12: Bike lane on Campbell Station Parkway

Multi-Use Trail on Duplex Road

"A trail that is physically separated from motor vehicle traffic by an open space or barrier and either within a right-of-way or a public easement that may be used by bicyclists, pedestrians, joggers, or other non-motorized travelers." - Bicycle and Greenway Plan 2021

Imagery date: 4/2023
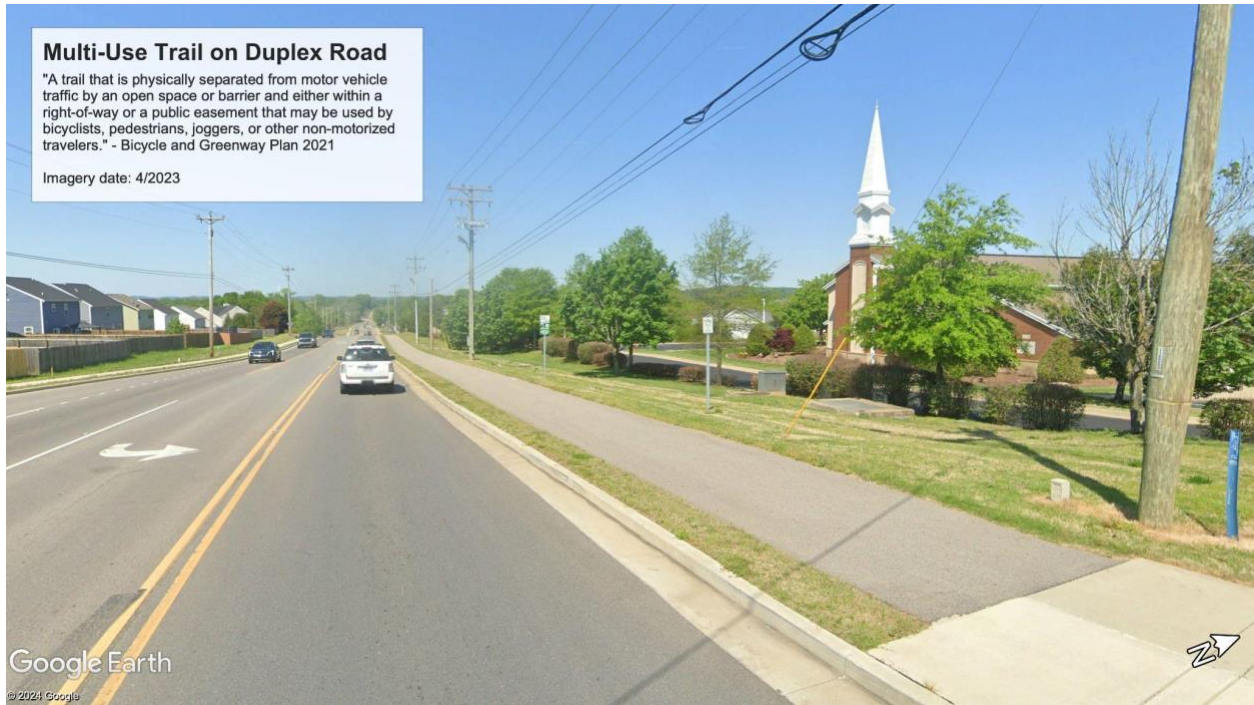
Figure 13: Multi-use trail on Duplex Road

Greenway on Friendship Drive

"A linear area maintained as open space in order to conserve natural and cultural resources and to provide recreational opportunities. Greenways also typically are used as linkages to tie a City's Park System together. They usually provide separation that can benefit pedestrians and/or cyclists, who may be made uncomfortable directly interacting with automobile traffic, particularly if the auto traffic flows at a high rate of speed." - Bicycle and Greenway Plan 2021

Imagery date: 1/2022

Figure 14: Greenway on Friendship Drive

Spring Hill has an adopted vision of walkability, but the implementation is divided between departments based on the type of infrastructure. The Parks and Recreation Department primarily oversees BGP infrastructure (viewed as recreational), and the Public Works Department primarily oversees sidewalks. Alderman Cox sees the Planning Commission

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as the bridge over that gap because it looks at existing infrastructure and requires connections that address overarching goals. Parks and Recreation Director Williams intends to include sidewalks in the next BGP update because the presence of a safe place to walk matters more than the specific type of infrastructure. Spring Hill views walkability as safe and easy pedestrian access, and the implementation of that vision is shared between departments and commissions across the city.

The impact of land use patterns

"The more walkways and bikeways we have, that helps cut down on traffic on the roadways," according to Interim Development Director Hicks. This is a powerful sentiment, and it is generally true. A limiting factor for transportation mode shift in Spring Hill is that separated land uses make it feel like there is nowhere to walk to. Scroggins said, "When you have walkability, you're trying to get somewhere. I don't think that's your neighbor. I think you're going to a business to get something." Nearly every interviewee touched on this issue. CIP Manager Stahl said, "[A walkability barrier] is that a lot of the [commercial] things are on Main Street, which doesn't have a sidewalk. It's hard for people to get to the restaurants and Walmart. Where the commercial is, there isn't residential right next to it." Similarly, Transportation Consultant Bolden stated, "It's not conducive to a lot of pedestrian activity, for someone to walk from their neighborhood over to the Walmart, the grocery store, or downtown… There's really nowhere to walk except within your neighborhood." Caskie called the development pattern of separated land uses typical of 1970s suburbs an "epic fail." She continued, "Now we are trying to fix it, but it's not going to be easy. It's going to be a challenge because we have such densely settled residential that there's really no place to go when you go walking…The way that things work now will get us to a better place, but it won't change the basic structure of how the city was constructed. That's going to take a century to change." There is broad agreement in the city government that the current land use patterns are a barrier to improved walkability in Spring Hill, but it is still difficult to make meaningful changes.

While the city does have the future land use plan, Spring Hill Rising 2040, sometimes its mixed land use recommendations are set aside when a development application matches the existing character of an area. Hicks said, "We really need an overall future plan, and we're working on that currently, that would show all of the greenways, walkways, bikeways, future zoning the way we think it should be, future roadways, and the width of those roadways. Instead of referencing three or four documents, we would only reference one…It's a livable document. It changes regularly based on somebody coming in and deciding to develop a lot that our future plan called for to be one thing, but it fits perfectly with the items around it. We have to go back and forth with those." This raises the question of whether the land use plan is serving its intended purpose. Mayor Hagaman said, "As time goes on, documents need to be altered because they are out of date…Every so often, we vet the status of the document."

Walkability and mixed land uses are stated goals for Spring Hill, and voting boards have been faced with proposed developments that didn't conform to the future land use plan because they matched the existing surroundings. Density and mixed land uses promote walkability, and vice versa. Spring Hill must stay true to its adopted master planning documents to ensure progress.

Why does it matter?

Interviewees had a range of perspectives on why improving walkability is important. Mayor Hagaman emphasized the health benefits when he said, "I'm kind of a green guy. I would rather a person be walking around than driving a car. I'd rather a person be outside working in the yard or playing ball than playing video games on TV because it's healthy. I think when the city makes provisions for walkability and green space in general, that helps the citizens achieve that healthy lifestyle." Hicks highlighted the traffic mitigation benefits of allowing people to walk between businesses. According to Bolden, "[Walkability] is an important component to the livability of a city, especially as Spring Hill continues to grow and focus on not being a bedroom community."

One of the most common themes was historical preservation for tourism and community building. Mayor Hagaman explained that Spring Hill is the site of important Civil War history and the city has several properties recognized as historically significant (City of Spring Hill, "Historically Significant Properties"). Hicks thought, "It would be neat to have trailheads at different historical locations and a self-guided map with QR codes that tell you about where you're at and where to go next." According to Williams, marking historic places has always been a goal of the greenway system. Integrating local history into the greenway system is both an opportunity to make Spring Hill a tourist destination and a tool for strengthening residents' sense of community. Mayor Hagaman highlighted walkability improvements as reasons to love the city. Williams emphasized the importance of giving residents a reason to love Spring Hill. She said, "When people go out and enjoy a place, whether it's a park or a greenway, I think they appreciate their surroundings and that serenity and they become protective of it. I think it comes back as a benefit for the city that people care about where they live and it makes them more invested. Now we've built a partner between city government and the community that everyone talks about that they want. The only way to do that is to get them to fall in love with their place." It is difficult to fall in love with a place from the bubble of your vehicle. Making it safer, easier, and more fun for residents to walk around town will allow people to meet each other, make connections, and strengthen the city's social fabric. It is encouraging to see that city officials believe in walkability and are pursuing the benefits.

Existing walkability improvement strategy

Hicks said, "We are the Planning Department. If we don't plan today for the future, it won't happen five to ten years from now. We have to think way ahead about walkable spaces, biking spaces, and methods of transportation other than jumping in your car and driving across town…We look at how Spring Hill is expected to grow and in some of those congested areas where we are having more growth, we're trying to put in walkways and bikeways." The city's approach to improving pedestrian connectivity appears to be threefold. Firstly, when new development happens in Spring Hill, the applications undergo a technical review by all municipal departments. In this process, the Development Services Department and Parks and Recreation Department ensure that each application includes plans to build the pedestrian infrastructure required by the Unified Development Code (UDC) and the BGP. Secondly, the Board of Mayor and Aldermen (BOMA) funds the Neighborhood Sidewalk Program, which allows Spring Hill residents to apply for new sidewalks and pedestrian safety improvements. The Public Works

Department, the Capital Improvements Department, and the Transportation Advisory Committee jointly operate this program. Finally, the Parks and Recreation Department pursues grants to fund sections of the BGP. Grants occur sporadically, and there are currently no dedicated funds for BGP implementation. It is promising that Spring Hill is approaching walkability improvements from several angles.

Developer contributions

When new developments are proposed, developers must adhere to the UDC and the BGP, where applicable. For instance, if a developing parcel intersects with a proposed greenway on the BGP, the developer must either include the infrastructure or work with city staff on an acceptable alternative. In this way, the city ensures that new developments comply with the vision and adopted plans to develop walkability in Spring Hill. As Hicks put it, "[Developers] are trying to build a subdivision or a site as cheap as possible, but at the same time, we want to make sure it's what the needs of Spring Hill will be for today and for tomorrow."

Tradeoffs between types of pedestrian infrastructure

Sometimes, the development community questions the city's requirements. D/C 1 was not convinced that MUTs are always worth the expense compared to sidewalks because their width is comparable to lanes of traffic. He said, "I've been surprised by Duplex. The MUT there has gotten utilized. But from my own selfish perspective and Spring Hill's traffic woes, my thought is usually 'You could fit an entire other lane there. Would it be better served to alleviate traffic farther with an additional lane?'" He recognized that kids can ride their bikes more easily on MUTs but argued that he would be scared for his kids to do so alongside a main road, where MUTs are usually located. D/C 3 thought the resistance to MUT width was short-sighted. He said, "The finished product could be very nice. [If you see] Shelby Bottoms [in Nashville], there are a ton of people on that trail walking and biking. You need that space, in my opinion. If it's a heavily used trail, it's the appropriate size. I think getting people to have the vision of what it could be and why it may be important to build that [wide] takes a little bit of education."

It is true that MUTs are more expensive to build than sidewalks. Asphalt, used for MUTs, can be cheaper than concrete, used for sidewalks, but MUTs are usually twice as wide as sidewalks. D/C 3 said that the cost per linear foot is higher for MUTs, and the costs really start to add up when you account for grading and stream crossings. D/C 2 claimed that walking trails are still one of the least expensive amenities to provide, and most developers are interested in trail networks despite the absolute cost. Additionally, pedestrian infrastructure improvement costs pale in comparison to car traffic improvement costs. D/C 2 claimed that developers in Middle Tennessee generally understand and accept that they must pay to mitigate the traffic impacts of their developments. The fact that pedestrian improvements are still contested despite their comparatively low costs suggests that walkability is not yet considered necessary for the success of a development.

One thing that MUTs provide which sidewalks cannot is space for cyclists. When the BGP calls for a MUT, the city is essentially planning for both bike and pedestrian traffic. Therefore, by comparing sidewalks and MUTs for walkability, the entire dimension of cyclist

benefit is lost in the discussion. A more appropriate conversation would compare MUTs with the combination of a sidewalk and a bike lane. Alderman Cox liked that having both a sidewalk and an MUT provides users with choice and variety. Now that a significant length of MUT has been built on Duplex Road, there is an opportunity to reassess whether people are walking and cycling as much as expected. Alderman Fitterer claimed to see far more cyclists on MUTs than actual bike lanes. Commissioner Golias wondered whether MUTs might make more sense than bike lanes in Spring Hill. Unprotected bike lanes create a high degree of traffic stress compared to other forms of bike infrastructure, deterring potential bicycle users (Furth, 2008). So far, exceptions to the BGP favoring MUTs have occurred on a case-by-case basis. Parks Director Williams recently accepted a proposed MUT over the bike lane and sidewalk combination required by the BGP and UDC. She also acknowledged that it is time for a BGP update in the next couple of years, so it is possible that a preference for MUTs over sidewalks and bike lanes could be made official soon.

Some interviewees expressed concerns about the safety of bike lanes. D/C 1 is a cyclist who usually opts to ride in the car lane even when a bike lane is available because the bike lanes can collect dangerous debris. Commissioner Ballard has noticed that many of the roads in Spring Hill lack a shoulder which could make bike lanes scarier to use. He said, "Where I grew up, there were shoulders so that you had places to bail out to if you had to." In the case of recreational users, D/C 3 felt that cyclists would not want to stop at all of the signalized intersections in town, diminishing their potential for recreational use.

Despite the downsides, there is still a place for bike lanes in Spring Hill. According to Alderman Fitterer, one unexpected benefit of bike lanes is that they make drivers perceive the road as narrower, which slows them down. Regarding a section of Buckner Lane near the Port Royal Road intersection, he said, "We installed bike lanes which effectively narrowed the car lanes and the average speeds dropped like two and a half miles an hour instantaneously and have stayed down ever since." However, Scroggins disagreed with this idea. His perspective was that unprotected bike lanes are nothing more than paint, so they don't actually slow anyone down. The presence of bike lanes can slow traffic, but the impact is minimal for unprotected bike lanes (Younes et al. 2024). On existing streets that are too narrow to build an MUT, bike lanes are a great opportunity to repurpose excess lane width for multimodal capacity.

Flexibility in BGP implementation

Spring Hill's Bicycle and Greenway Plan is a conceptual, not just prescriptive, document. Parks Director Williams, who oversees the BGP, stated that she is willing to be flexible on materials and exact routes due to topographical limitations. The BGP identifies attractors and generators of pedestrian traffic across town and proposes routes to connect them. For Williams, "My mindset is always: just give me a way to get from here to there where it doesn't take a car." Alderman Fitterer echoed this sentiment, "It's easy to draw a line on a paper…then you get out there and run into the real world, and you've got to adjust. One of the trickier parts is, how do you adjust and meet the intent of the policy?" D/C 2 said, "They've been very willing to think about higher-level goals of connectivity, but the specific route is variable…They've given us the latitude to make some logical adjustments."

Figure 15: MUT on Lewisburg Pike

Figure 16: Street view of MUT on Lewisburg Pike

Williams is not the only city staff person who works flexibly with developers. In D/C 3's experience, Williams' role is to point out that there is a plan and make sure it is shown. He said, "But in terms of how it gets built, she totally defers to engineering, more so than planning." The engineering team in the Development Services Department has the technical knowledge to assess the specific placement of infrastructure. Additionally, Public Works Director Scroggins

argued, "I know what's in the field currently, and I notice when things coming in aren't doable. If you don't physically go look at what you're tying into, there are always gaps. All the time, I see new developments unable to connect to existing infrastructure because whoever built it stopped short because of an obstacle. Then you end up with space that never gets tied in."

D/C 3 had worked with staff in the past who were not willing to deviate from the BGP and appreciates the city's current flexibility. All three developers shared a desire for continued collaboration with city staff. D/C 1 shared a local example of an MUT that would have benefited from more flexibility in the planning process. About 5 miles away from Spring Hill on Route 431, there is a new development fronted by an MUT roughly 800 feet long (Figure 15-Figure 16). The nearest MUT section on Route 431 is about a mile north as there is minimal new development in the area. D/C 1 understood that developments will fill in over time, but he was concerned that when the time comes, northward MUT connectivity will be impossible. An existing adjacent neighborhood features a retaining pond stretching alongside the road and no pedestrian frontage. D/C 1 asked, "I am 100% in favor of walkability, but where you have geographic limitations, does it make sense? Would that [investment] be better utilized in a different area where it would be easier to connect things?" The ability to be flexible when implementing the BGP is appreciated by all stakeholders.

Fees-in-lieu-of

Developers can request to pay a fee-in-lieu-of to the city instead of building a certain piece of infrastructure themselves. The idea is that the city will complete the project itself at a later date. Sometimes this makes sense–if a road is slated to be widened in the next year, it would be a waste of money to install a brand-new sidewalk today. However, in many cases, these payments are requested because, if built, the required section of MUT, bike lane, or sidewalk would not connect to anything yet (Figure 17). Some staff members are more comfortable accepting fees-in-lieu-of than others. For example, Hicks said, "Now [developers] don't have to build something that looks kind of silly sometimes, 700 ft of sidewalk with no sidewalk within a half mile of either end of it…Then when the time comes, we can run that sidewalk and it's already paid for!" However, the general sentiment among interviewees was that fees-in-lieu-of should be avoided except in special circumstances. Alderman Fitterer thought that fees-in-lieu-of have created missed opportunities in the past, but he claims that the Planning Commission has gotten pretty good at rejecting requests for them. The Planning Commission recognizes that you have to start somewhere, and as more development occurs, disconnected pathways become part of the overall pedestrian network. Regarding disconnected pathways in residential areas, Alderman Fitterer said, "You're going to put residents in there. They can only walk a thousand feet in each direction, but I'd rather have that than nothing."

Fees-in-lieu-of have some limitations. Firstly, their success depends on the bookkeeping. According to Alderman Fitterer, the fees collected are not earmarked. This means that the money is lumped into the city's general fund and not guaranteed to be used for its intended purpose. Secondly, rising construction costs can make it such that the collected fee will no longer cover the project if the city waits too long. Additionally, D/C 3 claimed that "for a municipality to build a sidewalk, it does take two or three times more money than it does for a private developer to build it." He speculates that fees-in-lieu-of are often higher than developer costs partly because of a Tennessee law that requires municipalities to select designers based

on qualifications, not cost. Generally, fees-in-lieu-of seem to be an inefficient way to meet walkability goals, as they divert and dilute developer contributions to the pedestrian network.
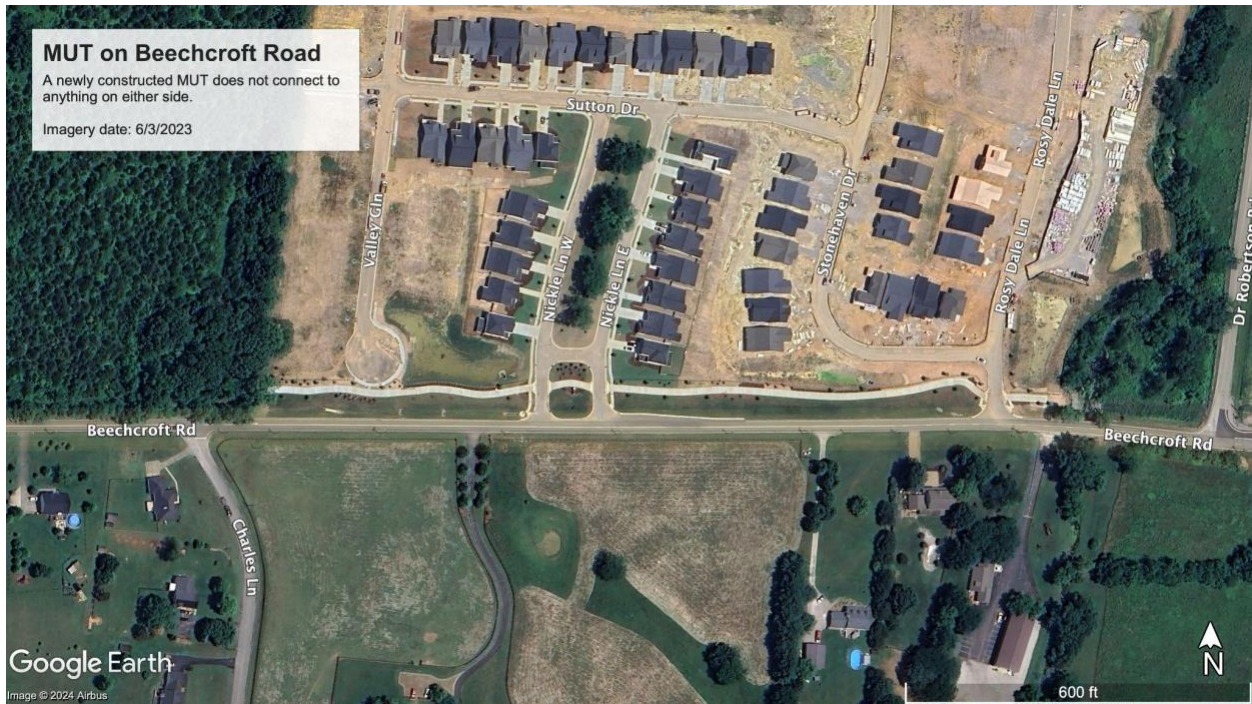
Figure 17: Example of an isolated MUT segment

Municipal contributions

Since the beginning of Spring Hill's rapid development, the city has improved at requiring new developments to include adequate pedestrian access. Commissioner Golias said, "Since I've been here, the city has done a good job of promoting the pedestrian in new developments… It is always a part of the conversation." However, gaps still exist within and between previously developed and unlikely-to-develop areas. "We're way behind, but I think we are shooting for adequate and excellent. I think the town has grown so fast that this is one item that wasn't 'on the front burner' early on when the town first started their big boom," said Hicks. Similarly, Caskie said, "This city grew in a generation and a half how something else grew in a century. Other cities grew over such long times, and the developers didn't build it all for them. They spent tax dollars over time to do a lot of this work. Now we are trying to do it all at once."

Road widening

Most of the major thoroughfares across town began as old country roads, so they are narrow and lack space for pedestrians. Caskie felt that those gaps should improve as those roads get widened. Indeed, road widening has successfully improved pedestrian connectivity in Spring Hill before. Duplex Road, an arterial road that used to lack consistent sidewalks, was recently widened and now features a popular MUT. However, the prospect of road widening can also slow down pedestrian improvements. No one wants to build a sidewalk that will eventually

be torn out, but some roads aren't expected to be widened for years. Road ownership also complicates things. CIP Director Stahl acknowledged that walkability in commercial areas isn't great, particularly on Main Street, but the city cannot put in sidewalks because it is a state road. Usually, road widening is associated with decreased pedestrian safety, but perhaps surprisingly, at times the opposite has been true in Spring Hill. Because many of the widened roads began without pedestrian infrastructure at all, investment in road widening provided an opportunity to fund walkability improvements. Spring Hill should continue to use these opportunities, ensuring that transportation improvements benefit more than just car users.

Neighborhood Sidewalk Program

The city has not always required developers to build sidewalks on both sides of the road, so several neighborhoods across town lack a safe place to walk. Bolden said, "[The presence of sidewalks] really depends on the area of town and its age… I think what it shows is the growth of the city over time." The city created a Neighborhood Sidewalk Program to build new sidewalks in old neighborhoods. Mayor Hagaman described, "When the city started developing, pedestrian connectivity was not part of the thought process. We have taken a stance to be proactive in setting aside a bucket of money to create sidewalks in neighborhoods without sidewalks to keep [residents] safe." Some interviewees also mentioned funding available for pedestrian safety improvements, but I couldn't find any information about it on the website, so I will focus on the NSP. The NSP streamlines the tedious capital improvement process to allow for the quick completion of relatively minor projects. Stahl said, "We have a concrete contractor so that we don't have to go bid it out. While city staff can submit NSP proposals, the program is intended to be accessed by homeowners' associations or self-organized groups of residents. Alderman Cox said, "Now we put it into the hands of the homeowners because some of them don't want it." No matter how compelling of a network gap, each proposal must show support from nearby residents, even though the sidewalks would be built in the city's right of way. Scroggins said that people will get upset if you start digging in their yard without permission. In cases of dead-end roads and cul-de-sacs, it makes sense to let homeowners have the final say. However, I think the city should be careful to consider whether a new sidewalk might have network effects that outweigh the preferences of a handful of residents.

Resistance from residents does not only affect the city's retroactive sidewalk efforts. D/C 2 said, "We sometimes struggle when a greenfield development is next to an existing development. [Our desire] is to continue trails to the edges of the property and potentially beyond, creating wider greenway networks…It is often not seen as a good thing to have new pedestrians wandering through this existing neighborhood…It is always tricky to introduce change into an existing development." Because true walkability requires a connected network, the success of new developments is limited by existing neighborhoods. D/C 1 described neighborhoods with brand-new MUTs and major connectivity gaps because sidewalk-lacking neighborhoods sat between them and commercial areas. D/C 3 echoed that Spring Hill won't be able to connect through existing streets if the city doesn't do it itself.

Grants

Grants are one way for the city to fund BGP projects. Alderman Fitterer said, "Unless we are willing to increase revenues to fund things, there's just limited funding to go around. A two-million-dollar walking trail where you can get 1.6 of it funded through a grant is a lot better financial deal than coming up with two million bucks on your own. Now, there are downsides to grants. You trigger NEPA requirements and some additional strings and reviews you have to work through, but that's just a reflection and a reality of where we are with all of our capital needs." Alderman Cox shared that the city has people reaching out for grants because the government likes to see that you're creating a sustainable walking environment. He said, "There is money out there so that you're not putting the burden on your taxpayers." But Alderman Cox also acknowledges that the city can't just rely on grants. He said, "It takes so long to go through that process. There are cases where it makes sense to go after them, but in other cases, we as a city need to budget for it and take care of our citizens."

According to City Administrator Caskie, everything was paid for by developers and grants until recently. "The Buckner Lane project is probably one of the first things that we actually funded with taxpayer dollars. We've been heavily dependent on other people doing things for us. It's not just greenways that we aren't prioritizing." When asked about grant alternatives, Alderman Fitterer said, "We could just fund [the BGP] out of the budget, but do you want me to click off all the other major needs that we have in town?... Unless we are willing to increase revenues to fund things, there's just limited funding to go around." Alderman Fitterer also noted that there are potential opportunities to leverage but not enough hours in the day to pursue them right now. Over time, the city could explore partnerships with school boards or historical trusts, for instance.

Williams seemed to place walkability improvements on the same priority level as traffic improvements when she said, "If we're going to help our own traffic problems and try to be a pedestrian-friendly city, this is basic infrastructure that you've just got to bite the bullet and pay for it and put it in." While a few interviewees shared this perspective, there is also hesitancy around funding the BGP from the budget because of competing priorities, such as expanding the police and fire departments, and a perception that taxes would need to be raised to pay for everything.

Recommendations

Put simply, the development community seeks to profit from building in Spring Hill, and the city tries to channel that investment into a desirable outcome for its residents. A high-quality development requires both parties because each has unique resources and expertise. D/C 2 said, "It would be a real challenge to try and solve [suburban walkability] only on the municipal side. It really needs to be a partnership of municipal policy and developer implementation." As D/C 3 put it, "The most successful designs are the ones that have collaboration between the developer and the city because the city [has its goals] but we don't have that sort of insight." The development community understands that the surrounding community informs good projects.

The city plays a major role in setting the standards. D/C 3 said, "If Spring Hill didn't have a walking plan, they wouldn't have a single walking path." Standards also keep the infrastructure

looking consistent across developments. Scroggins said, "Speaking from when I was a developer, the sidewalk is the last thing I'm really worried about. It's easy to forget that. That's where planning and engineering come in to verify that everything is lined up with what the codes say." Everyone follows the same code, so whatever is in the code is what gets built. This is especially important if the city wants to create a pedestrian network that feels cohesive to users. In some ways, the influence goes both directions. Alderman Fitterer said that requiring sidewalks on both sides of the street was "a very natural evolution of our code…The quality of development and construction in Spring Hill has risen over time, especially with the USTA development. You will continue to see the caliber of development increase, and then it's going to be demanded by the marketplace for amenities to match it." High-quality development raises the bar for city infrastructure as well.

Currently, most of the pedestrian infrastructure being built in the city is being installed by developers. D/C 3 said, "It seems like the philosophy of the city has been, 'Let's get developers to build what they can when they can,' and I do think that's the right approach because otherwise, nothing will ever happen." However, some in the development community want to see that the city contributes to the vision. D/C 3 said, "Nobody wants to build a sidewalk to nowhere, but if you're working in a municipality that is gonna collect fees and put those fees toward meaningful projects to make things connect, the mood changes considerably. Then, developers say 'I see the projects they've done around here. This could be nice. This could be an asset.'" He said developers just get a little frustrated when they have to build a sidewalk, but Spring Hill has barely spent anything to build their own sidewalks. The city likes the idea of walkability but has higher priorities for funding. The City is putting in effort, but it is mostly directed toward making sure the developers do their part. This requires staff to set good standards. Developers trust the city to indicate what it wants to look like and try to fit their developments into that vision. Yet, developers also want to see BGP buy-in from the city.

Paths of least resistance

It can be difficult to build support for municipal walkability improvement projects if the need is not obvious or urgent since there are many competing priorities for funding. The city needs visible successes to build up momentum. Caskie said, "Making [walkability] available is good, but no government wants to spend money for no benefit." Relatedly, Golias said, "I can definitely appreciate that the city has a vision and a plan…The hard part is that until you see something substantial, it's hard to appreciate all the planning that goes into it." Walkability improvements should be prioritized in areas with existing demand for safe access, such as mixed-use developments, school zones, and commercial areas. As walkable nodes are established, adjacent areas will likely begin to request safe connections into the walkable nodes. Thus, the walkable nodes could get larger with minimal resistance because the construction would not be considered pointless.

However, the city should not just wait until residents call about a lack of pedestrian safety. Demand can be predicted as part of the planning process for new developments and other projects. For example, the city is in the process of establishing the Harvey Park Greenway through a grant. The greenway will be 1.3 miles long, connecting a school, several neighborhoods, and a major retail area (City of Spring Hill, "Harvey Park Greenway Plan"). The city has a great opportunity to bolster walkability starting from each greenway access point.

Even before the greenway is built, city staff could set out on foot to identify gaps in the surrounding pedestrian network. Then, safety improvements could be made to ensure widespread access to the new greenway as soon as it opens. Such improvements will maximize the value of the city's investment in this greenway. The following sections explore additional examples of easily justifiable walkability improvements.

School zones

Walking to school is very desirable. It is a fun and healthy activity for kids, an opportunity for some adolescent independence, and a chance for parents to avoid lengthy pick-up lines. Several interviewees mentioned that low bus ridership has caused traffic jams around school drop-off and pick-up times. Safe, walkable nodes surrounding schools could ease transportation pressures by bringing students out of private vehicles. Pedestrian safety is always important, but the need is especially pronounced in school zones where young children may be walking.

When asked whether walking to school was common in Spring Hill, several interviewees talked about the handful of schools located in residential areas, such as Allendale Elementary and Longview Elementary. Stahl described the street near Longview as so full of pedestrians that drivers know to avoid that area at certain times of the day. Bolden thought these schools provided pockets of walkability but still had more potential. Similarly, Williams said, "If there were more routes to more neighborhoods that parents felt safe using, I think they would [walk to school more]." Caskie and D/C 3 weren't sure whether higher rates of walking to school were achievable because parents are too protective. To reveal and address parents' concerns, the city could partner with Maury County and Williamson County school boards to conduct a student transportation survey. Such a survey should ask, at a minimum, parents how their kid(s) usually gets to school, whether they have ever considered walking, and which factors influence their decision. Armed with this information, Spring Hill and the county school boards could create a Safe Routes to School plan that directly addresses stakeholder needs and provides clear steps for improvements.

Partnership with county school boards is crucial because of safety concerns around access to school property. D/C 2 said, "Schools are rightly very concerned about vehicular connections to their sites. They want them to be limited to drop-off and pick-up areas. [Additional connections] tend to create confusion and security concerns. Vehicular connections are very limited, which means there's an opportunity for pedestrian connections to adjacent developments." D/C 1 has worked on developments near schools and recalled close coordination with the school board to make sure they were ready for the traffic. Despite vehicular access getting most of the attention, pedestrian access still requires close collaboration. According to D/C 2, schools are "less concerned about pedestrian connections, but they just don't want them going all over the place. We tend to see one major trail that may go through a school site…and then there's obviously trails along the street, whether that's multi-use trails or sidewalks." Scroggins described a case where the school was uncomfortable with visitors coming to the school from more than one angle (Figure 18). He acknowledged, "You don't want a greenway coming into the back of a school where the playgrounds are." As a newer example, Spring Hill's Harvest Point subdivision provides direct pedestrian access to Spring Hill Middle School, which previously had no pedestrian access at all. Impactful

connections are possible, but they will require the city's vision, the developers' flexibility, and the school boards' cooperation.

Figure 18: Greenway on Callender Road that connects to Chapman's Retreat Elementary School

Mixed-use development

The city seems wary of bringing commercial uses into residential areas because some Spring Hill residents do not want an increase in foot traffic in their neighborhoods. However, according to Caskie, "More and more of the applications are coming as mixed development because more and more of the really high-end developers are seeing that mixed development creates a more vibrant community than the sterileness of the 70s suburb." Mixed-use developments that highlight walkability are being approved across town. Once built out, these developments will serve as walkable nodes that may prompt existing neighborhoods to desire a connection to the network. In Alderman Fitterer's experience, "I'm in a neighborhood that does not have sidewalks, but now that Buckner Lane is being redone with sidewalks and June Lake is being built with walking trails, we might get more opportunities soon."

As Spring Hill runs out of space for greenfield development, the playing field will naturally have to shift to infill development. Alderman Fitterer gave a reminder that the city's current land use patterns are not locked in. He said, "I always try to keep in mind that a site plan or a development proposal doesn't mean the property is going to be used like that forever. Things are going to redevelop." On the topic of redevelopment, D/C 2 said, "We've seen a trend of urbanizing suburban areas. Where you had commercial-only development, like big-box stores, they are finding opportunities [for infill]. What drives them a lot is parking because there are opportunities to share that parking with compatible uses. For example, residential and retail uses are not necessarily fully parked at the same time of day. There is an opportunity to add residential uses to what traditionally has been a commercial area…Suddenly you've got a much

more urban development pattern…You're starting to shorten vehicular trips and encourage pedestrian trips" Regarding his own experience with infill development, D/C 2 continued, "It takes a willing municipality because you have to rethink parking a little bit. Parking is surprisingly something that really drives what a parcel can be developed into." It is promising that Spring Hill has recently shown interest in rethinking its parking policies. Caskie said, "Frankly, I think one of the things that hurts us is parking minimums because it requires us to chew up a lot of landscape and separate people from the road. Maybe if we can get this country off of parking minimums, things will be easier. We're actually talking about it."

The opposite direction of redevelopment seems more challenging. On the topic of bringing commercial uses into residential areas, D/C 3 said, "In my professional opinion, in order to have walkability, you've gotta have density…The more people you have in a cluster, the more commercial things you can attract. A commercial business is interested in how many people live around here and whether they are served by the thing I want to offer them. If the answer is 'Wow, there's a lot of people here and they have to travel large distances,' then I want to put a store right there. Then everybody can walk." I agree with this perspective, but my concern is that without careful planning, no developer will be able to fit a store within a walkable distance of closely packed single-family residential developments. Unless land is set aside early, every acre will be covered with single-family homes, which are difficult to redevelop. In Spring Hill, most of the housing is built within HOA subdivisions, so it will not be possible to redevelop a single lot into a commercial structure in those places. Additionally, Spring Hill's voting boards may be reluctant to approve a commercial business amongst single-family housing given the risk of upsetting residents who may perceive that it would lower property values. Given that walkability is an adopted goal, it is worth figuring out how to get neighborhood buy-in for mixed-use infill development.

Commercial areas

The large retail centers in town could generate pedestrian traffic if they were more easily accessible. Main Street, also known as Highway 31, comes up a lot because it is notoriously congested and unwalkable. Reid noted that since there are lots of stores through there, putting in sidewalks when the road gets widened would improve walkability to the main hub of Spring Hill. Commissioner Golias noted that the excessive traffic might even make walkability more desirable in nearby neighborhoods. The biggest barrier to improving Main Street is that Highway 31 is a state road. Furthermore, it is only two lanes wide, and there is very little space available for widening.

While the city is looped in, the Tennessee Department of Transportation (TDOT) has the final say on what gets built. Commissioner Golias described a previous project that resulted in a lack of pedestrian infrastructure despite his requests. He said that when a commercial area went in next to the Crossing (Figure 19), "TDOT said, 'We do not want sidewalks on this road.'...Even when they did the traffic signal at that intersection, I actually said, 'Even if we don't have sidewalks, we should still do pedestrian push buttons so that people can get across.' And they said, 'We're not going to do it because TDOT's not even going to let us put sidewalks on Main Street.' We want a walkable area, and you've got to start somewhere, but when TDOT is telling you not to put sidewalks, how are you going to make it more walkable? I know it isn't a desirable area to walk around, but if you take your car to get work done or something, you could

go across to the bank or the pizza place. Without sidewalks, you don't even have that opportunity."

Figure 19: Intersection on Main Street with no sidewalks

Main Street is a long road with several distinct sections within city limits. The southernmost section, which includes the intersection that Golias mentioned, is up to five lanes wide and provides access to large retail centers. The middle section cuts through what is considered Spring Hill's downtown with two through lanes and a center turn lane. It provides access to several small commercial establishments, some with parking lots that feed directly onto Main Street. This is the only section with occasional sidewalk coverage. The northernmost section is two lanes wide with undulating turn lanes. It provides access to a wide variety of commercial establishments, primarily through parallel side streets.

The northernmost section of Main Street is proximate to many residential subdivisions, so this is what most interviewees were referring to when they expressed a desire for pedestrian access to Main Street. Because it is an arterial road, very few businesses have direct access to Main Street. While sidewalks along Highway 31 would provide excellent long-range pedestrian connectivity, this is the only way to provide safe pedestrian access to the retail hub. Fully connected sidewalks on and between the parallel side streets would be a massive improvement. While TDOT's collaboration will be necessary to achieve safe, signalized crossings across Main Street, the side street improvements could begin anytime. Even if TDOT does not end up allowing sidewalks alongside the highway itself, creating walkability in this area is possible.

Figure 20: Direct sidewalk connection from townhomes to Dollar General

Given the long distances between commercial and residential uses in Spring Hill, pedestrian connections should be made as direct and convenient as possible (Figure 20). Caskie said, "The closer we can bring pedestrians to the businesses, the better off we're going to be." Because most of the commercial buildings in Spring Hill have parking in the front, careful planning must go into a potential pedestrian's path from the sidewalk to the front door. Alderman Fitterer described assessing the pedestrian connectivity of a development application by looking for where it makes sense that pedestrians will come from and be going. He said, "Part of that is constrained within a site–it makes sense to get from the parking lot to the building entrance… Then I'll try to keep in mind the offsite things or nearby attractions…Instinctively to me, when you go into a hotel out of town, you're going to walk to dinner. So then it's back the other way. Can I get from the building entrance to these offsite destinations in a safe manner? A lot of times, it is solved through some pretty simple connections." It is helpful to imagine oneself attempting to access a site on foot. When you consider trying to get from the front door to an adjacent development rather than your car, there is potential to discover creative shortcuts that bypass parking lots altogether (Figure 21).

Figure 21: Possible shortcut from a proposed greenway to a commercial center

D/C 3 offered an excellent example of a retail area disconnected from its immediate surroundings. "Think about the Kroger on Port Royal, just north of Saturn Parkway. If you live even right next to that property, you still have to walk a pretty good way to get to the door of Kroger." Not only is it a long walk to Kroger from nearby neighborhoods, but it is also a very unsafe walk. There is currently no direct sidewalk connection, forcing pedestrians to choose between private property and dangerous proximity to a high-traffic road (Figure 22-Figure 23). Alderman Cox, who lives in a nearby subdivision, has been working toward filling this gap for years. He said, "We're driving a project right now to try to buy the sliver of land across four homeowner properties so that we can do the sidewalk without destroying the existing tree line." When the project went before BOMA this year, one resident urged the board to support the project because he had almost hit someone with his car there once. A child was walking below the trees, tripped, and fell into the road. Some residents will walk whether or not there is a sidewalk. The city has a responsibility to search for risky areas and fix them.

One existing improvement of a commercial area is the Town Center Redevelopment. The city established a committee to investigate the possibility of revitalizing the old downtown. The committee has recently completed its analysis and stakeholder engagement and is working toward a plan that BOMA could adopt as policy. Interestingly, the committee pointed out a nearby private, mixed-use development as part of the future town center. The rest of the project largely falls under the responsibility of the city. It has a strong focus on walkability improvements and historic preservation, and I think it is an excellent direction for the city.

Figure 22: Sidewalk gap on Buckner Lane

Figure 23: Street view of sidewalk gap on Buckner Lane

Tools for improvement

Strengthening the NSP

The city could begin to generate momentum for walkability improvements by better leveraging existing programs, such as the NSP. A limitation of the NSP is that the program largely places responsibility on homeowners to take action. Beyond this resident-level initiation, the city should also take a more thorough approach to identifying gaps and closing them across town. Ultimately, every pedestrian is a car off the road. The city should prioritize pedestrian connectivity as a part of its congestion remediation strategy.

The city should consider an amendment to the NSP that allows for improvements to be completed without a petition if the connection will serve an outsized number of residents. In the case of dead-end roads, especially cul-de-sacs, the city should continue to leave it up to residents. However, I think it is worth investigating whether any residential road segments without sidewalks limit the safe pedestrian access of adjacent neighborhoods. Given previous experience with residents resisting walkability improvements, communication is crucial. Residents whose yards are affected should always be contacted well in advance of construction beginning. Communicate that the project is proposed within the city's right of way. Emphasize how many children will benefit from the connectivity if there is a school nearby. Provide maps of the pedestrian network that the residents themselves will soon benefit from.

BGP implementation fund

The city does not have a systematic approach to implementing the BGP. Two related obstacles to progress are the lack of city property and regular funding. Caskie stated, "The problem [with the BGP] is that what [land] we don't own, we have to go buy. That's where it gets trickier because you're often in people's backyards or HOA public space." (Figure 24). As mentioned, implementation currently happens through developer contributions and grants. Williams suggested a potential way forward. She said, "A lot of people have owned their land for generations, and they may never sell it. So it may not ever develop and there's always going to be a broken part [of pedestrian infrastructure]. If we had a war chest we could go to, we could say, 'How do you feel about us buying twelve feet through there to let people walk? We have the money to do it.'" The city should investigate opportunities to establish a fund to build the bicycle and greenway network it adopted.

A new developer fee could be one source of funding. Williams said, "It's our responsibility to provide a good quality of life, and [a fee] would help us do that and have more offerings." D/C 2 did not immediately object to the suggestion of a new fee. He said, "I could see where the idea of development paying for additional trails or connecting trails has some logic to it. Maybe there's a gap nearby and some impact fee would help make that connection." D/C 1 wanted clarity on the details of such an arrangement. He said, "I am always interested in where our responsibility ends and where the city's responsibility starts. Our fear with more requirements is that it will raise our cost of development. That's okay as long as there is benefit from it. If it doesn't increase the amount of people who want to come to our neighborhoods, there is some tension…I would like to see a clearer demarcation of where we stop versus what comes out of the city's general fund or sidewalk fund." Clearly, there is an opportunity to

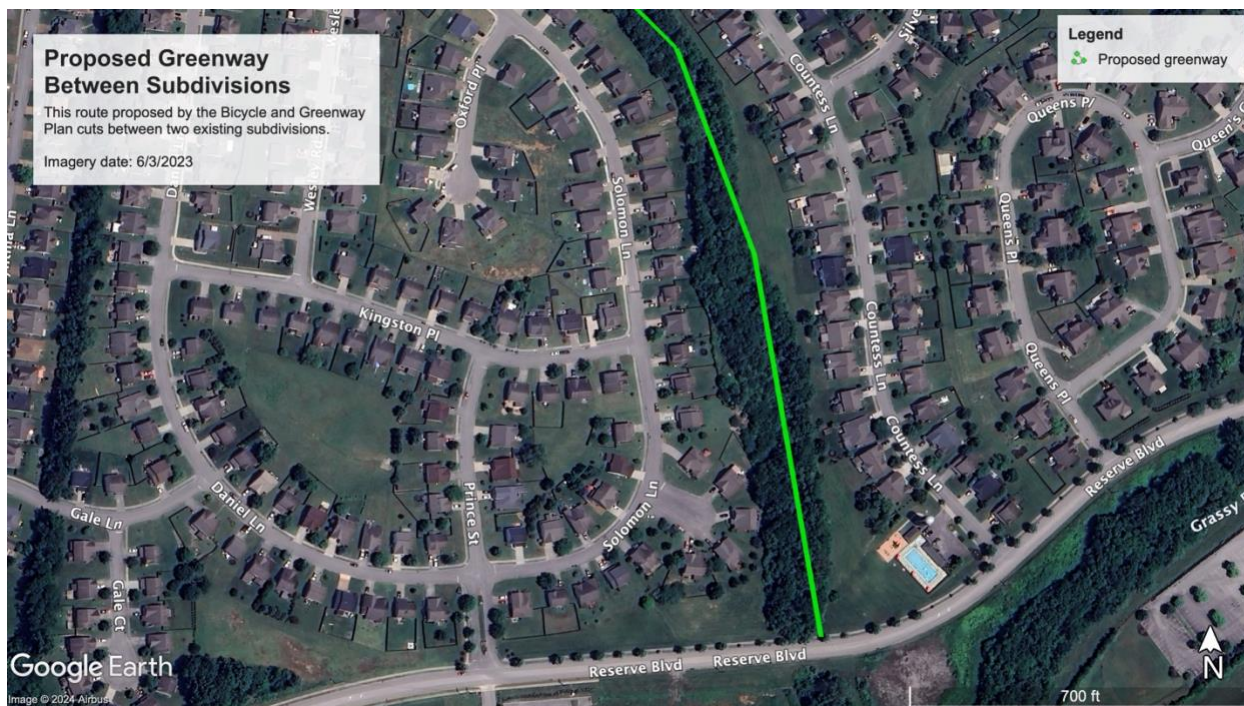produce great outcomes if sufficient buy-in can be achieved from the city and the development community.

Figure 24: A proposed greenway route passes between two built-out residential subdivisions.

Perhaps Spring Hill could take inspiration from Franklin, Tennessee, which has a parkland impact fee (Franklin, Tennessee, Ord. No. 2016-25). Franklin requires all developments including residential units to either pay a fee toward parkland improvements, dedicate land for parkland improvements, or construct parkland improvements themselves. Spring Hill could use a similar model to fund difficult-to-implement sections of the BGP. Developers are already required to construct any section of the BGP that intersects with their parcel, but that system does not account for the system-wide impacts that the introduction of pedestrians in that location will have. The logic is similar to traffic impact fees. By adding new density to an area, developers are adding pressure to the transportation system. Traffic improvements are usually the construction of a turn lane to minimize traffic slowdowns in front of the new development. A pedestrian impact fee would allow the city to resolve nearby network gaps that limit the effectiveness of any pedestrian infrastructure the developer is required to build.

BOMA could also build up the BGP implementation fund by making annual contributions, similar to its method of generating a parkland acquisition fund. BOMA has been putting money aside for years just in case the opportunity came up to buy a new park. Recently, that foresight paid off, and the city is working to secure around 30 acres of parkland in a prime residential location. Using similar logic, BOMA could set aside money to enable action on future pedestrian-related opportunities, such as grants that require matching funds.

For walking to be a widely adopted mode of transportation, comfort is crucial. It is easiest and most effective to understand the comfort level of a route if you walk it yourself. According to America Walks (2020), a walk audit is "an assessment of the pedestrian safety, accessibility, and comfort of a particular area." Sometimes, aerial imagery suggests connectivity, but once you get on the ground, it becomes obvious that a crossing is precarious or a pathway is incomplete. For example, one interviewee described a resident's request for a mid-block crosswalk to get to Walgreens at the intersection of Main Street and Campbell Station Parkway, a collector road (Figure 25). Because mid-block crosswalks are dangerous on such busy roads and there is a crosswalk at the intersection, the city decided not to oblige the request. I agree that a mid-block crosswalk would not be a good choice here, but I think a walk audit would have exposed potential alternatives to address the residents' discomfort. The Walgreens in question has no sidewalk access, so anyone approaching without a car is forced to walk in either the grass or the road. Even the existing crosswalk lacks a sidewalk at its terminus, and it appears to lack a walk sign despite its four-lane width (Figure 26). To improve the comfort level of this trip, the city could consider installing sidewalks from Walgreens to a safer crosswalk further down the collector road (Figure 27-Figure 28). The city's transportation consultant is likely the best person to make the final determination, but walk audits could still serve as a powerful exercise for identifying urgent safety needs and generating remediation ideas.

Figure 25: A Walgreens lacks sidewalks along the street
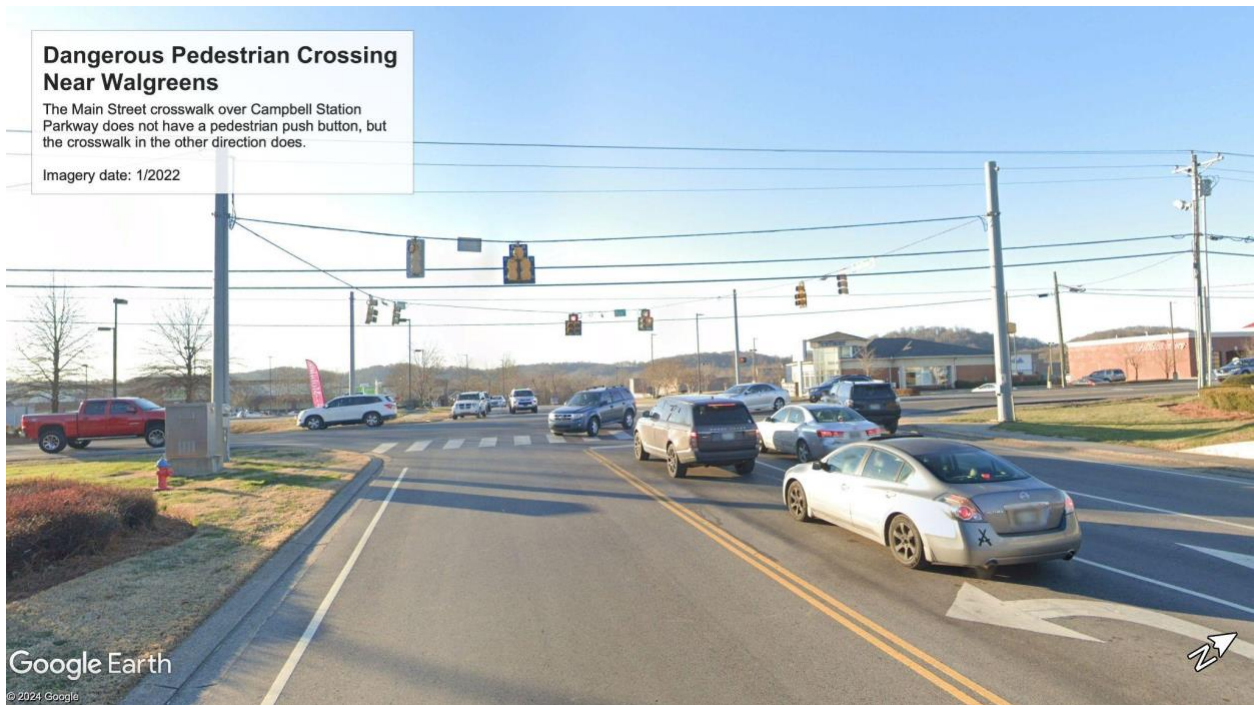

Figure 26: The crosswalk next to Walgreens crosses four lanes and lacks a pedestrian walk sign push button.

Figure 27: Comfortable pedestrian crossing down the street from Walgreens
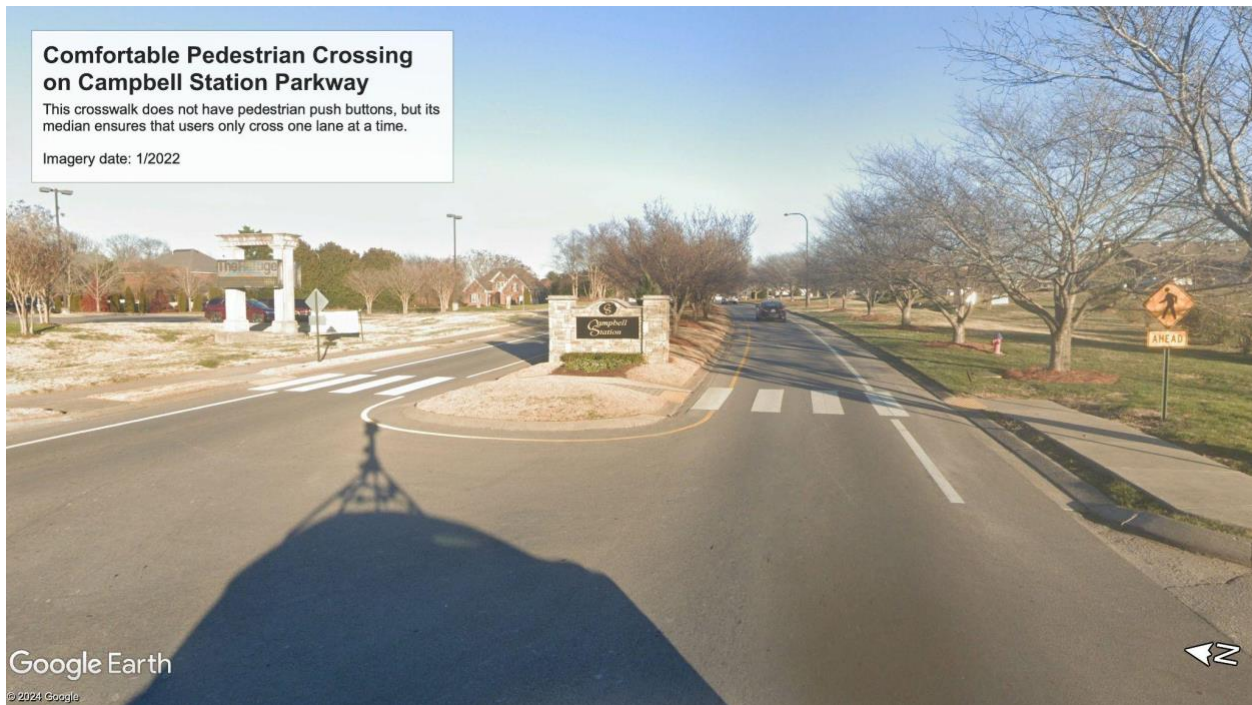

Figure 28: The comfortable pedestrian crossing has a median, so pedestrians only need to traverse one lane at a time.

Overcoming barriers

Beyond what has already been discussed, a few additional themes of barriers to true walkability came up during the interviews. These barriers present opportunities to strengthen the city's walkability improvement approach.

Catching up on ADA compliance

Accessibility for people with a range of abilities is crucial for an inclusive pedestrian network. The federal Americans with Disabilities Act (ADA) provides design standards that are meant to ensure accessibility in new buildings and renovations (U.S. Department of Justice Civil Rights Division). According to Bolden, "The city has done an ADA study that I think the feds required…Now the city is starting to address some ramp, sidewalk, and connectivity issues. For existing infrastructure, it typically falls on the Public Works department." Scroggins claimed that at one time the city had over nine million dollars in ADA improvements to be done because the rapidly changing standards are difficult to keep up with. He said, "ADA changes so much. Every two to three years, there's a new book to learn. You're never gonna be completely in compliance with everything that they change." Stahl estimated that the city currently has about four million dollars in ramp repairs to complete. The backlog is large, but the city makes sure that new projects are up to code. According to Stahl, "It's a typical sidewalk that we would put in–five feet wide with ADA ramps and all that." Renovations can be difficult because of old site features that may be incompatible with today's codes. For instance, Commissioner Golias, who also works as a consultant for the Town Center Redevelopment Committee, said, "You can want to make things better, but if you don't meet all of the requirements, then you can't do anything." Upgrading the infrastructure of older parts of town is an ongoing effort that will require creativity and collaboration.

Of course, the development community is also very familiar with these requirements. D/C 1 and D/C 3 described ADA requirements as a key element of their approach to walkability. Outlining his approach, D/C 3 said, "Immediately you have to think about the grades and slopes from the building to the street…and then try to provide the most direct path that you can." At one point he asked, "How walkable is a large set of stairs? It's better to put in a set of stairs than not, to make things walkable, but it's not accessible." D/C 1 also placed ADA compliance early in his site design process. He said that the terrain of some sites makes it such that upgrading from building-by-building ADA accessibility to site-wide ADA accessibility requires redesigning the site from the ground up. The city must make its accessibility priorities clear early in the development process so that any accommodations beyond the federally required level are baked into the design of each site.

Ensuring ADA compliance is an excellent opportunity to make sure wider walkability goals are also being met. ADA requirements ensure that the development community considers accessibility regardless of their level of attention to walkability. As the city works through its list of ADA compliance upgrades, the city employees should note the surrounding pedestrian conditions. For instance, if Public Works upgrades an ADA ramp but the sidewalk ends ten feet away, the pedestrian dead end could be added to a list of gaps for the city to address. After all, what is the point of investing in accessibility improvements if they do not provide meaningful

pedestrian connectivity? Catching up on ADA compliance will have maximized benefits if paired with an effort to bridge nearby network gaps.

Understaffing

Spring Hill's Planning Department has endured years of understaffing and high turnover. When asked whether Spring Hill would benefit from a transportation planner dedicated to active transportation (AT), most interviewees said the city had higher priorities. For example, Mayor Hagaman thought that hiring an AT planner would not be a wise use of money compared to hiring a new firefighter. If the city were to hire a new specialist, Alderman Cox would love to see somebody in the driver's seat on economic development to attract high-quality commercial tenants to the new developments across town. Even if the city did have the capacity for an AT planner, a few interviewees weren't convinced that the position was needed. Bolden said that an active transportation planner isn't strictly necessary because "In a city like Spring Hill that has so much development going on, as long as you have the right checkpoints, the right pieces in place, and people in the right places, then pedestrian safety, pedestrian accessibility, and ADA compliance should be covered." The consensus seems to be that Spring Hill would likely benefit from an AT planner, but the role is not currently justifiable.

However, nearly every single interviewee agreed that the city would benefit from a long-range planner who worked on a variety of future-thinking policies including walkability. Hicks said, "We would benefit from a long-term land use and transportation planner. And we are looking in that direction now." Describing some of the support that the city needs, Golias said, "We probably need to update [the BGP]. And maybe we do need to change what our zoning codes are…I think that's something [the city] could get better at. And it's not because they're not trying, but they don't have the people to do it." Regarding existing long-range plans, Ballard said, "We're basically dealing with putting out fires…I scratch my head thinking about how they ever carved out the time and resources to put [the UDC and BGP] together in the first place." A long-range planner would create staff capacity to keep Spring Hill's guiding documents current and adhered to.

Achieving Spring Hill's walkability goals is a team effort. Williams said, "It takes every department and the people within the department caring about it to enforce what BOMA has said they care about." Relatedly, Mayor Hagaman said, "You cannot do a good thing unless you have people standing behind you with their expertise." Spring Hill should consider hiring a long-range planner to ensure that Spring Hill's visionary goals are not lost in the shuffle of day-to-day development pressures.

Undefined finish line

Because many interviewees believe that new development is doing walkability right and it's just the old development that needs to be fixed, there is an implicit question of when the city will have done enough to fix old development. The NSP was almost canceled last year because it was not garnering many applications. According to Stahl, "We did talk to TAC about taking the money and transitioning it to pedestrian safety, ADA ramp, handrails, and fixing sidewalks." It was ultimately not canceled because Alderman Cox wanted a chance to make it easier for citizens to apply, but the money was split to partially address pedestrian safety issues. Cox said, "Until we're done–until all of the sidewalks are taken care of in Spring Hill, across the

neighborhoods, we should be utilizing [the NSP]." I think it is worth discussing what "done" means. Even if it seems far away and impossible to achieve, it is important to have a vision of what perfect walkability would look like for Spring Hill. Because the NSP specifically addresses residential areas, one might assume that "done" means every neighborhood in Spring Hill has sidewalks. Taking a holistic view of walkability, I feel that sidewalk funding should not go away until one can safely walk from any neighborhood to any commercial center in town. As long as there are residential areas without sidewalks, there must be pathways for residents to request them because people move and minds change. Additionally, as long as there are schools, commercial areas, or civic buildings without safe pedestrian access, the city should be saving up money to bridge those gaps. Pedestrian infrastructure is a city service. Establishing a clear vision of the walkability finish line will ensure that Spring Hill stays motivated to invest in pedestrians even as elected officials and city staff change.

Chapter 5: Conclusion

Spring Hill has made several commitments to improving walkability, from adopting and enforcing a Bicycle and Greenway Plan to establishing a Neighborhood Sidewalk Program to remediate lacking infrastructure in older subdivisions. Through conversations with city staff, elected officials, and members of the local development community, I have identified opportunities for the city to accelerate and maximize its walkability improvement efforts.

The city should bolster its existing pedestrian improvement efforts, particularly the NSP and pedestrian safety funds. If the NSP funds are not fully allocated in a given application cycle, that does not indicate a lack of need. The city should make sure the application process is not a barrier for concerned residents. The city should also be proactive in targeting investment in areas that are expected to invite pedestrian traffic, such as school zones, mixed-use developments, greenway trailheads, and commercial centers. Additionally, the city should consider creating an exception to homeowner petitions on sections of road that serve as critical pedestrian connections for an outsized population of residents. Finally, walk audits will be a key tool for revealing the urgency of certain safety improvements. The Jefferson County case study provides excellent examples of detail-oriented improvement recommendations that target school zones.

The city should pursue hiring a long-range planner to ensure that its visionary goals are not lost in the shuffle of day-to-day development pressures. Perhaps the long-range planner could work on a comprehensive plan that takes a holistic approach to walkability, acknowledging that all forms of pedestrian infrastructure are important for widespread connectivity.

With or without a long-range planner, the city could strengthen the next BGP update in the following ways. First, be sure to include sidewalks because excluding them paints an incomplete picture of network gaps. The BGP should also take a fresh look at its attractors and generators, as the routes in between are considered variable and those choices indicate the true intent of the policy. This variability is positive because it allows site-by-site routing adjustments that maximize investment. Next, the city should consider whether bike lanes or MUTs have proven to be the preferable form of cyclist infrastructure. If MUTs are preferred, the city could opt to require bike lanes only where there is limited space for alternative transportation infrastructure. Finally, the city should consider planning walking trail loops as part of the pedestrian network because they provide opportunities for historical preservation, recreational activity, and community building.

To increase capacity for funding pedestrian improvements, the city should consider establishing an account dedicated to BGP implementation. The account could be amassed through development fees, unused NSP funds, and annual budget dedications. A walkability development fee will require a clear delineation of responsibilities and visible progress to assure developers that they are benefiting from their contributions. In a given year, any unused NSP funds should be reallocated to other pedestrian efforts rather than reabsorbed by the budget. Additionally, BOMA should consider annual budget dedications, similar to its parkland acquisition fund, to ensure that pedestrian improvement opportunities are not missed.

Finally, communication with both residents and developers will be critical to minimize the tensions that come with construction. Developers want to know exactly what is expected of them and what benefits their contributions will generate. Residents want to know that their concerns are being seriously considered. Be very clear about the widespread positive implications that small-scale pedestrian infrastructure projects can have. Also, be clear about why certain projects are not feasible if you cannot oblige a request. Because it can be difficult to find information online, the city should consider adding a walkability landing page to the website. Such a webpage could include a decision tree of which department is responsible for what issues and information about the NSP. The case studies provided valuable examples of community engagement methods that go beyond one-way information sharing and attempt to strengthen AT culture.

Small cities with suburban form face unique challenges in providing walkability to their residents. This work not only contributes to Active Transportation and suburban form research, it also offers lessons and tools to other small cities and towns grappling with pedestrianization. Spring Hill, Tennessee is an interesting example of a municipality that has taken steps to address past development patterns and encourage more pedestrian-friendly infrastructure in the future. I am excited to see what Spring Hill will become with a little more investment in and dedicated attention to walkability.

Reflections

This thesis was a fantastic opportunity to experience the realities of planning outside of major metropolitan regions. Engaging in conversations with a wide variety of local actors allowed me to better understand the day-to-day workflows that impact outcomes more directly than policy alone. Ultimately, this research resulted in a collection of recommendations for improving existing processes in Spring Hill and similar places. Given more time, I would have attempted to exemplify some of the more detail-oriented recommendations such as identifying high-impact pedestrian infrastructure interventions. Future research could expand this work by investigating the walkability practices of more suburban places and interviewing more people, including developers and members of the public. Additionally, it would be impactful to include county staff and officials, who play a large role in the walkability of unincorporated areas. In general, suburban retrofitting for multimodal transportation is an area of study ripe with opportunity.

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