Memphis Pedestrian and School Safety Action Plan

Prepared for the City of Memphis

Prepared by Alta Planning + Design
with Powers Hill Design, LLC, Kimley-Horn and Associates, Inc.,
The Center for Partnerships in GIS, and The University of Memphis

Acknowledgements

TECHNICAL ADVISORY COMMITTEE

Special thanks to the members of the Technical Advisory Committee who participated in the development of this plan through planning direction, meetings, and plan review.

Kyle Wagenschutz*	City of Memphis Engineering Division
John Cameron	City of Memphis Engineering Division
Manny Belen	City of Memphis Engineering Division
Stephen Edwards	City of Memphis Engineering Division
John Paul Shaffer	Livable Memphis
Dennis Lynch	Sierra Club
Louis Patrick	Mayor's Advisory Council for Citizens with Disabilities
Katherine Coulter	Aging Commission of the Mid-South
Dedrick Brittenum	Mayor's Office
Josue Rodriguez	Memphis Center for Independent Living
Bonnie Good	Construction Inspections
John Lancaster	Memphis Area Transit Authority
Brian Shipp	Shelby County Schools

PROJECT CONSULTANTS

alta PLANNING + DESIGN

POWERS HILL DESIGN
CIVIL ENGINEERING. CIVIL RESPONSIBILITY.

Kimley»Horn

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*Project Contact: Kyle Wagenschutz, City of Memphis | kyle.wagenschutz@memphistn.gov

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Project Background

The Memphis region is working towards the goals of safety, connectivity, accessibility, and mode shift in order to increase livability through improved public health and safety, reduced environmental impact, transportation efficiency, and increased economic opportunity (outlined in the MPO's 2014 *Regional Bicycle and Pedestrian Plan*). A safe and connected pedestrian network across the City of Memphis remains a high priority in order to achieve these goals.

The City of Memphis' pedestrian network includes **over 3,400 miles of existing sidewalks**. As the City's public infrastructure has aged, a growing need for repair and maintenance of the network has significantly outpaced maintenance completed through existing processes. It is the responsibility of every Memphis property owner to keep his or her sidewalk in good repair. It is the responsibility of the City, however, to make sure that property owners fulfill their obligation to maintain the sidewalks. To date, the City's approach to sidewalk maintenance has been primarily reactive. As citizen requests are made for sidewalk maintenance, the City notifies property owners of their responsibility and then proceeds through a legal process, as necessary, to ensure repairs are completed.

In 2012, the City shifted to a proactive approach to sidewalk maintenance by completing a comprehensive review of the sidewalk network and **estimated a total repair cost near the total sidewalk replacement cost of $1.1 billion, including $343 million in "urgent repairs." This inventory also demonstrated that over 250 miles of roadways have incomplete sidewalks, and over 750 miles of roadways have no sidewalks.** Capital funds for pedestrian infrastructure continue to be limited, however, with **an average budget of only $33,400 annually for sidewalk repair since 2004**. The City's extensive area and street network mileage relative to its population and tax base make infrastructure investments especially challenging. Following the City's 2012 survey of needs, a clear prioritization scheme was needed to support targeted public investments in new sidewalks and sidewalk maintenance.

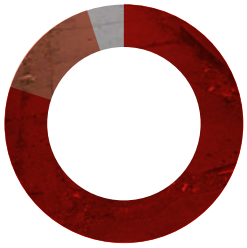
The City of Memphis Division of Engineering initiated a planning process in the spring of 2013 to respond to these challenges. This document, the product of that process, serves as the city's first official plan to proactively address pedestrian infrastructure needs that impact safe access to public schools inside city boundaries. **By focusing on schools, the City hopes to prioritize improvements that benefit students, children, and families when walking to and from school, as well as increase resident access to the parks, community centers, and libraries,** often located in close proximity to schools. Given the limited public resources available, the City plans to prioritize short-term improvements that will provide the highest safety benefit to the most vulnerable users.

There are two central objectives for this plan:

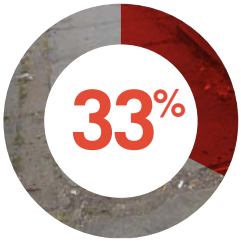
- To assess existing conditions and **develop a transparent, data-driven prioritization methodology** that identifies needed sidewalk and pedestrian crossing projects serving public schools
- To craft **an implementation strategy capable of delivering high-priority projects in the short-term** that improve pedestrian connectivity and safety

This plan builds on previous planning efforts conducted by the City of Memphis and local and regional partners, including the *Memphis MPO Regional Bicycle and Pedestrian Plan* (2014), the *Memphis Urban Area Long Range Transportation Plan* (2012), the *Mid-South Regional Greenprint and Sustainability Plan* (2013), the *Memphis Area Transit Authority Short Range Transit Plan* (2012), the draft *Memphis Midblock Crossing Policy*, and the *Memphis Complete Streets Project Delivery Manual* (2014). This plan was funded by the Surface Transportation Program as a Tennessee Department of Transportation Locally Managed Program.

HOW EXTENSIVE IS THE PROBLEM?



80-95% OF SIDEWALKS **REQUIRE REPAIR**



OF SIDEWALKS REQUIRE
IMMEDIATE REPAIR

Additional **13% of sidewalks (446 miles)** are less than standard width allowed for proper wheelchair access

OVER **250 MILES**
OF ROADS WITH INCOMPLETE SIDEWALKS

&

750 MILES
OF NON-HIGHWAY ROADS WITH NO SIDEWALKS

WHAT IS THE NEED?

More than

11,000 **MEMPHIS RESIDENTS**

walk directly to work or to reach a bus on their way to work each day

African Americans make up

70% **OF MEMPHIS RESIDENTS**

who walk directly to work or to reach a bus on their way to work each day

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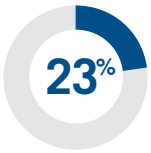
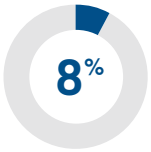


Almost

150,000 **Memphis residents are under 16 and non-drivers**

65,000 **Memphis residents are over 65** and typically over 20% of these (13,000) do not drive



50,000 **Memphis residents have a disability that requires mobility assistance (ie. wheelchair)**

30,000 **Memphis households do not have access to a car**

WHAT IS THE COST?

TOTAL REPLACEMENT COST for existing sidewalk network in Memphis is

$1,100,000,000

Total replacement cost for most urgent repair in Memphis is $363,000,000

LIFE SPAN OF A SIDEWALK under normal conditions is somewhere between

50 - 75 YEARS

depending on a number of environmental factors.

In order to properly maintain sidewalks on an annual basis, Memphis would need to budget and spend

$19,000,000 EACH YEAR, INDEFINITELY

At a rate of $19,000,000 each year, it would take more than

24 YEARS

to fix only those sidewalks in need of urgent repair or substandard width. Before those repairs were completed, another **33% of sidewalks** would age into disrepair

Since 2004, Memphis has only cumulatively budgeted

$334,000

on sidewalk repair

Planning Process

This plan was developed between April, 2014 and May, 2015. The planning process was directed by a Transportation Advisory Committee of stakeholders and organized into five core phases:

- Existing Conditions Analysis
- Pedestrian Network Analysis
- Project Identification and Prioritization
- Pedestrian Facility Toolbox Development
- Implementation Plan Development

The core tasks conducted for each phase are summarized in Figure 1 and described by phase in the following section.

Figure 1: Planning Process

PROJECT DIRECTION

The Division of Engineering led this plan and organized a **Transportation Advisory Committee** (TAC) to represent key groups across the city. This group provided direction and feedback throughout the planning process, meeting four times and connecting the project team with existing data resources. The TAC was composed of City staff and local advocates representing a diverse group of interests, including the Division of Engineering, the Memphis Area Transit Authority, the Mayor's Office, the Mayor's Advisory Council for Citizens with Disabilities, the Aging Commission of the Mid-South, the School Safety department, Livable Memphis, and the Sierra Club.

The project team also conducted in-depth **stakeholder interviews** with representatives of four groups as an early part of the existing conditions analysis:

- The City of Memphis Engineering Division
- Shelby County Schools and the University of Memphis
- The Mayor's Advisory Council for Citizens with Disabilities
- Livable Memphis and the Sierra Club

The key issues and needs identified in these interviews guided the development of the rest of the plan.

EXISTING CONDITIONS ANALYSIS

Existing conditions were evaluated using a mix of qualitative and quantitative methods.

- In addition to conducting the stakeholder interviews described above, the project team visited high-crash intersections, observed pedestrian and driver behavior throughout the city, and **documented conditions** near Memphis schools prior to beginning quantitative analyses
- The project team also developed, administered, and analyzed the results of a **school survey** designed to collect information about barriers, popular walking routes, challenging roadways and intersections, and estimates of the percentage of students who regularly walk to school
- The project team conducted **pedestrian counts**, describing volumes and behaviors at key locations around the city, and documented the results for use in future empirical studies on the impact of infrastructure investments
- The project team conducted a **crash analysis** analyzing the "who, what, where, when, and why" of pedestrian crashes occurring on the city's roadways

The findings of these components of the existing conditions analysis are documented in Chapter 2.

PEDESTRIAN NETWORK ANALYSIS

The project team next conducted the three core quantitative analyses describing the pedestrian network.

- First, the team made an assessment of the geographic distribution of demand for walking based on **locations where people live, work, play, learn, and access transit.**
- Secondly, the team completed a **three-part assessment of the supply of pedestrian infrastructure**, describing pedestrian comfort and safety along 1) each roadway segment, 2) at each potential crossing, and 3) across major roadway corridors. Together, the demand and supply frameworks form a Pedestrian Suitability Index that can be used continuously over time to track infrastructure quality against demand for walking.
- Finally, the team completed a **shortest path analysis to identify the most likely walking routes** between trip origins and destinations, including schools, parks, transit stops, and key employment centers

Chapter 3 documents the methodology and results of the quantitative analyses.

PROJECT IDENTIFICATION AND PRIORITIZATION

Development of 20-year Project List. The project team built the pedestrian project list directly from the existing conditions and pedestrian network analyses. They analyzed the entire public, non-highway roadway network by each block and intersection. This network was filtered down to a set of blocks and intersections with potential need for pedestrian infrastructure improvements based on the results of the pedestrian network analyses. Block- and intersection-level improvements were then grouped into logical projects around schools, taking into consideration the crash analysis findings and stakeholder input. The project team shared the initial project list with schools and City staff for feedback.

Prioritization Scheme. In parallel to development of the full 20- year Project List, the project team and steering committee established a weighted prioritization scheme tying together each of the analyses conducted and providing a weighted score for each project. This data-driven prioritization framework was then used as the key input to the final phased project list presented in this plan.

The full methodology used to develop and prioritize the project list is described in Chapter 4 along with Phase 1 projects. The full project list is provided in Appendix E.

PEDESTRIAN FACILITY TOOLBOX DEVELOPMENT

In tandem with project list development, the project team created a **Pedestrian Facility Design Toolkit** to assist the City in the selection and design of pedestrian facilities. The toolkit pulls together best practices by facility type from public agencies and institutional design guidance nationwide. The facility types described in the Toolkit will form the key components of each linear and intersection project recommended. Each facility type is covered within a single sheet relaying associated treatments, important design information, example photos, schematics, and a summary of guidance from current or upcoming state and national design standards.

Appendix C provides the Pedestrian Facility Design Toolkit.

IMPLEMENTATION PLAN DEVELOPMENT

Development of the implementation plan began with a comparative **report on peer city practices** related to funding, sidewalk maintenance, equity, and other key challenges faced by the City of Memphis. Key highlights from that review are provided in Appendix B. Best practices drawn from this review formed the starting point for the development of a **full implementation strategy** designed to improve pedestrian connectivity and safety through strategic investment and a set of programs encouraging concurrent private investment. This strategy follows the Five E's framework developed by the national Walk Friendly Community program—Engineering, Education, Encouragement, Enforcement, and Evaluation and Planning—as well as the sixth E, Equity.

In order to illustrate the types of improvments recommended by this plan, the project team selected **twenty pilot projects** to be analyzed in greater detail than the remainder of the project list and summarized on one-page project cutsheets. These projects are geographically distributed across the city and include a range of linear and crossing improvements.

CHAPTER 2:

EXISTING CONDITIONS ANALYSIS

Chapter Contents:

Introduction

A **mix of qualitative and quantitative methods** were used to document existing conditions for pedestrians across the City of Memphis. As a starting point, four key **stakeholder groups shared their knowledge** of physical conditions for pedestrian travel in the city as well as policy and process challenges to addressing infrastructure needs. Simultaneously, a **school survey** was conducted to identify specific needs around schools and the barriers that influence walking to school. Next, the project team conducted a **field inventory** and summarized infrastructure challenges with a **photo inventory** based on stakeholder feedback and observations. The project team also reviewed all **relevant plans and policies** and summarized existing plans to address pedestrian needs along with **policy language gaps** influencing the pedestrian environment. A detailed analysis of **pedestrian crashes** that occurred between 2007 and 2011 followed, along with pedestrian counts at strategic locations to document pedestrian volumes and behaviors in different roadway and land use contexts. This chapter summarizes the key takeaways of each of these analyses.

Stakeholder Input

Four key stakeholder groups shared their insights on existing pedestrian conditions: the City of Memphis Engineering Division, Shelby County Schools, the Mayor's Advisory Council for Citizens with Disabilities (MACCD), and Memphis pedestrian advocates including Livable Memphis and the Sierra Club. These discussions helped the project team understand the range of issues related to walking from multiple perspectives, and informed the project approach and plan recommendations. A summary of these perspectives is provided here.

CITY OF MEMPHIS ENGINEERING DIVISION

Prioritizing limited funds for pedestrian projects presents a key challenge for the Engineering Division. The cost of sidewalk repairs throughout the city is estimated to be near or over $1 billion, while the annual budget for all sidewalk investments in recent years, including new sidewalk construction, has been in the $200,000 - $250,000 range. While property owners across the city are financially responsible for sidewalk repairs, the current sidewalk repair process is complaint-driven, expensive to administer, and not resulting in high rates of sidewalk repair by property owners. City staff expressed a need for new revenue sources and reform to the current approach to enforcing property owner's sidewalk maintenance responsibilities.

Key Takeaways

- Costs associated with identified needs far exceed available public funds.
- Investments in the sidewalk network are largely complaint-driven, which does not ensure that limited funds are directed to the locations with the largest need.
- Changes to sidewalk maintenance enforcement may result in a more efficient, effective process.
- Related City projects already underway include 1) research on a new funding stream known as a Transportation Utility Fee and 2) the development of a program intended to assist property owners with "true economic hardships" repair sidewalks adjacent to their property.

SHELBY COUNTY SCHOOLS

Shelby County Schools supports students walking to school in most situations. When hazards such as at-grade railroad crossings or major high-speed roadways are located between student's homes and their school, the school district provides buses. Crime, a lack of adequate pedestrian infrastructure, and wide streets with high motor vehicle volumes and/or speeds were cited as the biggest barriers students face when walking to school. Participants agreed that strategic investments in sidewalks and pedestrian crossings could lead to increased rates of walking to school, which could in turn lead to cost savings for the district in the form of fewer buses.

Key Takeaways

Crime, limited sidewalks, high-speed intersections, and high-traffic streets are some of the biggest barriers for kids walking to school.

- There is no policy that prohibits walking to school, but there are also no programs that encourage walking.
- The process of consolidating schools has in some cases created longer distances between schools and students' homes, and bussing is relatively common.
- Investment in sidewalks can lead to large cost savings for the school district if it results in needing fewer buses. The elimination of one bus saves about $43,000 per year.
- Principals are the best source of information for how students get to school and walking conditions within school zones.

Stakeholders helped to develop the plan strategy and reviewed recommendations throughout the planning process.

Shelby County Schools representatives support students walking to school when students can walk comfortably and don't face barriers like crime, a lack of pedestrian infrastructure, and high-speed, high-traffic streets.

THE MAYOR'S ADVISORY COUNCIL FOR CITIZENS WITH DISABILITIES (MACCD)

People with disabilities face unique challenges when navigating the city. Inattention to the needs of people using mobility devices such as walkers and wheelchairs can create impassable barriers and serious safety issues. The Mayor's Advisory Council for Citizens with Disabilities discussed the range of difficulties they face when curb ramps are not in place, when sidewalk obstructions block the pedestrian clear zone, and the impact of broken and uneven sidewalk surfaces, among other issues. The project team heard that accessibility improvements and sidewalk maintenance efforts should be prioritized in locations with high concentrations of low-income disabled residents, near medical centers, and near transit stops.

Key Takeaways

- Proximity to Section 8 housing, medical institutions, and transit should be factors for prioritizing infrastructure improvements.
- Sidewalks uprooted by trees and sidewalk network gaps are the most significant barrier for people with disabilities.
- Curb ramps are being installed throughout the city, but there is still more work to be done.
- A lack of enforcement of the sidewalk ordinance prohibiting obstructions (benches, "sandwich" signs, etc) creates real issues for people using mobility devices such as wheelchairs.
- Driver behavior, specifically a failure to yield to pedestrians, creates scary and dangerous situations.
- At signalized intersections, there is a need to provide adequate walk time for people of all ages and abilities.

PEDESTRIAN ADVOCATES

Livable Memphis and the Sierra Club are two organizations that have been working to improve walking conditions in Memphis. Both groups are concerned about equitable access to high-quality pedestrian infrastructure, and would like to see a data-driven process for prioritizing investments that works well for all areas of the city. Different neighborhoods have different issues, but there is need throughout the city to improve conditions for walking.

Key Takeaways

- There are unmet pedestrian infrastructure needs throughout the city, but the nature of the needs are different based on the part of town.
- Economic issues have led to a lack of adequate sidewalk maintenance in the Frayser neighborhood and South Memphis.
- Annexed areas that have previously been rural or low density suburban with rural characteristics lack sidewalks.
- Older neighborhoods in the central part of the city are more likely to have issues with tree roots cracking and/or uprooting sidewalk panels.
- Income should be the metric used to prioritize investments in under-served neighborhoods.

Summary of Key Issues

The following pages feature a photo inventory that documents some of the key issues in Memphis related to the pedestrian environment and the behavior of people traveling in the public right of way. The photo inventory includes examples of local best practices, barriers to pedestrian activity, and observed behaviors that impact pedestrian safety.

LOCAL BEST PRACTICES

Much of the central city, including downtown and Memphis' inner neighborhoods, are pleasant and interesting places to walk. Outside of the central city, local streets in residential neighborhoods also largely support walking. The City is increasing accessibility for people with disabilities through its ongoing curb ramp program. Additionally, several recent road diet projects and the use of innovative crossing treatments such as Rectangular Rapid Flash Beacons and Pedestrian Hybrid Beacons have improved walking conditions on several corridors, near schools, and at major trail crossings.

KEY OPPORTUNITIES

Opportunities to improve conditions for walking in Memphis include:

- **Sidewalk maintenance** to repair crumbling or uprooted sidewalk panels that create tripping hazards and limit accessibility for people with disabilities
- **Closing sidewalk gaps,** particularly along high demand routes
- **Improving pedestrian safety and comfort** along wide, high-speed arterial and collector streets by:
  - providing buffers from fast-moving traffic with street trees, on-street parking, or on-street bikeways
  - widening existing sidewalks
  - implementing road diets on select streets to simplify pedestrian crossings and make room for buffers and wider sidewalks
- **Increasing the frequency of formal pedestrian crossings,** especially along wide, high-speed arterial and collector streets
- **Enhancing existing midblock crossings and minor/major intersections** with features such as raised median refuge islands, high-visibility crosswalk markings, pedestrian beacons, or full signals
- **Ensuring pedestrian-friendly design at major intersections,** including features such as adequate walk time, high-visibility crosswalk markings, advance stop bars, pedestrian priority treatments at slip lanes, and protected left turn signal phasing
- **Behavior change programming** aimed at creating a culture of yielding to pedestrians and promoting the safety benefits of using existing marked crossings

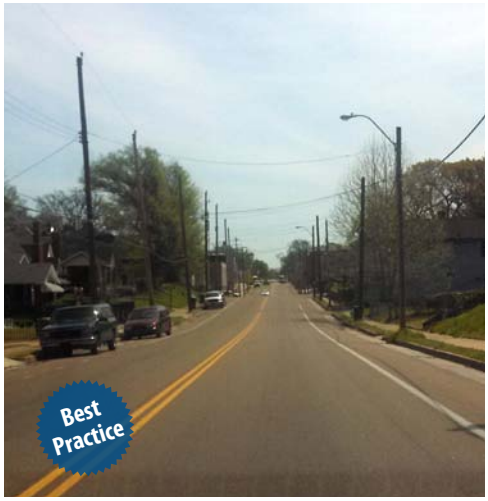
PEDESTRIAN ENVIRONMENT:

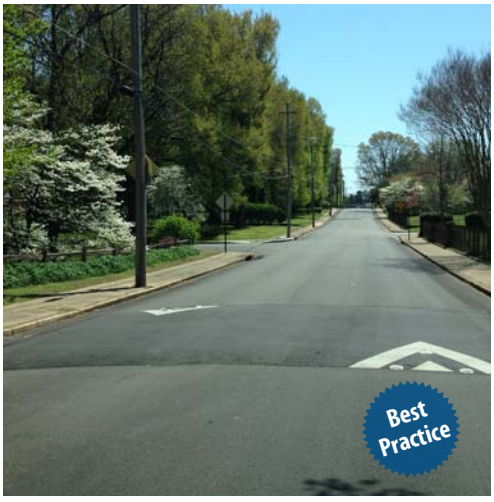
CORRIDORS

Sidewalk Design

This sidewalk on Poplar Avenue includes a planting strip to buffer pedestrians from busy traffic, improving the pedestrian environment.

Further west, curb-tight sidewalks that lack a buffer zone along this busy section of Poplar Avenue make for an unpleasant walking experience.





Left: On-street parking provides a buffer for pedestrians on McLemore Avenue.

Right: Speed humps and other traffic calming measures improve walking along local streets by reducing motor vehicle speeds and traffic volumes.

PEDESTRIAN ENVIRONMENT:

CORRIDORS

Sidewalk Gaps

Left: Even short gaps in the sidewalk network on major arterials can create serious safety issues. Walking along the roadway is a prominent recorded cause of crashes.

Right: Demand paths illustrate a need for sidewalks in many locations throughout the city.

Sidewalk Obstructions

Left: Utility poles obstruct the pedestrian walkway on some streets, particularly those without a sidewalk buffer. This sidewalk is impassible for a person in a wheelchair.

Right: Sign placement reduces the pedestrian through zone in an otherwise well-designed pedestrian refuge island.

Sidewalk Condition

This man opted to use the narrow shoulder on a high-traffic, high-speed street instead of the sidewalk, presumably due to cracks (right) and frequent driveway ramps that do not appear to meet ADA cross-slope requirements.

PEDESTRIAN ENVIRONMENT:

MIDBLOCK CROSSINGS

Refuge Islands

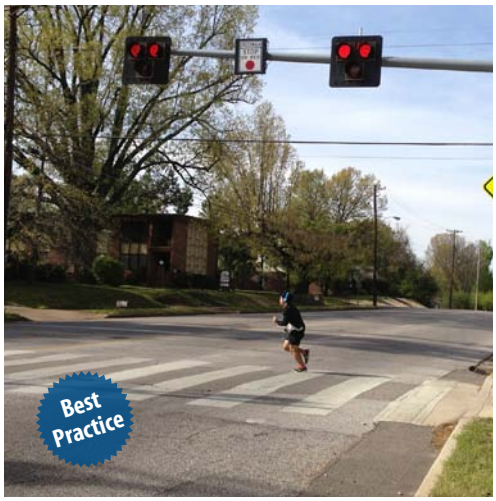
A median with an integrated pedestrian refuge near Frayser High School allows people to cross one direction of Dellwood Avenue traffic at a time.

Pavement Markings

Left: A lack of conveniently spaced pedestrian crossings causes many pedestrians to cross at midblock locations, where drivers are unlikely to expect them.

Right: Transverse crossing markings consisting of two parallel white lanes are less visible than continental "zebra" style markings.

Signage and Beacons



Left: Pedestrian hybrid beacons are highly effective at encouraging drivers to stop, and are appropriate on streets with 3 to 6 lanes and speeds of 30-45 mph.

Right: Driving culture in Memphis does not include yielding to pedestrians at uncontrolled locations. "Stop here for pedestrians" signs may help change behavior.

PEDESTRIAN ENVIRONMENT:

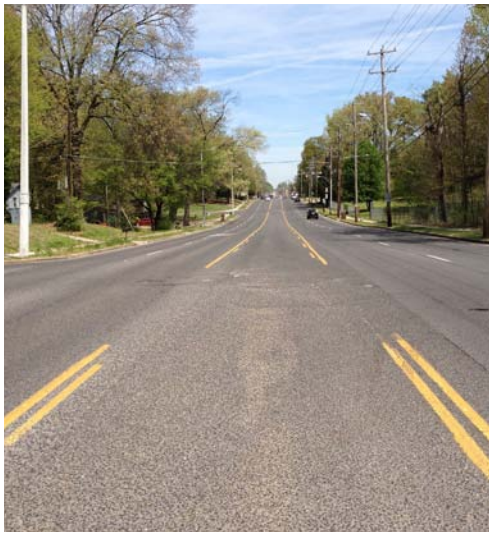
INTERSECTIONS

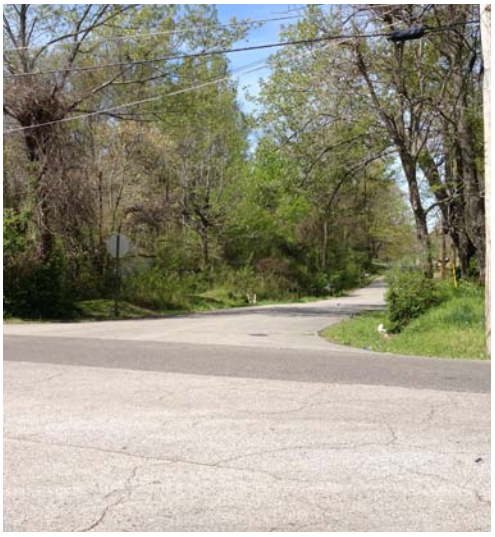
Major Intersections

Left: Major intersections throughout the city have faded or worn stop bars and crosswalk striping.

Right: Slip lanes allow high speed turns, which may contribute to drivers failing to yield to pedestrians in crosswalks.

Minor Intersections





Left: Where local streets intersect with arterial streets, marked crossings are not often present. At Mill Branch Road and Wilson Road, the closest signalized intersection is a half mile away, an unreasonable travel distance for crossing the street.

Right: Some pedestrian crashes occur at the intersection of two local streets. This high-crash intersection (8th Road at Honduras Drive) could be improved by adding approaching sidewalks and a 4-way stop.

Left: This treatment on Kansas Street provides a good example of a sidewalk-railroad crossing, with tactile warnings, gentle slope, and level surface where the concrete and railroad ties meet.

Right: The City has constructed over 16,000 ADA compliant curb ramps since 2006, dramatically improving mobility for people with disabilities. Curb ramps are particularly important along major streets.

Review of Existing Plans

A full review of relevant existing documents and plans was conducted as the starting point for this plan, including city, regional and state plans, and currently programmed pedestrian projects. Below is a summary of items most relevant to this planning process and a description of how they were incorporated into this plan.

Table 2.1 Summary of Existing Plans

Key Sections of Existing Plans	Consideration for Pedestrian Plan
MATA Short Range Transit Plan (2012)	
Identified 'key corridor routes' and 'emerging key corridor routes'	These corridors influenced project prioritization.
$3 to $9 million of infrastructure improvements recommended to support the proposed system at 29 locations over a period of five years	There is potential to use transit-focused funding sources at these locations.
Memphis MPO Regional Bicycle and Pedestrian Plan (2014 draft)	
Goals include reducing crashes, maximizing capacity, providing connections.	The shortest-path analysis considered generators/attractors identified in the regional plan.
Survey Results - Factors that limit walking and factors that would encourage more walking were identified.	Public support for pedestrian improvements on busy streets influenced the supply analysis.
Recommended Network - Plan identifies 484 miles of programmed and recommended pedestrian and bicycle facilities.	Recommended networks are considered in this plan.
Prioritization - The plan prioritizes pedestrian facilities and improvements on roadways.	Prioritization factors are considered in this plan.
Problem Points and Corridors – The plan identifies issues and recommends further investigation.	Problem points and corridors are considered in this plan.
Memphis Urban Area Long Range Transportation Plan: Direction 2040 (2012)	
Improved Crossings – The plan recommends improvements at locations requiring enhanced levels of pedestrian visibility.	Intersections and midblock crossings recommendations are key plan priorities.
Access Management – The plan describes the need for improved access management to reduce collisions, protect capacity, and improve livability.	Proposed intersection improvements may include access management improvements.
Mid-South Regional Greenprint & Sustainability Plan (2013)	
The *Vision Plan* considered equity and inventoried recreational, natural, and cultural destinations.	The equity analysis is an input to the prioritization process of this plan.
The *Bus Transit to Workplace Study* described job clusters and the quality of transit service in these clusters. It also assessed funding availability through the TDOT Multimodal Access Fund.	Job clusters are considered in the shortest path analysis. The Multimodal Access Fund is identified in the evaluation of funding mechanisms.
Tennessee Long-Range Transportation Plan, Bicycle and Pedestrian Element (2005)	
Education (7.1.2.2) - Relevant actions include providing demonstration grants to communities, updating motor vehicle training materials, and analysis of crash data. Enforcement (7.1.2.3) - Relevant actions include developing enforcement plans for high-incidence locations and specific training programs for police officers, and modifying the Vehicle Code as it relates to bicycle and pedestrian laws.	Potential opportunity for the City of Memphis to share resources with the state to achieve common objectives. This coordination is recommended in the implementation section of this plan.
Trip Attractors and Generators (5.5) identified in the plan include tourist, college/university, parks and annual events	These attractors and generators are considered in the demand analysis.
Programmed Projects	
2014-2017 Transportation Improvement Program (TIP) 2013-2017 Capital Improvement Program (CIP)	Programmed projects are considered in project development.

Review of Policies and Standards

Appendix A includes a detailed table of relevant state and city code language, which identifies individual sections of the code or policy, lists the relevant language, and provides comments or suggested revisions to existing code, policies, or procedures that will improve the pedestrian environment. The following documents are included in the policy review:

- *TDOT Bicycle and Pedestrian Policy* (2005)
- *TDOT Long-Range Transportation Plan - Bicycle and Pedestrian Element*
- *City of Memphis Code of Ordinances*
- *City of Memphis Crosswalk Policy* (2014) - DRAFT
- *City of Memphis Sidewalk Ordinance* (2013)
- *Ordinance to Stop (Crosswalk Policy)* (2009)
- *Memphis and Shelby County Unified Development Code* (2010)
- *City of Memphis Complete Streets Project Delivery Manual* (2015)

The most important recommended updates from the policy review for consideration by the City of Memphis include:

- **Sidewalk requirements for new developments** – New developments are an important opportunity for upgrading existing sidewalks or closing gaps in the existing network. Existing processes should be updated to close loopholes that allow some development projects to proceed without providing or upgrading sidewalks to current standards.
- **Sidewalk repair procedures** – Opportunities may exist to simplify the process for property owners that are financially able to repair their sidewalks.
- **Crossing warrants and standards** – The City of Memphis does not currently have guidelines for determining the appropriate marked pedestrian crossing treatment based on the roadway context. A strong set of draft guidelines developed by the City are reviewed here. Enhanced guidelines based on comprehensive national standards guidance are included as an element of the Pedestrian Design Guidelines included in Appendix C.
- **Crosswalk Marking Maintenance** – Crosswalk pavement markings are a critical element of the pedestrian network. Many marked pedestrian crossings at both signalized intersections and midblock locations throughout the city are faded and in need of re-striping. It is important to establish a schedule to inspect and maintain markings at least once a year.

Crash Analysis

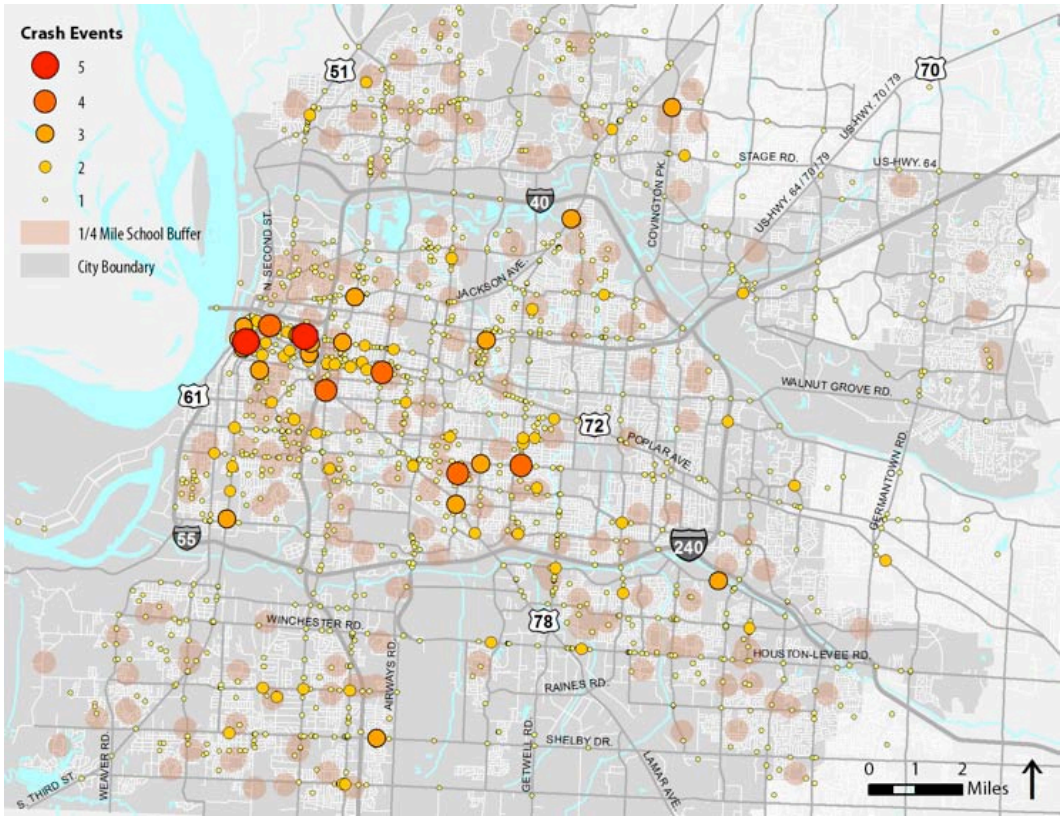
A detailed review was conducted of data for five years (2007-2011) of pedestrian-involved crashes in the City of Memphis, as reported by the Tennessee Department of Safety. Safety issues for pedestrians were identified based on the crash analysis, field observations, and stakeholder interviews. This section reviews the key findings of that analysis, which influenced the key opportunities identified at the beginning of this chapter.

WHAT ARE THE TRENDS IN PEDESTRIAN CRASHES IN MEMPHIS?

1,725 unique crash events occurred in the City of Memphis between 2007 and 2011, with the following distribution. Map 2.1 shows the frequency of pedestrian-involved crashes.

- Seventy-five crashes, or four percent of all crashes, resulted in a fatality.
- The highest density of crashes occurs in downtown and midtown Memphis, where the highest pedestrian activity is expected. Crash density is notably low in East Memphis compared to the rest of the central city.
- Concentrations of crashes also occur around Frayser Boulevard to the north, west of Interstate 55 between Raines Road and Shelby Drive to the south, and along Winchester Road to the southeast.

Map 2.1 Frequency of Pedestrian-Involved Crashes

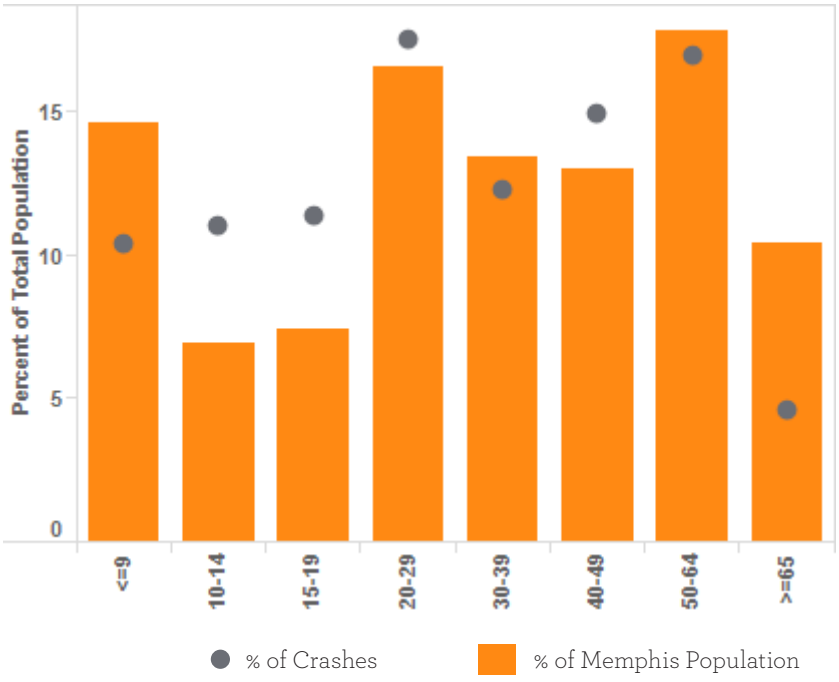


WHO IS INVOLVED IN PEDESTRIAN CRASHES?

Concentrations of crashes with children below age 12 overlap with several elementary and middle school areas. Many crashes with youth occur on multi-lane roadways, but clusters are also observed on local roadways. Figure 2.1 illustrates the age distribution of Memphis City residents as well as the age distribution of pedestrians involved in crashes with motorists. Crash frequency and geographic distribution vary by age group as follows:

- **Youth aged 10 to 19 are overrepresented in pedestrian crashes.** Crashes involving youth 18 years old or younger constitute 30% of pedestrian crashes.
- Children below age 12 are overrepresented in crashes near elementary and middle schools, as well as in afternoon crashes.
- High school age youth are marginally overrepresented near high schools, and overrepresented in morning crashes near high schools.
- Many crashes with youth occur on multi-lane roadways, but clusters are also observed on local roadways in neighborhoods north and south of downtown both inside and outside of the I-40/I-240 loop.
- The 65 and over population is underrepresented in crashes. This may be a result of less walking in this age group or greater exercise of caution by this group.

Figure 2.1: Age Distribution of Pedestrian Crashes and All Residents



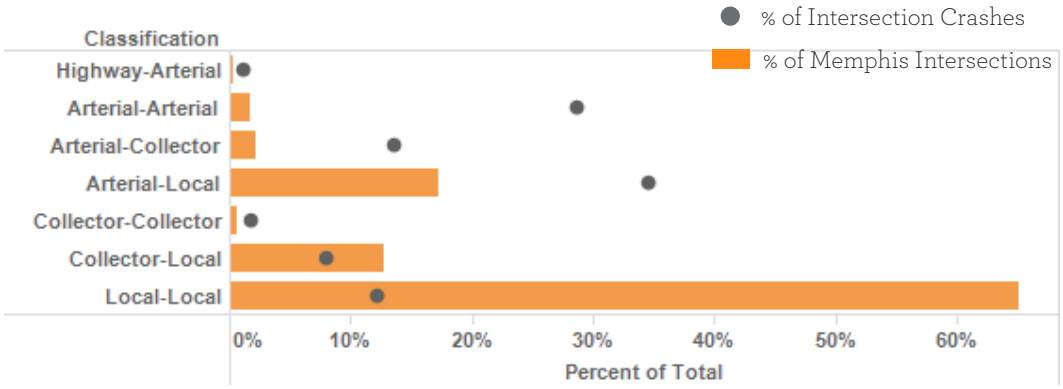
WHERE DO PEDESTRIAN CRASHES OCCUR?

Crash locations reveal the types of roadways that act as barriers to pedestrian travel in Memphis.

Intersection Crashes

- More than 40% of pedestrian crashes occur at intersections, and another 20% of all crashes occur near intersections but not within them.
- More than 40% of crashes at intersections occur at signalized intersections, and the majority of top crash locations (80%) are signalized intersections. Only 3% of intersections city-wide are signalized.
- **Fourteen of twenty-four top crash locations are located on major commercial corridors;** half of these locations contain at least one crossing with six or more lanes.
- Arterials are overrepresented in all intersection crashes. Over 75% of crashes take place at an intersection where at least one leg is an arterial roadway. One-quarter of crashes occur at major intersections where two arterials meet. Arterial-arterial intersections make up just 5% of intersections in Memphis. See Figure 2.2.

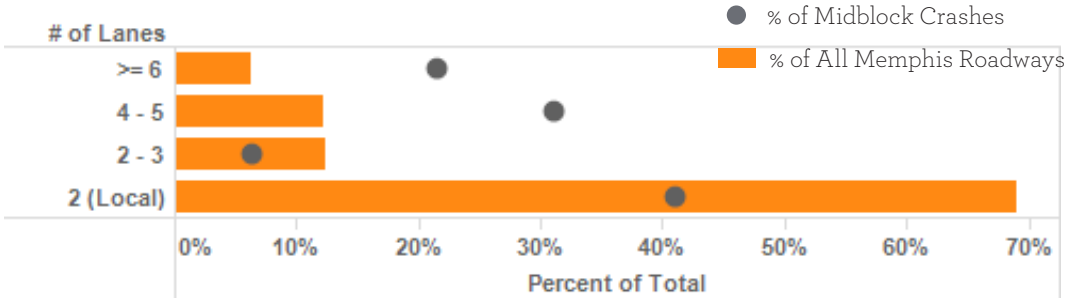
Figure 2.2: Functional Classification of Roadways in Intersections with Crashes and All Intersections



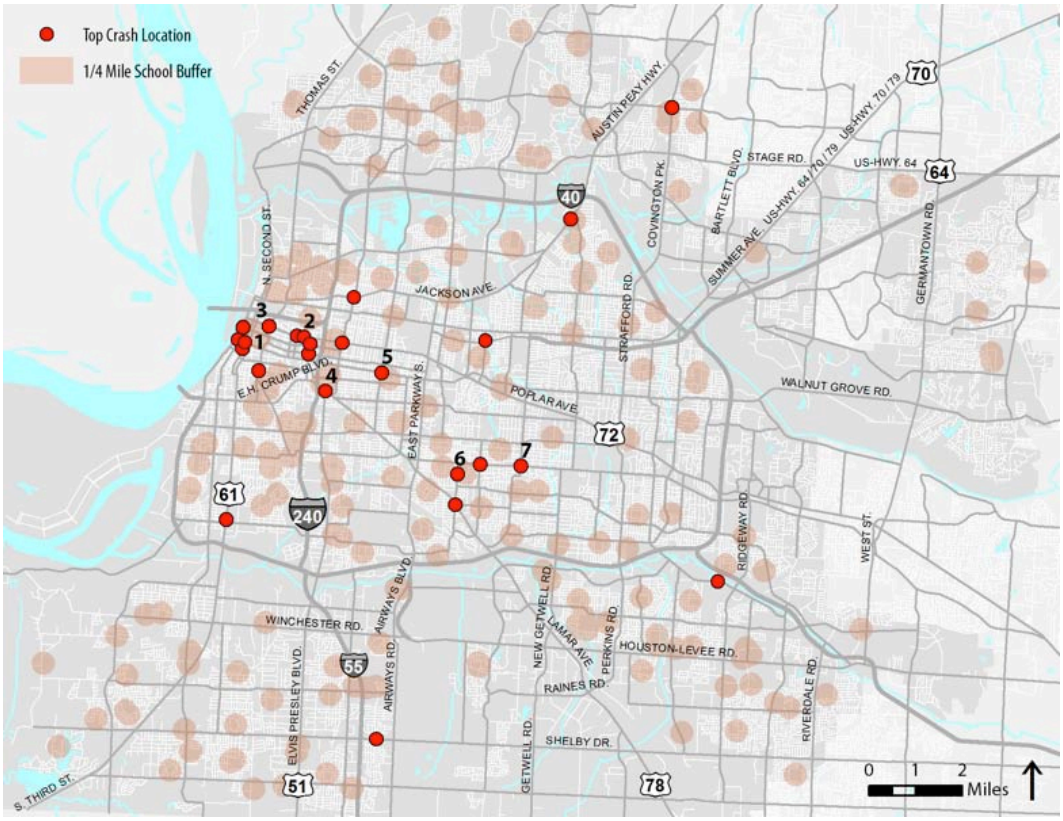
Midblock Crashes

- 35% of pedestrian crashes occur midblock (between intersections).
- Over 50% of midblock crashes occur on arterials, which constitute only 18% of all road mileage in Memphis. Similarly, **over 50% of midblock crashes occurred on roads with four or more lanes**. See Figure 2.3.
- For midblock crashes, injuries are more likely to be fatal on higher-speed roadways, while the likelihood of a crash resulting in no injury is higher on low-speed roadways.
- The four roadways with the most midblock crashes are majority six-lane roadways. Poplar Avenue has the most intersection and midblock crashes.

Figure 2.3: Midblock Crashes by Number of Travel Lanes



Map 2.2 Top Pedestrian Crash Locations



Top Crash Locations

Five Crashes:

1. Union Ave & Second St
2. Poplar Ave & Ayers St

Four Crashes:

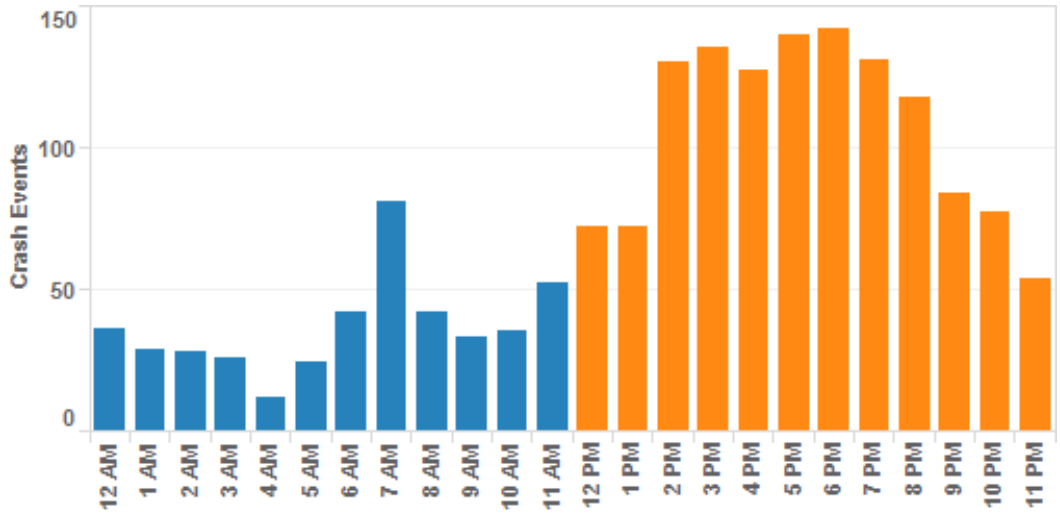
3. Poplar Ave & US 51
4. Lamar Ave & Bellevue Blvd
5. Union Ave & S McLean Blvd
6. Pendleton St & Deadrick Ave
7. Park Ave & Highland Rd

WHEN DO PEDESTRIAN CRASHES OCCUR?

The timing of pedestrian crashes near schools follows a somewhat different pattern as compared to all crashes in the city. Particularly, crashes occur at a higher rate during morning commute times within a quarter-mile of high schools, and at a lower rate between 9 am and noon within a quarter mile of elementary or middle schools. Pedestrian crashes are distributed over time as follows:

- **Pedestrian crash events peak in the afternoon and evening**, but the evening peak is much higher. See Figure 2.4.
- Pedestrian crashes are fairly evenly distributed throughout the week, and are lowest on Sundays and highest on Fridays.
- Crashes occur at a higher rate during morning commute times within a quarter-mile of high schools.
- Crashes occur throughout the year with some peaking in April, May, and October.

Figure 2.4: Pedestrian Involved Crash Events by Hour (All crash events)



WHY ARE CRASHES OCCURRING?

Contributing factors are not routinely recorded, limiting the ability to understand behaviors of pedestrians and motorists involved in crashes. However, an examination of the contributing factor to crashes where a factor was recorded yielded the following findings:

- The top contributing factor within all age groups was 'Darting Running'.
- The second highest contributing action, 'Walking in Roadway', is common along several major corridors. **31% of crashes with pedestrians between ages 19 and 25 involve 'Walking in Roadway'.**
- The third highest contributing action, 'Crossing No Signal', is common in downtown and midtown.
- Playing in the Roadway contributed to 7% of crashes with school age children.
- Seniors are the most likely age group to be hit because they are 'Not Visible.'

Table 2.2 Top Contributing Pedestrian Actions (All crashes with reported action, 448 total)

Pedestrian Action	# of Total Crashes	% of Total Crashes
Darting Running	153	34%
Walking in Roadway	95	21%
Crossing No Signal	59	13%
Not Visible	34	8%
Crossing with Signal	21	5%

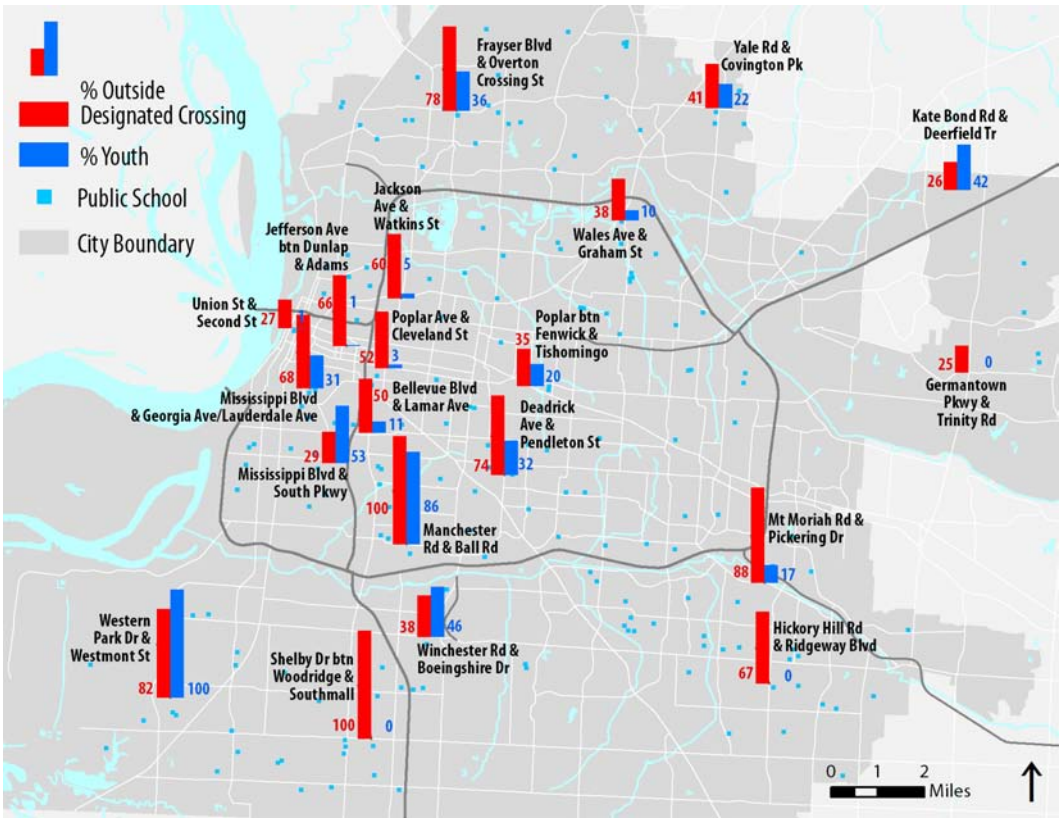
Pedestrian Counts

A regular pedestrian count program is instrumental in measuring change over time. This empirical data can be used to monitor implementation of the recommendations of this Action Plan and its impact. **Counts will provide information about location-specific pedestrian behaviors, while also documenting general trends in pedestrian volumes** (where pedestrian activity is occurring and where it is not), and provide a basis for understanding how demographics, land use, and other factors influence pedestrian travel.

Twenty locations were selected for initial counts as part of this planning process. These locations were a mix of high crash intersections, locations identified in the school survey or by stakeholders, locations of planned improvements, and locations likely to have high walking activity based on the pedestrian network analyses. Counts were conducted in the fall of 2014 and one view of the results is presented here. Map 2.4 below highlights locations where pedestrians crossed outside of designated crossings, as well as percentage of youth pedestrians. **Pedestrians crossing outside of designated crosswalks were observed throughout this planning process, and may be indicative of a need for additional pedestrian crossing opportunities** or for additional enhancements to improve conditions for pedestrians at existing signalized intersections or other marked crossings.

A proposed pedestrian count methodology and ongoing process for implementation is recommended in a separate document produced for this planning process and includes the full results of the 2014 counts.

Map 2.4 Count Results by Percentage of Youth Pedestrians and Percentage of Pedestrians Crossing outside a Designated Crossing



School Survey Summary

The following section highlights the results of a school survey that was developed as part of this Action Plan and administered in May 2014. The survey identified primary perceived barriers for children walking to and from school, key routes used, and specific roadways or intersections that are perceived as particularly dangerous by public school administrators.

Twenty-nine schools provided input – twenty elementary schools, six middle schools, and three high schools. The frequency of responses related to high-volume or high-speed roadways, roadways lacking sidewalks, and issues pertaining to crossing guards suggest that a plan with recommended improvements that will increase pedestrian safety will be welcomed by Memphis area schools.

SCHOOL ENROLLMENT AND WALKING RATES

Administrators were asked to report enrollment data along with the number of students currently walking to or from school. One school did not report enrollment data, and two schools provided incomplete data for the numbers of current students walking to or from school.

Reported walk rates ranged from 0 to 100% of enrolled students, with **an average of 36% of enrolled students walking to school and 38% walking home from school.** A summary of walk rate data by school level is provided in Table 2.3.

CROSSING GUARDS AT STREET CROSSINGS NEAR SCHOOL

When asked whether or not crossing guards assist children near the school, 69% of respondents indicated that they do provide assistance. Several survey participants indicated that their school is either in need of assigned crossing guards or that assigned guards are not always present.

Table 2.3 Walk Rates of Responding Schools

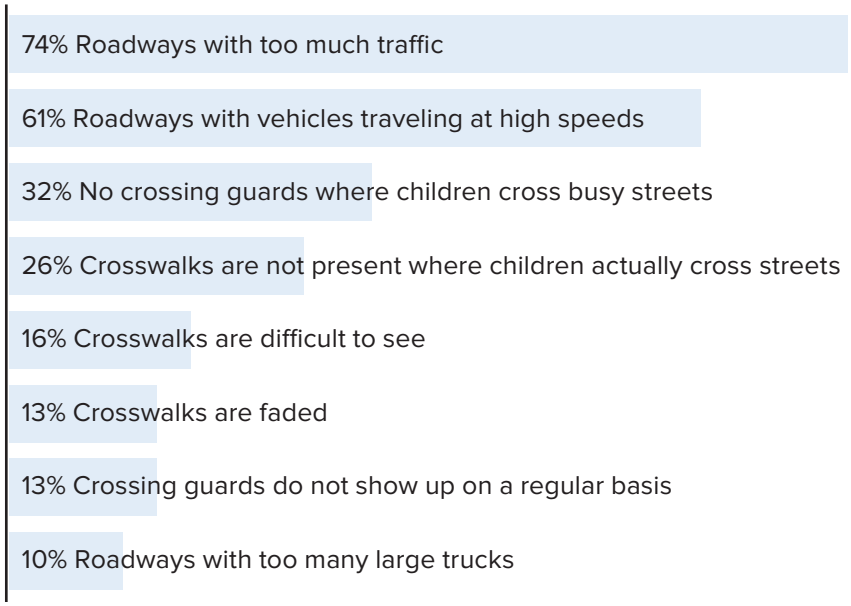
% Walking (AM)	# of Schools
Elementary Schools	
0% - 20%	8
21% - 40%	4
41% - 60%	5
61% - 80%	2
81% - 100%	2
Middle Schools	
0% - 20%	1
21% - 40%	2
41% - 60%	0
61% - 80%	2
81% - 100%	0
High Schools	
0% - 20%	2
21% - 40%	2
41% - 60%	0
61% - 80%	0
81% - 100%	0

% Walking (PM)	# of Schools
Elementary Schools	
0% - 20%	8
21% - 40%	4
41% - 60%	4
61% - 80%	3
81% - 100%	2
Middle Schools	
0% - 20%	2
21% - 40%	0
41% - 60%	2
61% - 80%	2
81% - 100%	0
High Schools	
0% - 20%	1
21% - 40%	1
41% - 60%	0
61% - 80%	1
81% - 100%	0

OBSTACLES TO CROSSING STREETS FOR CHILDREN WALKING TO SCHOOL

Survey participants were asked to indicate up to three obstacles for children crossing streets on the way to school. **'Roadways with too much traffic' was the most frequently indicated obstacle (74%)**, followed by 'Roadways with vehicles traveling at high speeds' (61%) and 'No crossing guards where children cross busy streets' (32%). Frequencies for all responses are provided in Figure 2.5.

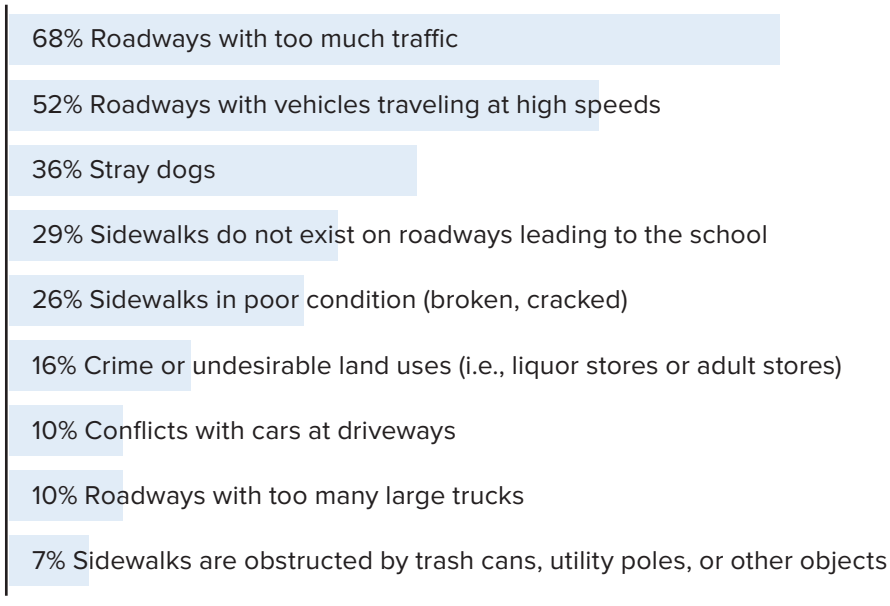
Figure 2.5 Obstacles to Crossing Streets in the Vicinity of Schools



OTHER OBSTACLES FOR CHILDREN WALKING TO SCHOOL

Survey participants were also asked to consider streets between intersections, and identify the biggest obstacles for children walking to school. 'Roadways with too much traffic' was again the most frequent response (68%), followed by 'Roadways with vehicles traveling at high speeds' (52%), and 'Stray dogs' (35%). Frequencies for all responses are provided in Figure 2.6.

Figure 2.6 Obstacles Along Walk Routes in the Vicinity of Schools



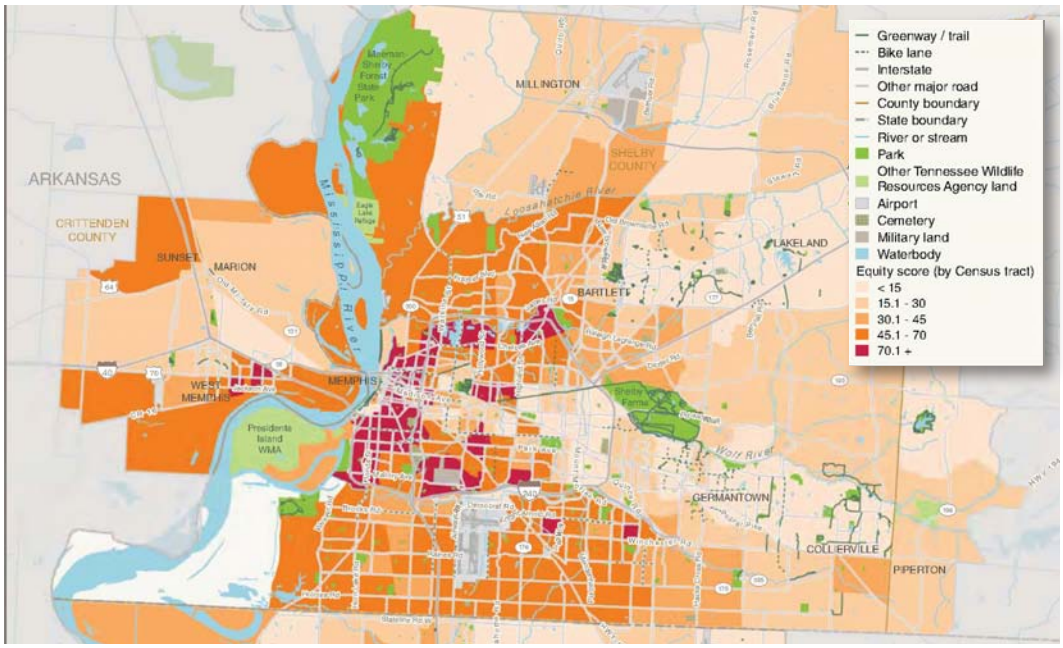
The responses to these questions pertaining to specific locations (e.g., main walking routes, streets that are not suitable as walking routes, and other specific concerns) were geo-coded (i.e., mapped) by the project team for use in the development of the proposed pedestrian network.

Equity Analysis

The 2013 *Mid-South Regional Greenprint & Sustainability Plan* established an objective to ensure that all citizens share equitable access to community resources. The plan includes a detailed equity analysis that assigns an equity score to each census tract in the region, covering the entire City of Memphis extents, based on a composite scoring approach. Higher equity scores correspond to higher than average rates of one or more of the following groups:

- Households living below the poverty line
- Households without vehicles
- Non-white populations
- Limited English Proficiency (LEP) populations

These equity scores were used throughout this plan to meet a similar objective of providing all citizens with equitable access to sidewalk resources. Chapter 4 describes how equity scores influenced project development and project prioritization.



The 2013 *Mid-South Regional Greenprint & Sustainability Plan* established an equity score for each census tract in the City of Memphis. These scores were used in this planning process during project development and prioritization.

CHAPTER 3:

NETWORK ANALYSIS

Chapter Contents:

Introduction

Detailed assessments of demand for walking and the quality of the pedestrian network were conducted using two data-driven models: (1) the Pedestrian Suitability Index (PSI), and (2) the shortest path analysis. The PSI describes the relationship between demand for walking activity and the supply of facilities for pedestrians throughout the City. The shortest path analysis is a complementary analysis tool that provides more localized demand information by identifying the roadways most likely to be used by pedestrians.

Together, these two quantitative models **provide a useful framework for identifying specific segments and intersections in need of pedestrian improvements.** The findings of these analyses, in combination with the existing conditions analysis described in Chapter 2, were essential in developing and prioritizing potential projects.

Pedestrian Suitability Index

The Pedestrian Suitability Index (PSI) is a supply and demand model that evaluates roadway and sidewalk quality (supply) and estimates pedestrian activity (demand).

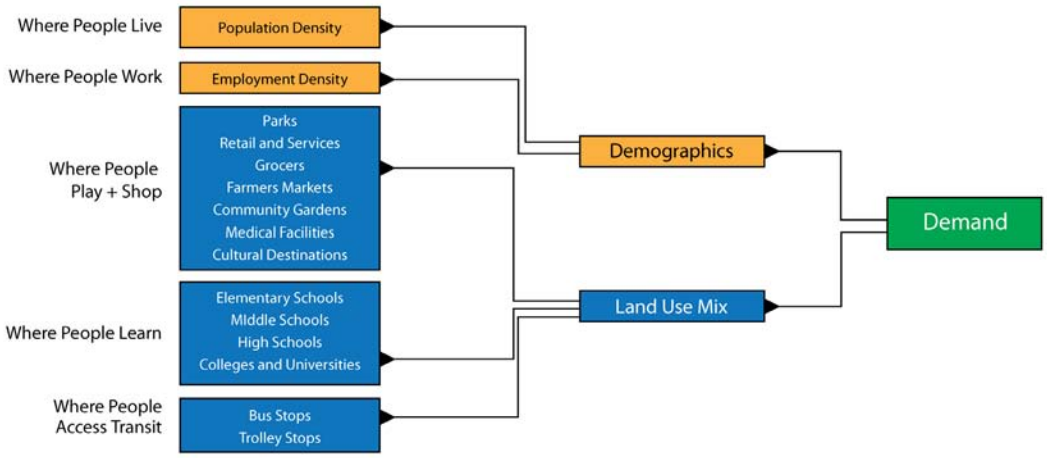
- PSI's **demand model** combines information about where people live, work, play, access transit, and access schools into a composite sketch that shows where—and to what degree—pedestrian activity is likely to occur.
- PSI's **supply model** describes the quality of the pedestrian network by evaluating street and intersection attributes such as traffic volume, speed limit, sidewalk width, marked crosswalks, and traffic control.

The combined results of the PSI supply and demand analysis visualize how well pedestrian facilities are meeting walking needs in different parts of the city. The end result of integrating the supply and demand models is an **overall suitability index that graphically represents where improvements are likely needed based upon the relative quality of the network compared to the demand.** This model informed the development of the project list by highlighting areas where there is a combined result of high demand and low supply.

Demand Analysis

The demand model identifies expected pedestrian activity by overlaying the locations where people **live, work, play, access public transit, and go to school** into a composite sketch of demand. Figure 3.1 summarizes this approach.

Figure 3.1: Demand Model Approach



SCORING METHOD

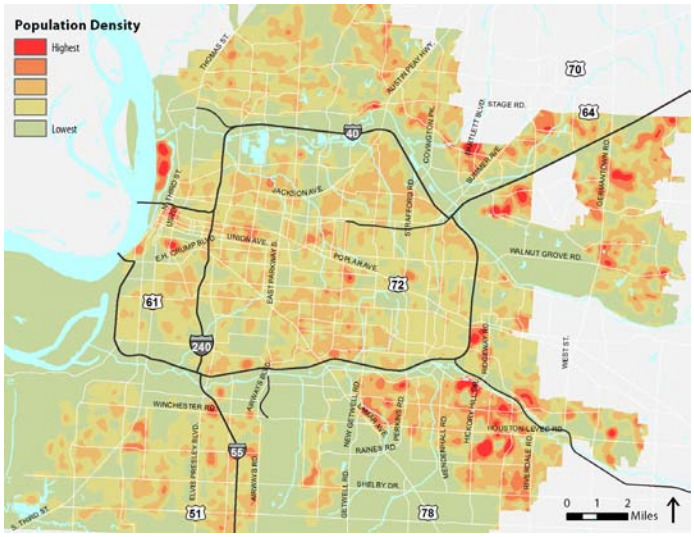
Each demand input is scored on a scale of 1 – 5 based on density and proximity of origins and destinations and then assigned weighted multipliers to reflect the relative influence categories have on pedestrian activity. As illustrated in Table 3.1 below, each major category received equal weight in the scoring.

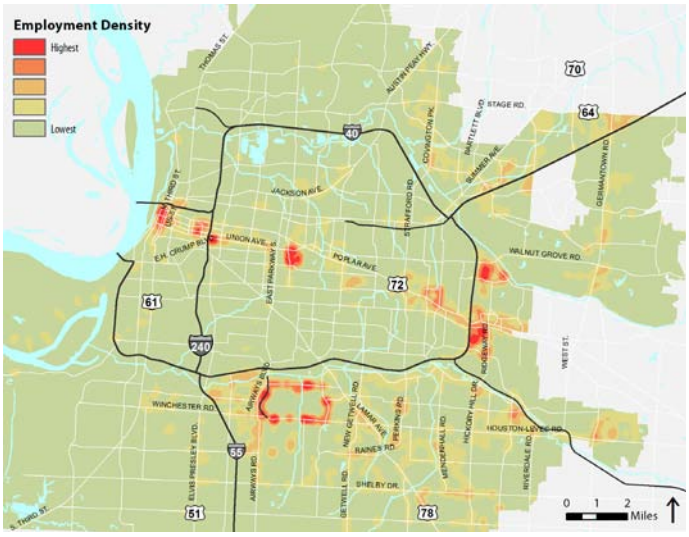
Table 3.1: Demand Scoring Input

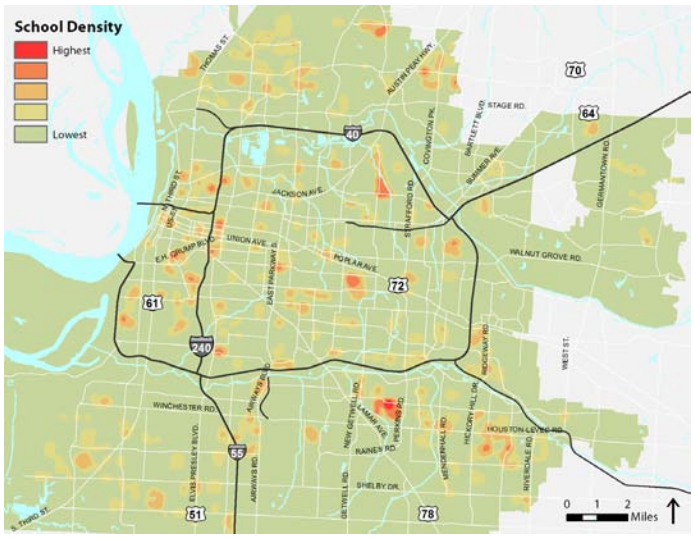
Category	Input	Score Method	Score Range	Category Influence
LIVE	Total Population	Density of population	1-5	20%
WORK	Total Employment	Density of employment	1-5	20%
LEARN	Higher Education	Feature located in block	1	20%
	Elementary Schools	Feature located in block	1	
	Middle Schools	Feature located in block	1	
	High Schools	Feature located in block	1	
PLAY + SHOP	Parks	Feature located in block (or intersects with block)	3	20%
	Retail and Service Jobs (CNS 17/18/19)	Density of employment	1-5	
	Grocers/Farmers Markets/Community Gardens	Feature located in block	3	
	Medical Facilities	Feature located in block	3	
	Cultural Destinations	Feature located in block	2	
TRANSIT	Bus Stops (with ridership)	Average passengers on/off within block	1-5	20%
	Streetcar Stops (with ridership)	Average passengers on/off within block	1-5	
	Key Corridor Route from Short Range Transit Plan	Route traverses block	1	

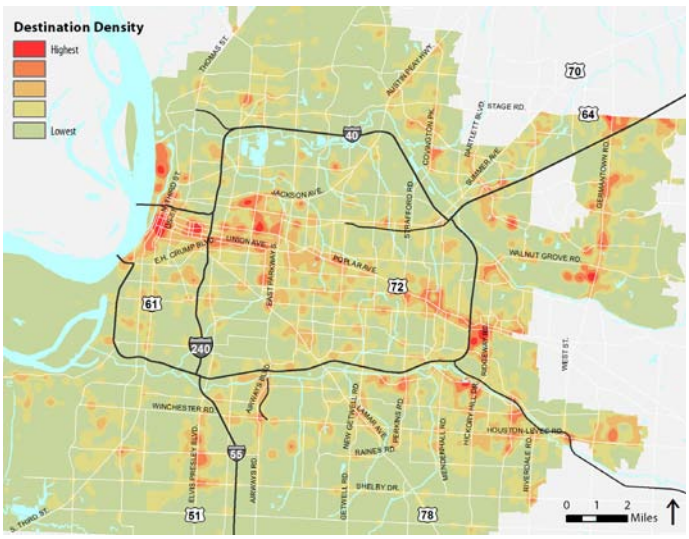
DEMAND ANALYSIS RESULTS

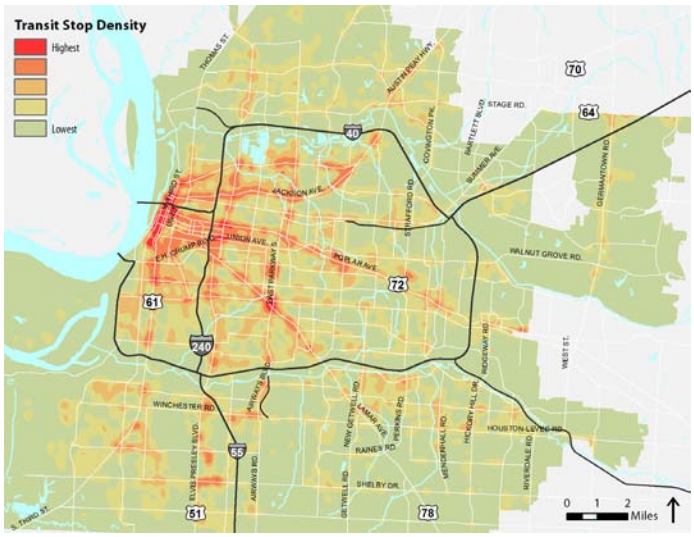
The following maps present relative intensities of potential walking activity according to each input category.



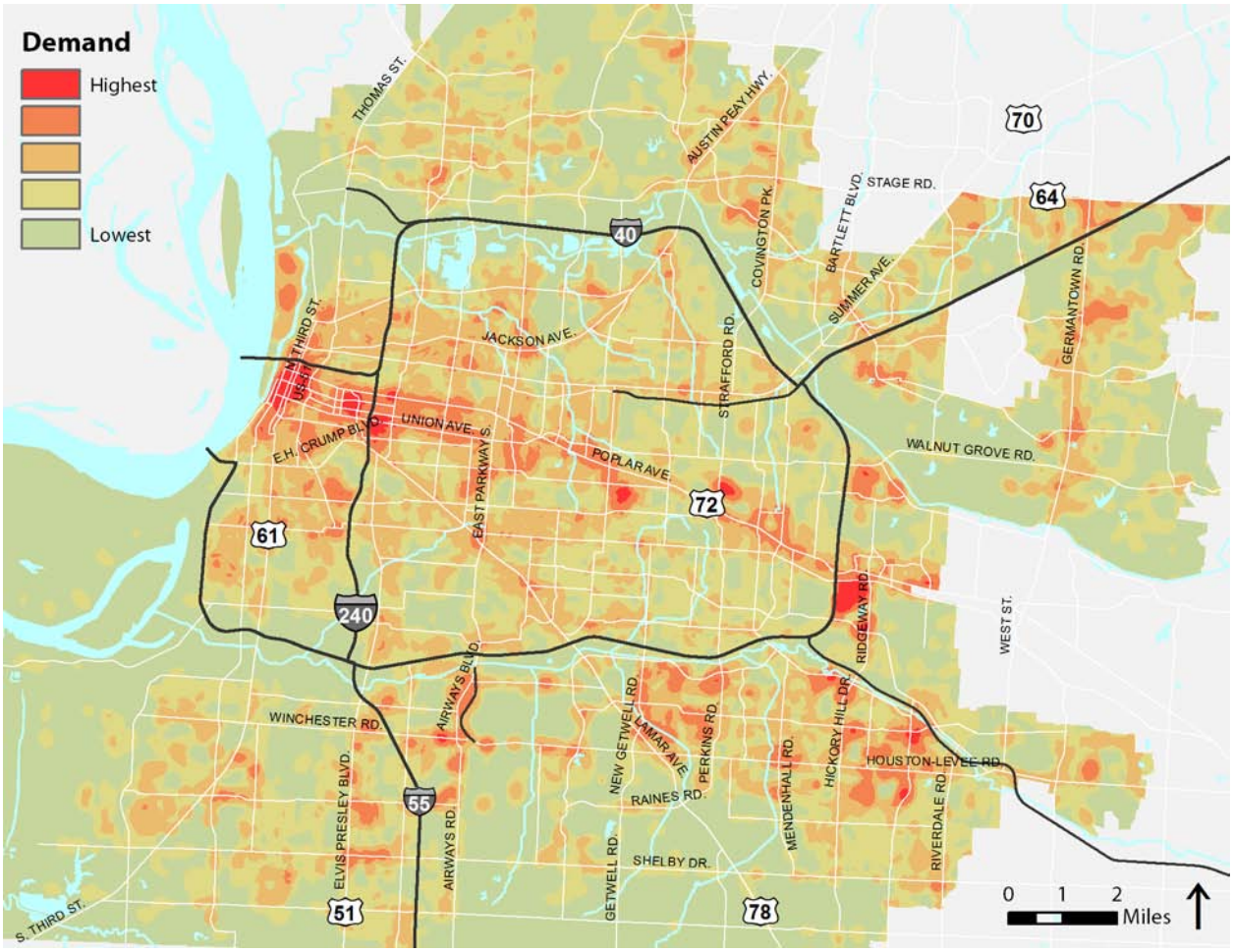








The combined distribution of residents, employment, schools, attractions, and transit is shown as a composite demand map. **Orange and red areas on this map indicate a high demand for walking trips based on the volume and density of trip generators and attractors.**



Demand for walking trips is distributed across the City of Memphis. Key findings of the demand analysis include:

- **Downtown, midtown, and the Poplar Avenue corridor** hold the highest demand for walking trips inside the I-240 Loop.
- Additional nodes of demand within the I-240 Loop exist in **Harbor Town, the neighborhoods south of downtown, along Lamar Avenue, along Summer Avenue/North Parkway, and along Jackson Avenue.**
- The **Hickory Hill area** in the southeast quadrant of Memphis **between I-240, Lamar Avenue, Raines Road, and Riverdale Road** has high demand for walking trips.
- Outside of the I-240 Loop, **Elvis Presley Boulevard, Winchester Road, Airways Boulevard, Germantown Road, Covington Pike, Austin Peay Highway, Stage Road, and Frayser Boulevard** also indicate significant demand.
- The areas bordered by **Walnut Grove Road, Shady Grove Road, the Wolf River, and I-240; Poplar Avenue, Quince Road, Ridgway Road, and I-240; and Sycamore View Road near State Road/Mullins Station Road and Southwest Tennessee Community College** are additional demand nodes.

Supply Analysis

The supply analysis scores segments and intersections based on roadway and sidewalk characteristics that have an impact on pedestrian safety, comfort, and ease of movement. The purpose of the supply analysis is to determine if and where improvement projects may be most needed given the existing conditions (supply) as compared to expected demand. The supply analysis is divided into three parts:

- **Network Suitability** – Suitability of a roadway for pedestrian travel along that roadway
- **Intersection Suitability** – Suitability of an intersection for a pedestrian crossing
- **Roadway Permeability** – Ease with which a roadway can be crossed by someone walking

NETWORK SUITABILITY

Network suitability is based on characteristics of the roadway and the vehicular traffic it carries, the space provided for pedestrians, and the presence and quality of the sidewalks along the roadway. The roadway network is scored by block and all parameters are summarized at the block level.

Composite Network Suitability Scoring Methodology

The composite network suitability scoring was designed to evaluate the presence and quality of the sidewalk on a given block as well as the comfort of traveling along the sidewalk based on the characteristics of the adjacent roadway. All roads are capable of receiving a high pedestrian network suitability score, but higher order streets will require additional amenities such as wider sidewalks and/or buffers from traffic to achieve the highest scoring category that a lower order street would achieve from the simple presence of a sidewalk.

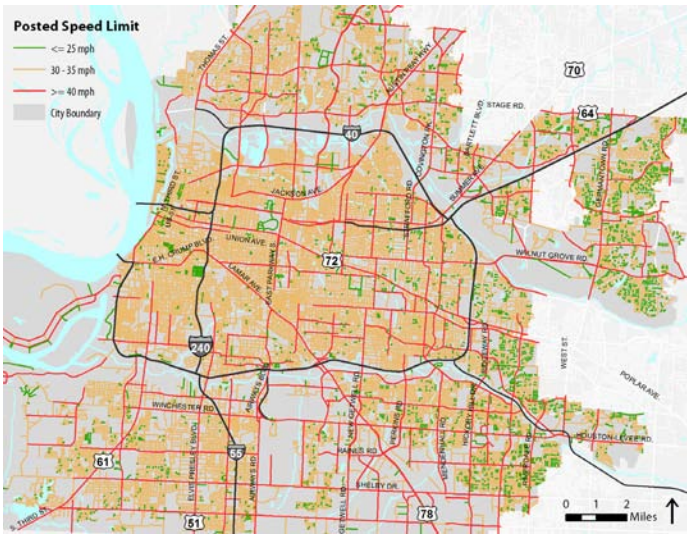
Table 3.2 summarizes the scoring methodology for the pedestrian network. Any score over 80 is considered a 'highly suitable' segment for pedestrian travel. Examples of highly suitable roadways within the three roadway classifications examined (local, collector, arterial) are included in Table 3.2 to illustrate the infrastructure needed for each roadway type to reach a high suitability score. A score over 100 is possible with the scoring matrix.

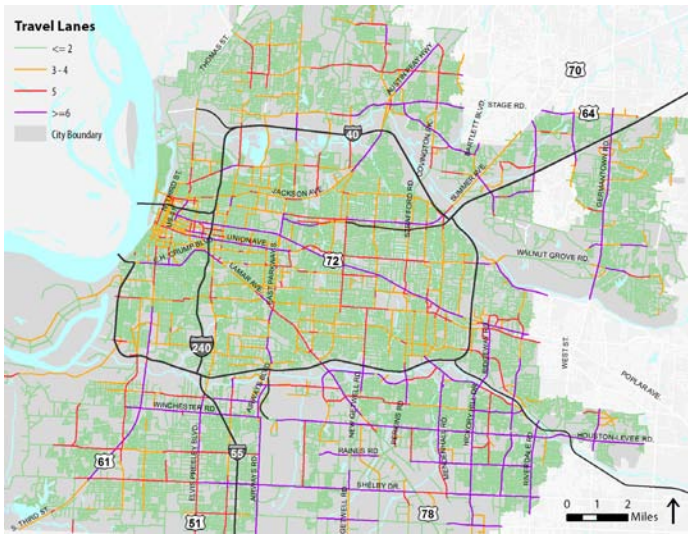
Table 3.2: Composite Pedestrian Network Suitability Scoring Table

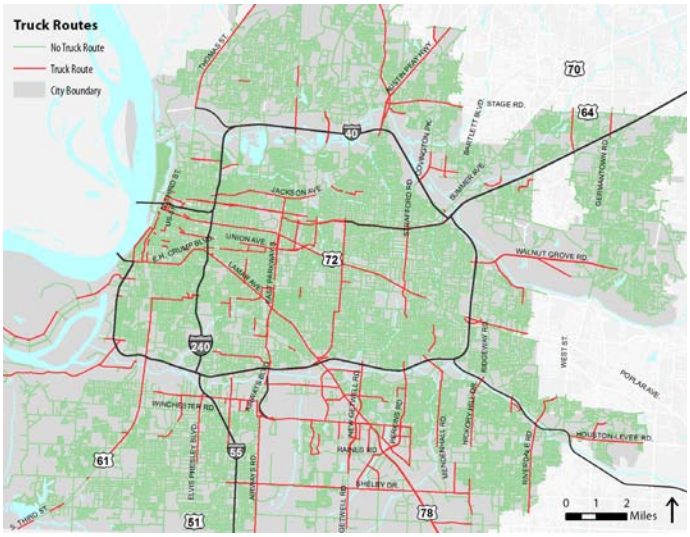
CATEGORY	CRITERIA	ITEM SCORING	SCORING FOR HIGH QUALITY SEGMENT		
			Local	Collector	Arterial
Roadway Characteristics	Posted Speed Limit		2 lane, 25 mph, not truck route 45	3 lane, 35 mph, not truck route 30	5 lane, 40mph, truck route 10
	<=25 mph	20			
	30 – 35 mph	10			
	>= 40 mph	5			
	Roadway Width/Number of Lanes				
	2 lanes	15			
	3 - 4 lanes	10			
	>= 5 lanes	5			
	Truck Routes				
	Absence of truck route	10			
	Presence of truck route	0			
Pedestrian Space	Sidewalk Presence		Complete sidewalk, typical width without buffer 20	Complete sidewalk, 5 – 10 ft with buffer 30	Complete sidewalk, wide with buffer 35
	Complete Sidewalk	15			
	Partial Sidewalk	10			
	Little or No Sidewalk	0			
	Sidewalk Width				
	>= 10’	10			
	5 – 10’	5			
	< 5’	0			
	Sidewalk Buffer				
	Buffer (Landscaped buffer or on-street parking or both)	10			
	No buffer	0			
Sidewalk Quality	Sidewalk Obstacles		No sidewalk quality issues 35	No sidewalk quality issues 35	No sidewalk quality issues 35
	No obstacle	20			
	Obstacle	10			
	Severe obstacle (or no sidewalk)	0			
	Sidewalk Obstructions				
	No obstructions	15			
	One obstruction	10			
	Multiple obstructions (or no sidewalk)	0			
	TOTAL POSSIBLE POINTS		**100**	**95**	**80**

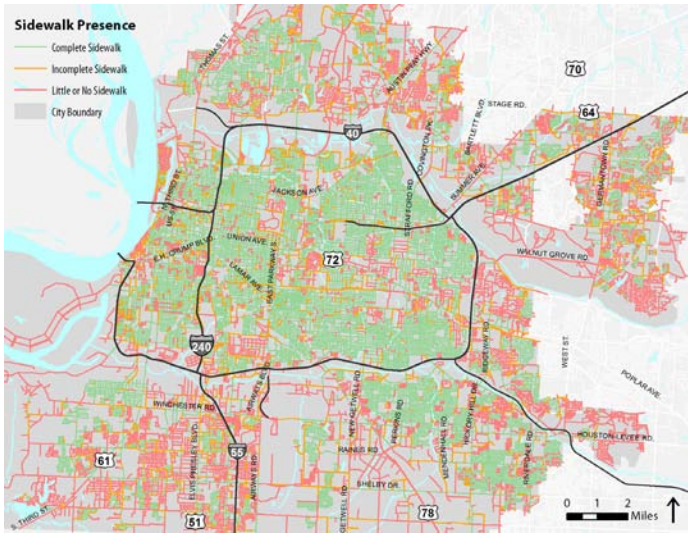
Network Suitability Results

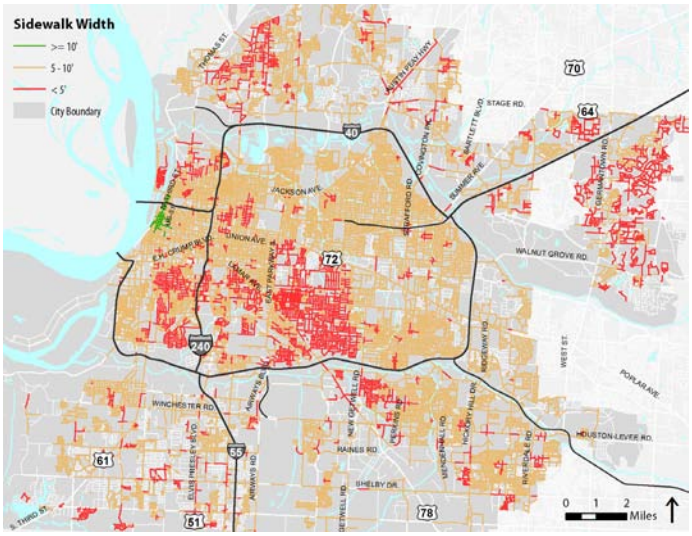
The maps below present geographic variation in eight factors that influence the quality of the pedestrian environment along corridors. These inputs were combined to create the composite network suitability map.

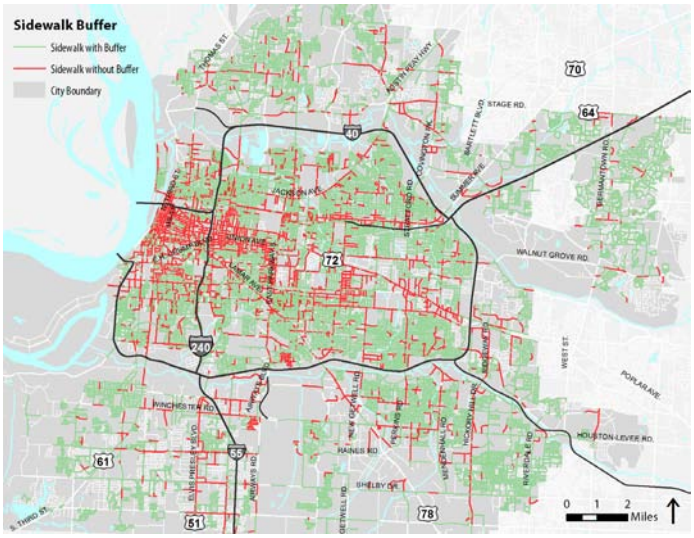


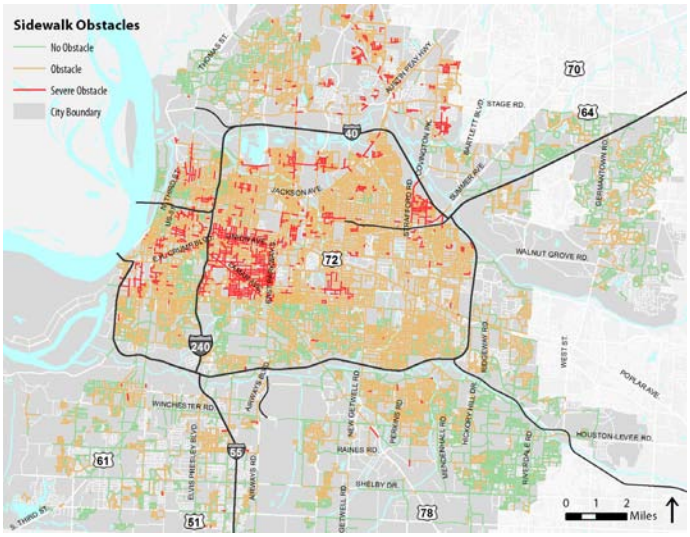


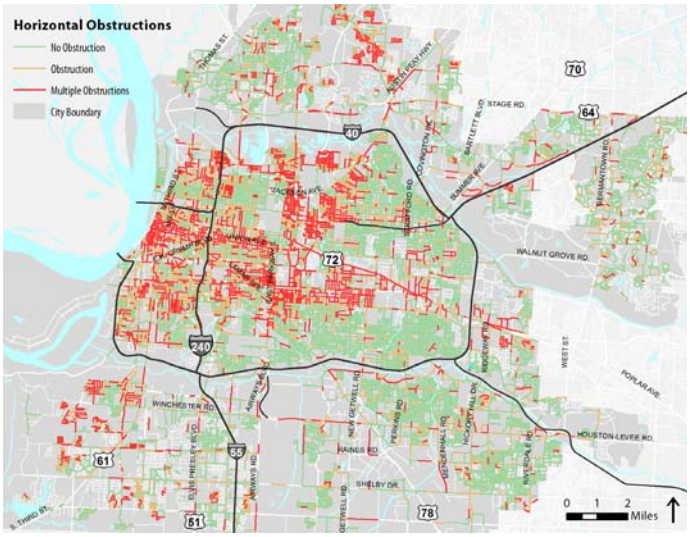








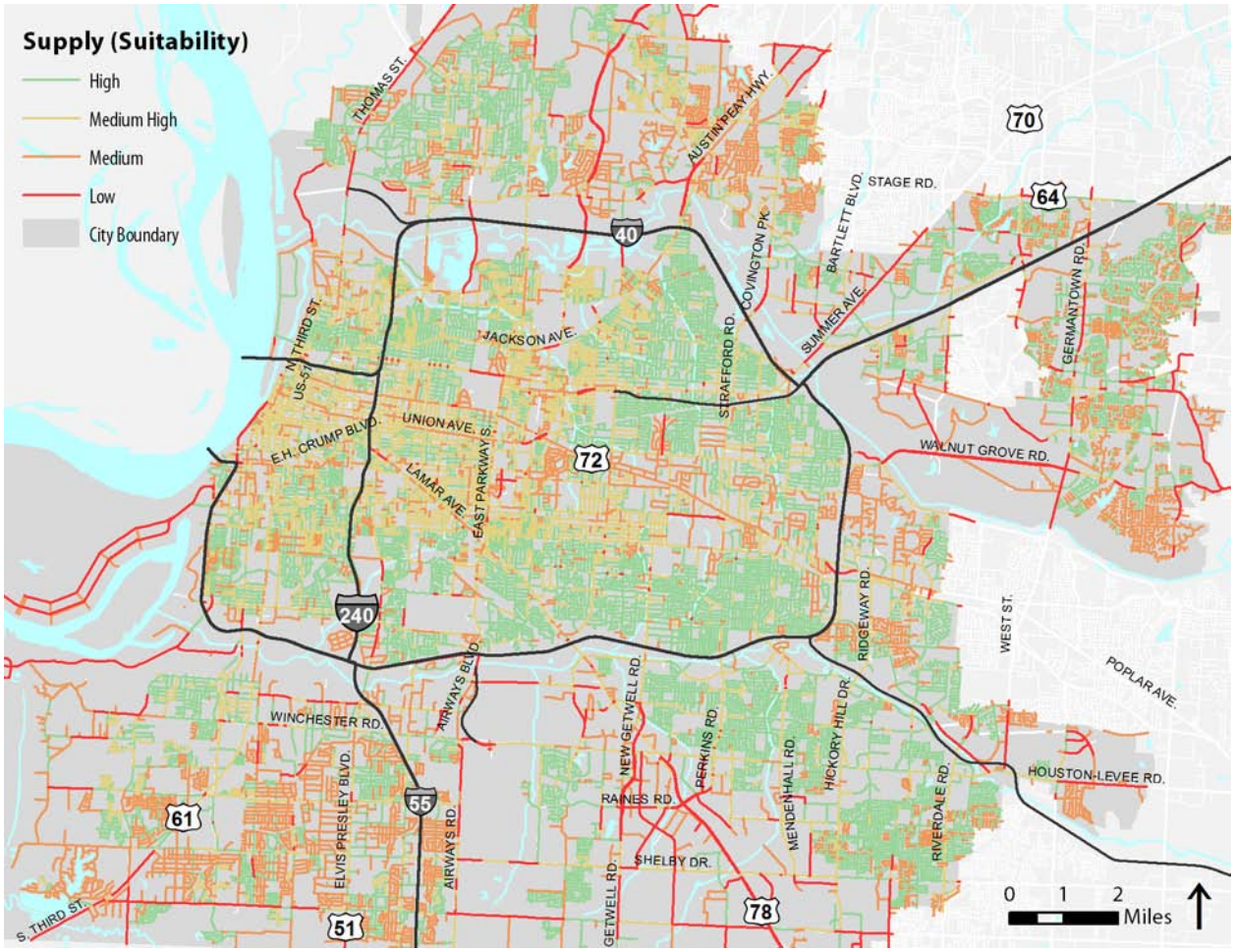




The results of the composite network suitability analysis are shown in Table 3.3 and the figure on the following page. Greenway trails are included in the pedestrian network and classified as 'highly suitable'. Almost half of roadway and greenway mileage scored as 'highly suitable' while one hundred and eighty miles of roadway scored in the lowest category. Over three-quarters of low-scoring roadways are collectors or arterials (identified as 'major roadways' in the table). Of collectors and arterials, 19% received a 'low suitability' score.

Table 3.3: Pedestrian Network Suitability Scoring Results

Score	Class	Miles (All Roadways + Trails)	%of Total Mileage (All Roadways + Trails)	Miles (Major Roadways)	%of Total Mileage (Major Roadways)
80 - 100+	High Suitability	1,330	48%	280	33%
55 - 75	Medium High Suitability	582	21%	315	37%
35 - 50	Medium Suitability	648	24%	96	11%
0 - 30	Low Suitability	181	7%	158	19%
	All Classes	**2,742**	**100%**	**849**	**100%**



Key findings of the Pedestrian Network Suitability Analysis include:

- Most of the local road network within the I-240 Loop is suitable in its current state. **Missing sidewalks on local roads outside of the I-240 Loop reduce suitability throughout neighborhoods.** Speed reduction could improve suitability in some of these areas.
- **Major roadways servicing Aerotropolis are highly uncomfortable** for pedestrians. This area will be overlaid with demand to identify localized priorities, as pedestrian demand is likely concentrated in certain areas.
- **Lamar Avenue, Union Avenue, Poplar Avenue, Riverside Boulevard, North Parkway, Elvis Presley Boulevard, and Summer Avenue** are the least suitable for pedestrian travel in their current state inside the I-240 Loop.
- Outside of the I-240 Loop, **Airways Boulevard, New Getwell Road, Holmes Road, Lamar Avenue, Walnut Grove Road, Germantown Road, Summer Avenue, Austin Peay Highway, New Allen Road, and Thomas Street** are the least suitable for pedestrian travel in their current state.

INTERSECTION SUITABILITY

Intersections are scored through an analysis of roadway characteristics at the intersection as well as available pedestrian infrastructure. Roadway characteristics include posted speed limit, roadway width, and traffic control devices. Pedestrian infrastructure includes marked crosswalks, access ramps, raised medians, and pedestrian beacons. Intersections are scored along collector and arterial roadways only, since these major roadways were identified as barriers in the crash analysis and are the most difficult for pedestrians to cross. The scoring was set up so that local intersections would score as highly suitable, as described below.

Composite Intersection Suitability Scoring Methodology

To allow one intersection scoring method to apply to the variety of roadways in Memphis, the methodology begins by scoring intersections based on roadway characteristics that impact pedestrian crossing safety and comfort. Intersections with higher speeds and more travel lanes score fewer points than those with lower speeds and fewer travel lanes. Roadways then score points for pedestrian crossing amenities such as marked crosswalks, curb ramps, median refuge islands, and traffic signals.

All crossings types are capable of receiving a high crossing suitability score, but higher order streets will require additional features such as refuge island crossings or traffic signals to achieve the same suitability category that a lower order street would achieve without a marked crossing or from the simple presence of a marked crosswalk.

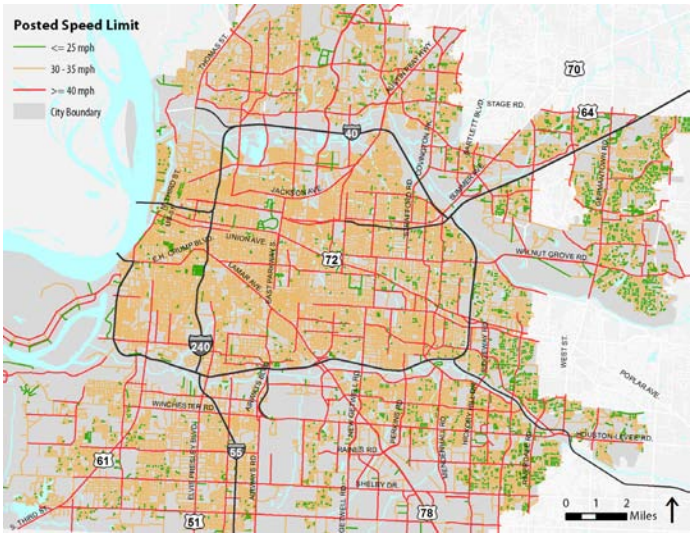
Table 3.4 summarizes the scoring methodology for intersections. Any score over 80 is considered a 'highly suitable' intersection for pedestrians to cross. Examples of highly suitable crossings at three combinations of roadway types (local-local, arterial-arterial, local-arterial) are also included in Table 3.4 to reinforce the infrastructure needed for each intersection type to reach this category. A score over 100 is possible with the scoring matrix.

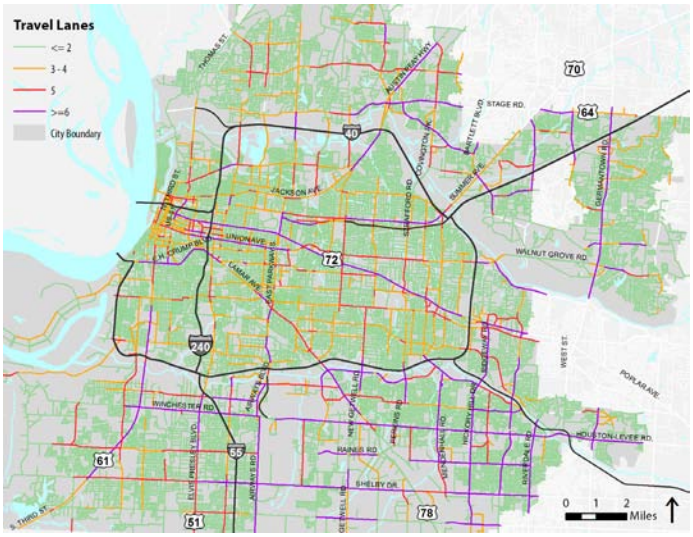
Table 3.4: Composite Intersection Suitability Scoring Table

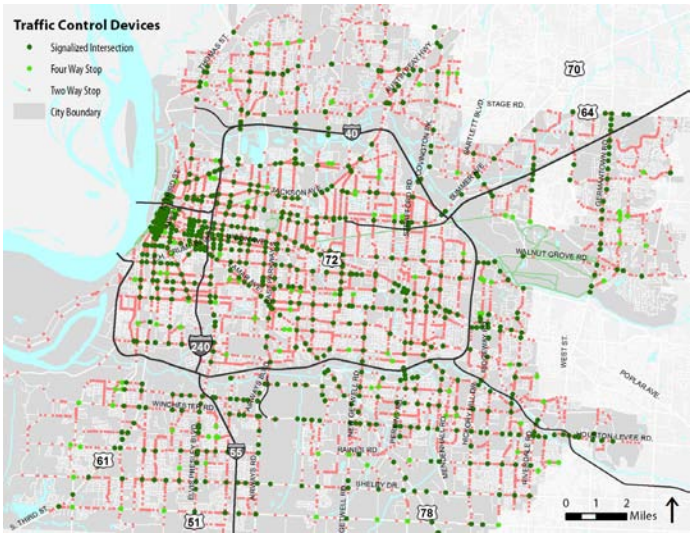
CATEGORY	CRITERIA	ITEM SCORING	SCORING FOR HIGH QUALITY CROSSING		
			Local-Local	Arterial -Arterial	Local-Arterial
Roadway Characteristics	Posted Speed		<=25 mph, 2 lanes, stop control 80	>35 mph, 5+ lanes, signalized 50	>35 mph, 5+ lanes, no control 10
	<= 25 mph	20			
	30 – 35 mph	10			
	> 35 mph	5			
	Roadway Width/Number of Lanes				
	2 lanes	25			
	3 - 4 lanes	10			
	>= 5 lanes	5			
	Traffic Volumes*				
	<= 9,000 AADT	15			
	9,000 – 15,000 AADT	5			
	>15,000 AADT	0			
	Traffic Control Devices				
	Traffic Signal	40			
	Stop Control	20			
	No Control	0			
Pedestrian Infrastructure	Crosswalks		Curb ramps 15	Marked crosswalks, curb ramps 30	Marked crosswalks, curb ramps, pedestrian refuge, RRFB 65
	Marked Crossing	15			
	No marked crossing	0			
	Curb Ramps				
	Presence of curb ramps	15			
	Absence of curb ramps	0			
	Refuge Island				
	Designated pedestrian refuge	15			
	Median island	10			
	No median or refuge	0			
	Pedestrian Beacon				
	RRFB	20			
	No signal	0			
	MAXIMUM POSSIBLE SCORE		95	80	75

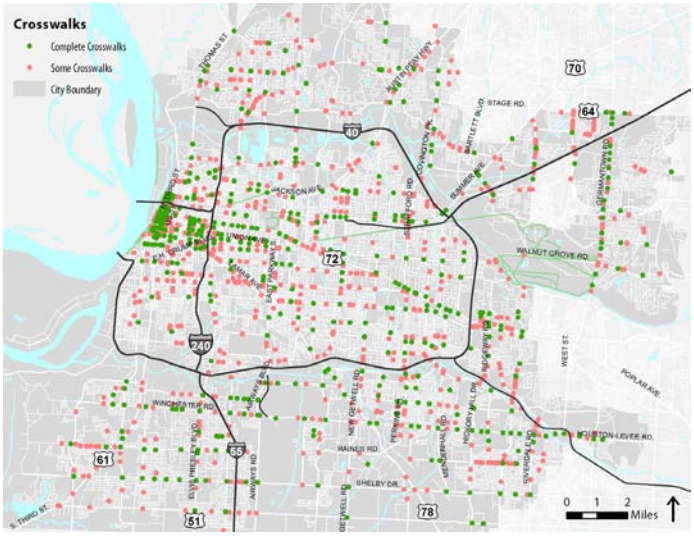
Intersection Suitability Results

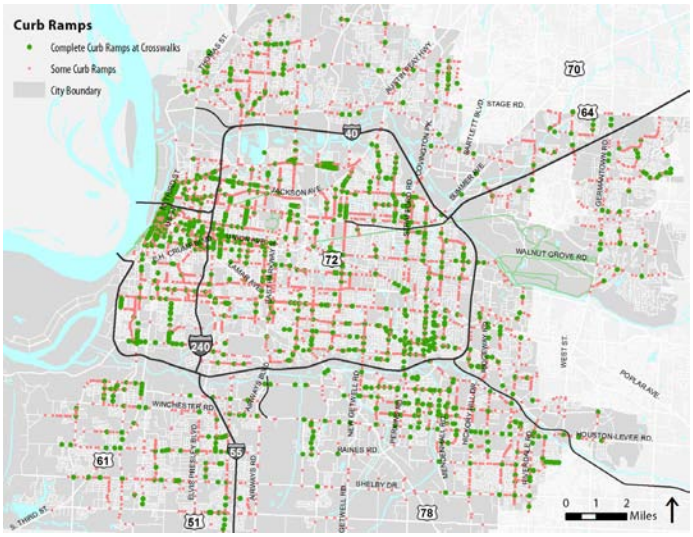
The maps below present geographic variation in seven factors that influence the quality of the pedestrian environment at intersections. These inputs were combined to create the composite intersection suitability map.

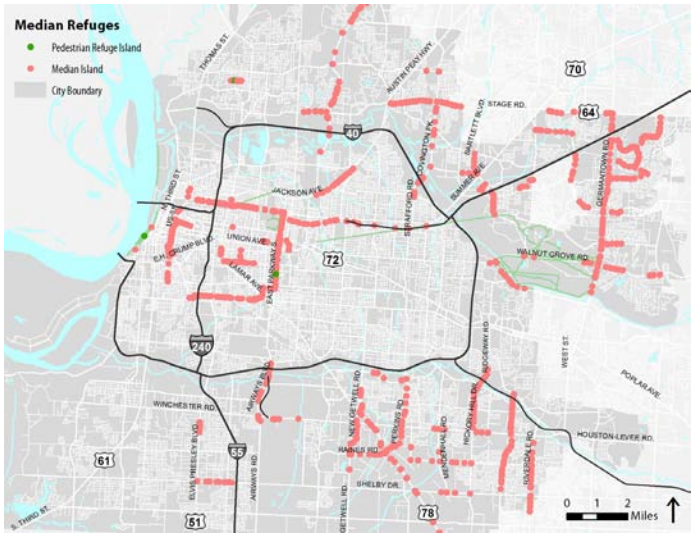


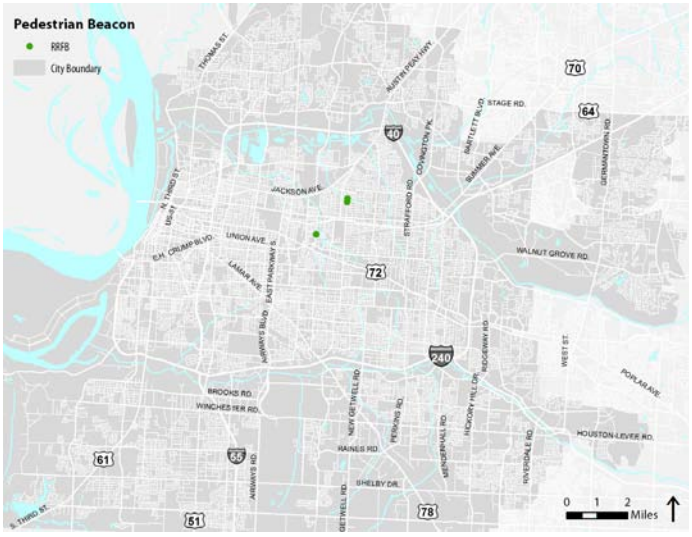








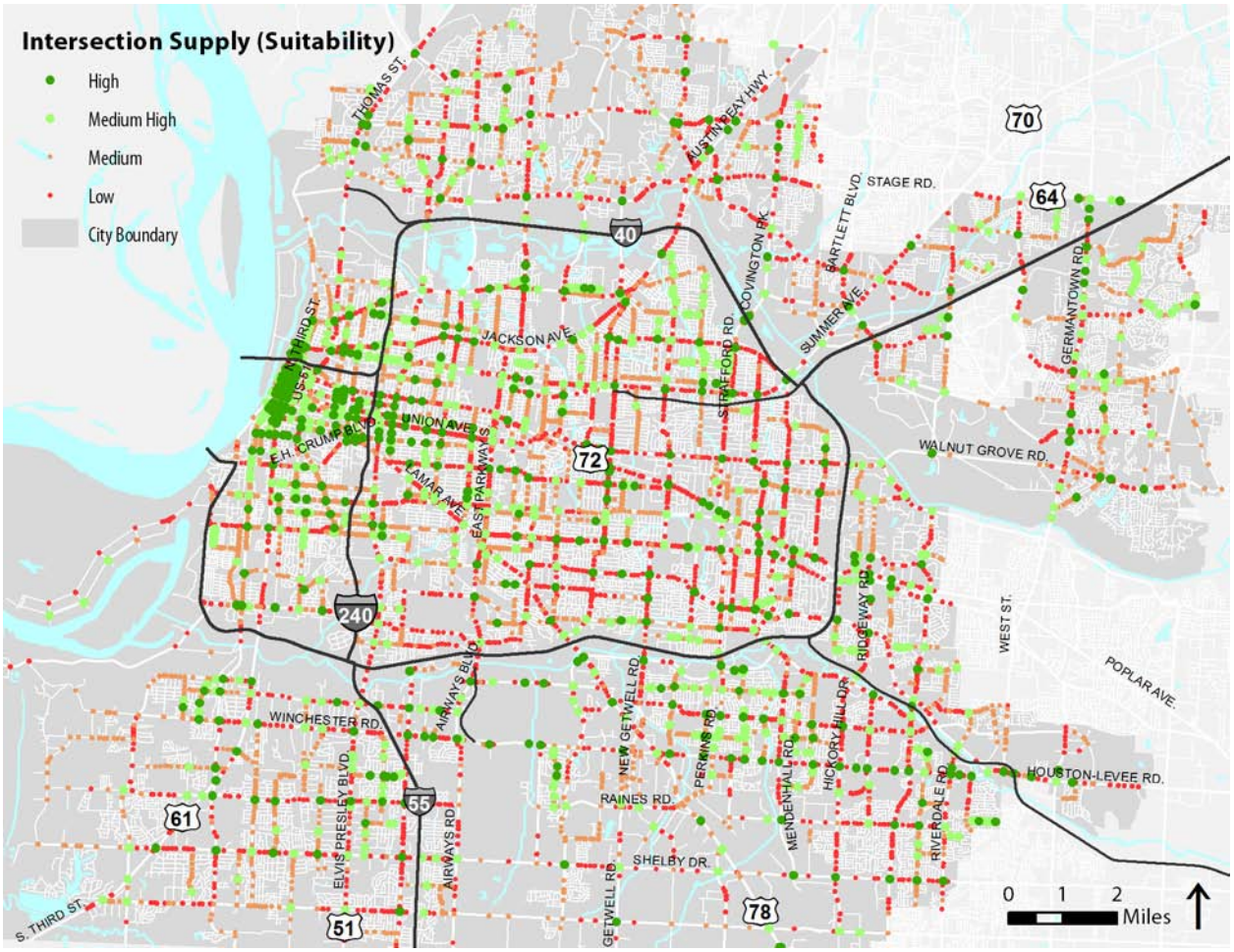




The results of the composite Intersection Suitability Analysis for intersections along major roadways are shown in Table 3.5 and the figure following. A summary is shown first for all intersections and then for signalized intersections and four-way stops only. The scoring was set up so that only uncontrolled crossings end up in the 'low suitability' category. At four-way controlled intersections (signals or stop signs), 13% are in the medium suitability category, warranting improvement in high demand areas.

Table 3.5: Intersection Suitability Scoring Results

Score	Class	All Intersections	Percentage of Total Intersections	Signalized Intersections/ Four-way Stops	Percentage of Signalized Intersections/ Four-Way Stops
80 – 100+	High Suitability	460	7%	453	49%
55 - 75	Medium High Suitability	674	10%	350	38%
35 - 50	Medium Suitability	2,788	40%	114	13%
0 - 30	Low Suitability	3,023	44%	0	0%
	All Classes	**6,945**	**100%**	**917**	**100%**



Key findings of the Intersection Suitability Analysis include:

- Most **intersections downtown are highly suitable** for pedestrian crossings because of extensive pedestrian infrastructure, including traffic signals, marked crosswalks, and curb ramps.
- Pockets of suitable crossings exist throughout neighborhoods inside and outside the I-240 Loop.
- **Unsignalized crossings along arterial roadways are highly unsuitable** for pedestrian crossings because of wide roadways, high speeds, and traffic volumes. The **need for crossings between signals** on these roadways is examined in the following 'Roadway Permeability' section.
- Signalized intersections along many arterials score well because of existing investments in crosswalks and curb ramps. Additional safety enhancements like protected walk phases or high visibility crosswalk markings could further enhance intersections where collisions have occurred despite a relatively high suitability score.

ROADWAY PERMEABILITY

In addition to intersection scoring, major roadway corridors (collectors and arterials) were scored to identify long segments that lack adequate pedestrian crossings opportunities, which can serve as barriers to safe and comfortable pedestrian travel, particularly in areas of high demand. These segments will be candidates for midblock crossings or improved crossings at unsignalized intersections that may include high-visibility crosswalks, pedestrian median refuge islands, and pedestrian beacons and related treatments. Segments were scored based on distances between crossings, posted speed limit, roadway width (approximated by number of travel lanes), median islands, and traffic volumes.

Composite Roadway Permeability Scoring Methodology

Scoring for roadway permeability is a combination of roadway characteristics and the distance between crossings. Higher speed and wider streets receive few points for roadway characteristics, but can be made suitable with marked crossings appropriate for the roadway context.

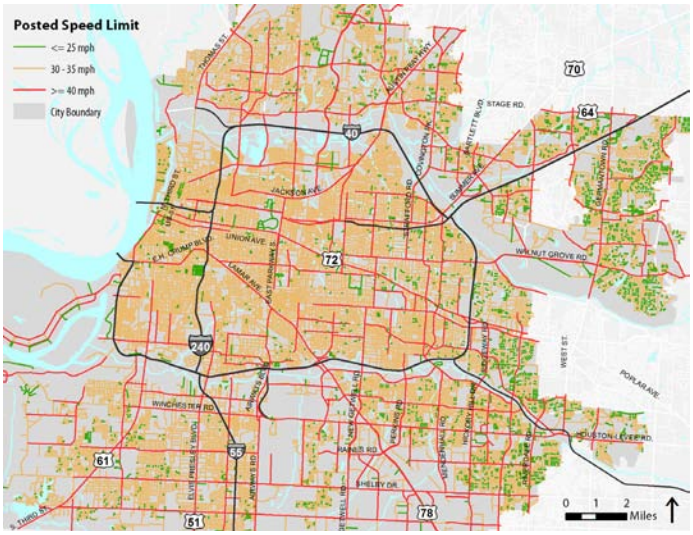
A score of 80 or above achieves the 'highly suitable' category for roadway permeability. Table 3.6 summarizes the scoring approach for roadway permeability and illustrates examples of highly permeable roadways of each roadway classification. Only collector and arterial roadways were included in the analysis since these are the roads likely to serve as barriers to pedestrian travel, but a theoretical scoring for local roadways is included to demonstrate how the scoring methodology was established.

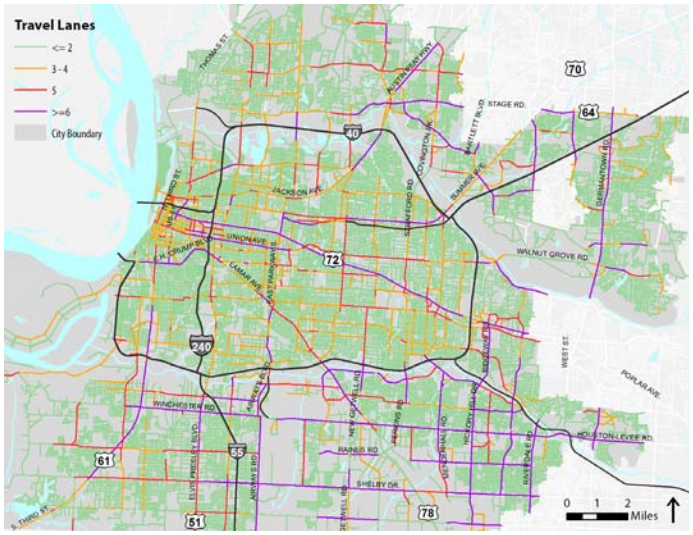
Table 3.6: Roadway Permeability Scoring Table

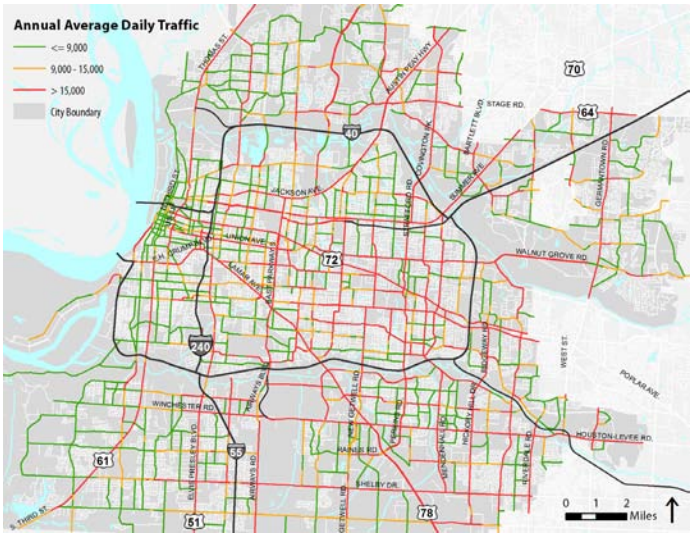
CRITERIA	ITEM SCORING	SCORING FOR HIGHLY PERMEABLE ROADWAY		
		Local	Collector	Arterial
Posted Speed		30	15	5
<= 25 mph	30			
30 – 35 mph	15			
> 35 mph	5			
Roadway Width/Number of Lanes		40	20	10
2 lanes	40			
3 -4 lanes	20			
>= 5 lanes	10			
Traffic Volumes		30	15	5
<= 9,000 AADT	30			
9,000 – 15,000 AADT	15			
>15,000 AADT	5			
Refuge Island		0	0	20
Median island	20			
No median island	0			
Distance between crossings		0	50	50
<= 600 ft	50			
600 – 1200 ft	25			
> 1200 ft	0			
MAXIMUM POSSIBLE SCORE		100	100	90

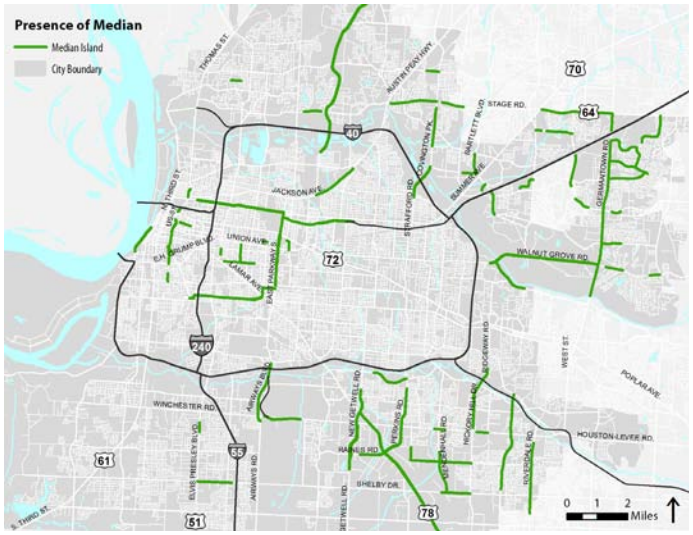
Roadway Permeability Results

The maps below present geographic variation in five factors that influence the ease of pedestrian mobility across roadways. Each of these inputs were combined to create the composite roadway permeability map.









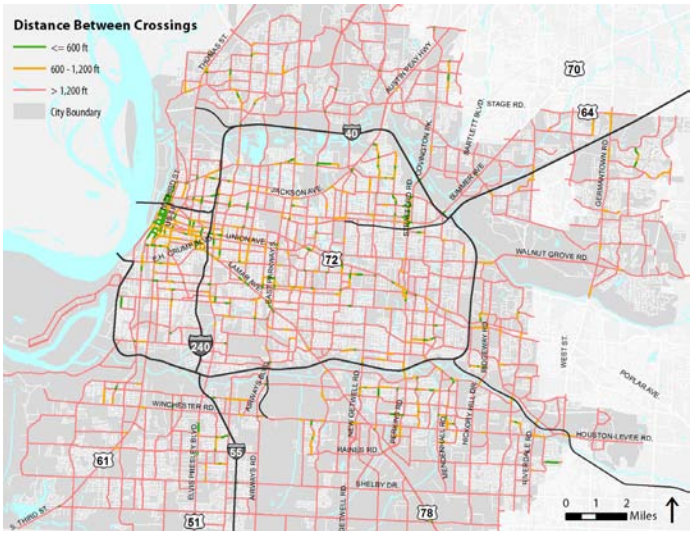
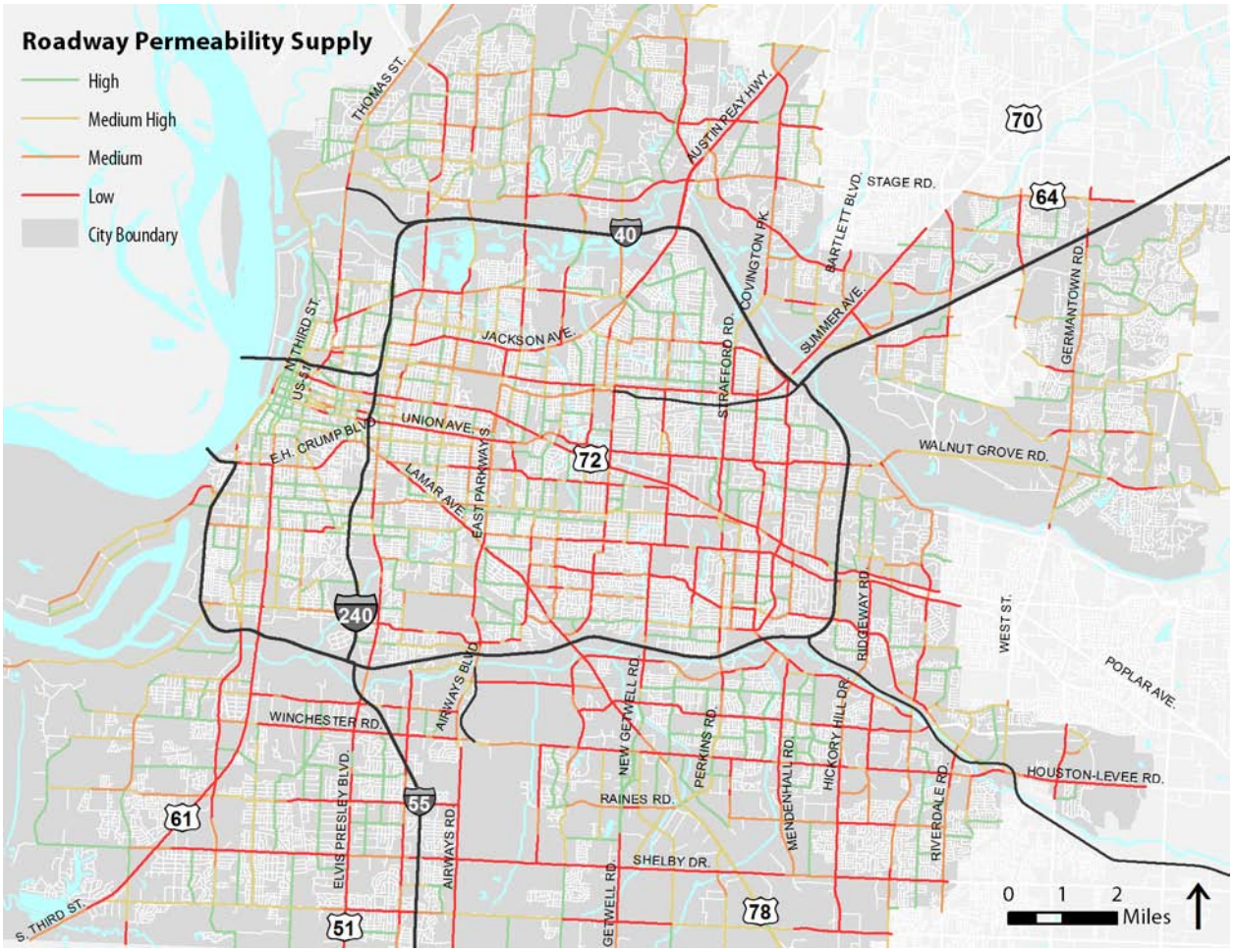


Table 3.7 and the figure below summarize the results of the Roadway Permeability Analysis. **Almost half of collector and arterial roadway mileage meets the 'high suitability' category.** Forty percent of the mileage is classified as medium or low suitability, indicating a need for additional crossings.

Table 3.7: Roadway Permeability Scoring Results

Score	Class	Miles	Percentage of Total Mileage
80 – 100+	High Suitability	258	42%
55 - 75	Medium High Suitability	209	19%
35 - 50	Medium Suitability	152	15%
0 - 30	Low Suitability	231	25%
	All Classes	**848**	**100%**



Key findings of the Roadway Permeability Analysis include:

- **Major roadways near downtown and midtown are more permeable** because of shorter block lengths and shorter distances between marked crossings.
- **Third Street, Lamar Avenue, Union Avenue, Poplar Avenue, and Thomas Street** present the largest barriers near central Memphis.
- **Eastern areas within the I-240 Loop and most arterials outside of the I-240 Loop** received lower scores because of **long distances between signalized crossings.** Demand nodes, such as employment centers and dense population and retail centers, help to prioritize specific locations for additional crossings. The shortest path analysis also identifies common pedestrian routes across barrier roadways.

Pedestrian Suitability Index Conclusions

The Pedestrian Suitability Index provides a picture of two phenomena:

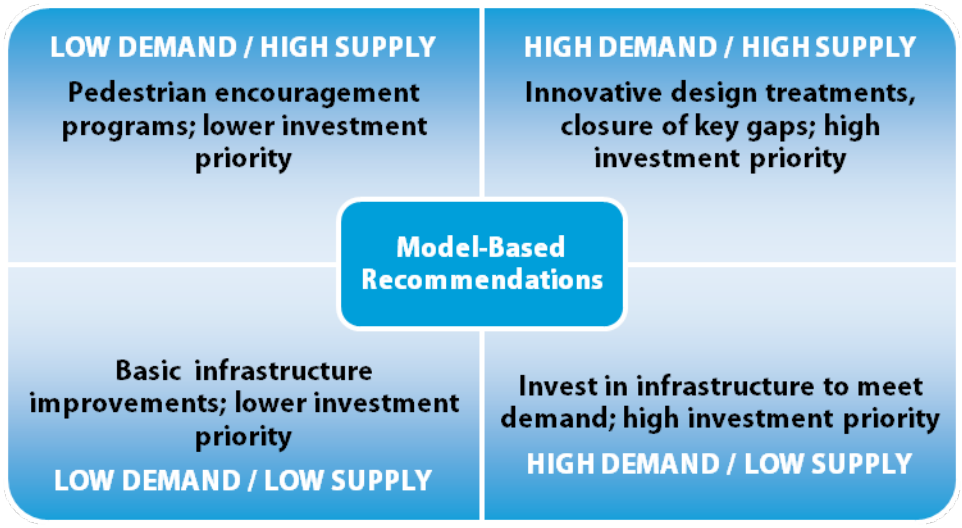
- **Geographic variations in demand** – potential activity levels based on where people live, work, play, access public transit, and go to school
- **Geographic variations in supply** – the quality of the physical pedestrian network

Variation in demand and supply are combined into the **Supply and Demand Typology Model.** Considering the relative supply and demand in different areas, a summary of possible pedestrian improvement options is summarized below.

- Areas with **high demand** and **low supply** of suitable infrastructure would greatly benefit from infrastructure investments to improve walking conditions. These areas may require sidewalk rehabilitation, wider sidewalks to accommodate high levels of demand, buffers from vehicular traffic (on some streets, a low cost solution may be to add bike lanes), or additional marked crossings. They should be high priority for investment.
- Areas with **high demand** for walking and **high supply** of suitable infrastructure can benefit from innovative programs and capital projects that further support walking, closure of key gaps, and can be considered showcase areas where best practices can be modeled. These areas may provide cost-effective opportunities for improvements (such as adding high visibility crosswalks or separating pedestrian/ vehicular movements at signalized intersections) and should also be high priority for investment.
- Areas with **low demand** for walking and **low supply** of suitable infrastructure can benefit from basic infrastructure improvements. These areas should be lower priority for investments.
- Areas with **low demand** for walking and **high supply** of suitable infrastructure can benefit from programs to encourage walking, and land use changes or development to increase the density of attractors and generators. The areas should be lower priority for investment.

In the following tables and figures, the 'high' and 'medium high' suitability categories are grouped as

Figure 3.2: Supply and Demand Typologies Model



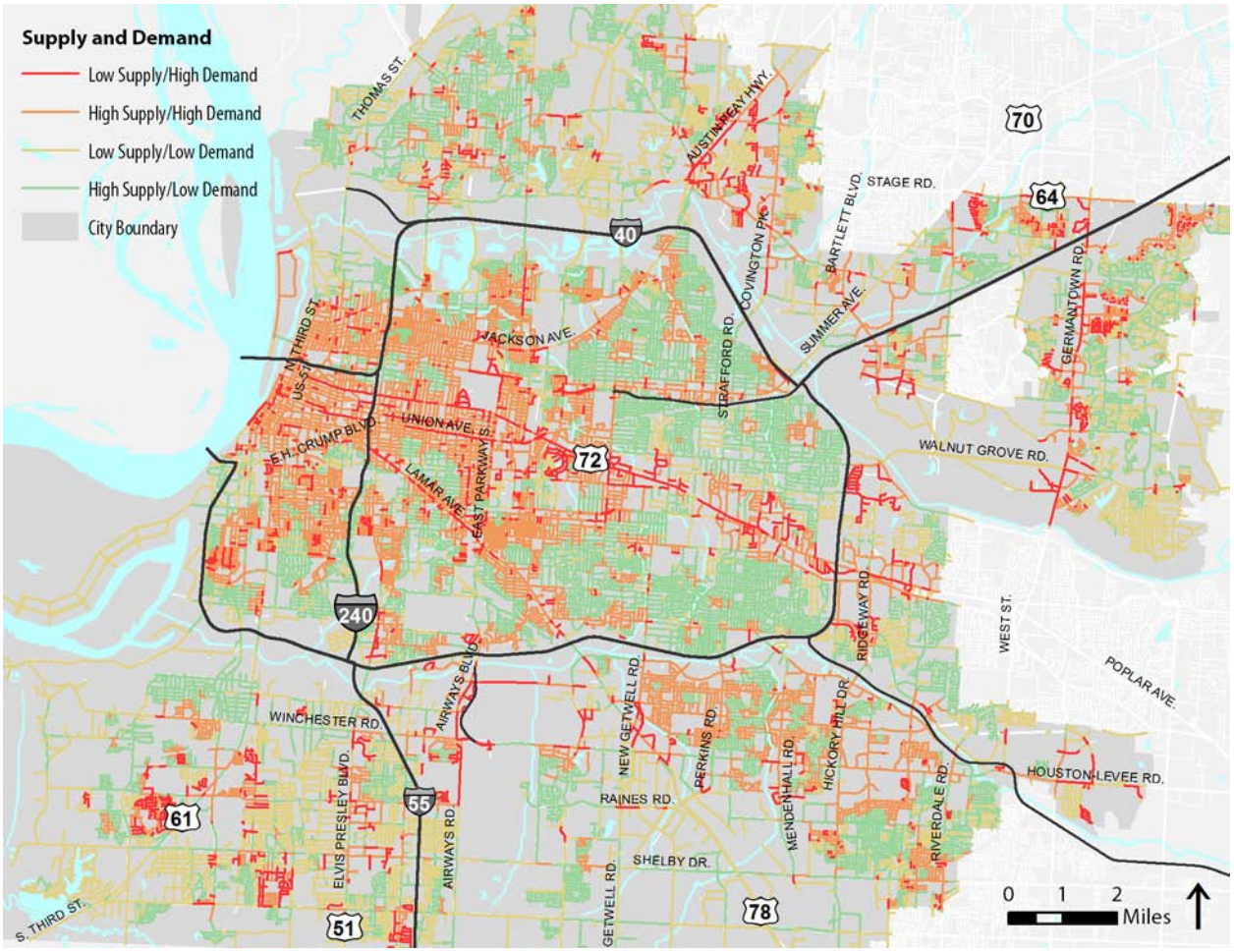
'High Supply' and 'low' and 'medium' categories are grouped as 'Low Supply'. The demand scoring results are similarly divided into 'High Demand' and 'Low Demand'.

NETWORK SUPPLY AND DEMAND

The combined supply and demand scores for the pedestrian network are summarized in Table 3.8 and the figure below. Approximately 9% of the network found to have 'low' or 'medium' suitability for pedestrian travel from the perspective of supply lies in high demand areas. These segments will be priorities for improvement.

Table 3.8: Supply and Demand Results for the Pedestrian Network

Class	Miles (All Roadways)	Percentage of Total Mileage (All Roadways)	Miles (Major Roadways)	Percentage of Total Mileage (Major Roadways)
Low Supply/High Demand	191	7%	65	8%
High Supply/High Demand	810	30%	307	36%
Low Supply/Low Demand	639	23%	189	22%
High Supply/Low Demand	1,102	40%	289	34%
All Classes	**2,742**	**100%**	**848**	**100%**



Key findings of the pedestrian network supply and demand analysis include:

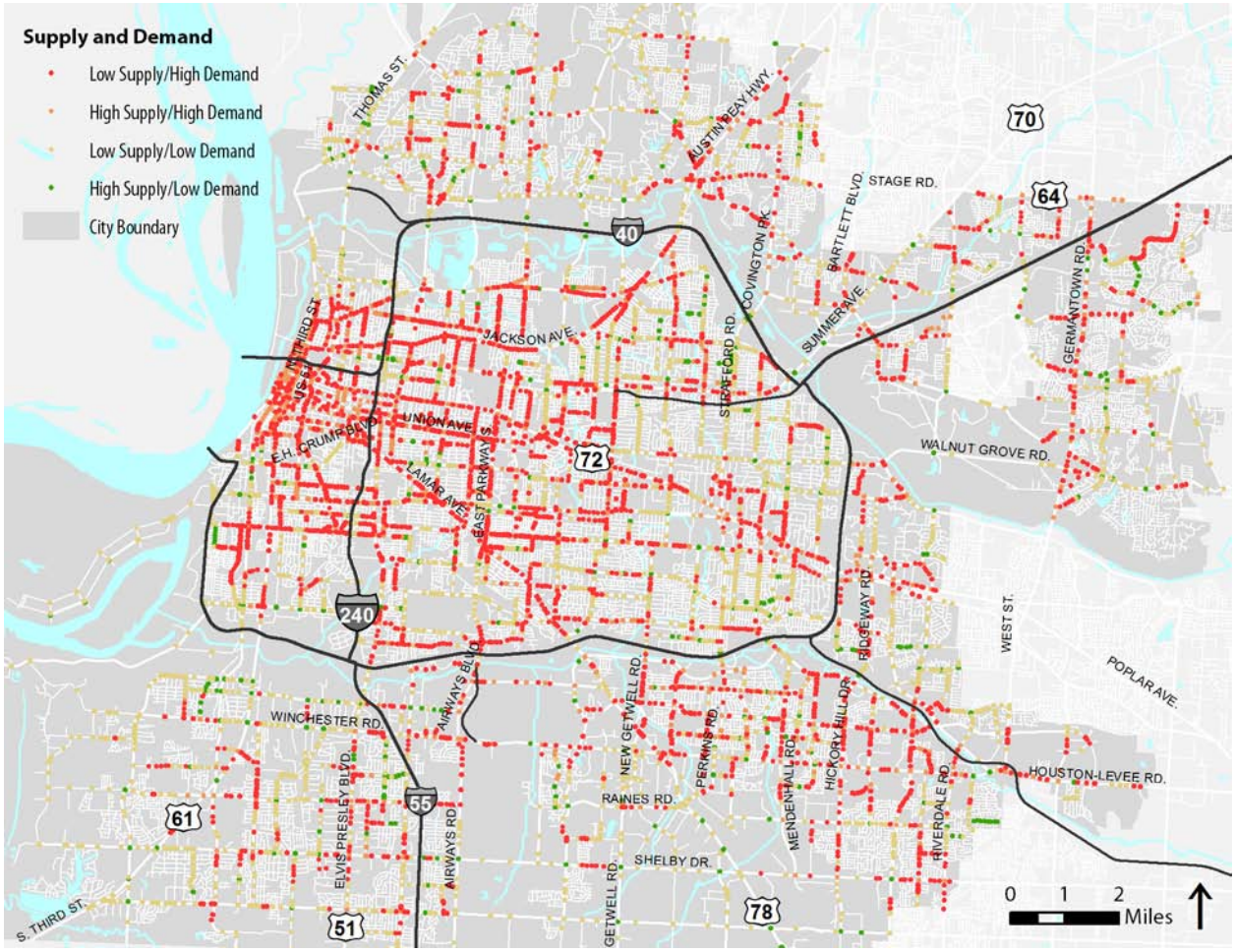
- **Poplar Avenue, Union Avenue, Harbor Town, and Lamar Avenue** will be high priorities for improved linear pedestrian infrastructure inside the I-240 Loop.
- The area near the **intersection of Poplar Avenue and I-40/I-240** requires improvements along Poplar Avenue and in connecting neighborhoods.
- **Significant neighborhood road clusters** showing low supply and high demand lie in areas **southeast, east, and northeast of the I-240 Loop**, including **Hickory Hill** and the **Germantown Road corridor**.

INTERSECTION SUPPLY AND DEMAND

The combined supply and demand scores for intersections are presented in Table 3.9 and the figure below. Many of the intersections shown with low supply and high demand are located between signalized intersections along major roadways. These issues relate to the barriers identified in the next section, and will not require improvement where distances are reasonable between high quality crossings.

Table 3.9: Supply and Demand Results for Intersections

Class	Miles	Percentage of Total Intersections
Low Supply/High Demand	3281	47%
High Supply/High Demand	753	11%
Low Supply/Low Demand	2530	36%
High Supply/Low Demand	381	5%
All Classes	**6,945**	**100%**



Key findings of the intersection supply and demand analysis include:

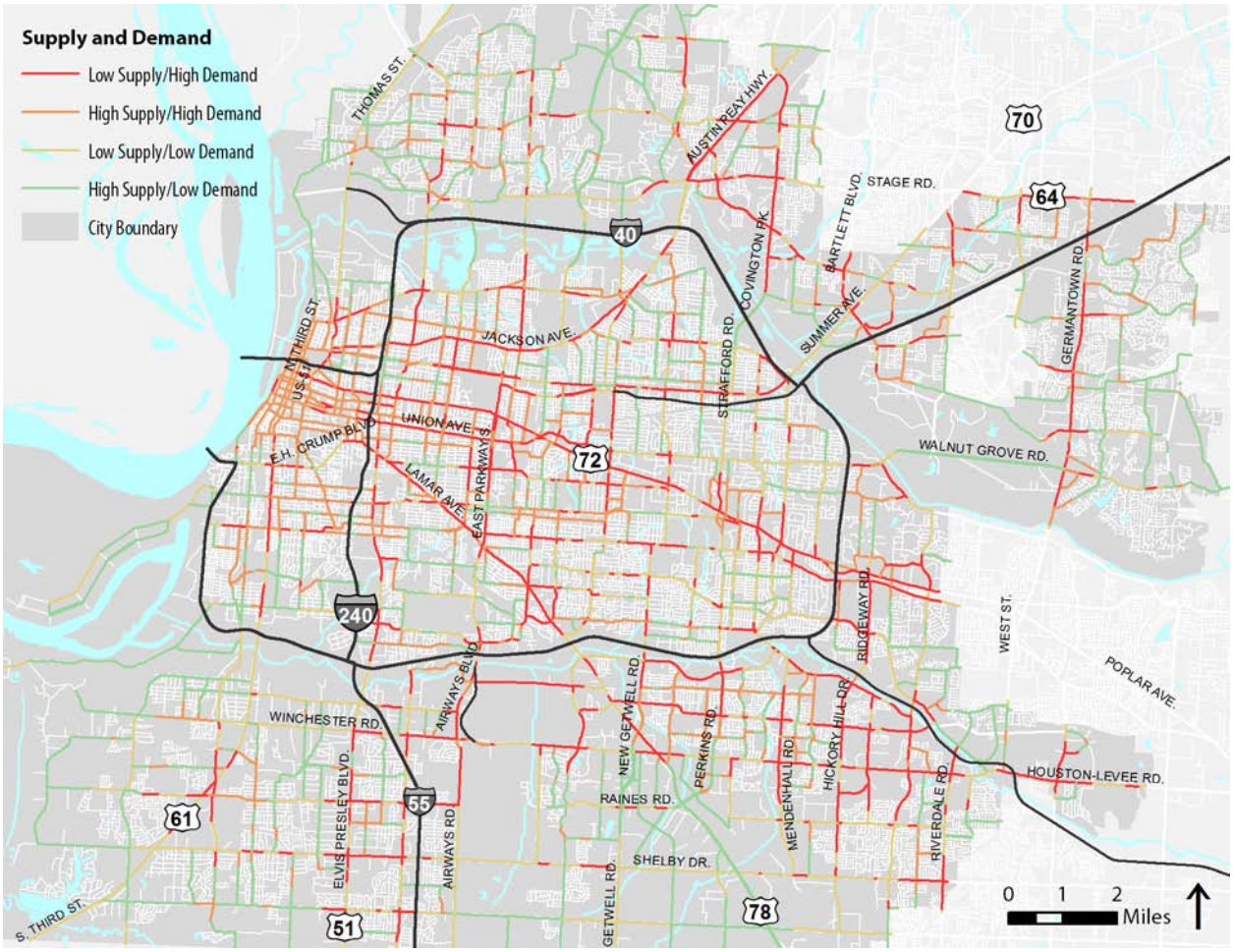
- **Several major roadways inside the I-240 Loop** are in higher demand areas and are **difficult to cross between signals**. These corridors should be considered for crossing improvements at unsignalized locations (refer to the findings of the Roadway Permeability Analysis in the following section).

ROADWAY PERMEABILITY SUPPLY AND DEMAND

The results of the roadway permeability supply and demand analysis are presented in Table 3.10 and the figure below. Approximately 23% of the roadways identified as having 'low' or 'medium' permeability are located in high demand areas. These roadways will be studied for crossing needs.

Table 3.10: Roadway Permeability Supply and Demand Result

Class	Miles	Percentage of Total Mileage
Low Supply/High Demand	192	23%
High Supply/High Demand	180	21%
Low Supply/Low Demand	190	22%
High Supply/Low Demand	287	34%
All Classes	**849**	**100%**



Key findings of the roadway permeability supply and demand analysis include:

- **Lamar Avenue, Union Avenue, Poplar Avenue, and Jackson Avenue** are roadways that act as barriers to pedestrian travel in higher demand areas inside the I-240 Loop.
- **Elvis Presley Boulevard, Winchester Road, and Germantown Road** are major barriers outside the I-240 Loop.
- The area **southeast of I-40/I-240** contains a number of higher order roadways in high demand areas that are difficult to cross.

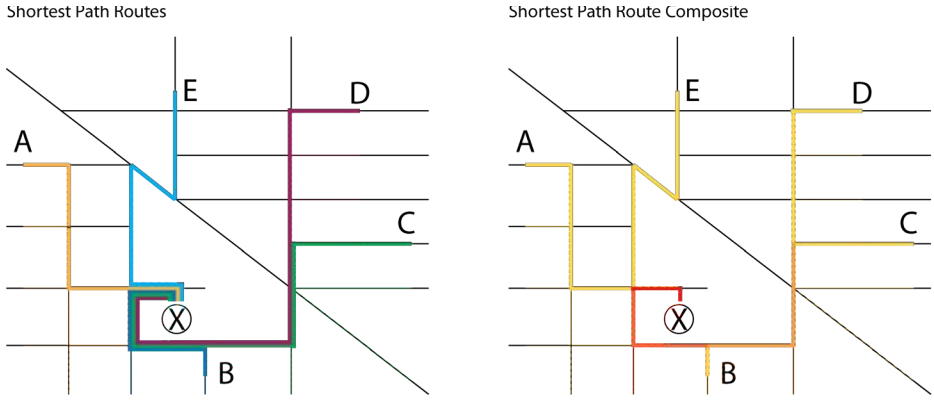
Shortest Path Analysis

OVERVIEW OF NETWORK ANALYSIS ROUTING METHODOLOGY

The Shortest Path Analysis complements the Pedestrian Suitability Index by identifying the roadway links that are most likely to be used for walking trips. Starting with the assumption that people will choose the most direct walking route between two points – regardless of the presence of sidewalks - the model uses GIS network analysis software to calculate the shortest routes between where people live (origins) and where they work, play, access transit, and go to school (destinations).

As individual paths are drawn from each origin to each destination, many resulting paths (or routes) will overlap. The overlapping routes are then combined to quantify the number of potential routes per network segment to identify the most travelled segments. Figure 3.3 illustrates how a set of individual routes translate into a 'heat map' of routes per segment, with more commonly used routes represented graphically on a scale from yellow (less commonly used) to red (more commonly used).

Figure 3.3: Shortest Path Analysis Methodology



Segments with a higher relative number of routes are thus identified as higher priority segments relative to those that link fewer origins and destinations.

Shortest Path Trip Inputs: Origins and Destinations

The destinations included in the shortest path analysis are summarized in Table 3.11. Path origins are represented by the midpoint of each street segment, as midpoints are comprehensive starting points (e.g., covers every street in the city) and are already located on the network used for the analysis. While not every street block contains residences, this method ensures coverage of all residences.

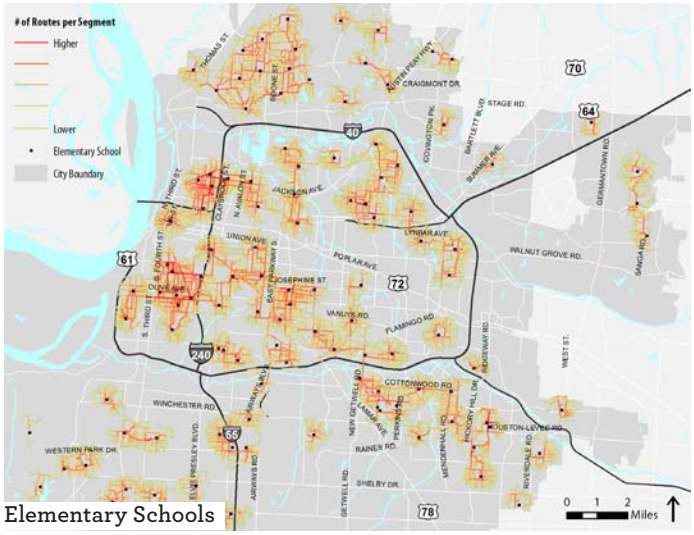
Table 3.11: Shortest Path Analysis Destinations/Radius

Destination Type	Search Radius
Elementary School	0.5 miles
Middle School	1 mile
High School	1 mile
Park	1 mile
Employment Center	1 mile
Transit Stop	0.5 mile

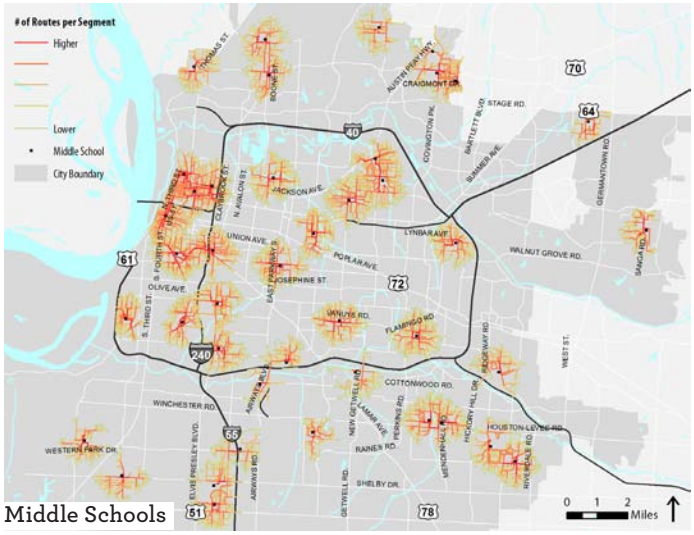
For each of the destinations, a route was generated from each origin to all destinations within the search radius. For transit stops, the route was generated from each origin to its nearest transit stop. The assumption is that a person might, for example, travel to a number of nearby parks, but would typically walk to the same (nearest) transit stop.

SHORTEST PATH ANALYSIS RESULTS

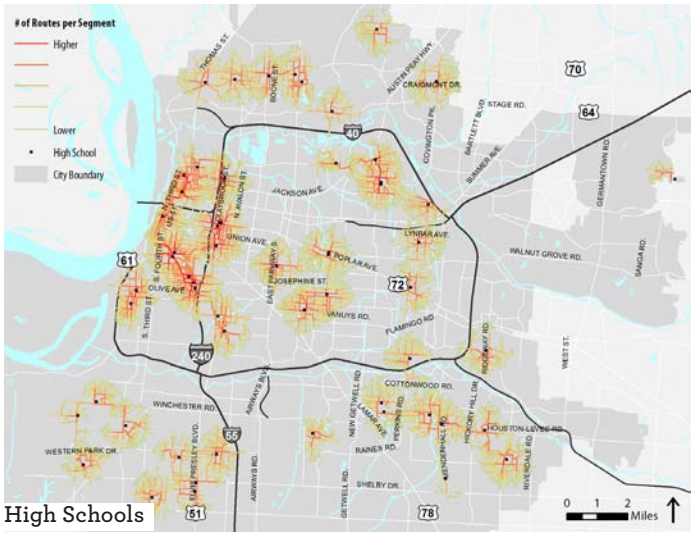
The results of the shortest path analysis are summarized by destination type in the following map series.



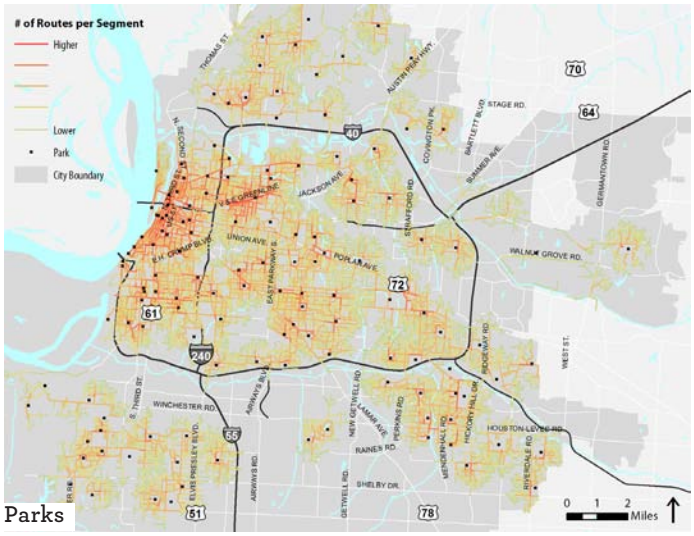
Elementary Schools



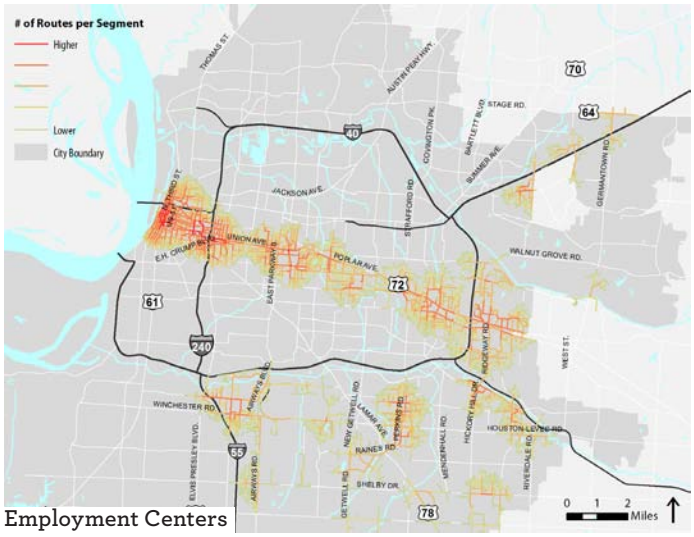
Middle Schools



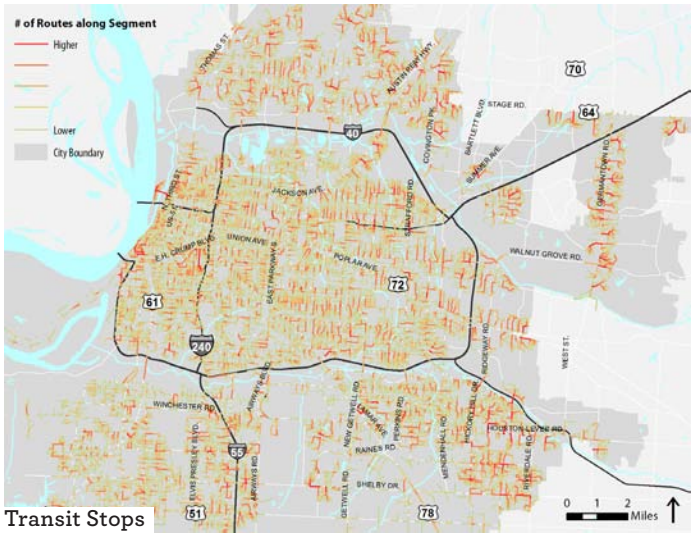
High Schools



Parks



Employment Centers



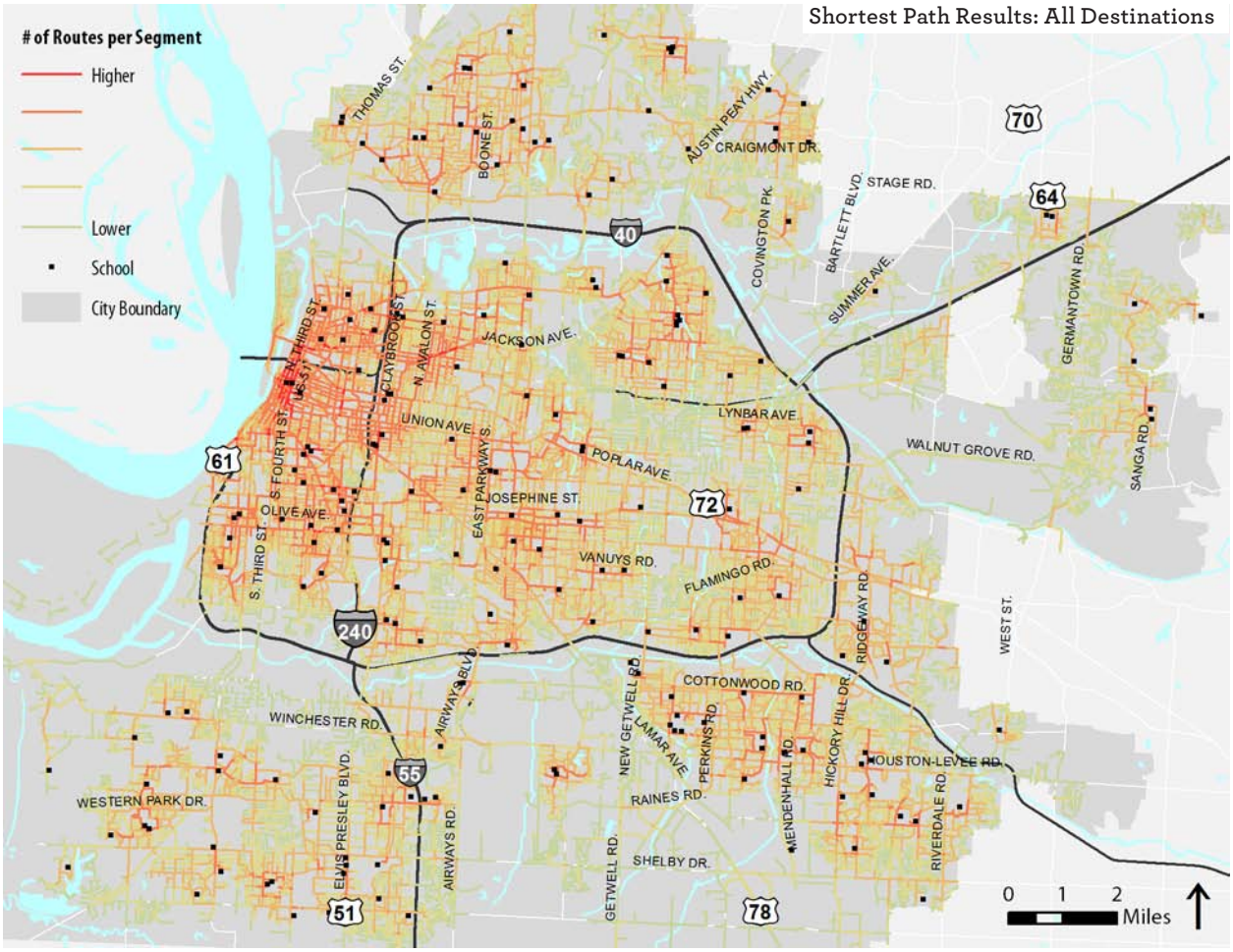
Transit Stops

Routes are displayed on each map using the composite approach that aggregates overlapping routes along each segment to categorically display the relative number of routes across the network.

For legibility, the results are presented as a separate map for each destination type, including individual maps for elementary, middle, and high schools.

A final composite map found at the end of this section combines the routes from each of the origin/destination pairs in Table 3.11 to display network segments that are the most likely to be commonly used for walking trips.

Routes from the previous six categories were merged to produce a composite map showing segments that serve many routes to multiple destination types.



Key findings of the composite shortest path analysis include:

- The **downtown roadway network** provides routes to **many destinations**, due to both the density of the street network (origins) and the density of attractors (destinations) in this area.
- Many local and collector street segments serve multiple routes and will be overlaid with supply to identify candidate projects. Some examples from neighborhoods around the city include **Ardmore St, Craigmont Drive, Flamingo Road, Cottonwood Road, Western Park Drive, Olive Avenue, Josephine Street, Vanuys Road, Fourth Street, and Claybrook Street.**
- The **Hickory Hill (southeast) and Frayser (northwest) neighborhoods** have the densest routes serving destinations outside the I-240 loop.

CHAPTER 4:

PROPOSED PRIORITY PEDESTRIAN NETWORK

Chapter Contents:

Introduction

Chapters 2 and 3 summarized the **quantitative spatial analyses** conducted as part of this planning process. The results identify areas within walking distance of public schools (within the City of Memphis) with existing **pedestrian safety issues, areas and specific routes of high pedestrian demand, current barriers to walking, and gaps in the supply of pedestrian infrastructure.** These quantitative analyses provided a strong foundation for the development of a set of pedestrian improvement projects that are needed to create a **functional pedestrian network linking neighborhoods and destinations** around the city.

This chapter describes the process used to translate these analyses into a project list, and how the crash analysis, Pedestrian Suitability Index, and shortest path analysis informed project prioritization. The use of quantitative metrics, supported by City policy, provide **a transparent and rational decision-making process** that supports project development and delivery.

This chapter includes the following sections:

- **Project List Development** – Describes the methodology for developing the list of pedestrian projects
- **Project Components** – Provides the total number of each type of improvement included in the full project list
- **Project Prioritization** – Describes the approach used to prioritize the pedestrian project list
- **Phase 1 Project Tables** – Describes the highest scoring projects for implementation in Phase 1. Remaining phases are outlined in Appendix E
- **Top Projects Serving Persons with Disabilities** – Describes the ways in which this plan considers the needs of the disabilities community and provides a list of the top projects from the project list serving this community as a reference
- **Complementary Projects** – Provides a list of roadway reconfiguration projects that would improve pedestrian crossing comfort of major roadways

Project List Development

QUANTITATIVE PROJECT SELECTION

The following criteria were used to filter the universe of potential projects down to a list of needed improvements. Roadway segments and intersections removed from consideration for pedestrian improvements in this process do not warrant investment in the time frame of this plan, given a limited funding environment.

- **Shortest Path Analysis**: Any roadway segment or intersection in the lowest two scoring categories on the Shortest Path Analysis Composite Map **was removed**.
- **Pedestrian Suitability Analysis – Supply**: Segments and intersections that scored 80 or above **were dropped** from the project list. These segments already provide a high level of service. Segments with a roadway permeability in the 'medium' or 'medium high' category **were dropped** from consideration for uncontrolled crossings, since these segments are less of a barrier to pedestrians.
- **Pedestrian Suitability Analysis – Demand**: Any segment or intersection in the lowest two scoring categories on the Composite Demand map **was removed**.
- **Alternative Criteria based on Equity**: Any segment that scores 'High' in the equity category was considered for a project even if it scored in the second to lowest category in the shortest path and demand analyses.

QUALITATIVE LINEAR PROJECT DEVELOPMENT

The results of the quantitative filters above were assembled into project routes using the following approach:

- Segments were grouped into linear routes that link neighborhoods to schools.
- Where a direct alternative is available with good infrastructure (as analyzed in the supply analysis), routes were not drawn.
- Where two alternatives exist, the shortest path analysis was used to select the preferred route alignment.
- Once routes were drawn, all segments along the route were included in the project regardless of the quantitative filters above.
- Intersection improvements were identified along each route. The following guidelines were used to designate improvements along routes.
    - » All signalized intersections along routes were evaluated for potential improvements such as pedestrian signal heads or leading pedestrian intervals regardless of supply scores.
    - » Improvements were included where needed at all stop-controlled crossings.
    - » The need for uncontrolled crossings was evaluated as part of 'intersection project development'.

INTERSECTION PROJECT DEVELOPMENT

Intersections along linear routes were examined for infrastructure needs and included as components of route projects, with the exception of uncontrolled crossings. The following process was used to identify intersections that need improvement where linear projects are not needed, and to identify locations where uncontrolled crossings are needed on and off routes.

Signalized Intersections and Four-way Stops

- Intersections that meet the criteria of the 'Quantitative Project Selection' approach were included in the project list
- Signalized intersections in the top two categories of the demand analysis and

shortest path analysis OR signalized intersection that have multiple recorded crashes between 2007 and 2011 were included in the project list regardless of their supply score. This accounts for signalized intersections with crosswalks and curb ramps that may need high visibility crosswalks, pedestrian signal heads, leading pedestrian intervals, or other improvements.

Uncontrolled Crossings

- Segments that meet the criteria of the 'Quantitative Project Selection' approach were eligible candidates for potential midblock crossings.
- An uncontrolled crossing was recommended where a school and neighborhood are separated by one of these segments.
- An uncontrolled crossing was considered on local roads within a quarter mile of a school where an intersection meets the criteria of the 'Quantitative Project Selection' approach and demand scored in the top two categories. These crossings may occur at intersections or mid-block.

Project List

The recommended linear and intersection projects resulting from this process are shown on Figure 4.1 and Figure 4.2. These projects are recommended to be implemented over the next twenty years. The following sections detail the facility types that make up these projects, the prioritization process that was used to phase the project list and identify short-term projects, and a set of potential complementary projects.

Figure 4.1: Recommended Linear Projects

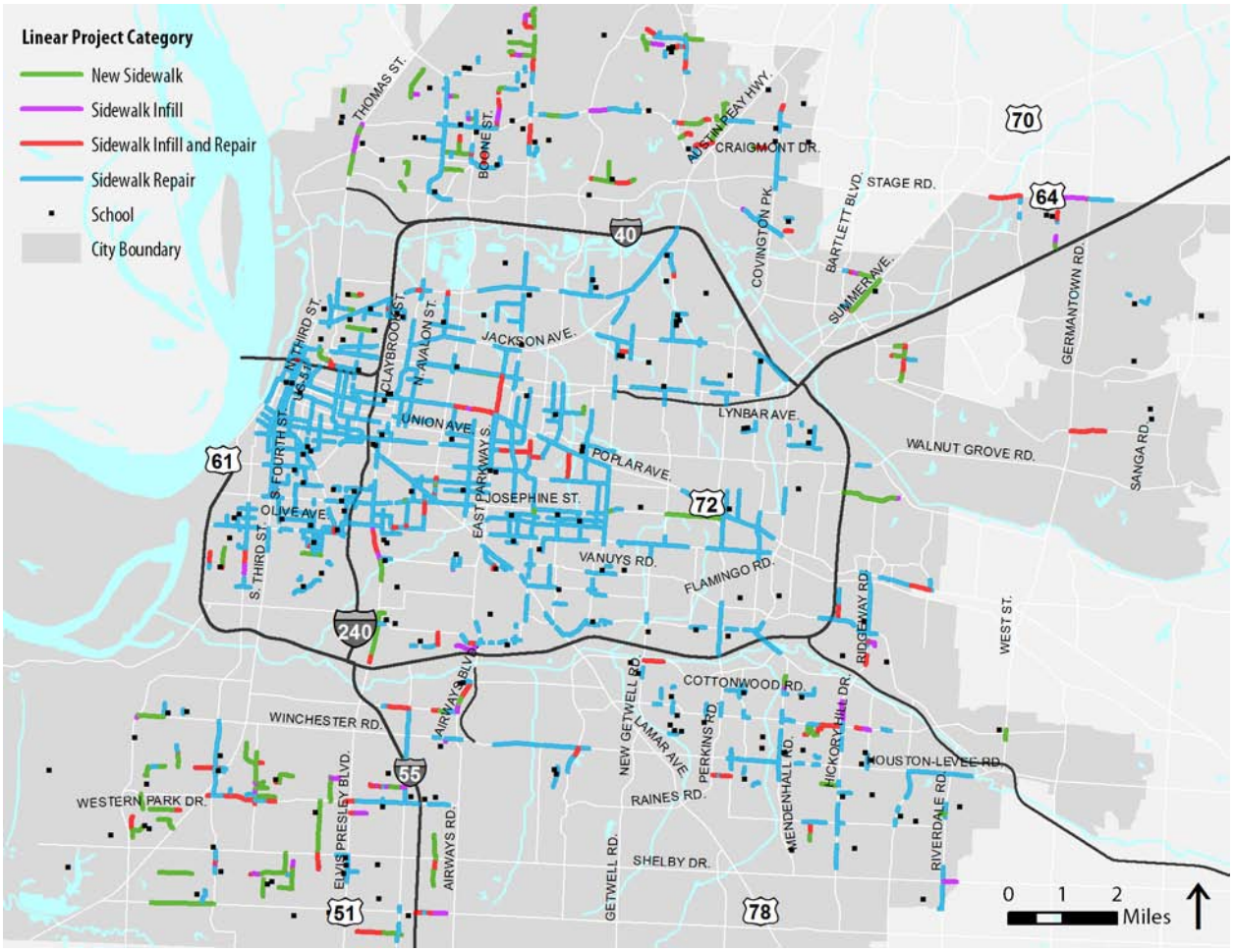
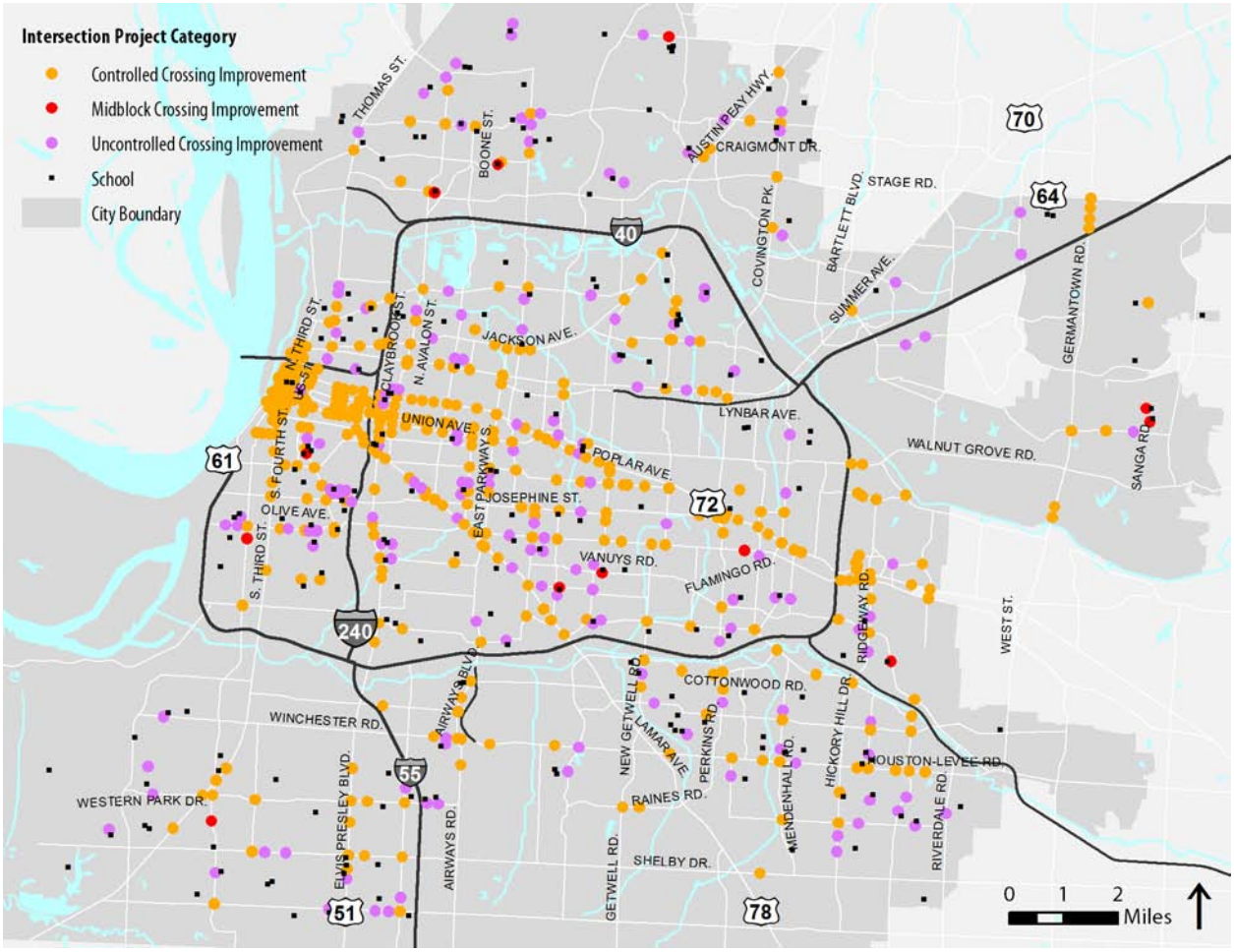


Figure 4.2: Recommended Intersection Projects



Project Components

Each linear and intersection project identified in this plan should be designed in accordance with the *Pedestrian Facility Design Toolkit* presented in Appendix C. The specific project components necessary to create a safe and comfortable corridor or crossing are dependent on the land use context and roadway characteristics. While a marked crosswalk alone may suffice to accommodate an uncontrolled crossing on a low-speed two-lane roadway, a similar crossing of a wider roadway with high speeds requires additional tools like an Active Warning Beacon or Hybrid Beacon.

The specific facility types associated with each project must be evaluated and identified as projects are implemented, using the *Pedestrian Facility Design Toolkit*. Twenty pilot projects have been evaluated with this toolkit and are presented in Chapter 5 with the detailed facility types recommended for each. A simpler evaluation was completed for the full project list in order to identify the approximate number of various facility types that will be necessary to implement the project list. The results of this evaluation are summarized in Table 4.1, and preliminary costs are provided in the project table beginning at the end of this chapter and continuing in Appendix E.

The distribution of facilities across projects will vary as projects are evaluated individually and implemented over twenty years. In addition, certain facility types could not be estimated for the full project list because of data limitations, but are expected to be included in projects. These include signal timing modifications, curb extensions, curb radii reduction, channelized right turn modifications, raised crosswalks, and pedestrian signal heads. Each of these improvements and applications are described in the *Pedestrian Facility Design Toolkit*. The overall cost shown in Table 4.1 is therefore below the 20-year target of $200 million in order to accommodate these items and other potential projects like road diets, which are detailed in the following section.

The costs shown for sidewalk repair are based on a preliminary cost evaluation of nine sample projects with varying levels of required repair. The number of obstacles and obstructions along each project requiring repair were summarized during the existing conditions analysis in Chapter 2. A typical cost per obstruction (utility pole, light pole, bus shelter, etc.) and cost per obstacle (uplifted panel, driveway, etc.) were identified based on this preliminary evaluation and used to estimate the repair cost of each project. These estimates are displayed in Table 4.1. Actual repair costs will vary by the type of obstacle or obstruction and specific corridor conditions. Costs shown below include a 20% contingency markup on construction costs and 10% preliminary engineering markup.

Table 4.1: Estimated Facility Types for the Full Project List

Project Type	Type	Unit	Estimated Quantity	Unit Cost (Typical)	Estimated Costs
Sidewalks	Sidewalk on one side (including curb and gutter installation)	Linear Mile	36	$1,320,000	$46,911,000
	Sidewalk infill (one side, without curb and gutter installation)	Linear Mile	36	$343,200	$12,462,000
	Sidewalk Repair (Obstructions)	Obstruction	4,454	$7,050	$31,401,000
	Sidewalk Repair (Obstacles)	Obstacle	98,391	$600	$59,035,000
Crossings	High-Visibility Crosswalk	Crossing	669	$1,300	$870,000
	Parallel Line Crosswalk	Crossing	3,160	$500	$1,580,000
	Crosswalk Marking Maintenance	Crossing	1,622	$500	$811,000
	Curb Ramp	Ramp	7,500	$1,200	$9,000,000
	Refuge Island	Crossing	78	$22,000	$1,716,000
Enhanced Crossings	Hybrid Beacon: HAWK	Crossing	114	$155,000	$17,670,000
	Active Warning Beacon: RRFB	Crossing	57	$19,100	$1,089,000
				TOTAL	**$182,545,000**

Project Prioritization

Following development of the project list, projects were prioritized based on the quantitative analyses along with factors including policy support, equity, stakeholder input, and proximity to key destinations. **Table 4.2 summarizes criteria and scoring for prioritization**. Projects were then phased based on **geographic equity** and **proximity to populations with disabilities**. Figures 4.3 and 4.4 show the resulting phased project lists. Tables 4.3 and 4.4 show Phase 1 projects. Phases 2 – 10 of the project list are provided in Appendix E.

Table 4.2: Project Prioritization Criteria

Criteria	Definition	Input	Rank	Measurement	Points	Max. Influence
School Access	To what extent does this improve pedestrian access to a school?	Public school locations	High	Project is within ¼ mile of a public elementary or middle school (or high school)	30 (20)	15%
			Med	Project is within ½ mile of a public school elementary or middle school (or high school)	15 (10)	
			Low	Project is further than ½ mile from a public school	0	
Promote Safety	To what extent does the project provide an immediate safety improvement at a location with a recorded safety concern?	Collision analysis shows intersections and street corridors with highest crashes	High	Multiple pedestrian crashes have occurred at the segment or intersection in the last five years for which there is data (2007 – 2011)	30	15%
			Med	A pedestrian crash has occurred at the segment or intersection in the last five years for which there is data (2007 – 2011)	15	
			Low	No crashes occurred	0	
Inadequate Infrastructure	Does the project improve conditions at an intersection or corridor with poor or inadequate infrastructure?	Pedestrian Suitability Analysis – Supply Score	High	Segment or intersection is designated as lower supply	30	15%
			Med	Segment or intersection is designated as medium supply	15	
			Low	Segment or intersection is designated as higher supply	0	
Equity	To what extent does the project benefit underserved communities?	Equity composite measure showing geographies (census tracts) where pedestrian improvements could benefit areas with higher rates of poverty, households without vehicles, non-white populations, and limited English proficiency populations.	High	Census tract scored in the top tier in the Mid-South Greenprint's Equity Analysis	20	10%
			Med	Census tract scored in the middle tier in the Mid-South Greenprint's Equity Analysis	10	
			Low	Census tract scored in the lowest tier in the Mid-South Greenprint's Equity Analysis	0	

Criteria	Definition	Input	Rank	Measurement	Points	Max. Influence
Promote Connectivity to Destinations	How many origins and destinations will the segment connect?	Shortest Path Analysis	High	Project is in the top third of segments categorized by the number of routes served	20	10%
			Med	Project is in the middle third of segments categorized by the number of routes served	10	
			Low	Project is in the bottom third of segments categorized by the number of routes served	0	
Serves Activity Centers	Is the project located in an area with high demand for walking?	Pedestrian Suitability Analysis – Demand Score	High	Segment or intersection is designated as higher demand	20	10%
			Med	Segment or intersection is designated as moderate demand	10	
			Low	Segment or intersection is designated as lower demand	0	
Transit Access	To what extent does this improve pedestrian access to the transit network?	Transit ridership by stop (boardings)	High	Project is within ¼ mile of a transit stop with more than 100 boardings a day	20	10%
			Med	Project is within ¼ mile of a transit stop with 20 to 100 boardings a day	10	
			Low	Project is within ¼ mile of a transit stop with less than 20 boardings a day	5	
Civic Amenity Access	Does the project serve a public library or community center?	Locations of libraries and community centers	N/A	Project is within ¼ mile of a public library or community center	10	5%
Previously Proposed Projects	Does the project have direct support expressed by inclusion in an adopted planning document?	2011 Memphis MPO Regional Bicycle and Pedestrian Plan; MATA Short Range Transit Plan (SRTP): This plan identifies key transit stops where pedestrian improvements aimed at supporting transit should be focused	N/A	Project corresponds to a pedestrian improvement recommendation in the MPO Plan or is within a ¼ mile of a key transit stop from the MATA SRTP	10	5%
Stakeholder Input	Has the project location been identified by project stakeholders (TAC)?	School survey, Transportation Advisory Committee, sidewalk request program	N/A	The project corresponds to one of the following: Location was identified by a project stakeholder as a priority for improvement Location was identified as a problem in the 2011 MPO plan Location was requested more than once through the city's sidewalk request program	10	5%
				Maximum Points	200	100%

Figure 4.3: Phased Linear Project List

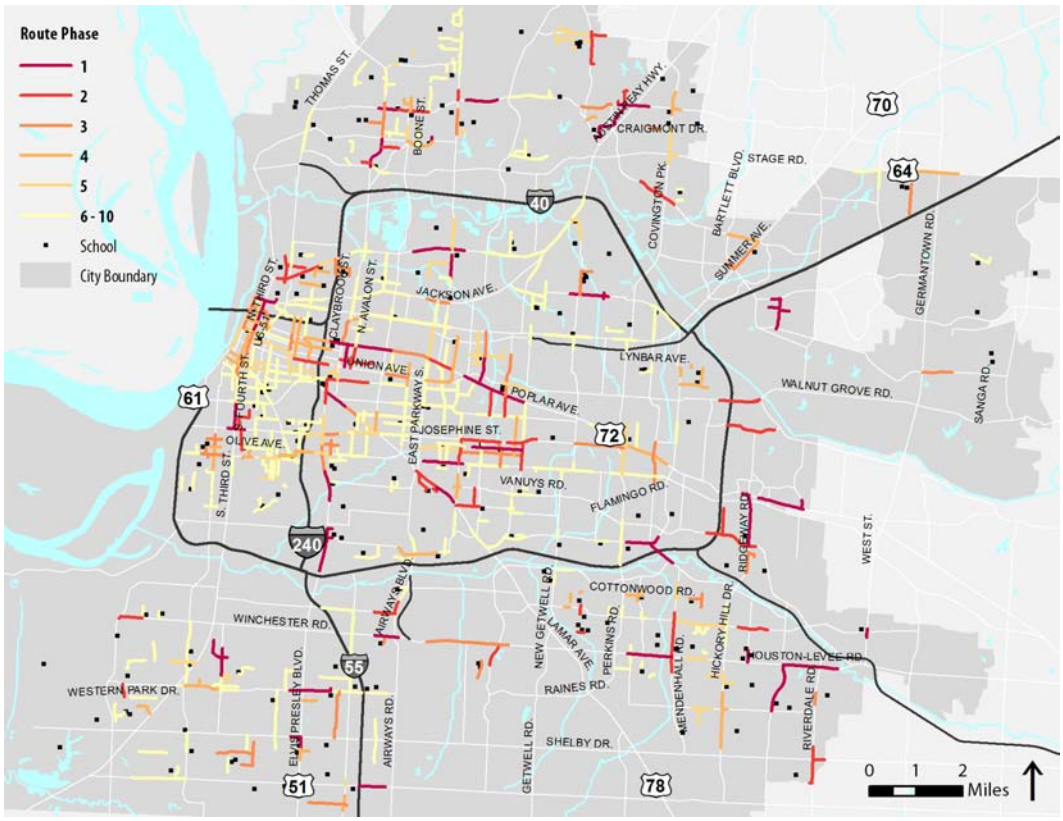
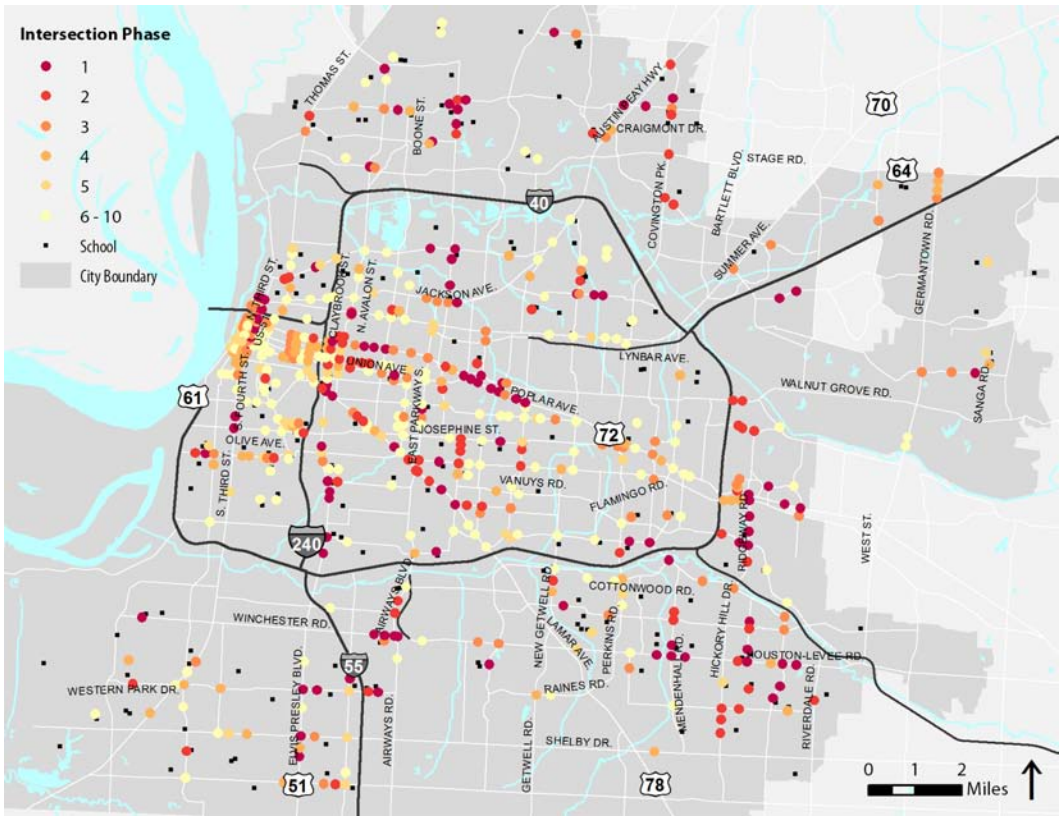


Figure 4.4: Phased Intersection Project List



Phase 1 Project Tables

The linear and intersection projects presented in Tables 4.3 and 4.4 are **priorities for implementation** based on **prioritization criteria scores**, **geographic equity**, and **consideration of proximity to persons with disabilities**. Projects are organized by council district. For linear projects that overlap multiple roadways, each segment along a particular roadway is scored independently and listed separately in the table. The maximum priority score of the segments constituting a project drives the project's phase. For intersection projects, a linear project ID is listed where a linear project overlaps an intersection. These intersection improvements are assumed to occur as part of the linear project and are included in those linear project cost estimates, but could also be completed independently.

Table 4.3: Phase 1 Linear Projects

PROJECT ID	STREET	FROM	TO	PROJECT TYPE	LENGTH (MILES)	PLANNING LEVEL COST ESTIMATE (ENTIRE PROJECT, INCLUDING INTERSECTIONS)	SCHOOL	PRIORITY SCORE	PHASE	STATE OWNED ROAD	TRANSIT ACCESS	SERVES PED. W. DISABILITIES	CITY COUNCIL DISTRICT	CITY COUNCIL SUPERDISTRICT
17	Mountain Terrace Street	Victoria Park Lane	Whitney Avenue	Sidewalk Repair	0.1	$48,000	Grandview Heights Elementary School	105	1		X		1	8
25	Frayser Boulevard	Ladue Street	West Range Hills Drive	Sidewalk Repair, Sidewalk Infill	0.5	$459,000	Trezevant High School	105	1		X	X	1	9
25	New Frayser Boulevard	Redcoat Road	Warford Road	Sidewalk Repair	0.2	-	Trezevant High School	75	1		X		1	9
38	Jones Road	Powers Road	Raleigh Millington Road	Sidewalk Repair	0.1	$658,000	Coleman Elementary School	95	1		X		1	9
38	Powers Road	Jones Road	Yale Road	Sidewalk Repair, Sidewalk Infill	1.0	-	Coleman Elementary School	105	1		X		1	9
41	Yale Road	Arsenal Street	Northmoor Street	Sidewalk Repair, Sidewalk Infill	0.7	$233,000	Craigmont Middle School	120	1		X		1	9
378	Macon Road	Chatwood Street	Weiner Road	Sidewalk Repair	0.8	$616,000	Kingsbury Middle School	115	1		X		1	9
378	Waring Road	Emily Avenue	Macon Road	Sidewalk Repair	0.1	-	Kingsbury Middle School	85	1		X		1	9
378	Wells Station Road	Lawrence Road	Macon Road	Sidewalk Repair	0.1	-	Kingsbury Middle School	85	1		X		1	9
420	Macon Road	Heathcliff Drive	Mullins Station Road	Sidewalk Infill	0.2	$1,716,000	Shady Grove Elementary School	95	1		X	X	1	9
420	Merimac Drive	Boyte Cove	Mullins Station Road	Sidewalk Repair, Sidewalk Infill	0.2	-	Shady Grove Elementary School	80	1		X	X	1	9
420	Mullins Station Road	Macon Road	Nixon Drive	Sidewalk Repair, Sidewalk Infill, New Sidewalk	0.7	-	Shady Grove Elementary School	105	1		X	X	1	9
420	Oak Park Drive	Greenland Road	Mullins Station Road	Sidewalk Repair	0.2	-	Shady Grove Elementary School	55	1		X	X	1	9
60	South Germantown Road	Callis Creek Drive	Lexus Lane	New Sidewalk	0.2	$522,000	Oak Forest Elementary School	100	1	X	X		2	9
63	Poplar Avenue	Interstate 240	Ridgeway Road	Sidewalk Repair	0.1	$401,000	Ridgeway High School	100	1	X	X		2	9
63	Ridgeway Road	Park Avenue	Quince Road	Sidewalk Repair	1.1	-	Ridgeway High School	100	1				2	9
67	Kirby Parkway	Great Oaks Road	Poplar Avenue	Sidewalk Repair	0.2	$480,000	Ridgeway High School	80	1		X	X	2	9
67	Poplar Avenue	Briarcrest Avenue	Dunmow Lane	Sidewalk Repair, Sidewalk Infill	1.0	-	Ridgeway High School	125	1	X	X	X	2	9
94	Kirby Parkway	East Raines Road	Winchester Road	Sidewalk Repair	1.1	$446,000	Kirby High School	95	1			X	2	8
95	Winchester Road	Kirby Parkway	South Germantown Road	Sidewalk Repair	1.2	$164,000	Kirby High School	100	1		X	X	2	9
396	Mount Moriah Road	Mount Moriah View	Willow Road	Sidewalk Repair	0.6	$320,000	Overton High School	80	1		X		2	8
396	South White Station Road	Helene Road	Willow Road	Sidewalk Repair	0.2	-	Overton High School	65	1		X		2	9
396	Willow Road	Lanier Lane	South White Station Road	Sidewalk Repair	0.5	-	Overton High School	95	1		X		2	9
68	Ridgeway Road	Ridge Meadow Parkway	Winchester Road	Sidewalk Repair	0.3	$215,000	Winridge Elementary School	115	1		X		3	8
85	Winchester Road	Castleman Street	West Winchester Square	Sidewalk Repair	1.0	$213,000	Wooddale Middle School	130	1		X		3	9
102	Winchester Road	Holly Circle	Winbrook Drive	Sidewalk Repair	0.5	$73,000	Winchester Elementary School	110	1		X		3	8

PROJECT ID	STREET	FROM	TO	PROJECT TYPE	LENGTH (MILES)	PLANNING LEVEL COST ESTIMATE (ENTIRE PROJECT, INCLUDING INTERSECTIONS)	SCHOOL	PRIORITY SCORE	PHASE	STATE OWNED ROAD	TRANSIT ACCESS	SERVES PED. W. DISABILITIES	CITY COUNCIL DISTRICT	CITY COUNCIL SUPERDISTRICT
110	East Raines Road	Graceland Drive	Marlin Road	Sidewalk Repair, Sidewalk Infill	0.9	$212,000	Hillcrest High School	125	1			X	3	8
110	Graceland Drive	Bonnie Drive	East Raines Road	Sidewalk Repair	0.1	-	Hillcrest High School	100	1		X	X	3	8
114	East Shelby Drive	Elvis Presley Boulevard	Gloria Road	Sidewalk Repair	0.2	$52,000	Whitehaven Elementary School	110	1	X	X		3	8
114	Elvis Presley Boulevard	East Shelby Drive	Whitehaven Lane	Sidewalk Repair	0.3	-	Whitehaven Elementary School	120	1	X	X		3	8
426	East Holmes Road	Hudgins Road	Shepherds Tree Street	Sidewalk Repair, Sidewalk Infill, New Sidewalk	0.6	$418,000	Oakshire Elementary School	80	1		X	X	3	8
206	Elvis Presley Boulevard	Menager Road	Valse Road	Sidewalk Repair, New Sidewalk	0.7	$1,329,000	Hamilton Elementary School	135	1	X	X		4	8
214	Eloise Road	Corry Road	Elvis Presley Boulevard	Sidewalk Infill	0.1	$564,000	Norris Elementary School	105	1		X		4	8
214	Elvis Presley Boulevard	Eloise Road	Norris Road	Sidewalk Repair, New Sidewalk	0.2	-	Norris Elementary School	130	1	X	X	X	4	8
214	Norris Road	Amherst Street	Warren Street	Sidewalk Repair	0.2	-	Norris Elementary School	110	1		X	X	4	8
215	Elvis Presley Boulevard	Clementine Road	Norris Road	Sidewalk Repair, New Sidewalk	0.7	$1,853,000	Norris Elementary School	140	1	X	X	X	4	8
225	Hugenot Street	Lamar Avenue	Malone Avenue	Sidewalk Repair	0.1	$285,000	Bethel Grove Elementary School	95	1		X	X	4	8
225	Lamar Avenue	Hugenot Street	Lowell Avenue	Sidewalk Repair	0.5	-	Bethel Grove Elementary School	120	1	X	X	X	4	8
227	Park Avenue	Ethel Street	Laurel Street	Sidewalk Repair	0.8	$458,000	Dunbar Elementary School	110	1		X		4	8
235	Spottswood Avenue	Kent Street	South Highland Street	Sidewalk Repair	1.1	$748,000	Arrow Academy Elementary School	125	1		X	X	4	8
250	Poplar Avenue	Lafayette Street	South Highland Street	Sidewalk Repair	0.8	$676,000	East High School	155	1	X	X	X	5	9
251	Poplar Avenue	Lafayette Street	Scott Street	Sidewalk Repair	0.6	$383,000	East High School	155	1	X	X	X	5	9
257	Tillman Street	Johnson Road	Poplar Avenue	Sidewalk Repair	0.6	$534,000	Lester School	140	1		X	X	5	9
309	North Watkins Street	Poplar Avenue	South Watkins Street	Sidewalk Repair	0.4	$492,000	Central High School	120	1		X	X	5	9
309	South Watkins Street	North Watkins Street	Union Avenue	Sidewalk Repair	0.1	-	Central High School	130	1		X	X	5	9
310	Poplar Avenue	North Tucker Street	Stonewall Street	Sidewalk Repair	0.8	$624,000	MCS Preparatory Academy - Northwest	130	1		X	X	5	9
311	Poplar Avenue	North Bellevue Boulevard	Stonewall Street	Sidewalk Repair	0.6	$654,000	MCS Preparatory Academy - Northwest	145	1		X	X	5	8
131	Neely Road	Hillview Avenue	Ivan Road	Sidewalk Infill, New Sidewalk	0.6	$1,121,000	Raineshaven Elementary School	120	1		X	X	6	8
134	East Fairway Avenue	Hillbrook Road	Hillridge Street	Sidewalk Repair, Sidewalk Infill	0.4	$457,000	Southwest Career and Technology Center	120	1		X	X	6	8
134	Hillbrook Road	East Fairway Avenue	End of Hillbrook Road	Sidewalk Infill	0.3	-	Southwest Career and Technology Center	110	1		X	X	6	8
180	East McLemore Avenue	South Fourth Street	South Third Street	Sidewalk Repair	0.4	$390,000	A. B. Hill Elementary School	120	1		X		6	8
181	South Third Street	East E H Crump Boulevard	East McLemore Avenue	Sidewalk Repair	0.6	$408,000	Booker T. Washington High School	120	1	X	X		6	8
298	Lamar Avenue	Melrose Street	South Bellevue Boulevard	Sidewalk Repair	0.5	$467,000	Bruce Elementary School	150	1	X	X		6	8
313	North Third Street	Adams Avenue	Interstate 40	Sidewalk Repair	0.4	$192,000	Veritas College Preparatory School	145	1	X	X	X	6	8
4	Frayser Boulevard	Aden Street	Riney Street	Sidewalk Repair	0.4	$202,000	Denver Elementary School	100	1		X		7	8
23	North Watkins Street	Delano Avenue	Whitney Avenue	Sidewalk Repair	0.7	$265,000	Delano Elementary School	130	1		X	X	7	8
326	A W Willis Avenue	North Front Street	North Sixth Street	Sidewalk Repair	0.5	$124,000	Memphis College Preparatory School	130	1	X	X		7	8
326	North Sixth Street	A W Willis Avenue	Mill Alley	Sidewalk Repair	0.1	-	Memphis College Preparatory School	95	1		X		7	8
327	North Third Street	A W Willis Avenue	Jackson Avenue	Sidewalk Repair	0.2	$118,000	Memphis College Preparatory School	130	1	X	X		7	8
362	Chelsea Avenue	Fairfax Street	May Street	Sidewalk Repair	1.1	$764,000	Promise Academy	155	1		X	X	7	8
363	North Hollywood Street	Eldridge Avenue	Staten Avenue	Sidewalk Repair	0.5	$791,000	Promise Academy	135	1		X	X	7	8

Table 4.4: Phase 1 Intersection Projects

Id	LINEAR PROJECT ID	LOCATION	INTERSECTION TYPE	PRIORITY SCORE	PHASE	PLANNING LEVEL COST ESTIMATE	STATE OWNED ROAD	TRANSIT ACCESS	SERVES PED. W. DISABILITIES	CITY COUNCIL DISTRICT	CITY COUNCIL SUPERDISTRICT
13,203	14	Range Line Road & Orman Avenue	Unsignalized	150	1	$159,000		High	X	1	9
13,141	0	North Trezevant Street & Frayser Boulevard	Unsignalized	140	1	$159,000		High	X	1	8
13,202	14	Range Line Road & Sandpiper Avenue	Unsignalized	135	1	$159,000		X	X	1	9
14,214	42	Yale Road & Powers Road	Unsignalized	130	1	$181,000		X		1	9
14,565	44	Scheibler Road & Covington Pike	Unsignalized	125	1	$181,000	X	X	X	1	9
13,747	29	Trudy Street & Ridgemont Avenue	Unsignalized	120	1	$181,000			X	1	9
14,425	41	Scheibler Road & Yale Road	Signalized	120	1	$6,000		X		1	9
13,207	25	Frayser Boulevard & Ladue Street	Unsignalized	115	1	$159,000		High	X	1	9
24,336	378	Macon Road & Waring Road	Signalized	115	1	$2,000		X		1	9
8,858	94	Chanlone Way & Kirby Parkway	Unsignalized	140	1	$159,000				2	8
286	0	West Massey Road & Quail Hollow Road	Unsignalized	130	1	$181,000				2	9
8,695	94	Kirby Parkway & Timber Trail	Unsignalized	130	1	$181,000				2	8
93	62	McQueen Drive & Quince Road	Unsignalized	120	1	$181,000				2	9
146	63	Harwick Drive & Ridgeway Road	Unsignalized	120	1	$181,000				2	9
15,860	0	Greenbrook Parkway & Macon Road	Unsignalized	120	1	$181,000				2	9
26,250	0	North Ericson Road & Trinity Road	Unsignalized	120	1	$181,000				2	9
8,312	0	Belle Forest Drive & Ridgeway Road	Unsignalized	115	1	$181,000		X		2	9
98	63	Poplar Avenue & Ridgeway Road	Signalized	110	1	$2,000	X	X		2	9
378	67	Poplar Avenue & Poplar Pines Drive	Signalized	110	1	$8,000	X	X	X	2	9
8,718	95	Winchester Road & Kirby Parkway	Signalized	110	1	$2,000		X	X	2	9
24,883	396	Willow Road & Colonial Road	Unsignalized	110	1	$23,000		X		2	9
38,434	63	Ridgeway Road & Park Avenue	Signalized	110	1	$2,000		X		2	9
15,543	420	Macon Road & Mullins Station Road	Unsignalized	105	1	$159,000		X	X	2	9
9,097	95	Winchester Road & Ross Road	Signalized	95	1	$3,000		X	X	2	9
25,123	396	Willow Road & South White Station Road	Signalized	95	1	$3,000		X		2	9
142	63	Ridgeway Road & Quince Road	Signalized	90	1	$2,000				2	9
525	67	Kirby Parkway & Poplar Avenue	Signalized	90	1	$12,000	X	X	X	2	9
38,433	63	Ridgeway Road & Primacy Parkway	Signalized	85	1	$2,000		X		2	9
12,155	104	Boeingshire Drive & Winchester Road	Unsignalized	150	1	$181,000		X		3	8
8,387	68	Ridgeway Road & Ridge Meadow Parkway	Unsignalized	140	1	$181,000				3	8
7,882	71	Emerald Street & Winchester Road	Unsignalized	135	1	$181,000		X		3	9
7,259	82	Knight Arnold Road & Ashwood Street	Unsignalized	130	1	$181,000				3	9
12,067	105	East Raines Road & Boeingshire Drive	Unsignalized	130	1	$181,000				3	8
6,989	97	Tchulahoma Road & East Oak Side Drive	Unsignalized	125	1	$159,000		X		3	8
8,307	68	Winchester Road & Ridgeway Road	Signalized	125	1	$2,000		X		3	8
11,301	115	McClure Road & Elvis Presley Boulevard	Unsignalized	125	1	$181,000	X	X		3	8
11,999	102	Winchester Road & Winbrook Drive	Signalized	115	1	$2,000		X		3	8
12,156	102	Winchester Road & Airways Boulevard	Signalized	110	1	$2,000		X		3	8
7,726	85	Castleman Street & Winchester Road	Signalized	105	1	$3,000		X		3	9
11,518	110	East Raines Road & Faronia Road	Signalized	100	1	$5,000		X	X	3	8
7,804	396	Mount Moriah Road & Private Drive	Signalized	85	1	$12,000		X		3	8
12,184	102	Winchester Road & Holly Circle	Signalized	80	1	$11,000		X		3	8
22,137	228	Park Avenue & Hanley Street	Unsignalized	145	1	$23,000		X		4	8
19,371	0	Castalia Street & Lamar Avenue	Unsignalized	140	1	$181,000	X	High		4	8
21,604	205	South Bellevue Boulevard & East Trigg Avenue	Unsignalized	140	1	$181,000	X	X		4	8
7,827	76	South Mendenhall Road & Newberry Avenue	Unsignalized	135	1	$181,000		X		4	9
19,721	0	East Parkway South & Seelbinder Drive	Unsignalized	135	1	$45,000	X	X		4	8
22,027	218	Ketchum Road & Crosby Street	Unsignalized	135	1	$159,000		X		4	8
22,118	225	Lamar Avenue & Fizer Avenue	Unsignalized	135	1	$181,000	X	X	X	4	8
22,188	238	Kimball Avenue & Pendleton Street	Signalized	135	1	$13,000	X	High	X	4	8
21,584	215	Elvis Presley Boulevard & Norris Road	Signalized	120	1	$5,000	X	High	X	4	8
21,672	206	Elvis Presley Boulevard & Menager Road	Signalized	120	1	$11,000	X	X		4	8
7,776	85	Winchester Road & South Mendenhall Road	Signalized	115	1	$2,000		X		4	8
21,661	206	Elvis Presley Boulevard & Roberts Road	Signalized	110	1	$8,000	X	X		4	8
22,628	257	Tillman Street & Walnut Grove Road	Unsignalized	155	1	$181,000	X	High	X	5	9
22,764	253	Lafayette Street & Poplar Avenue	Signalized	155	1	$5,000	X	High	X	5	9
22,507	257	Poplar Avenue & Tillman Street	Signalized	145	1	$10,000	X	High	X	5	9
22,767	250	Poplar Avenue & South Marne Street	Unsignalized	145	1	$181,000	X	X	X	5	9
24,334	378	Macon Road & Vaughn Road	Unsignalized	145	1	$159,000		X		5	9
19,425	294	Union Avenue & South Rembert Street	Unsignalized	135	1	$159,000	X	X	X	5	9
22,880	237	Southern Avenue & Greer Street	Unsignalized	135	1	$23,000		X	X	5	9

Id	LINEAR PROJECT ID	LOCATION	INTERSECTION TYPE	PRIORITY SCORE	PHASE	PLANNING LEVEL COST ESTIMATE	STATE OWNED ROAD	TRANSIT ACCESS	SERVES PED. W. DISABILITIES	CITY COUNCIL DISTRICT	CITY COUNCIL SUPERDISTRICT
22,902	256	Walnut Grove Road & North Greer Street	Unsignalized	135	1	$181,000	X	X	X	5	9
22,416	251	Poplar Avenue & North Humes Street	Signalized	125	1	$15,000	X	X	X	5	9
19,125	310	Poplar Avenue & North Evergreen Street	Signalized	110	1	$6,000		X	X	5	9
20,283	251	Scott Street & Poplar Avenue	Signalized	110	1	$10,000	X	X	X	5	9
23,333	250	South Highland Street & Poplar Avenue	Signalized	100	1	$2,000	X	X	X	5	9
18,935	310	Poplar Avenue & North Avalon Street	Signalized	95	1	$2,000		X	X	5	9
24,035	378	Macon Road & North Graham Street	Signalized	95	1	$9,000		X		5	9
23,204	250	South Prescott Street & Poplar Avenue	Signalized	90	1	$3,000	X	X	X	5	9
19,277	310	Poplar Avenue & North McLean Boulevard	Signalized	85	1	$4,000		X	X	5	9
18,184	297	South Bellevue Boulevard & Vinton Avenue	Unsignalized	160	1	$23,000	X	High	X	6	8
18,175	298	South Bellevue Boulevard & Lamar Avenue	Signalized	145	1	$5,000	X	High		6	8
20,794	406	East McLemore Avenue & South Third Street	Signalized	145	1	$8,000	X	X		6	8
17,132	315	South Third Street & Union Avenue	Signalized	140	1	$2,000	X	High	X	6	8
17,263	315	South Third Street & Madison Avenue	Signalized	140	1	$2,000	X	High	X	6	8
18,311	330	Jefferson Avenue & North Montgomery Street	Unsignalized	140	1	$181,000		X	X	6	8
20,650	154	South Parkway West & Kansas Street	Unsignalized	140	1	$181,000		X		6	8
36,665	0	Lamar Avenue & Harbert Avenue	Signalized	135	1	$12,000	X	High	X	6	8
17,750	337	Madison Avenue & South Manassas Street	Signalized	130	1	$2,000		High	X	6	8
18,205	300	Union Avenue & South Bellevue Boulevard	Signalized	130	1	$5,000	X	High	X	6	8
18,176	298	Lamar Avenue & West Snowden Circle	Signalized	125	1	$13,000	X	High		6	8
11,340	114	East Shelby Drive & Elvis Presley Boulevard	Signalized	120	1	$7,000	X	X		6	8
17,289	313	Washington Avenue & North Third Street	Signalized	120	1	$2,000	X	High	X	6	8
17,290	313	Adams Avenue & North Third Street	Signalized	120	1	$2,000	X	High	X	6	8
11,455	110	Elvis Presley Boulevard & East Raines Road	Signalized	110	1	$2,000	X	X	X	6	8
21,456	206	East Person Avenue & Elvis Presley Boulevard	Signalized	105	1	$5,000	X	X		6	8
21,576	215	Elvis Presley Boulevard & East Alcy Road	Signalized	105	1	$9,000	X	X	X	6	8

Id	LINEAR PROJECT ID	LOCATION	INTERSECTION TYPE	PRIORITY SCORE	PHASE	PLANNING LEVEL COST ESTIMATE	STATE OWNED ROAD	TRANSIT ACCESS	SERVES PED. W. DISABILITIES	CITY COUNCIL DISTRICT	CITY COUNCIL SUPERDISTRICT
18,319	311	Poplar Avenue & North Montgomery Street	Unsignalized	160	1	$181,000		High	X	7	8
20,167	363	North Hollywood Street & Matthews Avenue	Unsignalized	150	1	$181,000		High	X	7	8
18,137	344	Chelsea Avenue & Ayers Street	Unsignalized	145	1	$181,000		X		7	8
20,066	401	Vollintine Avenue & North Hollywood Street	Unsignalized	145	1	$159,000		X		7	8
20,147	0	Jackson Avenue & Meagher Street	Signalized	145	1	$9,000	X	High		7	8
39,290	349	Access Road & North Watkins Street	Signalized	140	1	$11,000		X	X	7	8
18,097	312	Poplar Avenue & Decatur Street	Signalized	135	1	$5,000		X	X	7	8
18,464	0	Larkin Avenue & North Claybrook Street	Unsignalized	135	1	$23,000		High	X	7	8
17,386	313	North Third Street & Exchange Avenue	Signalized	130	1	$2,000	X	High		7	8
17,398	327	Jackson Avenue & North Third Street	Signalized	130	1	$8,000	X	High		7	8
17,403	327	North Third Street & A W Willis Avenue	Signalized	130	1	$2,000	X	High		7	8
17,409	326	A W Willis Avenue & North Second Street	Signalized	130	1	$2,000	X	High		7	8
20,175	362	Chelsea Avenue & Bryan Street	Signalized	130	1	$5,000		High	X	7	8
17,308	320	Jackson Avenue & North Front Street	Signalized	120	1	$2,000		High		7	8
17,311	320	Jackson Avenue & North Main Street	Signalized	120	1	$2,000		High		7	8
17,404	326	A W Willis Avenue & North Main Street	Signalized	120	1	$2,000		High		7	8
17,753	337	North Manassas Street & Jefferson Avenue	Signalized	120	1	$2,000		X	X	7	8
17,755	337	Adams Avenue & North Manassas Street	Signalized	120	1	$4,000		X	X	7	8
17,757	337	North Manassas Street & Washington Avenue	Signalized	120	1	$2,000		X		7	8
17,760	337	North Manassas Street & Poplar Avenue	Signalized	120	1	$3,000		X		7	8
12,500	23	Delano Avenue & North Watkins Street	Signalized	110	1	$4,000		X	X	7	8
17,474	320	North Lauderdale Street & Exchange Avenue	Four Way Stop	110	1	$2,000		X	X	7	8
19,881	362	Springdale Street & Chelsea Avenue	Signalized	110	1	$5,000		X	X	7	8
12,992	17	Whitney Avenue & Mountain Terrace Street	Four Way Stop	105	1	$2,000		X		7	8

Top Projects Serving Persons with Disabilities

The emphasis of this plan is safe and comfortable walking access for students, including students with disabilities, to Memphis Public Schools. The general population of persons with temporary and permanent disability is also particularly affected by the quality and completeness of the sidewalk network. It is especially difficult for residents in wheelchairs or using other mobility devices to navigate the city and access critical destinations like transit stops, grocery stores, and medical facilities.

This plan has sought to incorporate the needs of these individuals at every stage. Representatives from the Mayor's Advisory Council for Citizens with Disabilities and the Memphis Center for Independent Living took part in the Transportation Advisory Committee for the plan. A **stakeholder group meeting was also independently conducted with representatives from the Mayor's Advisory Council for Citizens with Disabilities**, and their perspective was documented in chapter two, informing the methodology for the plan. **Stated priorities** for this group included the following:

- **Transit access**, a key priority for persons with disabilities in Memphis, is included in both the demand analysis and the shortest path analysis. Transit is then accounted for in several prioritization criteria, including the outcomes of those two analyses and a standalone transit access category.
- **Medical facilities**, another key priority, were included in the 'play + shop' category of the demand analysis.
- **Projects near housing serving persons with disabilities** is a priority for the group as well. Proximity to such housing was accounted for in project phasing and is identified as such for all projects in the project list, as described below.
- **Maintenance of sidewalks, including maintenance of clear zones, and sidewalk gaps** were called out as barriers to be solved in these locations. The supply analysis identified sidewalks with these issues and scored them higher. The supply analysis scoring then fed directly into prioritization scoring, giving weight to segments with the greatest issues.
- Disability Community stakeholders also expressed **a need for longer walk phases at signalized intersections and a culture of stopping for pedestrians**. Signalized intersections were included in the project list as a result, even where ramps and crosswalks are in place, to ensure walk phases are analyzed and adjusted as needed. Programs are recommended in chapter five to enforce stopping behavior at crosswalks.

All specific projects identified by stakeholders, including the disability community, during stakeholder meetings were given additional weight in the 'stakeholder input' category of the prioritization scoring. During phasing, those **projects located within a half mile of housing serving persons with disabilities were prioritized** over similarly scored projects not within a half mile. Every single project in the project list indicates whether it is within a half mile of known housing serving persons with disabilities so that this criteria can be used on an ongoing basis as the city reevaluates needs and priorities.

This project has sought to provide a starting point for tackling the most important projects serving schools, while providing the City with rich data to be used on an ongoing basis as priorities change or specific funding sources are obtained for all pedestrian needs. In order to call attention to the particular needs of persons with disabilities, a separate project list is provided here. This list represents the **top 58 projects** (intersection or linear) from the entire project list by priority score **within a quarter mile of housing for persons with disabilities or medical facilities**.

PROJECT ID	PRIORITY SCORE (MAX)	STREET	FROM	TO	PROJECT TYPE	LENGTH (MILES)
362	155	Chelsea Avenue	Fairfax Street	May Street	Sidewalk Repair	1.06
250	155	Poplar Avenue	Lafayette Street	South Highland Street	Sidewalk Repair	0.80
13,203	150	Range Line Road & Orman Avenue	-	-	Unsignalized Intersection Improvement	-
320	145	Jackson Avenue	North Front Street	North Lauderdale Street	Sidewalk Repair	0.35
320	-	North Lauderdale Street	Alabama Avenue	Washington Avenue	Sidewalk Repair	0.37
337	145	North Manassas Street	Madison Avenue	Poplar Avenue	Sidewalk Repair	0.36
300	145	Union Avenue	South Bellevue Boulevard	South Dunlap Street	Sidewalk Repair	0.75
215	140	Elvis Presley Boulevard	Clementine Road	Norris Road	Sidewalk Repair, New Sidewalk	0.73
257	140	Tillman Street	Johnson Road	Poplar Avenue	Sidewalk Repair	0.60
13,141	140	North Trezevant Street & Frayser Boulevard	-	-	Unsignalized Intersection Improvement	-
39,290	140	Access Road & North Watkins Street	-	-	Signalized Intersection Improvement	-
330	135	Jefferson Avenue	Adams Avenue	North Montgomery Street	Sidewalk Repair	0.56
330	-	Adams Avenue	Jefferson Avenue	North Manassas Street	Sidewalk Repair	0.32
303	135	North Pauline Street	Poplar Avenue	South Pauline Street	Sidewalk Repair	0.43
303	-	South Pauline Street	Madison Avenue	Union Avenue	Sidewalk Repair	0.14
312	135	Poplar Avenue	Ayers Street	North Bellevue Boulevard	Sidewalk Repair	0.52
22,880	135	Southern Avenue & Greer Street	-	-	Unsignalized Intersection Improvement	-
22,902	135	Walnut Grove Road & North Greer Street	-	-	Unsignalized Intersection Improvement	-
326	130	A W Willis Avenue	North Front Street	North Sixth Street	Sidewalk Repair	0.45
326	-	North Sixth Street	A W Willis Avenue	Mill Alley	Sidewalk Repair	0.08
304	130	Dr Martin Luther King Jr Avenue	South Manassas Street	South Somerville Street	Sidewalk Repair	0.42
304	-	South Somerville Street	Dr Martin Luther King Jr Avenue	Peabody Avenue	Sidewalk Repair	0.18
307	130	Linden Avenue	South Bellevue Boulevard	South Cleveland Street	Sidewalk Repair	0.23
307	-	South Cleveland Street	Linden Avenue	Peabody Avenue	Sidewalk Repair	0.13
307	-	South Claybrook Street	Linden Avenue	Union Avenue	Sidewalk Repair	0.17
323	130	Madison Avenue	North Third Street	South Manassas Street	Sidewalk Repair	0.84
338	130	North Dunlap Street	Madison Avenue	Poplar Avenue	Sidewalk Repair	0.35

PROJECT ID	PRIORITY SCORE (MAX)	STREET	FROM	TO	PROJECT TYPE	LENGTH (MILES)
338	-	South Dunlap Street	Madison Avenue	Union Avenue	Sidewalk Repair	0.14
327	130	North Third Street	A W Willis Avenue	Jackson Avenue	Sidewalk Repair	0.22
23	130	North Watkins Street	Delano Avenue	Whitney Avenue	Sidewalk Repair	0.70
310	130	Poplar Avenue	North Tucker Street	Stonewall Street	Sidewalk Repair	0.82
302	130	South Manassas Street	Dr Martin Luther King Jr Avenue	Madison Avenue	Sidewalk Repair	0.36
302	-	Walnut Street	Dr Martin Luther King Jr Avenue	Vance Avenue	Sidewalk Repair	0.13
18,436	130	South Cleveland Street & Union Avenue	-	-	Signalized Intersection Improvement	-
18,453	130	Jefferson Avenue & North Cleveland Street	-	-	Signalized Intersection Improvement	-
18,660	130	North Watkins Street & Access Road	-	-	Signalized Intersection Improvement	-
110	125	East Raines Road	Graceland Drive	Marlin Road	Sidewalk Repair, Sidewalk Infill	0.89
110	-	Graceland Drive	Bonnie Drive	East Raines Road	Sidewalk Repair	0.06
417	125	Madison Avenue	South Cleveland Street	South Evergreen Street	Sidewalk Repair	0.74
67	125	Poplar Avenue	Briarcrest Avenue	Dunmow Lane	Sidewalk Repair, Sidewalk Infill	0.99
67	-	Kirby Parkway	Great Oaks Road	Poplar Avenue	Sidewalk Repair	0.20
235	125	Spottswood Avenue	Kent Street	South Highland Street	Sidewalk Repair	1.07
301	125	Vance Avenue	Boyd Street	Walnut Street	Sidewalk Repair	0.70
17,375	125	Court Avenue & North Fourth Street	-	-	Unsignalized Intersection Improvement	-
17,775	125	North Danny Thomas Boulevard & Saint Jude Place	-	-	Unsignalized Intersection Improvement	-
18,830	125	North Watkins Street & Brown Avenue	-	-	Unsignalized Intersection Improvement	-
21,157	125	South Parkway East & McMillan Street	-	-	Unsignalized Intersection Improvement	-
21,158	125	South Parkway East & South Orleans Street	-	-	Unsignalized Intersection Improvement	-
21,159	125	South Parkway East & Gabay Street	-	-	Unsignalized Intersection Improvement	-
324	120	Adams Avenue	North Fourth Street	North Manassas Street	Sidewalk Repair	0.67
324	-	North Fourth Street	Adams Avenue	Jefferson Avenue	Sidewalk Repair	0.07
329	120	Ayers Street	Galloway Avenue	Poplar Avenue	Sidewalk Repair	0.54
357	120	Brown Avenue	Lewis Street	North Claybrook Street	Sidewalk Repair, Sidewalk Infill	0.31

PROJECT ID	PRIORITY SCORE (MAX)	STREET	FROM	TO	PROJECT TYPE	LENGTH (MILES)
357	-	North Claybrook Street	Brown Avenue	Vollintine Avenue	Sidewalk Repair	0.16
305	120	East E H Crump Boulevard	East Street	South Somerville Street	Sidewalk Repair	0.43
134	120	East Fairway Avenue	Hillbrook Road	Hillridge Street	Sidewalk Repair, Sidewalk Infill	0.35
134	-	Hillbrook Road	East Fairway Avenue	End of Hillbrook Road	Sidewalk Infill	0.27
306	120	East Street	East E H Crump Boulevard	Union Avenue	Sidewalk Repair	0.44
238	**120**	Kimball Avenue	Pendleton Street	Semmes Street	Sidewalk Repair	0.50
238	**-**	Rutland Street	Barron Avenue	Kimball Avenue	Sidewalk Repair	0.39
225	**120**	Lamar Avenue	Hugenot Street	Lowell Avenue	Sidewalk Repair	0.49
225	**-**	Hugenot Street	Lamar Avenue	Malone Avenue	Sidewalk Repair	0.10
331	**120**	North Cleveland Street	North Watkins Street	Poplar Avenue	Sidewalk Repair	0.56
325	**120**	North Danny Thomas Boulevard	Adams Avenue	Saint Jude Place	Sidewalk Repair	0.61
328	**120**	North Dunlap Street	Poplar Avenue	Lane Avenue	Sidewalk Repair	0.39
336	**120**	North Manassas Street	Leath Street	Poplar Avenue	Sidewalk Repair	0.39
299	**120**	Peabody Avenue	East Street	South Bellevue Boulevard	Sidewalk Repair	0.59
245	**120**	Southern Avenue	Alexander Street	Walker Avenue	Sidewalk Repair, New Sidewalk	0.50
245	**-**	Walker Avenue	Patterson Street	Southern Avenue	Sidewalk Repair	0.13
7,231	**120**	Getwell Road & Comanche Road	-	-	Signalized Intersection Improvement	-
13,747	**120**	Trudy Street & Ridgemont Avenue	-	-	Unsignalized Intersection Improvement	-
17,366	**120**	Union Avenue & South Lauderdale Street	-	-	Signalized Intersection Improvement	-
18,307	**120**	South Claybrook Street & North Claybrook Street	-	-	Signalized Intersection Improvement	-
18,674	**120**	Jackson Avenue & North Watkins Street	-	-	Signalized Intersection Improvement	-
32,691	**120**	Mimosa Avenue & Carpenter Street	-	-	Unsignalized Intersection Improvement	-

Complementary Projects

POTENTIAL ROADWAY RECONFIGURATIONS FOR PEDESTRIAN AND BICYCLIST SAFETY

This plan focuses on identifying projects that directly serve pedestrians and improve the pedestrian network, including sidewalks and crossing improvements. Other roadway projects, like lane reduction to accommodate bike lanes and speed and volume management improvements, also benefit pedestrians by reducing the number of motor vehicle lanes they must cross and reducing the speeds of vehicles. The crash analysis summarized in Chapter 2 showed that pedestrian crashes are overrepresented on arterial roadways and multi-lane roadways. Half of the twenty-four intersections where the most crashes occurred between 2007 and 2011 contain six or more lanes, and the four roadways with the most mid-block crashes over this period are majority six-lane roadways.

There are many opportunities throughout Memphis to reduce the number of vehicular lanes by one or two lanes in order to accommodate bicycle lanes or protected bicycle lanes in what is termed a 'road diet'. More guidance on Lane Reconfigurations and Road Diets is provided in Appendix C. In addition to the benefits to the bikeway network that road diets provide, they also improve pedestrian crossings by reducing the number of motor vehicle lanes they must cross on major roadways, where safety issues have been identified. Preliminary analysis in this plan shows a need for 171 pedestrian beacons across the city to facilitate crossings of major roadways. This analysis follows the Enhanced Crossing Treatment Selection chart presented in Appendix C. Road diets on the roadways in need of these beacons may reduce the number of beacons needed, or shift the need away from the more expensive Hybrid Beacons to Active Warning Beacons.

All roadways with more than three lanes where a pedestrian crossing improvement is recommended midblock or at an unsignalized intersection were examined for a potential road diet based on traffic volumes and the number of lanes at that crossing location. The roadways listed in Table 4.5 are potential candidates for lane reduction based on this analysis. Road diets on these roadways could improve motorist, pedestrian, and bicyclist safety and reduce the cost of implementing pedestrian crossing improvements. Each of these roadways requires a more detailed traffic analysis to identify potential impacts and determine appropriate project extents before implementing a reconfiguration. Table 4.5 also indicates where a roadway has a recommended on-street facility in the regional *MPO Bicycle and Pedestrian Plan*.

Table 4.5: Potential Road Diet Candidates at Recommended Pedestrian Crossings of Major Roadways

Street	Existing Lanes	Proposed Lanes	Posted Speed	Traffic Volumes (AADT)	Crossing Location(s)	MPO Bicycle & Pedestrian Plan
Airways Boulevard	7	5	40	32,015	Dwight Road	Recommended facility further south starting at Ketchum Road
Appling Road	7	5	45	27,692	Oakfield Drive	Existing bike lanes
Barron Avenue	4	3	40	16,574	Greer Street	Funded bike lanes
Central Avenue	4	3	40	16,002	Alexander Street	Existing bike lanes
Chelsea Avenue	5	3	40	10,295	Ayers Street	Recommended on-street bike facility
Chelsea Avenue	5	3	40	15,161	North Evergreen Street	Existing bike lanes
Chelsea Avenue	4	3	40	10,427	Ash Street	Recommended on-street bike facility
Colonial Road	4	3	35	16,368	Sea Isle Road	No recommendation

Street	Existing Lanes	Proposed Lanes	Posted Speed	Traffic Volumes (AADT)	Crossing Location(s)	MPO Bicycle & Pedestrian Plan
East Holmes Road	5	3	40	14,135	Windham Road, Whitworth Avenue, and Haleville Road	Recommended on-street bike facility; section further east is a funded facility
East Person Avenue	4	3	35	13,975	Pillow Street	Recommended on-street bike facility
East Raines Road	7	5	40	14,204	Rainbranch Drive & Boeingshire Drive	Recommendation further west starting at Millbranch Road
East Raines Road	7	5	40	11,579	Crump Road & Rocky Park Drive	Existing bike lanes
East Shelby Drive	5	3	45	15,936	Gill Drive & Berta Road	Recommended on-street bike facility
Elvis Presley Boulevard	5	3	40	19,855	McClure Road	Recommended on-street facility; section further north is funded, starting at Shelby Dr
Estate Drive	4	3	40	12,968	Sea Isle Road	No recommendation
Frayser Boulevard	5	3	40	14,113	Aden Street, North Trezevant Street, & Ladue Street	Recommended on-street bike facility
Getwell Road	7	5	40	17,058	Cochese Avenue	No recommendation
Hickory Hill Road	7	5	45	26,531	West Rosewind Circle & Ashridge Place	Funded facility further north starting at Winchester Road
Horn Lake Road	4	3	45	8,271	Honduras Drive	Funded on-street bike facility
Jackson Avenue	4	3	40	19,564	North Avalon Street	No recommendation
Jefferson Avenue	5	3	40	4,566	North Montgomery Street	Funded on-street bike facility
Kimball Avenue	4	3	40	14,662	Haynes Street	No recommendation
Kirby Parkway	7	5	45	27,945	Timber Trail & Chanlone Way	Recommended on-street bike facility
Knight Arnold Road	5	3	40	17,646	Ashwood Street	Recommended on-street bike facility
Macon Road	7	5	45	19,094	Mullins Station Road & Greenbrook Parkway	Recommended on-street bike facility
Macon Road	4	3	40	14,379	Vaughn Road	Recommended on-street bike facility
Millbranch Road	4	3	40	14,235	David Drive	Existing bike lanes
Millbranch Road	5	3	40	8,532	Hester Road	Recommended on-street bike facility
National Street	4	3	40	14,868	Vernon Avenue	No recommendation
North Cleveland Street	4	3	35	14,772	Larkin Avenue	Funded on-street bike facility
North Graham Street	4	3	35	13,094	Kingsbury Road	No recommendation
North Highland Street	4	3	40	8,048	Given Avenue	No recommendation
North Hollywood Street	5	3	40	13,471	Matthews Avenue & Vollintine Avenue	Funded on-street bike facility
North Watkins Street	5	3	40	18,125	Saint Elmo Avenue	Existing Bike Lanes
North Watkins Street	4	3	40	12,194	Brown Avenue	Recommended on-street bike facility
Outland Road	5	3	45	14,870	Cromwell Avenue	Funded on-street bike facility
Park Avenue	4	3	35	15,849	Hanley Street & Haynes Street	Existing bike lanes
Quail Hollow Road	5	3	35	11,536	West Massey Road	Recommended on-street bike facility

Street	Existing Lanes	Proposed Lanes	Posted Speed	Traffic Volumes (AADT)	Crossing Location(s)	MPO Bicycle & Pedestrian Plan
Quince Road	5	3	40	15,655	McQueen Drive	No recommendation
Raleigh Lagrange Road	7	5	45	19,539	Chiswood Street	Recommended on-street bike facility
Raleigh Millington Road	4	3	40	19,845	The Place Drive	No recommendation
Range Line Road	5	3	40	11,402	Orman Avenue & Sandpiper Avenue	Recommended on-street bike facility
Ridgemont Avenue	5	3	40	8,135	Trudy Street	Recommended on-street bike facility
Ridgeway Road	7	5	40	34,039	Harwick Drive & Macinness Drive	No recommendation
Ridgeway Road	5	3	45	13,252	Belle Forest Drive, Ridge Meadow Parkway & Silverleaf Road	Recommended on-street bike facility
South Bellevue Boulevard	4	3	35	12,252	Vinton Avenue	Recommended on-street bike facility
South Mendenhall Road	7	5	40	31,896	Newberry Avenue	No recommendation
South Mendenhall Road	7	5	40	26,898	Derron Avenue	Funded on-street bike facility
South Parkway East	4	3	35	12,385	Sardis Street	No recommendation
South Parkway East	5	3	35	18,189	McMillan Street, South Orleans Street & Gabay Street	Existing bike lanes
South Parkway West	5	3	40	3,802	Hanauer Street & Kansas Street	Recommended on-street bike facility
South Perkins Road	7	5	40	35,115	Aloha Avenue	Recommended on-street bike facility
Southern Avenue	4		35	17,661	Greer Street	Recommended on-street bike facility
Stratford Road	4		40	16,315	Owen Road	No recommendation
Summer Avenue	7		40	24,452	High Point Terrace & Vaughn Road	No recommendation
Tchulahoma Road	4		45	9,704	East Oak Side Drive	Recommended on-street bike facility
Thomas Street	4		35	15,944	Marble Avenue & Wells Avenue	No recommendation
Tillman Street	4		35	9,986	Walnut Grove Road	Funded bike project to the north
Trinity Road	5		45	14,594	North Ericson Road	Existing bike lanes
Walnut Grove Road	5		35	18,733	North Greer Street	Recommended on-street bike facility
West Massey Road	4		30	3,015	Quail Hollow Road	Recommended on-street bike facility
West Raines Road	5		40	3,720	Warbonnet Street	No recommendation
Winchester Road	7		40	24,310	Boeingshire Drive	Recommended on-street bike facility
Winchester Road	7		45	34,916	Emerald Street	Funded on-street bike facility
Yale Road	5		40	10,856	Powers Road	Recommended on-street bike facility

THE BENEFITS OF ROAD DIETS

The wide roadways throughout Memphis with excess capacity present a large opportunity as the City works towards the goals outlined in the *2014 Regional Bicycle & Pedestrian Plan*. Road diets can increase safety for pedestrians, bicyclists, and motorists while improving the quality of life of a community. The Federal Highway Administration advances the road diet as a low-cost, proven safety countermeasure. A few examples from communities around the country are detailed below:

- **Ponce De Leon Avenue** was restriped from seven to five lanes in **Atlanta, GA**. Peak hour average speeds reduced to between 15mph and 20mph and the addition of bicycle lanes significantly increased the bicycle traffic.
- **East Boulevard** in **Charlotte, NC** was converted from four lanes to three lanes and saw a reduction in overall crashes, a decrease in average speeds, and an increase in outdoor dining.
- **NE 75th Street in Seattle, WA** was restriped from four lanes to three lanes, and saw collisions reduced by 45% and speeds reduced by 10% in the first year.
- A road diet project in **Vancouver, WA**, reduced crashes by 52 percent on an arterial with ADT of 17,000 vehicles. Traffic speeds went down 18 percent, traffic diversions did not occur, and an overwhelming majority (67 percent) of users surveyed felt safer.
- In **Clear Lake, IA**, a downtown segment of **U.S. 18** with 12,000 ADT was converted from four to two lanes plus a center turn lane. A significant reduction in crashes was evident, and aggressive speeding went down by 52 percent.
- **Stone Way** in **Seattle, Washington** was converted from four lanes to three lanes and saw pedestrian collisions decline by 80% and a 35% increase in bicycle traffic.

After Ponce De Leon Avenue was restriped from seven to five lanes in Atlanta, GA it saw a reduction in peak hour average speeds and increased bicycle traffic.

CHAPTER 5:

IMPLEMENTATION

Chapter Contents:

Introduction

This chapter recommends a structure for managing the implementation of the Memphis Pedestrian School Safety Action Plan. Implementing the recommendations of this plan will require leadership and dedication on the part of several agencies and partner organizations, as well as a stable source of revenue. Most importantly, success will be realized through the City's collaboration with other local agencies, as well as state and federal agencies, the private sector, and nonprofit organizations (NPOs).

Given the present day economic challenges faced by local governments (as well as their state, federal, and private sector partners), the financial resources available to implement this plan in the long term are uncertain. However, there are still important actions to take in advance of major investments, including key organizational and policy changes. Following through on the action steps described in this chapter will allow the key partners in Memphis to implement this plan over time while taking advantage of strategic opportunities, both now and in the future as new opportunities arise.

The chapter is organized into nine main components:

- **Walk Friendly Community Framework: The 6 E's** — Describes the organizing framework of the implementation strategy
- **Implementation Action Steps Table** — Provides a clear set of action steps along with responsible and supporting agencies and a proposed timeframe
- **Engineering** — Describes a strategy to implement the infrastructure recommendations of this plan
- **Education** — Describes education programs that will support sidewalk repair by property owners and provide institutional knowledge of best practices in pedestrian facility design
- **Encouragement** — Summarizes encouragement programs to support sidewalk repair by property owners
- **Enforcement** — Summarizes a program to encourage motorist yielding at crosswalks
- **Evaluation and Planning** — Describes an ongoing strategy to track progress against the recommendations of this plan by enhancing data collection, tracking performance measures, and updating analyses over time; and describes strategies for funding and partnerships
- **Equity** — Summarizes a program to support disadvantaged homeowners with sidewalk repairs
- **Pilot Project Summaries** — Illustrates twenty projects from the full project list to demonstrate the types of improvements recommended in different contexts around the city

Walk Friendly Community Framework: The 6 E's

As a first step in communicating its intention to improve conditions for pedestrians, the City of Memphis should complete the process of applying for Walk Friendly Community recognition through the Walk Friendly Community program. The Walk Friendly Community (WFC) program is a national initiative, led by the Pedestrian and Bicycle Information Center (PBIC). It uses a "5 E's" framework to help communities evaluate walkability and identify areas where additional focus could improve the attractiveness of walking. The 5 E's include Engineering, Education, Encouragement, Enforcement, and Evaluation and Planning. While not part of WFC criteria, many communities have also added a sixth "E" for self-evaluation purposes: Equity.

Communities wishing to become a WFC must apply to Walk Friendly Communities via an online application. The WFC Assessment Tool available from the website includes all of the questions related to the 5 E's and other relevant community information. A multi-person review panel scores the applications, and then WFC award designations are announced.

To aid the City of Memphis in this application process, this chapter is organized around the 6 E's.

Implementation Action Steps Table

The steps necessary to implement this plan are outlined in the following table along with responsible agencies and phasing. The 'short term' phase indicates actions to be taken within two years of plan adoption. The 'medium term' phase indicates actions to be taken within five years of plan adoption. Additional detail on each action step is provided in the sections following this table.

TASK	LEAD DEPT. OR GROUP	SUPPORT	DETAILS	PHASE
ENGINEERING				
Project List				
Select and construct a set of pilot projects	Engineering	Public Works, Shelby County, Tennessee Department of Transportation (TDOT)	Select a set of pilot projects for early implementation to build momentum and demonstrate to the public the types of projects recommended by this plan	Short Term
Build project list into Capital Improvement Program (CIP)	Engineering	City Council, Mayor's Office, Public Works	Move forward projects in phase 1 by incorporating into CIP, contacting property owners about repairs, and working with strategic partners	Short Term and Ongoing
Update the project list	Engineering	Memphis Metropolitan Planning Organization (MPO), Public Works	Update the project list annually based on changing destinations, land uses, and City priorities	Ongoing
Coordinate sidewalk improvements and utility pole relocation with Memphis Light, Gas, and Water (MLGW)	Engineering	MLGW, Public Works	Coordinate gas and sewer line replacements with sidewalk projects; work with MLGW to seize utility pole relocation opportunities	Ongoing
Coordinate sidewalk, ADA improvements, and bus shelter placement with MATA	Engineering	MATA, Public Works	Identify project list segments that overlap with areas identified in MATA's 2012 Short Range Transit Plan; partner with MATA to implement new crossing treatments along transit routes, and work with MATA to (re)locate bus shelters	Short Term, Ongoing

TASK	LEAD DEPT. OR GROUP	SUPPORT	DETAILS	PHASE
Policy, Code, Standards, and Practices				
Reform sidewalk maintenance and repair practices	Engineering	Public Works, City Council, Planning and Development, Private Contractors, Livable Memphis, Sierra Club, Memphis Center for Independent Living (MCIL)	Reform enforcement practices; implement new strategies for repairing sidewalk damage from tree roots; institute low-cost, temporary sidewalk repair measures when property owners do not fulfill maintenance responsibilities; create structure for ongoing sidewalk inspection program	Short Term
Update standards and requirements for new sidewalk construction	Planning and Development	Local arborists and/or landscape architects, Engineering, nonprofit organizations, Public Works	Develop a list of approved street tree species; update code to ensure sidewalks are at least five feet wide; close loopholes in the Memphis and Shelby County Unified Development Code that allow developers to avoid building sidewalks; explore creation of a fee-in-lieu or sidewalk benefit zones program	Short to Medium Term
Strengthen code language requiring relocation of utility poles and other obstructions	Planning and Development	MLGW, Engineering, TDOT, private developers, Public Works	Require utility pole relocation during private (re)development and roadway reconstruction when pedestrian through-zone requirements outlined in the Memphis Complete Streets Project Delivery Manual are not met	Short to Medium Term
Ensure code language supports a high quality pedestrian environment during and after property redevelopment	Planning and Development	Memphis MPO, Engineering, private developers, Public Works	Update access management policy; strengthen pedestrian access requirements during construction projects	Short to Medium Term
Consider pedestrian benefits of potential road diet projects	Engineering	Planning and Development, TDOT, local businesses and neighborhood groups	Include the desirability of a pedestrian buffer from traffic when selecting roadways for road diet projects	Short Term
Adjust posted speed limits based on target speed recommendations contained in the *Memphis Complete Streets Project Delivery Manual*	Engineering, TDOT, Police	Public Works, Planning and Development, nonprofit organizations, neighborhood groups	Posted speeds should be reviewed and modified based on land use context and roadway functional classification/width as outlined in the *Memphis Complete Streets Project Delivery Manual*	Short to Medium Term
Coordinate updates to existing code language, policies, and practices related to pedestrian crossings	Engineering	Planning and Development, Public Works	Strengthen code language related to pedestrians entering crosswalks; update crosswalk policy; establish maintenance schedules for crosswalk markings and lighting; create implementation plan for pedestrian improvements at signalized intersections	Short to Medium Term
EDUCATION AND ENCOURAGEMENT				
Develop a series of programs designed to increase property owner compliance with sidewalk code	Engineering	City Council, Planning and Development, Public Works, Finance, community-based organizations	Develop a sidewalk maintenance responsibilities program, financial incentives program, and Fast-Fix program	Short Term, Ongoing
Offer regular professional development courses for law enforcement, planners, policy makers, and engineers	MPO, local advocacy organizations, University of Memphis	Engineering, Planning and Development, Police Academy	Develop curriculum, identify instructors, and establish format and schedule	Short Term; Ongoing

TASK	LEAD DEPT. OR GROUP	SUPPORT	DETAILS	PHASE
ENFORCEMENT				
Conduct regular crosswalk enforcement actions	Police	City Council, local media	Develop targeted enforcement program schedule and coordinate with media	Ongoing
EVALUATION AND PLANNING				
Develop performance measures	Engineering, Planning and Development, Police	City Council, nonprofit and community-based organizations, Public Works	Work with interdisciplinary team to select appropriate performance measures; consider adopting performance standards or benchmarks	Medium Term
Improve data collection and management efforts	Planning and Development	Engineering, City Council, Police, schools	Develop and administer surveys; institute pedestrian count program; develop new reporting requirements	Medium Term; Ongoing
Update quantitative analyses conducted during this planning process	Memphis MPO	Engineering, Planning and Development, consultant	Update crash analysis, shortest path analysis, and pedestrian suitability index on a regular basis	Ongoing
Complete an Annual Report Card	Engineering	Livable Memphis, Memphis MPO, Sierra Club, MCIL	Track progress in engineering, education, encouragement, enforcement, equity, evaluation and planning	Ongoing
Prepare Walk Friendly Community Application	Engineering	Planning and Development, Police, Schools, MATA, advocacy groups	The questions in the WFC application will provide a comprehensive evaluation of the City's efforts to be more pedestrian friendly	Short to Medium Term
Funding				
Take full advantage of all currently available funding sources for pedestrian projects	Engineering	Planning and Development, Memphis MPO, Memphis Area Transit Authority (MATA)	Monitor existing federal, state, and private foundation grant opportunities	Ongoing
Explore strategies to increase funding for pedestrian projects	Mayor's Office, City Council	Planning and Development, Engineering	Explore political feasibility of voter-approved bond measures, a transportation user fee, and/or sales tax increases; create budget set-aside for pedestrian projects; investigate development impact fees, raising funds from parking revenue, and/or creating business improvement districts	Short to Medium Term
Strategic Partnerships and Coordination				
Review project selection criteria for competitive grant programs with the Memphis MPO	Engineering	Memphis MPO	Ensure that project selection criteria allows sidewalk projects to receive fair consideration relative to other modes	Short to Medium Term
Coordinate with the Tennessee Department of Transportation (TDOT)	Engineering	TDOT, City Council, Memphis MPO	Work with TDOT to implement projects on state-owned roads; consider adopting a resolution requesting the provision of sidewalks on all non-freeway TDOT road projects	Short to Medium Term, Ongoing
Coordinate with non-profit and neighborhood groups	Engineering	Livable Memphis, neighborhood groups, other NPOs, Sierra Club, MCIL	Partner with nonprofit organizations to promote recommended programs and ongoing sidewalk inspection efforts	Ongoing
EQUITY				
Develop a program to assist disadvantaged property owners in compliance with sidewalk code	Engineering	City Council, Planning and Development, Public Works, Finance, community-based organizations	Develop a Sidewalk Maintenance Support for Disadvantaged Homeowners program	Short Term, Ongoing

Engineering

PROJECT CONSTRUCTION

Current Means of Implementing Pedestrian Projects

Existing mechanisms for implementing new sidewalk construction, sidewalk maintenance, and pedestrian intersection enhancements include the following:

- **The City's sidewalk program,** currently funded at approximately $100,000 annually from the City's general fund.
- **Neighborhood sidewalk improvement projects,** when funding is available. Funding levels vary up to $150,000 annually.
- **Safe Routes to School projects,** funded through the federal grants administered by the Tennessee Department of Transportation.
- **City and state roadway reconstruction projects.** Major projects of this nature are limited in quantity.
- **Land development and redevelopment requirements.** Current code requires developers to construct sidewalks at the time of new development or redevelopment. Most new residential development includes sidewalks as intended by the code. Many commercial and residential redevelopment projects, however, are not bringing adjacent sidewalks up to current City standards due to loopholes in requirements.
- **Sidewalk repair and replacement completed by property owners.** City code requires that property owners maintain sidewalks adjacent to their property. Many property owners are not currently satisfying this responsibility.
- **Americans with Disabilities Act (ADA) curb ramp program**, funded at $1 million annually. The City has constructed over 16,000 curb ramps since 2006.

Project List Implementation

A core component of implementing this plan will be the construction of projects that benefit pedestrians – including new sidewalks, sidewalk repairs, and crossing improvements. The following steps will begin the process of addressing projects strategically in accordance with the project list.

- Send the list of **Phase 1 projects along state-owned roads to TDOT**; work with TDOT to build these projects (see Strategic Partnerships and Coordination). State-owned roads are flagged in the project lists in Chapter 4 and Appendix E.
- Send a list of **Phase 1 projects near high-use transit stops to Memphis Area Transit Authority** and work with MATA to fund these projects (see Strategic Partnerships and Coordination). Projects near high-use transit stops are flagged in the project lists in Chapter 4 and Appendix E.
- Identify **property owners along Phase 1 and Phase 2 projects**; send them a guide to sidewalk maintenance, explaining that their sidewalk is part of a high priority segment. Property owners can be identified using the GIS database created for this project overlaid with the city's parcel data.
- **Establish the timeframe for the phases** identified in this plan based on the amount of annual funding secured (see Funding).
- **Construct projects in Phase 1** not completed by property owners using new funding set-aside in Capital Improvements Program, along with other secured funding (see Funding).
- **Maintain the GIS database** created for this planning process, updating the sidewalk layer as sidewalks are constructed or repaired.

- **Update the project list on an annual basis** to account for changes in land use, new or closed schools, and the most recent data on pedestrian crashes. The prioritization scoring driving the project list order should also be updated annually, or as needed, to reflect changing City priorities. Phasing should be updated over time based on the amount of funding secured and the number of property owners that complete projects.

POLICY, CODE, STANDARDS, AND PRACTICES UPDATES

This section contains an overview of recommendations for ensuring that the City's policies, codes, standards, and practices support plan implementation. See Appendix B for recommended language updates to the *City of Memphis Code of Ordinances, the Memphis and Shelby County Unified Development Code (2010), the City of Memphis Sidewalk Ordinances (2013), The City of Memphis Crosswalk Policy (2014), and the Ordinance to Stop (Crosswalk Policy) (2009).*

Sidewalk Maintenance Practices Updates

The City should implement the following reforms to current sidewalk maintenance enforcement practices for situations in which property owners fail to fulfil their obligation to maintain sidewalks:

- Increase the cost of City-completed repairs, or **charge an additional fee if property owners do not comply within a specified time period**. The Federal Highway Administration's *A Guide for Maintaining Pedestrian Facilities for Enhanced Safety* reports that Ithaca, New York charges an extra 25 percent for repairs completed by the City. (Potential changes to *City Code Sec. 12-28-6B*)
- Add the cost of repairs to the property owner's existing tax bill. (Potential changes to *City Code Sec. 12-28-6B*)
- **Maintain an ongoing inspection program** that covers the entire sidewalk network every five years to keep a current database of sidewalk repair needs.

The following strategies are recommended to repair sidewalks where they are damaged by existing, mature trees:

- **Rebuild the sidewalk outside the root zone.** This may require an easement from the property owner where right-of-way is not sufficient.
- Develop a standard detail for a "bridged" or "reinforced" sidewalk panel design to replace panels damaged by existing trees.
- Consider the use of plastic, rubber, and permeable sidewalks as an alternative to "bridged" or "reinforced" sidewalk panel design, as recommended by the FHWA's *Guide for Maintaining Pedestrian Facilities for Enhanced Safety.*
- Manually (with an ax) cut roots with arborist supervision. The use of mechanical equipment is not recommended.

The following **low-cost measures are recommended when a sidewalk maintenance issue has been reported**. These measures should be used temporarily until the responsible property owner is able to fully repair or replace the sidewalk. Interventions may include one or more of the following:

- Grinding/Horizontal Cutting: Remove raised portions of sidewalk panels to provide a smooth surface.
- Wedging: Use asphalt (or concrete) shims to remove tripping hazards created by vaulted sidewalk panels.
- Patching: Use concrete or asphalt to fill small gaps or broken corners.
- Mud-Jacking: A method for raising sunken sidewalk panels. Drill holes in sidewalk panels and inject concrete or other material to lift the panel to its previous height. This may also be an effective long-term treatment, although it is not widely used; additional testing is needed.
- Painted Warnings: Paint warnings on the sidewalk in advance of the maintenance

issue so that approaching pedestrians are aware of the problem.

New Sidewalk Construction Policy Updates

The following best practices are recommended for new sidewalk construction in the City of Memphis:

- Work with arborists and/or landscape architects to **develop a list of approved street tree species, appropriate tree well dimensions, and proper spacing to minimize future damage in new sidewalk construction** or property redevelopment. (Potential updates to *Memphis and Shelby County Unified Development Code (2010) Section 4.6 – Landscaping and Screening*)
- Update *City Code Sec. 12-28-10* and *City of Memphis Sidewalk Ordinances (2013) Division 2, Section 34-171* to ensure all new sidewalks are at least five feet wide.
- Strengthen *Memphis and Shelby County Unified Development Code (2010) Section 4.3 – Streetscape Standards* by **making it more difficult to receive a waiver from requirements**, and by recommending **minimum pedestrian clear zones of six to twelve feet along collectors, arterials, and in districts where pedestrian volumes are expected to be high**.
- Establish a Fee-in-lieu or Pedestrian Benefit Zone program. Potential updates to *City Code Sec. 12-28-3*. (See page 76 of the *Wilmington Pedestrian Plan*[1] for sample policy language from Salisbury, NC.)
- **Close loopholes that allow some development to proceed without providing or updating sidewalks to all current standards, including ADA requirements**. Potential updates to *City Code Sec. 12-28 – Sidewalk Construction and Maintenance* and *City of Memphis Sidewalk Ordinances (2013) Division 2, Sections 34-151 and 34-152*.
- Add city code policy stating that **temporary access for pedestrians must be accommodated on the same side of the street as existing sidewalk** during redevelopment construction projects, utility work, or sidewalk repair.
- Establish policies or programs to improve access management at existing developments. Potential updates to *Memphis and Shelby County Unified Development Code (2010) Section 4.4 Access Management*

Sidewalk Obstruction Policy Updates

The following code language changes are recommend to reduce utility pole and other obstructions along existing and future sidewalks.

- Amend policy language on sidewalk width with a definition of the required dimensions to ensure 'free passage' (potential modification to *City of Memphis Sidewalk Ordinances (2013) Division 3, Sections 34-171.*)
- Amend policy language that requires MLGW to relocate utility poles during roadway reconstruction if the existing location of utility poles creates ADA non-compliance issues (potential modification to *City of Memphis Sidewalk Ordinances (2013) Division 3, Sections 34-171.*) **Enlist MLGW as a proactive partner in addressing these issues.**
- **Require utility pole relocation, or the relocation of other obstructions such as signs or hydrants, during private sector redevelopment** when established through-zone width standards outlined in the *Memphis Complete Streets Project Delivery Manual* are not met (potential modification to *City of Memphis Sidewalk Ordinances (2013) Division 3*).

1 www.wmpo.org/PDF/2009-08_WalkWilmington_Plan%5BFINAL%5D.pdf

Traffic Calming + Road Diets

In certain land use contexts, **traffic calming can improve pedestrian safety as a supplement or replacement to sidewalk installation**. Road diets that replace one or two motor vehicle lanes with bicycle lanes also improve pedestrian safety by reducing the effective crossing distance of multi-lane roadways. The following steps are recommended to strategically implement traffic calming and road diets.

- Update the prioritization criteria for potential road diet projects to include the desirability of a pedestrian buffer zone from traffic and the pedestrian priority score of the corridor.
- Adjust posted speed limits based on target speed recommendations contained in the *Memphis Complete Streets Project Delivery Manual*.

Pedestrian Crossings

The following policy changes and programs are recommended to improve pedestrian crossing infrastructure and safety.

- Update *City Code Sec. 11-28* to include stronger language about stopping for pedestrians entering crosswalks.
- **Establish a schedule to ensure all pedestrian crosswalk markings are inspected, and maintained if necessary, at least once a year**. If resident feedback is requested, consider the following steps to make this process easier for residents:
  - Publicize that residents should call the City 311 number to report faded crosswalk markings.
  - Add crosswalk maintenance to the list of *Services Provided by Public Works* on http://www.memphistn.gov/Government/PublicWorks.aspx.
  - Consider adding a section to the *Learn about City of Memphis Services* webpage to report faded crosswalks. http://www.memphistn.gov/Residents/IWantTo/LearnaboutCityofMemphisServices.aspx
- **Complete a signage inventory in high-activity pedestrian areas** to determine whether sign pollution is impacting the effectiveness of pedestrian signage.
- Update and adopt the *DRAFT City of Memphis Crosswalk Policy* according to the recommendations provided in Appendix B.
- **Create a schedule to monitor, upgrade, and install new lighting** at existing pedestrian crossings.
- **Develop an implementation plan for pedestrian improvements to existing signalized intersections**, which includes the following:
  - Signal timing adjustments based on the presence of children, older adults, and people with disabilities;
  - Signal timing adjustments to ensure that pedestrians can cross any street in one phase;
  - "No right turn on red" sign installation in high pedestrian activity areas and close to schools;
  - Leading Pedestrian Intervals — policy on where these should be used; and
  - Push button actuation vs. automatic (concurrent) — policy on where each should be used.

Education

EDUCATION CAMPAIGN: SIDEWALK MAINTENANCE RESPONSIBILITIES	
Purpose	Encourage property owners to initiate sidewalk repair independently
Target audience	Property owners
Implementing agency	Engineering Division
Partners	City Attorney's Office, Neighborhood and Civic Organizations
Key elements	Develop and promote a user-friendly guide that clearly explains property owner sidewalk maintenance responsibilities.

Currently, many property owners do not realize that they are responsible for keeping sidewalks adjacent to their property in a state of good repair. In 2014, a joint initiative between the Engineering Division and the City Attorney's Office established the City's legal process for enforcing the City's sidewalk ordinance. Coupling such enforcement with education about sidewalk maintenance will likely result in increased compliance with the existing ordinance.

The Engineering Division should **develop and promote a property owners' guide** to sidewalk maintenance that does the following:

- Explains Memphis's sidewalk standards;
- Illustrates common sidewalk deficiencies with photographs;
- Outlines property owner responsibilities in simple language;
- Describes the process for completing repairs; and
- Informs property owners of special programs available to assist with fulfilling their obligations, such as cost sharing incentives, financial hardship programs, and the Fast-Fix program (See Sidewalk Repair Incentives and Sidewalk Repair Financial Hardship/Equity Program).

The property owners' guide to sidewalk maintenance should be available on the City's website, **printed and mailed to property owners along the priority routes identified in this plan**, and promoted via door hangers, postcards, existing city newsletters, and/or utility bills. Communications sent through neighborhood, multifamily housing, and homeowner associations; active neighborhood forums such as Nextdoor and Facebook; and local media outlets can also increase knowledge of the guide.

Property owners should receive a window sticker or yard sign signifying they have completed a sidewalk repair as a way to encourage their neighbors to follow suit. All messaging should convey a positive tone that encourages neighbors to work together (e.g., "Let's fix it!"). For greater buy-in and compliance, a transparent approach is recommended to clearly explain why the law requires property owners to maintain sidewalks.

PROFESSIONAL DEVELOPMENT COURSES FOR POLICE	
Purpose	Educate law enforcement officers on pedestrian laws and safety
Target audience	Memphis Police
Implementing agency	Local advocacy organization or another outside consultant
Partners	Memphis Police Department Academy
Key elements	Develop and implement a course for Memphis Police focused on pedestrian laws and safety

Most law enforcement professionals do not receive training specific to pedestrian laws and safety. **Police education courses or training** can help officers improve public safety and enforce existing laws more effectively by providing them with the training they need.

Trainings should complement officers' basic training and cover a variety of topics pertaining to walking. These include the relevant laws and statutes; proper compliance by pedestrians and motorists; new pedestrian infrastructure; common crash types and causes; options for enforcement and education (e.g. officer discretion and issuing a citation vs. a warning, diversion class options); and safety promotion materials that can be handed out during a traffic stop or public event.

Trainings are also great times to discuss creative enforcement solutions, such as crosswalk stings and officer involvement in local walking encouragement programs (e.g., Safe Routes to School). All attendees would benefit from training time devoted to the officers' discussion of local enforcement challenges related to walking.

If possible, presenters should meet with high-ranking officers to help foster institutionalized support for the program. Identifying potential champions within the Memphis Police Department or MPD Academy will help officers see their peers' support for bicycling and walking initiatives.

PROFESSIONAL DEVELOPMENT COURSES FOR PLANNERS AND ENGINEERS	
Purpose	Educate City planners and engineers on pedestrian facilities and policy issues
Target audience	City planners, engineers, and policy makers
Implementing agency	Planning Division, Engineering Division
Partners	Memphis Metropolitan Planning Organization (MPO)
Key elements	Develop and implement a course for Memphis planners and engineers focused on the needs of pedestrians

Professional development courses provide training to transportation and other professionals who do not have extensive experience or training in pedestrian facility design and related policy issues. This can be a successful way to institutionalize knowledge of pedestrian facility design and create an agency culture that values walking.

Curriculum should cover the following topics:

- Pedestrian behavior
- Elements of a walkable city
- A summary of recent City efforts to increase walkability
- City of Memphis sidewalk and trail design guidelines
- Pedestrian safety countermeasures
- The *Memphis Complete Streets Project Delivery Manual*
- Memphis's new midblock crossing policy
- The *Americans with Disabilities Act*

The training program could be delivered over a two- or three-day session, or courses can be offered on a recurring basis by offering brown bag lunch events. City planners, engineers, and policy makers bring their lunch to a half or one hour training on a specific topic. The sessions are offered once a month, or on a schedule convenient to organizing staff. Trainings are an opportunity for City staff to share project updates, successes, and challenges with colleagues, especially those based in other departments.

Encouragement

FINANCIAL INCENTIVES FOR SIDEWALK REPAIR AND REPLACEMENT	
Purpose	Support property owner efforts to comply with sidewalk ordinance
Target audience	Property owners
Implementing agency	Engineering Division
Partners	Local credit unions, community banks, community development corporations
Key elements	Offer low- or no-interest loans, or matching funds to property owners who bring adjacent sidewalks up to City standards

The cost of sidewalk repair or replacement is a barrier to action for many Memphis property owners. The City should consider using **financial incentives** to encourage property owners to repair adjacent sidewalks in disrepair, as other cities throughout the country have done. These incentives commonly take one of two forms: the availability of low- or no-interest loans, or an offer by the city to match property owner funds put toward sidewalk repair and replacement. For example, Tumwater, Washington covers 80 percent of the cost of sidewalk infill if the property owner agrees to pay for the remaining 20 percent of construction costs. Helena, Montana offers zero-interest loans to property owners that replace sidewalks adjacent to their property, and Syracuse, New York allows property owners to take advantage of low interest rates (seven percent over a period of ten years) to repair or construct sidewalks.

Incentives could be made available to all property owners, limited to a geographic zone or specified distance from a school, or only to property owners located on high priority routes identified through the prioritization process used in this plan's development. Once eligibility requirements are agreed upon, program details should be distributed to qualifying property owners that receive a notification stating that the sidewalk adjacent to their property must be repaired to alleviate a safety issue.

Information about the program should be featured on the City's website, as well as printed and mailed to property owners along the priority routes identified in this plan. It should also be promoted through homeowner programs and realtors; neighborhood, multifamily housing, and homeowner associations; and community centers. The information should be posted on online neighborhood forums, such as Facebook and Nextdoor. All related sidewalk repair materials should state that financial assistance is available.

FAST-FIX PROGRAM FOR SIDEWALK REPAIR	
Purpose	Streamline the process for owner-initiated sidewalk repairs
Target audience	Property owners
Implementing agency	Engineering Division
Partners	Third-party contractors
Key elements	Create an administrative structure at the City of Memphis to connect property owners with insured, City-approved contractors

A **Fast-Fix Sidewalk Repair program**, modeled after a similar program in Dallas, Texas, would make compliance with the City's sidewalk ordinance simple, convenient, and economical for property owners. The program would provide property owners with a list of insured, City-approved contractors that provide prompt, low-cost sidewalk repair services. After the repair is completed, the City inspects the work and a one-year warranty is issued by the contractor if the repair passes the inspection. Since the contractors are pre-approved and have received special training on Memphis's sidewalk standards, no building permit is required.

This information should be offered online in addition to being mailed to all property owners notified that they are in violation of the sidewalk ordinance. Educational materials related to the sidewalk ordinance and related programs should also reference or provide a step-by-step guide to this process.

Enforcement

CROSSWALK ENFORCEMENT ACTIONS	
Purpose	Promote a culture of courtesy in Memphis's crosswalks
Target audience	People driving and walking
Implementing agency	City of Memphis Police Department
Partners	Schools (especially, crossing guards and school officers)
Key elements	Plainclothes police officers or selected volunteer decoys attempt to cross streets and marked mid-block crossings. If people driving fail to yield to people walking in a crosswalk, a second police officer issues a ticket.

Crosswalk enforcement actions (sometimes known as "pedestrian stings") raise public awareness about the legal obligation of motorists to stop for pedestrians at crosswalks. While crosswalk enforcement actions do result in tickets being distributed, the greater impact comes through media publicity of the event and officers' verbal or written warnings to reinforce the importance of obeying pedestrian crossing laws.

Most crosswalk enforcement sites are selected because they have been identified as locations where pedestrians have trouble crossing or where a large volume of pedestrians (especially vulnerable pedestrians, such as children and seniors) is expected. High-crash locations may also be candidates for enforcement actions. If locations near schools are selected, the best timing for an enforcement action is the back-to-school window just after school has begun for the year.

Once a site is selected for an enforcement action, plainclothes police officers or selected volunteer decoys attempt to cross at corners and marked mid-block crossings at this site. A second officer is waiting nearby, and issues a ticket to motorists who fail to yield to the pedestrian in a crosswalk. Decoys may be notable community members (e.g., the mayor, a local celebrity or athlete) or officers in costume (e.g., Santa Claus, cartoon character, banana) to increase media interest in the event.

Evaluation and Planning

Ongoing monitoring and evaluation will enable the City and its partners to gauge progress on plan implementation and related outcomes. The recommended approach for this plan consists of three primary elements: 1) development of performance measures, 2) improved data collection efforts to support performance measure tracking, and 3) updating quantitative analyses conducted as part of this plan on a regular basis. These metrics and strategies are described in more detail below. In addition, the Walk Friendly Community application recommended at the beginning of this chapter will provide a starting point for ongoing monitoring and may influence the performance measurements selected.

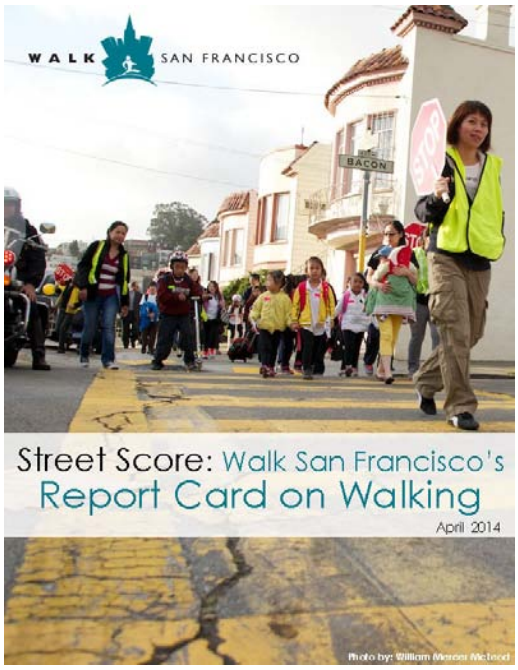
PERFORMANCE MEASURES

ANNUAL REPORT CARD	
Purpose	Detail and track the plan's progress and results.
Target audience	City officials and the public
Implementing agency	Engineering Division
Partners	Livable Memphis, Memphis MPO, Sierra Club, MCIL
Key elements	An analysis and grade of progress in engineering, education, encouragement, enforcement, equity, evaluation and planning

The annual report card will detail the plan's progress and resulting changes in the pedestrian environment. Key performance measures in engineering, education, encouragement, enforcement, equity, evaluation and planning will be weighed against set goals to help the City evaluate the effectiveness of the plan and promote the success of the plan to the public. The report card will include a map of implemented infrastructure changes, an analysis of pedestrian counts before and after new infrastructure, and an evaluation of pedestrian safety. Infrastructure performance measures should be tracked semiannually so that adjustments can be made as needed to improve performance. Other categories, like public opinion, may be tracked annually or biannually.

Sample annual report cards:

- Bicycle Friendly State, 2014 Report Card (Tennessee) *http://bikeleague.org/sites/default/files/BFS2014_Tennessee.pdf*
- Street Score: Walk San Francisco's Report Card on Walking, April 2014 *http://walksf.org/wp-content/uploads/2014/02/Walk-SF-Street-Score-2014-Report-Card-on-Walking.pdf*



Potential performance measures are listed below.

Engineering

- Linear feet of sidewalks repaired or replaced
- Linear feet of new sidewalks constructed
- Number of new pedestrian crossings installed
- Number of existing pedestrian crossings enhanced (curb ramps replaced, crosswalk additions/crosswalk upgrade to high-visibility/crosswalk maintenance/signal timing improvements/new signage)
- Percent of new development/redevelopment projects meeting current sidewalk design standards
- Linear miles of road diet projects completed
- Percent of property owners completing requested sidewalk repairs

Education

- Number of property owners reached through sidewalk maintenance education program
- Percent of Memphis Police officers that have attended pedestrian-focused professional development course
- Percent of policy makers that have attended pedestrian-focused professional development course
- Percent of planning/engineering staff that have attended professional development course focused on the needs of pedestrians

Encouragement

- Number of property owners participating in sidewalk repair incentive program (loans/matching funds)
- Number of participants in Fast-Fix program

Enforcement

- Number of targeted crosswalk enforcement actions completed

Equity

- Number of households assisted with sidewalk maintenance costs through disadvantaged homeowners assistance program

Evaluation and Planning

- Percentage of students who walk to school
- Percentage of all trips made by walking
- Number of pedestrian traffic injuries and fatalities
- Percent of traffic injuries and fatalities that are pedestrians
- Average trip distance by transportation mode
- Percent of residents satisfied with the safety and comfort of the pedestrian network
- Percent of residents satisfied with the connectivity of the pedestrian network
- Percent of residents interested in walking more frequently
- Total spending on pedestrian projects and programs
- Percent of transportation funding spent on pedestrian projects and programs
- Proportion of short term/priority pedestrian projects with secure funding

ENHANCED DATA COLLECTION TO SUPPORT MONITORING AND EVALUATION

Ongoing evaluation depends on access to high quality data. Currently available information provides a window into safety trends, facility implementation, funding, and travel behavior, but important knowledge gaps remain. To support performance measurement, the City should institute the following data collection efforts:

- Maintain the **GIS datasets** produced for this planning effort over time as sidewalks are constructed and repaired. This data maintenance will require coordination with the construction department and should be coordinated with the Memphis MPO's data on pedestrian facilities. Establish a regular communication schedule between the construction department and the engineering department and update the GIS data following each communication.
- Establish a **Pedestrian Count Program** consisting of a combination of manual counts using city staff or volunteers, automatic counts at locations throughout the city, and before and after counts when new facilities are installed. The City should coordinate with the Memphis MPO on this program to avoid duplicate effort, since the MPO conducts pedestrian counts for the regional travel demand model.
- **Conduct biannual surveys** to identify and track how, when, and why people travel for transportation and recreation as well as their opinions on the experience of walking in Memphis.
- **Adopt reporting requirements** related to infrastructure implementation, program participation, and spending on City initiatives related to improving walkability

QUANTITATIVE ANALYSIS UPDATES

Repeating the existing conditions analyses conducted during this planning process on a biannual basis will provide the City with a detailed snapshot of pedestrian safety, network quality and connectivity, and pedestrian suitability. The analysis will also enable the City to update project prioritization.

STRATEGIES FOR INCREASING FUNDING

Budget Set-Aside

Creating a budgetary set-aside for pedestrian infrastructure that connects the magnitude of the pedestrian safety problem to spending on pedestrian infrastructure, as the Nashville MPO has done, may be a strategy that helps secure additional funding and increase public support. The Executive Board of the Nashville MPO has endorsed a 15 percent budgetary set-aside for active transportation projects, including pedestrian infrastructure, to reflect the reality that "one-third of Americans do not drive or own cars, and 12 percent of all U.S. trips are made by walking or bicycling, yet these modes account for 14 percent of traffic fatalities and only 1.6 percent of federal transportation funding."[2]

Transportation User Fee

Many municipalities, such as Austin, Texas; Bozeman, Montana; Corvallis, Oregon; and Port Orange, Florida have instated per-household and/or per-business transportation user fees in an effort to make up for declining gas tax revenues that have historically funded many transportation projects. Fees are typically assigned proportionally based on estimated trip generation or vehicle miles traveled, but they may also be collected at a flat rate. Transportation user fees are typically collected via local utility bills, and provide stable funding for ongoing operations and maintenance of the transportation system.

Bond Measures

Nashville, Tennessee; Charlotte, North Carolina; Seattle, Washington; Lee's Summit, Missouri; Boulder, Colorado; and Durham, North Carolina have all recently passed local bond measures that support pedestrian infrastructure and maintenance projects.

Parking Revenue

In select areas, such as business districts, on-street parking can be a reliable revenue source for local governments. The City of Memphis has already had success raising revenue through on-street parking meters downtown.

Business Improvement District Funds

Business improvement districts are a type of public-private partnership that leverage public and private funds to increase the attractiveness of defined geographic areas to existing and potential customers. These entities often see value in making streetscape improvements that make walking to and within the area safer and more comfortable.

Impact Fees and Development Taxes

Municipalities in Tennessee have the ability to levy an impact fee or development tax, and this revenue could be used to build and maintain sidewalks or enhance pedestrian crossings. The City should consider instituting such a fee or negotiating public improvements as part of the land development process.

2 http://www.nashvillempo.org/docs/Health/HealthSummary_June2012.pdf

STRATEGIC PARTNERSHIPS AND COORDINATION

Building and maintaining strategic relationships with local, regional, and state agencies as well as nonprofit groups will be essential to timely implementation of this plan. Key opportunities for synergy between the City and other agencies with overlapping goals are identified below:

- Collaborate with the **Memphis Area Transit Authority** when implementing sidewalk and pedestrian crossing improvements along transit routes. MATA's *2012 Short Range Transit Plan* identifies transit stop infrastructure improvements, including bus shelters, pedestrian crossings, curb ramps, and sidewalks. Transit-focused pedestrian improvements may be funded through grants focused on transit access, expanding the potential funding pool for these sources. Educate MATA staff on pedestrian clear zone requirements contained in the *Memphis Complete Streets Project Delivery Manual* as they relate to transit stop amenities - such as shelters, trash bins, signage, and other elements - that may obstruct pedestrian access when placed inappropriately.
- Coordinate sidewalk projects with water and gas line replacements managed by **Memphis Light, Gas, and Water.** Replacing utility lines at the same time as sidewalks can lead to significant cost savings.
- Work with **TDOT** to implement sidewalk and crossing improvements on state-owned roads inside the city limits. Also consider adopting a resolution requesting the provision of sidewalks on all non-freeway TDOT road projects.
- Partner with **nonprofit groups** such as Livable Memphis, the Sierra Club, the Memphis Center for Independent Living, neighborhood groups, and community development corporations on sidewalk repairs and inspections.
- Work with **Shelby County Schools** to update the school survey regularly and track changing priorities around schools over time.
- Partner with institutions like the **University of Memphis** and major hospitals to improve infrastructure in and around their campuses.

The Memphis Area Transit Authority will be a key partner as they seek to improve pedestrian access to transit as recommended in the *Short Range Transit Plan*.

Equity

SIDEWALK MAINTENANCE SUPPORT FOR DISADVANTAGED HOMEOWNERS	
Purpose	Ensure that the effort to enhance Memphis's sidewalk network does not place an unfair burden on disadvantaged property owners
Target audience	Low-income property owners who are also disabled or over 65 years old
Implementing agency	Engineering Division
Partners	City Attorney's Office, Neighborhood and Civic Organizations
Key elements	Relieve disadvantaged property owners of their sidewalk maintenance responsibilities

The City is currently developing a mechanism for property owners with a demonstrated financial hardship to be relieved of their sidewalk maintenance responsibilities, using the Shelby County Low Income Home Energy Assistance Program as a model. The initial criteria for this program include the following:

- Property owner's household size and income are consistent with 2013 Poverty Thresholds defined by the US Census Bureau, as shown below; or
- Property owner's age is over 65 years and household income is at or below $25,000; or
- Property owner is certified medically as being totally (100 percent) disabled and household income is at or below $25,000; and
- Cited property is applicant's primary address.

HOUSEHOLD INCOME	OTHER QUALIFICATION
<= $12,500	1 person household
<= $16,000	2 person household
<= $19,000	3 person household
<= $24,000	4 person household
<= $29,000	5 person household
<= $32,000	6 person household
<= $37,000	7 person household
<= $41,000	8 person household
<= $49,000	9+ person household
<= $25,000	Age >= 65 yo
<= $25,000	100% disabled

If property owners meet the above criteria, the necessary sidewalk repairs will be completed by a third-party contractor at the City's expense, and the property owner will not be required to reimburse the City.

Information about this program should be available on the City's website, and should be shared with all property owners that receive a notification stating that the sidewalk adjacent to their property must be repaired to alleviate a safety issue. This program should be promoted through organizations supporting low-income individuals, seniors, veterans, and individuals with disabilities. Information should also be made available at hospitals, senior centers, libraries, and localized community events where the targeted population is present.

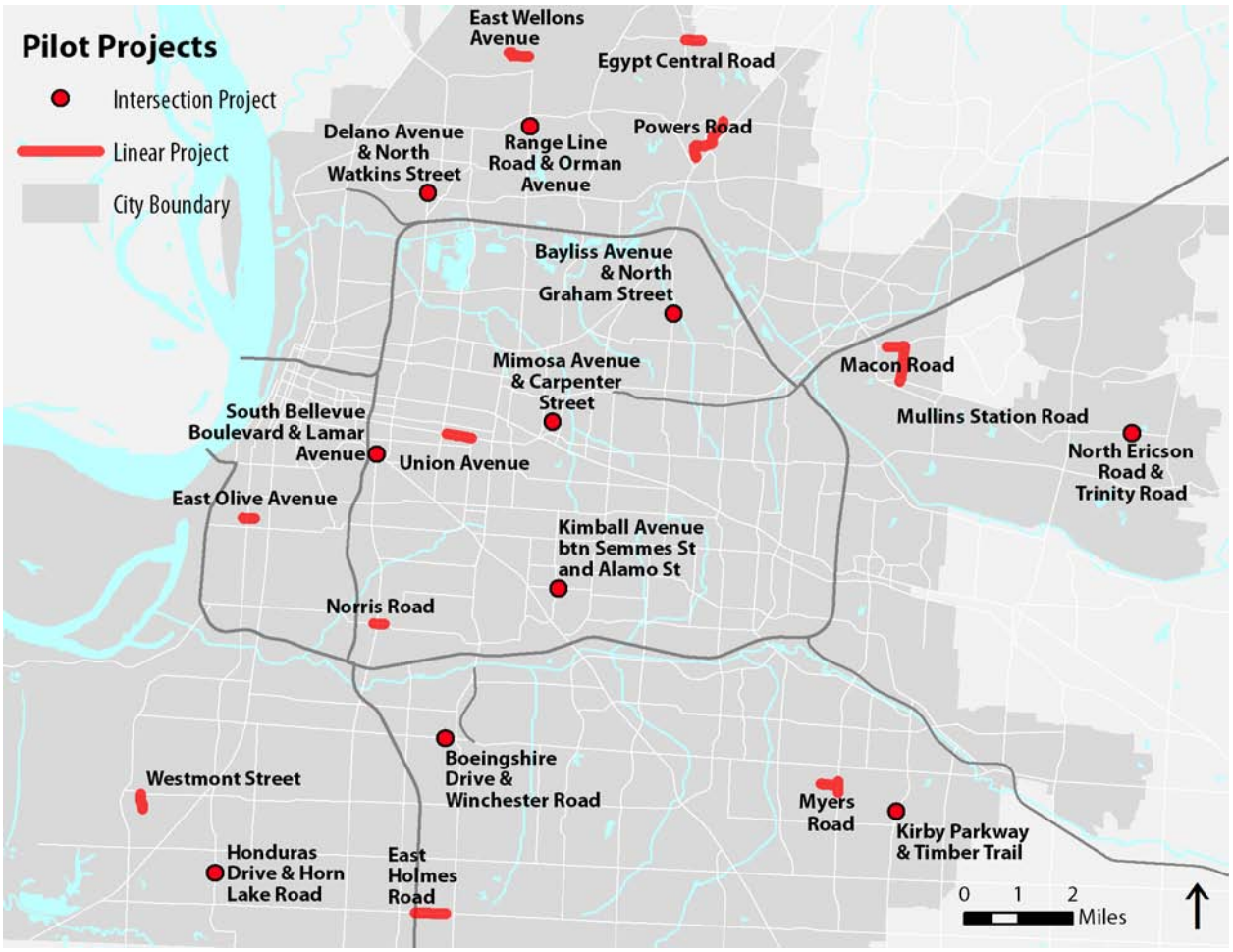
Pilot Projects

Twenty pilot projects were selected from the recommended project list for detailed analysis. The recommended improvements are presented on the following pages in summary exhibits. These exhibits illustrate how different recommended facilities should be implemented in different land use and roadway contexts in accordance with the *Pedestrian Facility Design Toolkit*. To meet that goal, segments were selected using a combination of the following inputs:

- **Weighted score** from prioritization,
- **Geographic representation**, and
- **Facility type representation** (ten corridor projects and ten intersection projects).

The result of this selection is a group of projects representing the seven primary council districts of the City and serving twenty distinct schools. Linear projects are presented in alphabetical order followed by the ten intersection projects in alphabetical order. In combination with the *Pedestrian Facility Design Toolkit* presented in Appendix C, these pilot project exhibits provide guidance on implementation of pedestrian improvements across the City.

The following pages show planning level design concepts and planning level construction cost estimates. Project development will require local review and approval, as well as TDOT approval on state-owned roads. Right-of-way costs are not included in cost estimates, since these must be negotiated at the time of implementation.



East Holmes Road Improvements

I-55 Bridge to Shepherds Tree Street: 0.6 Mile

PROJECT LOCATION

EXISTING CONDITIONS

Section of East Holmes Road missing pedestrian infrastructure.

Project Description

This sidewalk construction, repair, and infill project will improve pedestrian access and connect residents to Oakshire Elementary, area neighborhoods, and commercial destinations.

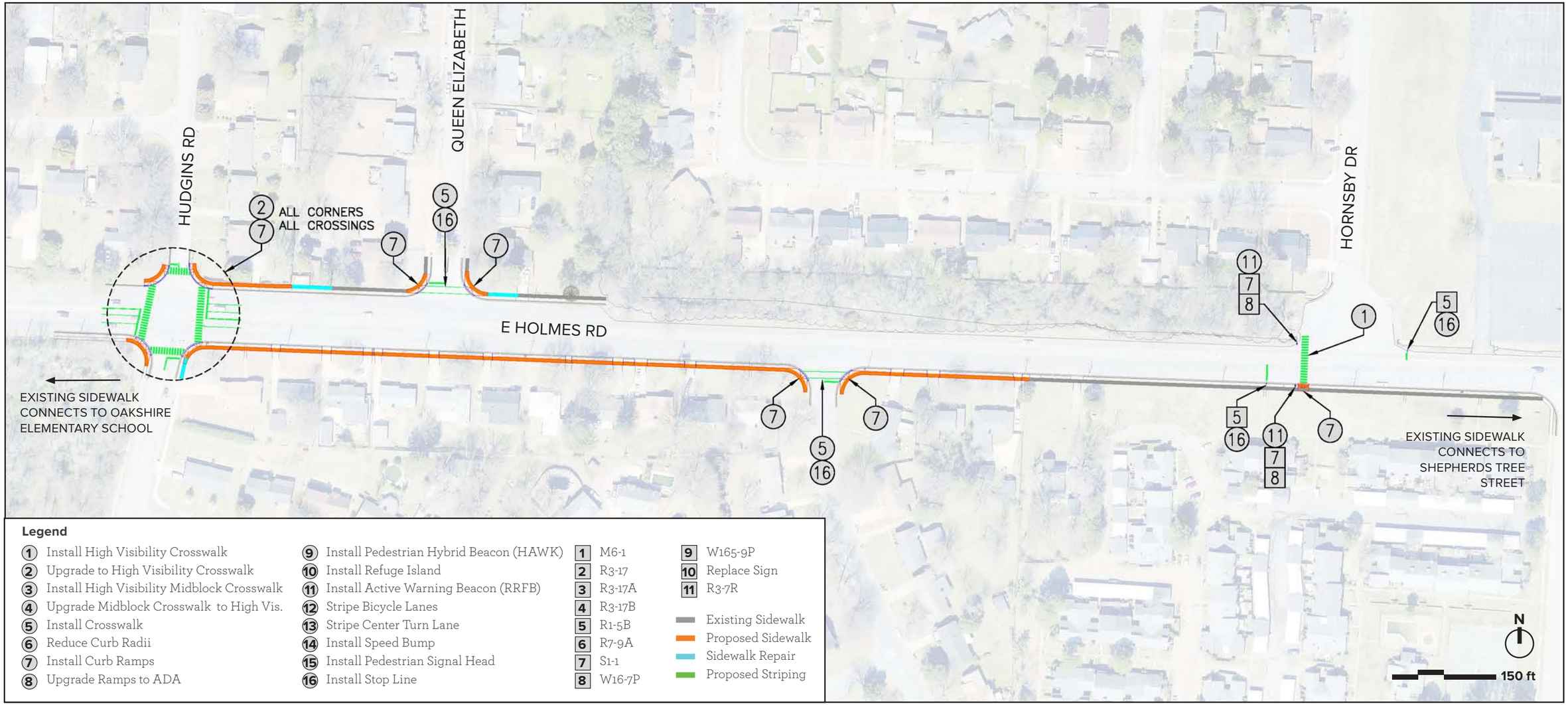
Existing Issues

- One pedestrian crash was recorded along this segment between 2007 and 2011
- Pedestrian network gaps divide neighborhoods and Oakshire Elementary School
- Only viable east-west route in the vicinity

Destinations Served

- Oakshire Elementary School
- Commercial destinations west of I-55
- Bus stops

PROPOSED IMPROVEMENTS



Project Components

- Complete large gaps in the pedestrian network between Hudgins Road and Hornsby Drive
- Repair existing sidewalk segments in spot locations
- Restripe the pedestrian crossings at Hudgins Road
- Relocate the existing crossing at Hornsby Drive and stripe as a high-visibility crosswalk
- Install a pedestrian-actuated Active Warning Beacon (RRFB) at the crossing
- Install accessible curb ramps at all crossings

Cost Estimate

Materials: $100,978
Mobilization/Traffic Control: $6,261
Engineering: $10,724
Contingency: $23,593
Total Cost: $141,556

East Olive Avenue Improvements

Kennedy Street to South Main Street : 0.2 Miles

PROJECT LOCATION

Project Description

This pedestrian improvement project will infill missing sidewalks and repair damaged sidewalks connecting Florida-Kansas Elementary School and McNeil Park. Olive Avenue has a posted speed limit of 30 mph.

Existing Issues

- Overgrown and damaged sidewalks prevent safe travel between area destinations
- Most pedestrian crossings are unstriped
- Segment was identified for improvement by a project stakeholder

Destinations Served

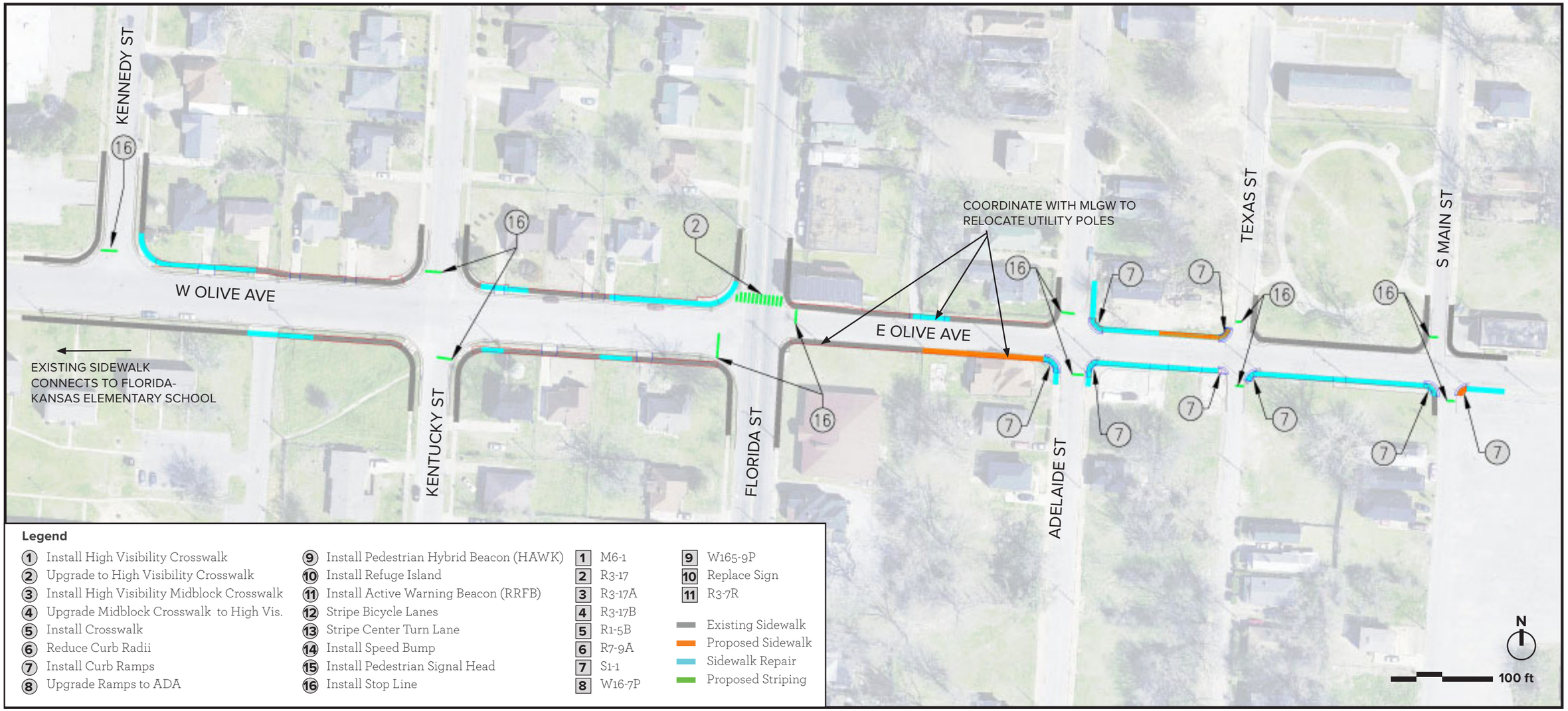
- Florida-Kansas Elementary School
- McNeil Park
- Bus stops at Florida Street and Olive Avenue

EXISTING CONDITIONS

Small sidewalk gaps exist along Olive Avenue

Existing sidewalks along the corridor are in disrepair

PROPOSED IMPROVEMENTS



Legend

- (1) Install High Visibility Crosswalk
- (2) Upgrade to High Visibility Crosswalk
- (3) Install High Visibility Midblock Crosswalk
- (4) Upgrade Midblock Crosswalk to High Vis.
- (5) Install Crosswalk
- (6) Reduce Curb Radii
- (7) Install Curb Ramps
- (8) Upgrade Ramps to ADA
- (9) Install Pedestrian Hybrid Beacon (HAWK)
- (10) Install Refuge Island
- (11) Install Active Warning Beacon (RRFB)
- (12) Stripe Bicycle Lanes
- (13) Stripe Center Turn Lane
- (14) Install Speed Bump
- (15) Install Pedestrian Signal Head
- (16) Install Stop Line

- [1] M6-1
- [2] R3-17
- [3] R3-17A
- [4] R3-17B
- [5] R1-5B
- [6] R7-9A
- [7] S1-1
- [8] W16-7P
- [9] W165-9P
- [10] Replace Sign
- [11] R3-7R

- Existing Sidewalk
- Proposed Sidewalk
- Sidewalk Repair
- Proposed Striping

Project Components

- Install sidewalk infill on East Olive Ave
- Repair sidewalk along entire corridor
- Stripe stop lines at all crossings
- Upgrade the crossing of Florida St to a high visibility crosswalk
- Relocate utility poles obstructing the sidewalk at several locations (This component can occur after other project components if necessary)

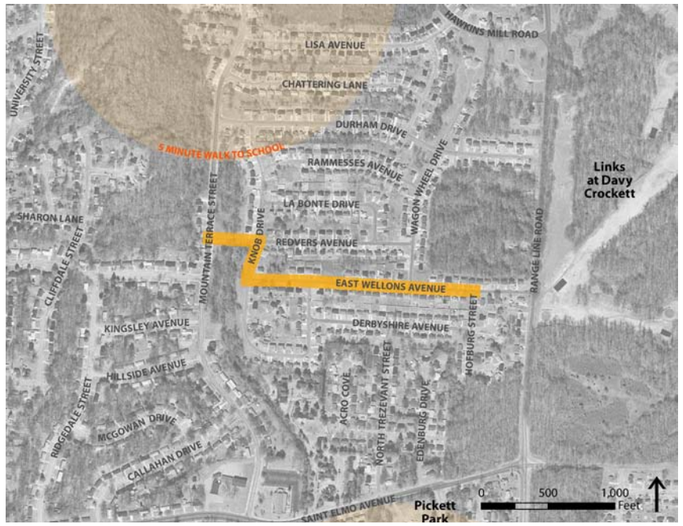
Cost Estimate

Materials: $62,688
Mobilization/Traffic Control: $3,887
Engineering: $6,657
Contingency: $14,646
Total Cost: $87,879

East Wellons Avenue Improvements

Hofburg Street to Mountain Terrace Street: 0.5 Mile

PROJECT LOCATION



Project Description

This pedestrian improvement project will provide a pedestrian access for residents in the Beacon Hills neighborhood traveling to Hawkins Mill Elementary School. Wellons Ave Knob Dr, and Redvers Ave each have posted speeds of 30 mph.

Existing Issues

- Incomplete pedestrian network throughout the neighborhood

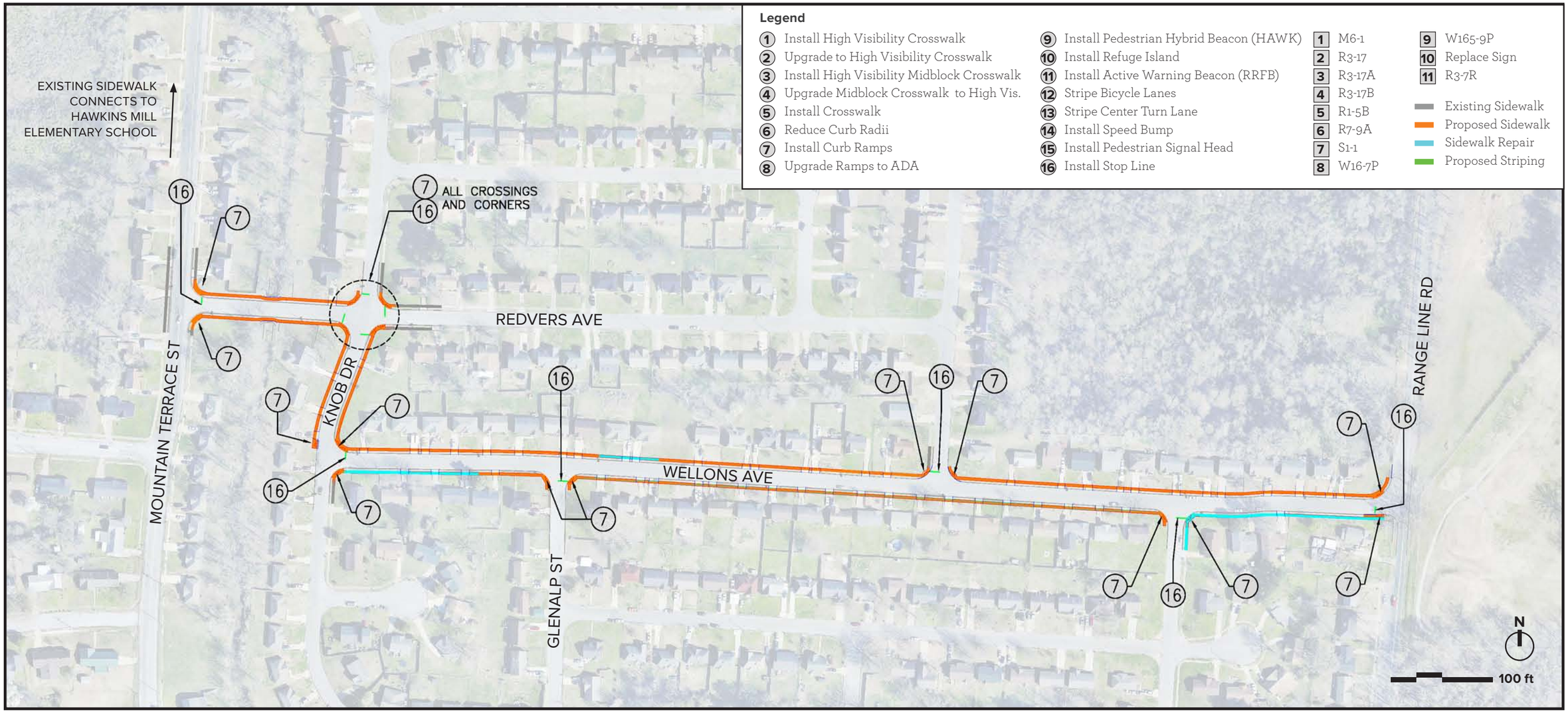
Destinations Served

- Hawkins Mill Elementary School

EXISTING CONDITIONS

Several sections of East Wellons Avenue lack sidewalks

PROPOSED IMPROVEMENTS



Project Components

- Complete unfinished sidewalk network along Wellons, Knob, and Redvers and repair existing sidewalks in spot locations
- Install stop lines at all crossings along the route

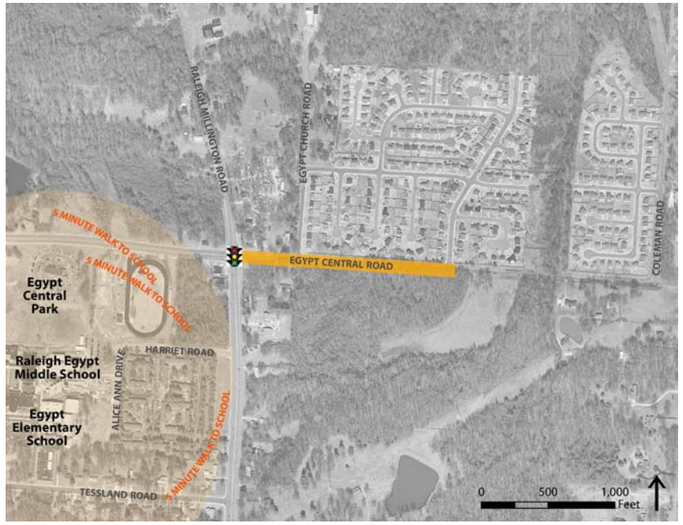
Cost Estimate

Materials: $243,641
Mobilization/Traffic Control: $15,106
Engineering: $25,875
Contingency: $56,924
Total Cost: $341,546

Egypt Central Road Improvements

Raleigh Millington Road to Grand Pyramid Drive: 0.3 Miles

PROJECT LOCATION



EXISTING CONDITIONS

Egypt Central Road from Raleigh Millington Road to Egypt Church Road is narrow with no shoulders or sidewalks

Project Description

This pedestrian improvement project will provide pedestrian facilities between several subdivisions and Raleigh Egypt schools, Egypt Central Park, and surrounding commercial destinations. Egypt Central Road has a posted speed of 45 mph and recorded traffic volumes of 10,200 AADT.

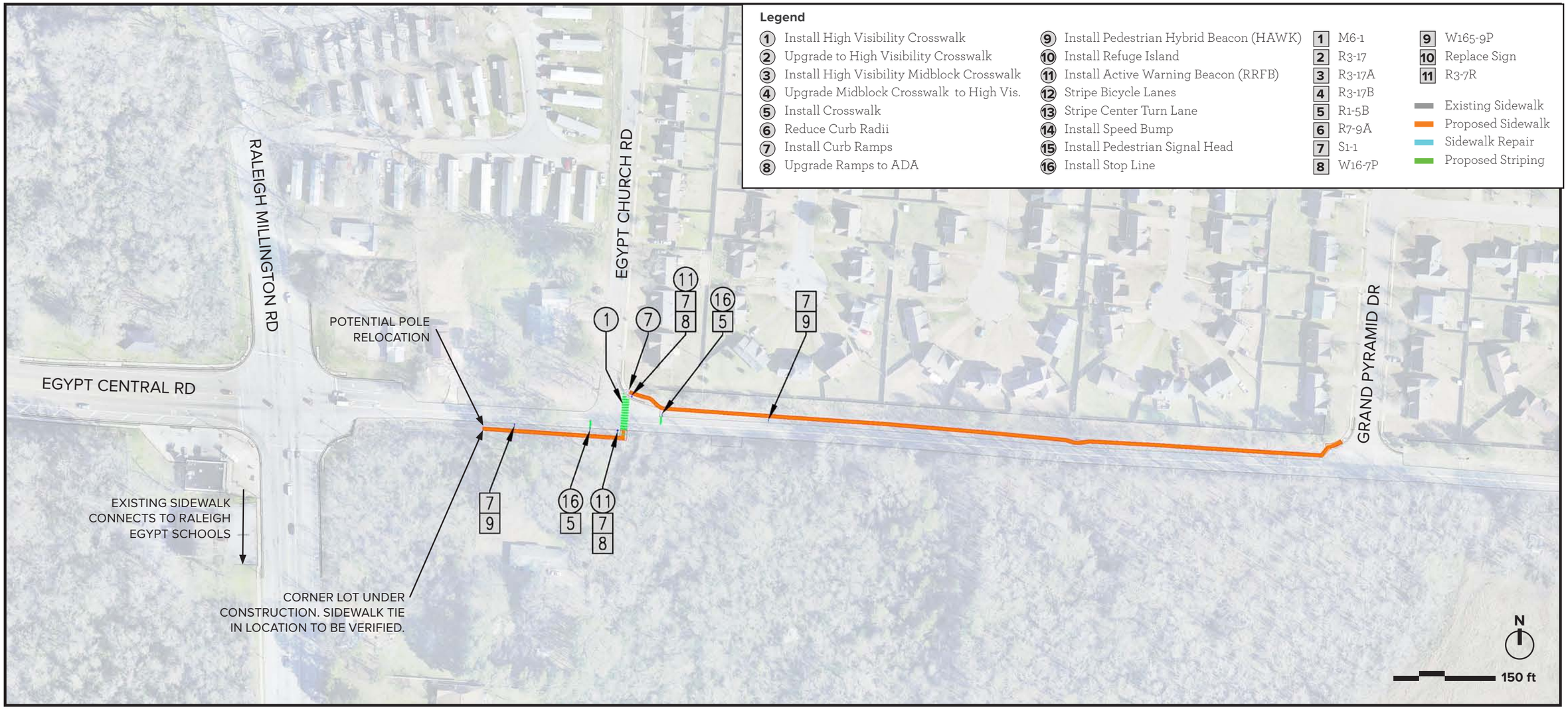
Existing Issues

- Two pedestrian crashes were recorded along this segment between 2007 and 2011
- No existing sidewalks east of Raleigh Millington on Egypt Central Rd
- Pedestrians observed in the street during fieldwork
- Narrow section from Raleigh Millington Rd to Egypt Church Rd disconnects neighborhoods from schools
- Segment is along a priority pedestrian corridor in the *2014 Regional Bicycle & Pedestrian Plan*

Destinations Served

- Egpyt Central Park
- Raleigh Egypt Middle School
- Raleigh Egypt Elementary School
- Elysian Fields, Pecan Manor, and Pecan Hill subdivisions

PROPOSED IMPROVEMENTS



Project Components

- Install new sidewalks along the south side of Egypt Central Rd from Raleigh Millington Rd to Egypt Church Rd
- Install a midblock crossing at Egypt Church Rd with a high visibility crosswalk and accessible curb ramps
- Install a pedestrian-actuated Active Warning Beacon (RRFB) at the new crossing
- Install stop lines in advance of the new crossing
- Install new sidewalk on the north side of Egypt Central Rd from Egypt Church Rd to Grand Pyramid Dr

Cost Estimate

Materials: $272,820
Mobilization/Traffic Control: $16,915
Engineering: $28,973
Contingency: $63,742
Total Cost: $382,450

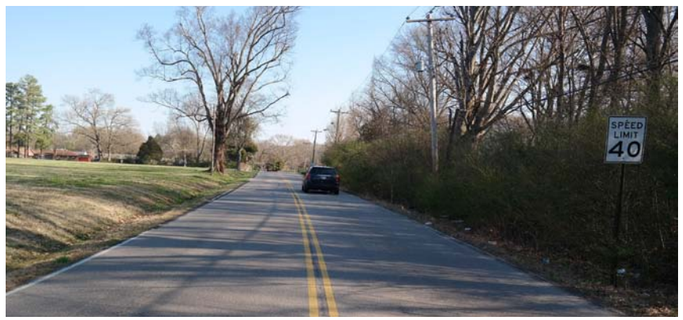
Macon/Mullins Station Improvements

Pelham Drive to Shelby Farms Greenline: 1 Mile

PROJECT LOCATION

EXISTING CONDITIONS

Macon Road currently lacks a complete sidewalk network.



Mullins Station Road is a narrow, two-lane roadway with incomplete sidewalks.

Project Description

This sidewalk construction and infill project will increase pedestian access for those traveling to multiple destinations, including school bus stops, MATA bus stops, parks, neighborhoods, and shopping centers.Macon Road has a posted speed limit of 40 mph with recorded daily traffic between 18,000 and 21,000 AADT. Mullins Station Road has a posted speed limit of 40 mph with recorded daily traffic between 2,000 and 4,000 AADT.

Existing Issues

- Students walk along Macon Rd and Mullins Station Rd to access school bus stops
- There are sidewalk gaps along both sides of Macon Road
- No existing network along Mullins Station south of Patmore
- All area crossings are unmarked
- Segment is along a priority pedestrian improvement corridor in the *2014 Regional Bicycle & Pedestrian Plan*
- Segments were identified for improvements by a project stakeholder

Destinations Served

- White Station Elementary School bus stops
- Shady Grove Elementary School bus stops
- Shelby Farms Park
- Shelby Farms Greenline
- Shelby Crossing Shopping Center

PROPOSED IMPROVEMENTS

Legend

1. Install High Visibility Crosswalk
2. Upgrade to High Visibility Crosswalk
3. Install High Visibility Midblock Crosswalk
4. Upgrade Midblock Crosswalk to High Vis.
5. Install Crosswalk
6. Reduce Curb Radii
7. Install Curb Ramps
8. Upgrade Ramps to ADA
9. Install Pedestrian Hybrid Beacon (HAWK)
10. Install Refuge Island
11. Install Active Warning Beacon (RRFB)
12. Stripe Bicycle Lanes
13. Stripe Center Turn Lane
14. Install Speed Bump
15. Install Pedestrian Signal Head
16. Install Stop Line

1. M6-1
2. R3-17
3. R3-17A
4. R3-17B
5. R1-5B
6. R7-9A
7. S1-1
8. W16-7P
9. W165-9P
10. Replace Sign
11. R3-7R

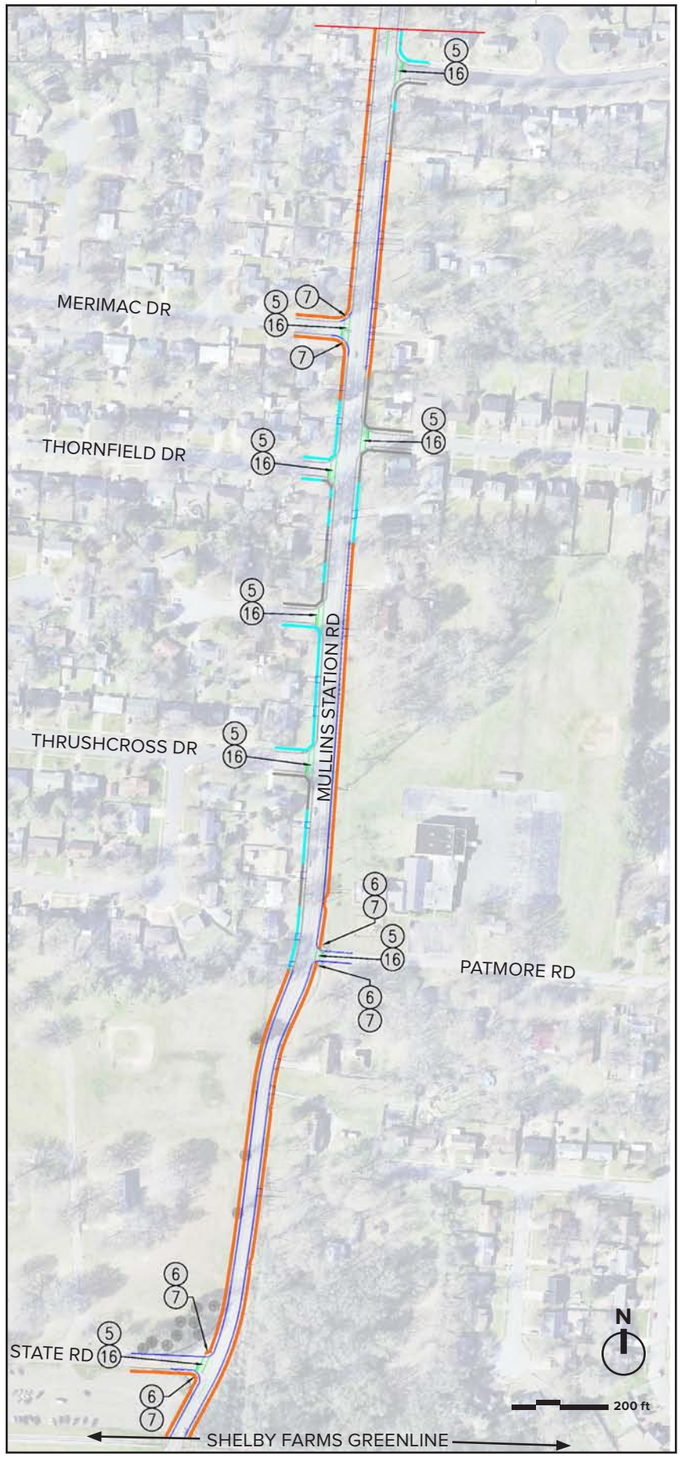
- Existing Sidewalk
- Proposed Sidewalk
- Sidewalk Repair
- Proposed Striping

Project Components

- Install sidewalks and improve crossings on Macon Road between Gilham Dr and Mullins Station Rd
- Complete significant gaps in the pedestrian network along Mullins Station Rd between Macon Rd and Shelby Farms Greenline and improve crossings
- Install accessible curb ramps at several intersections along the corridor
- Reduce curb radii at several intersections along the corridor
- Repair existing sidewalks in several spot locations along the corridor

Cost Estimate

Materials: $1,237,396
Mobilization/Traffic Control: $76,719
Engineering: $131,412
Contingency: $289,105
Total Cost: $1,734,632



MACON ROAD/ MULLINS STATION ROAD IMPROVEMENTS CONTINUED

Meyers Road Improvements

Firethorne Dr to Hickory Hill Road: 0.3 Mile

PROJECT LOCATION

EXISTING CONDITIONS

Hickory Hill Road at Myers Road lacks marked crosswalks

Myers Road lacks sidewalks

Project Description

This pedestrian improvement project will improve access from residential areas to the west to Hickory Ridge Elementary, area parks, commercial, and residential. A traffic analysis of this intersection was conducted to identify what impacts the recommendations may have on vehicular traffic and found no change in vehicular level of service as a result of the proposed changes. Myers Road has a posted speed limit of 30 mph.

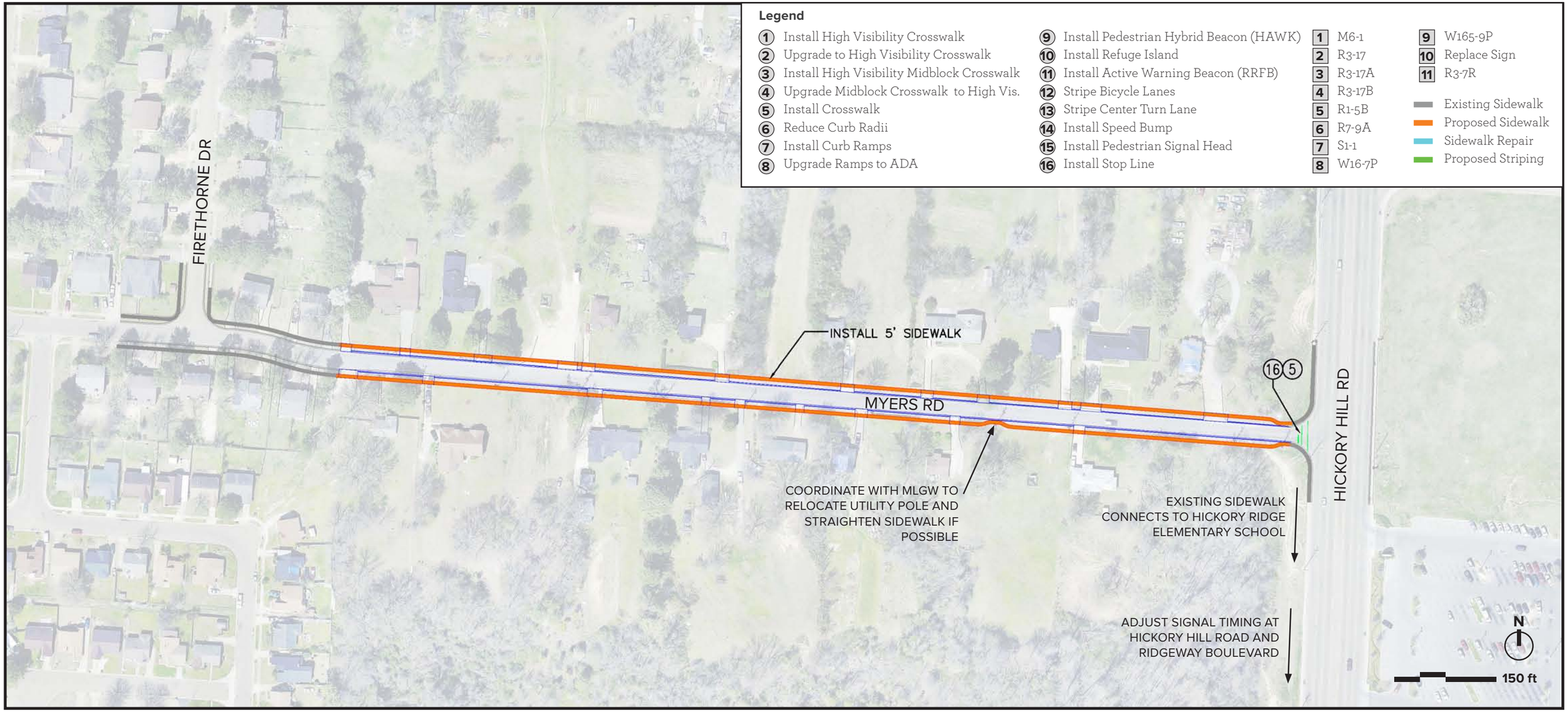
Existing Issues

- No existing pedestrian facilities along Myers Road
- Myers is the only nearby viable east-west route to Hickory Hill Road from the west
- Potentially highly-utilized route between area residential, schools, and parks
- Community has requested sidewalks for many years
- Segment was identified for improvement in the school survey conducted for this plan
- Pedestrian signal timings at Hickory Hill Rd & Ridgeway Blvd are slightly short in the E-W direction for the distance of the crossing
- One pedestrian crash was recorded at this intersection between 2007 and 2011

Destinations Served

- Hickory Ridge Elementary
- Flowering Peach Park
- Grocery store

PROPOSED IMPROVEMENTS



Project Components

- Install new sidewalks from Firethorne Dr to Hickory Hill Rd
- Extend the EB/WB pedestrian clearance interval at Hickory Hill Rd & Ridgeway Blvd from 30 to 32 s
- Stripe a crosswalk at Hickory Hill and Meyers
- Relocate utility pole in order to install new sidewalk if possible, or construct sidewalk around this obstruction

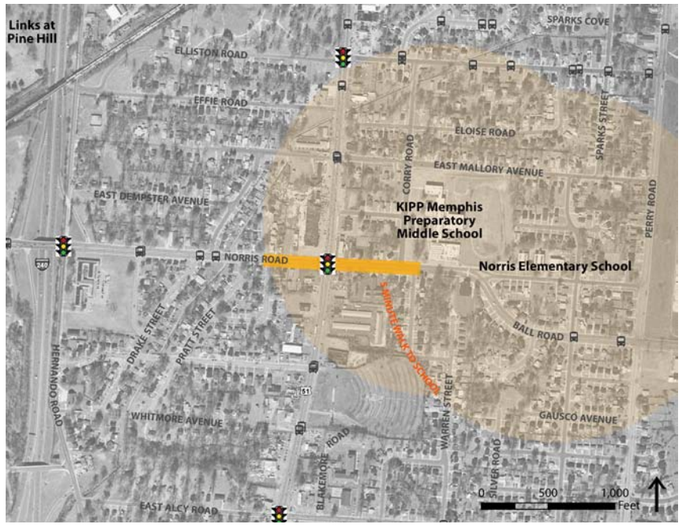
Cost Estimate

Materials: $505,917
Mobilization/Traffic Control: $31,367
Engineering: $53,728
Contingency: $118,202
Total Cost: $709,214

Norris Road Improvements

Amherst Street to Warren Street: 0.2 Mile

PROJECT LOCATION



EXISTING CONDITIONS

Obstacles in sidewalks hinder pedestran access along Norris Road

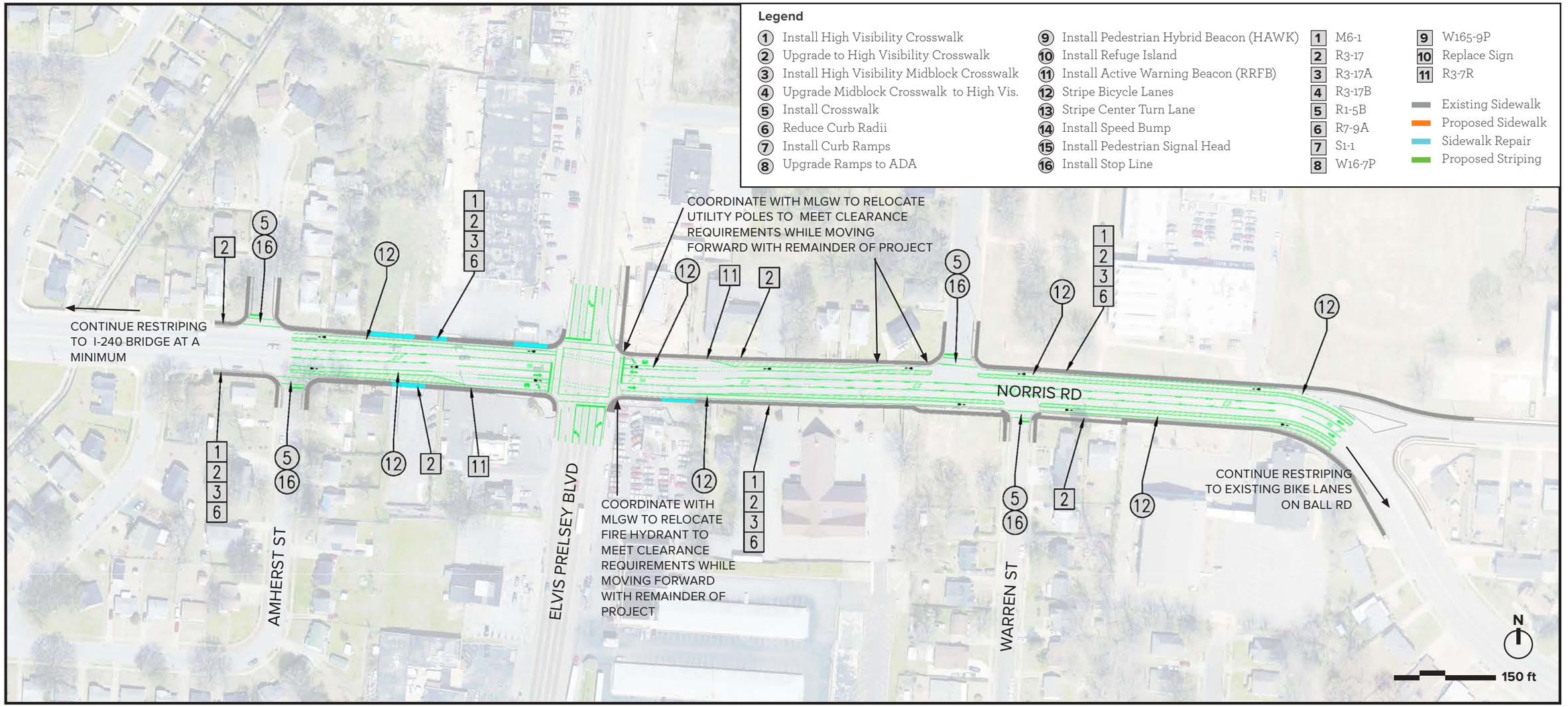
Project Description

This lane reconfiguration and repair project will add a buffer between pedestrians travelling on Norris Road and vehicular traffic, improve the condition of pedestrian facilities, and move forward a previously recommended bikeway project. Norris Road has a posted speed limit of 40 mph and recorded traffic volumes between 12,000 and 16,000 AADT. A traffic analysis of this intersection was conducted to identify potential impacts on vehicular traffic and found an acceptable impact on vehicular level of service as a result of proposed changes. The westbound movement in the AM peak hour changed from a level of service B to C, which remains well within an acceptable peak level of service range.

Existing Issues

- Pedestrian network is mostly complete, but significant obstructions exist along the route
- Highly travelled route with several transit stops in the vicinity
- Wide cross section of both Norris and Elvis Presley creates crossing safety issues for pedestrians, and marked crosswalks are barely visible
- Identified as a priority for bike facilities in the *2014 Regional Bicycle & Pedestrian Plan*
- Identified as a priority pedestrian improvement corridor in the *2014 Regional Bicycle & Pedestrian Plan*
- Traffic analysis indicates that the current pedestrian clearance intervals are insufficient
- One pedestrian crash was recorded at this intersection from 2007 -11

PROPOSED IMPROVEMENTS



Destinations Served

- Cory Middle School
- Norris Road Elementary School
- Retail destinations on Elvis Presley

Project Components

- Repair sidewalks in spot locations and move sidewalk obstructions where feasible
- Restripe to a 3 lane cross-section with buffered bike lanes
- Install high visibility crosswalk markings at Elvis Presley
- Update signal timing to provide adequate pedestrian clearance intervals: 28 s in the EB/WB direction and 25 s in the NB/SB direction

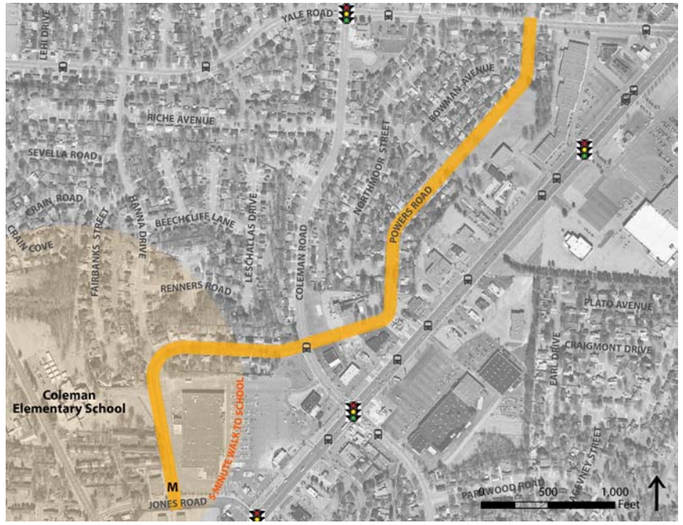
Cost Estimate

Materials: $51,435
Mobilization/Traffic Control: $3,189
Engineering: $5,462
Contingency: $12,017
Total Cost: $72,104

Powers Road Improvements

Yale Road to Jones Road: 1 Mile

PROJECT LOCATION



EXISTING CONDITIONS

Several sections of Powers Rd lack sidewalks

Powers Rd at Coleman Rd is currently an unmarked crossing

Project Description

This corridor project will provide a connection to Coleman Elementary School from surrounding neighborhoods to the northeast. Powers Road has a posted speed limit of 30 mph. Coleman Road is posted at 40 mph and has a recorded traffic volume at Powers Road of 14,100 AADT.

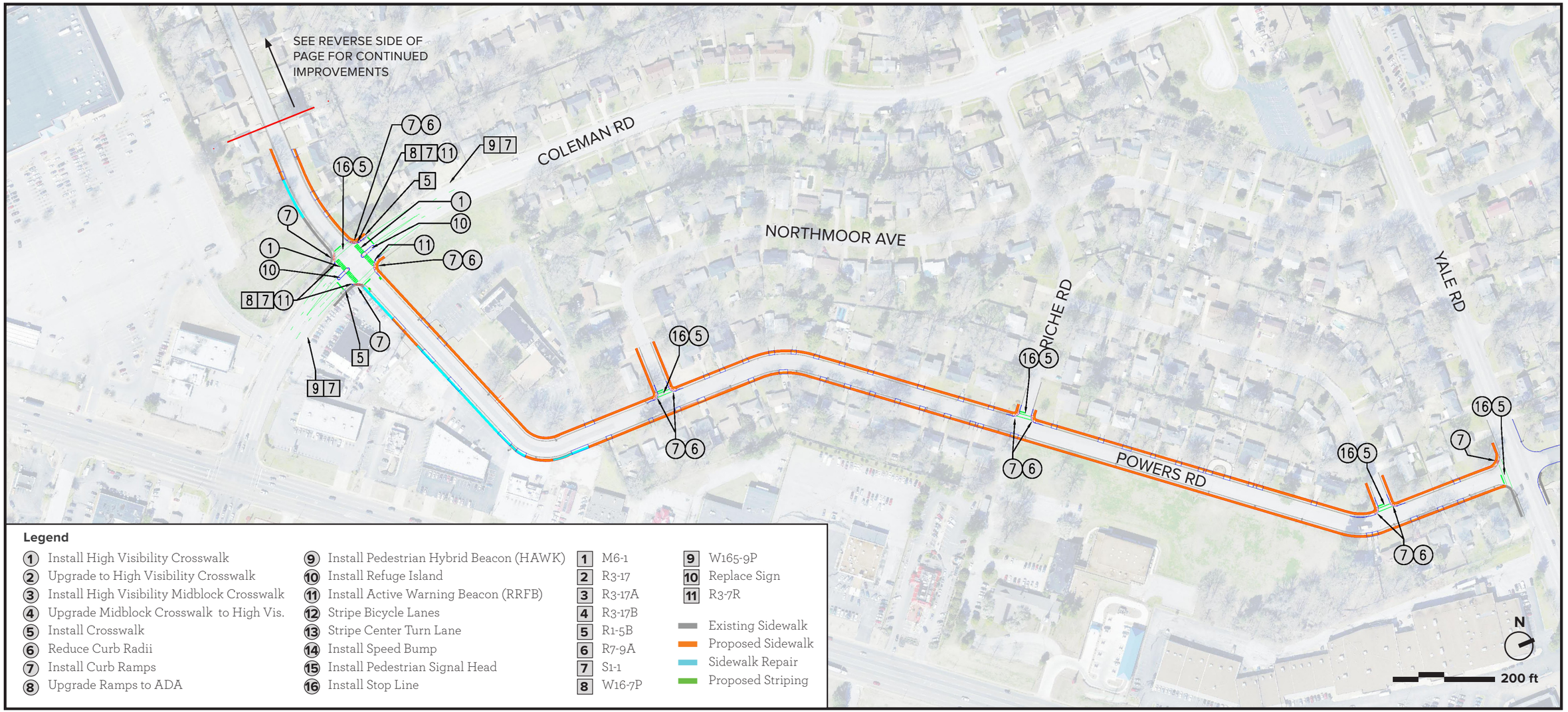
Existing Issues

- Significant gaps in existing pedestrian facilities
- Inadequate crossing treatments at intersection of Coleman Rd and Powers Rd
- Segment was identified for improvements in the school survey conducted for this plan

Destinations Served

- Coleman Elementary School
- Raleigh Public Library
- Raleigh Community Center
- Retail along Austin Peay Hwy

PROPOSED IMPROVEMENTS: OPTION A



Project Components

- Install new sidewalks from Hannah Dr to Yale Rd
- Repair and/or replace deficient sidewalks along Powers Rd
- Add accessible curb ramps at all crossings along the corridor
- Reduce curb radii at Coleman Rd/Powers Rd, Riche Rd/Powers Rd, and Bowman Ave/Powers Rd
- Install pedestrian-actuated Active Warning Beacons (RRFBs) at both legs of the Coleman Road crossing

Option A

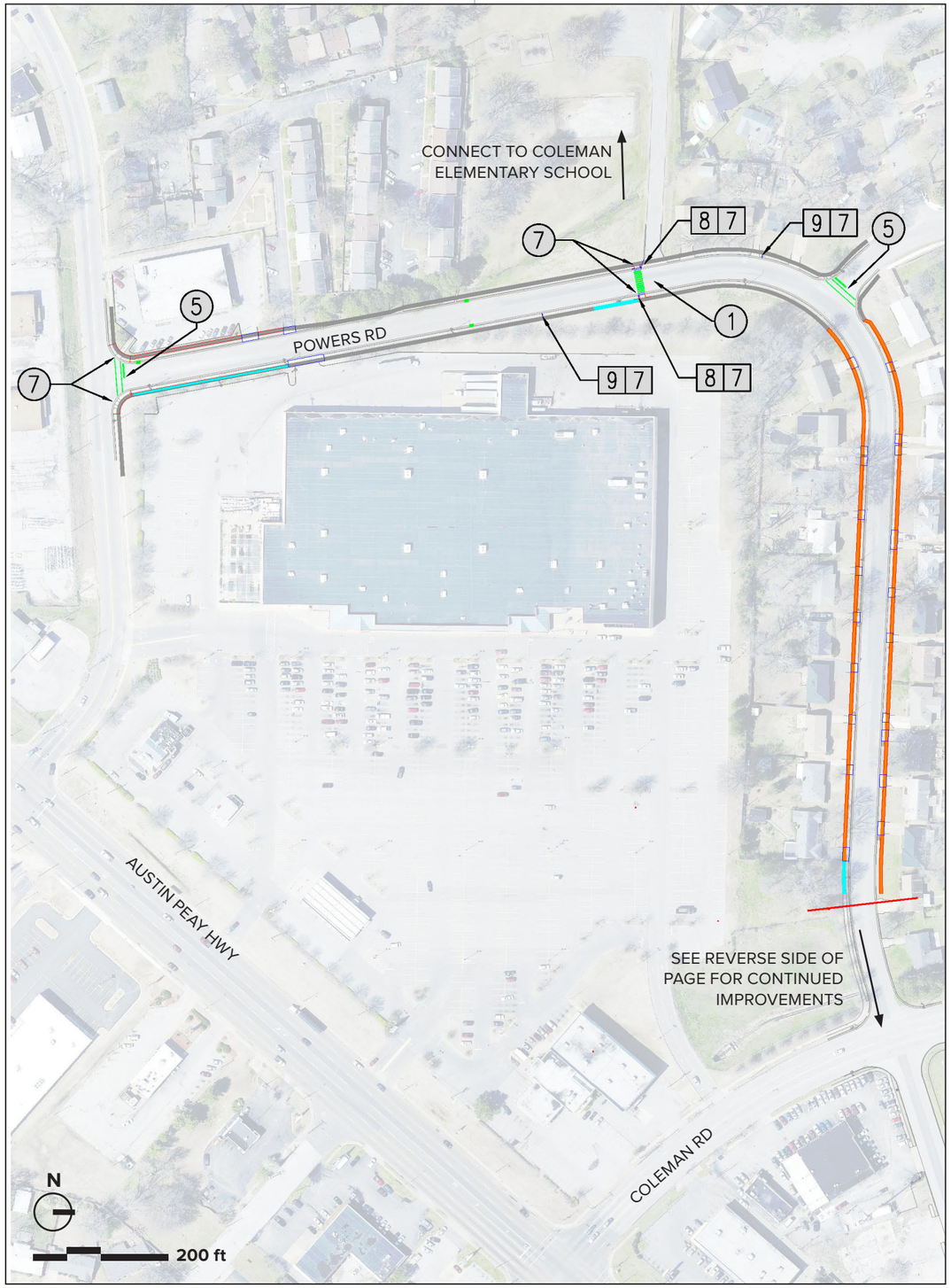
- Restripe Coleman Road at approaches to Powers Road with narrower lanes to allow installation of a median refuge island

Option B

- Implement a road diet on Coleman Road, restriping it to 3 lanes and bike lanes, and install a median refuge island at the Powers Road crossing

Cost Estimate

Materials: $598,830
Mobilization/Traffic Control: $37,127
Engineering: $63,596
Contingency: $139,911
Total Cost: $839,464



Union Avenue Improvements

South Barkdale Street to South Cooper Street: 0.5 Miles

PROJECT LOCATION

EXISTING CONDITIONS

Union Avenue is currently a six lane, undivided highway with a high visibility marked crosswalk at South Rembert Street.

Project Description

This lane reconfiguration project will provide a buffer to Union Avenue sidewalks, reduce the effective crossing width of Union Avenue, and expand the bicycle network. Union Avenue is currently a six lane roadway with a posted speed of 35 mph. Recorded traffic volumes on this segment vary between 33,000 and 36,000 AADT. The project will improve access to Idlewild Elementary School and the many surrounding destinations.

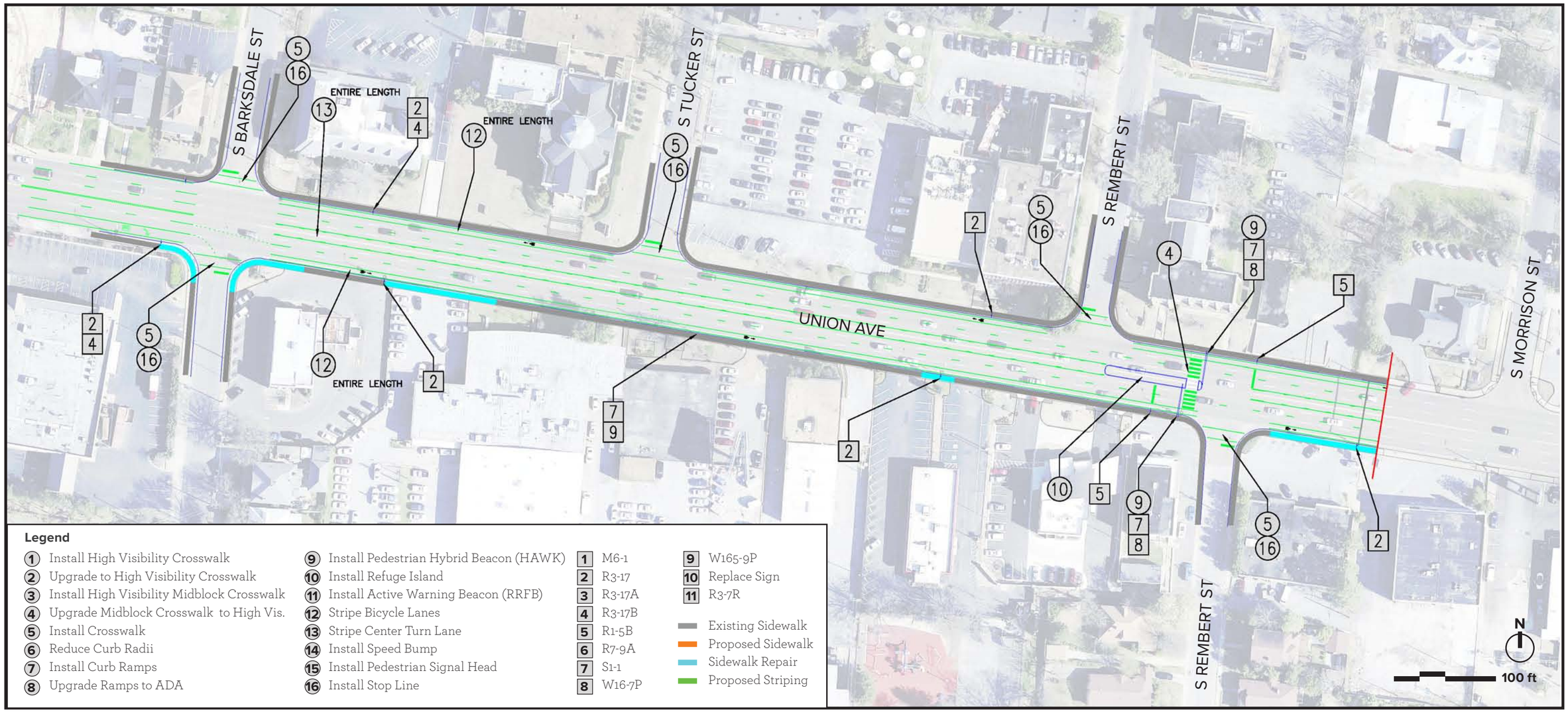
Existing Issues

- Four pedestrian crashes were recorded along this segment between 2007 and 2011
- Mostly complete pedestrian network along Union Avenue in need of repair
- Insufficient crossing treatment for the street width and speed at South Rembert Street
- No existing crosswalk striping or signage at most streets intersecting Union Avenue in this area
- Segment is along a priority pedestrian improvement corridor in the *2014 Regional Bicycle & Pedestrian Plan*
- Segment was identified for improvement by a project stakeholder

Destinations Served

- Idlewild Elementary School
- Commercial destinations
- Bus stops

PROPOSED IMPROVEMENTS

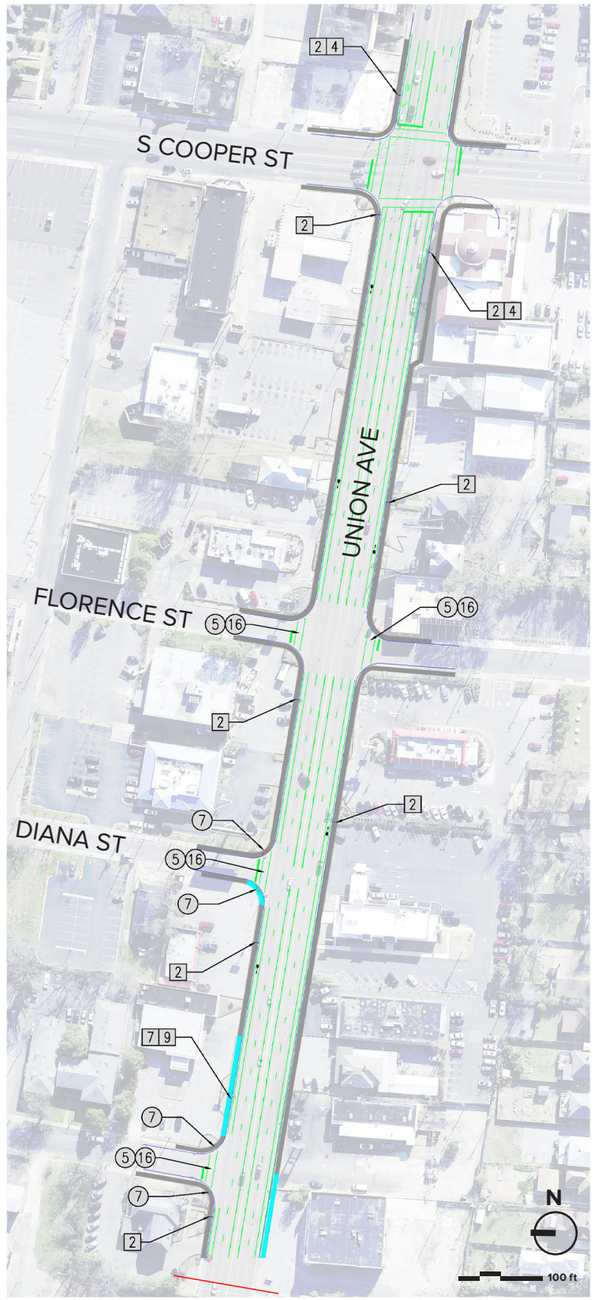


Project Components

- Restripe Union Avenue from 3 lanes in each direction to 2 lanes in each direction with bike lanes and a continuous two-way left-turn lane, reducing effective crossing width for pedestrians
- Restripe the high visibility midblock crosswalk in the vicinity of South Rembert Street and install advance stop lines and signage
- Install a median refuge island in the crossing at South Rembert Street and a Pedestrian Hybrid Beacon (HAWK)
- Add crosswalk striping, signage, and stop lines at all streets intersecting Union Avenue
- Repair sidewalk along Union Avenue and move obstructions where feasible

Cost Estimate

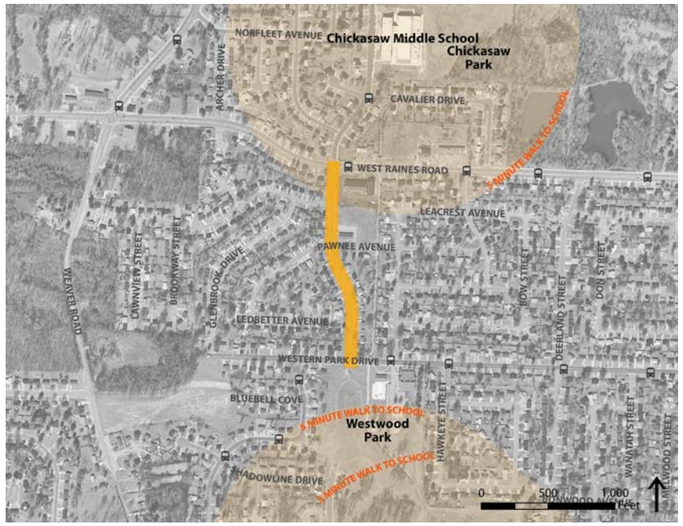
Materials: $256,929
Mobilization/Traffic Control: $15,930
Engineering: $27,286
Contingency: $60,029
Total Cost: $360,173



Westmont Street Improvements

West Raines Road to Western Park Drive: 0.3 Mile

PROJECT LOCATION



EXISTING CONDITIONS

Evidence of pedestrian demand along Westmont Street

Several sections of Westmont Street lack sidewalks

Project Description

This pedestrian improvement project will complete the pedestrian network along Westmont Street and provide access to several schools and parks. Westmont Street has a posted speed limit of 30 mph.

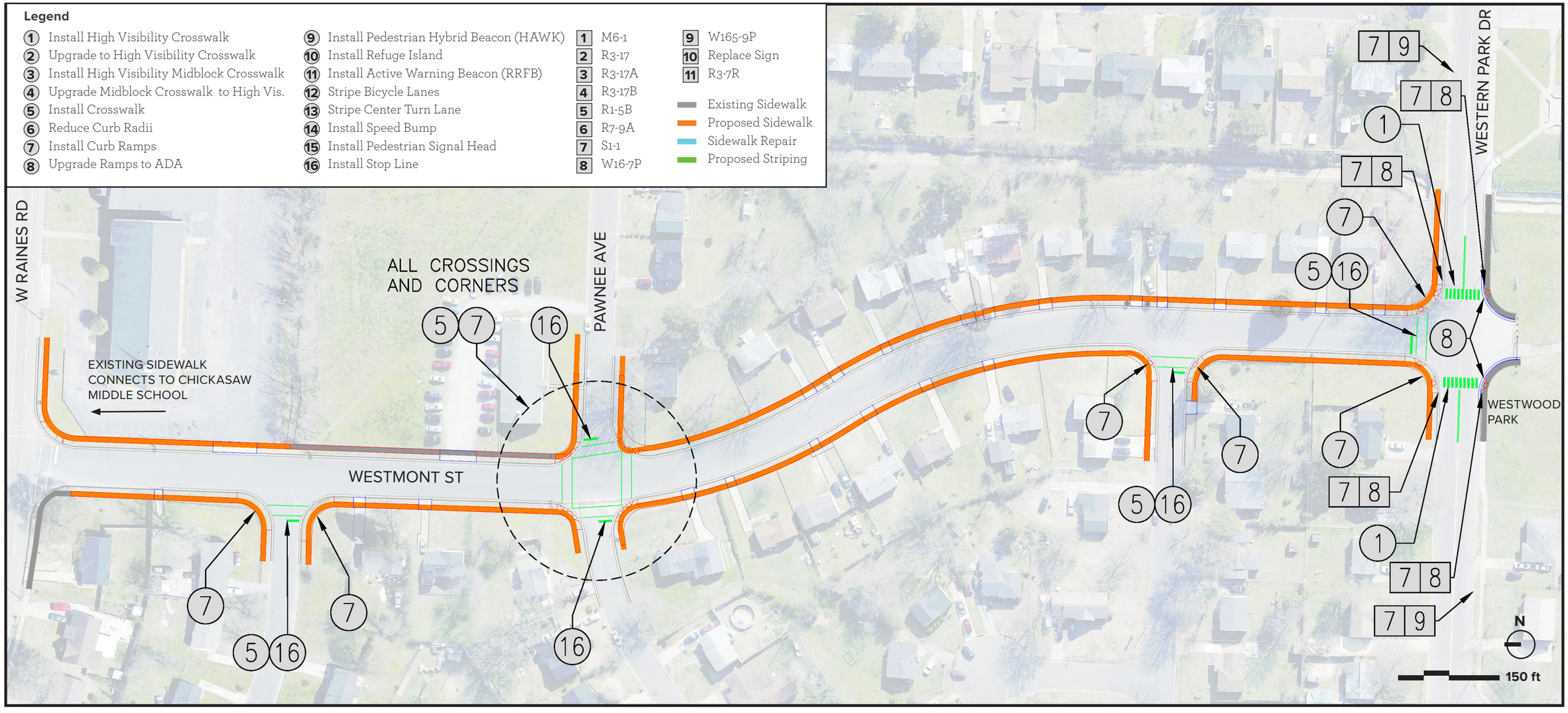
Existing Issues

- Incomplete sidewalks along Westmont Road
- Few adequate north-south routes between West Raines Road and Western Park Drive in the area
- No marked crosswalks across Western Park Drive in front of Western Park
- Segment is along a priority pedestrian improvement corridor in the *2014 Regional Bicycle & Pedestrian Plan*
- Segment was identified for improvement by a project stakeholder

Destinations Served

- Westwood High School
- Chickasaw Middle School
- Westwood Park

PROPOSED IMPROVEMENTS



Project Components

- Complete pedestrian network along Westmont Road
- Install accessible curb ramps at all crossings
- Install crosswalks and stop lines at all intersections
- Install high visibility crosswalks across Western Park Drive and pedestrian signage

Cost Estimate

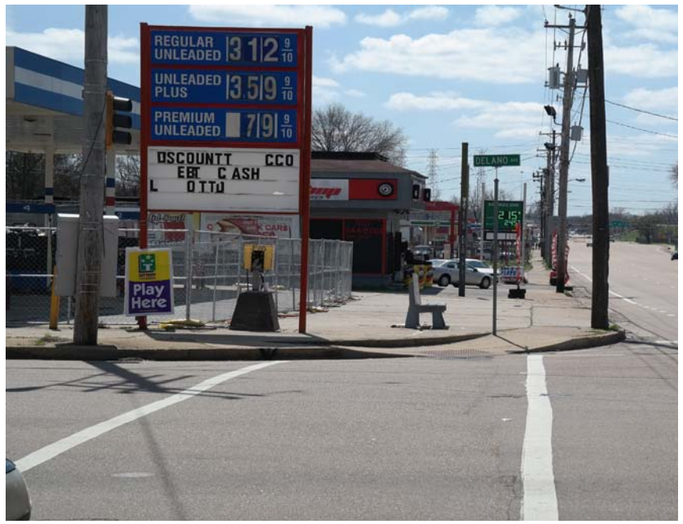
Materials: $134,806
Mobilization/Traffic Control: $8,358
Engineering: $14,316
Contingency: $31,496
Total Cost: $188,976

Delano Avenue Crossing Upgrade

At North Watkins Street

PROJECT LOCATION

EXISTING CONDITIONS



Winchester Road at Boeingshire Drive is a signalized intersection but does not have any pedestrian control devices

Project Description

This intersection improvement project will provide enhanced pedestrian facilities to the existing crossing at Delano and North Watkins. This crossing has close proximity to Delano Elementary School and commercial destinations, and is the location of highly-utilized bus stops along a key transit corridor. Delano Avenue has a posted speed of 40 mph and traffic volumes between 5 and 9K. Watkins Street has a posted speed of 40 mph and traffic volumes between 20 and 23K.

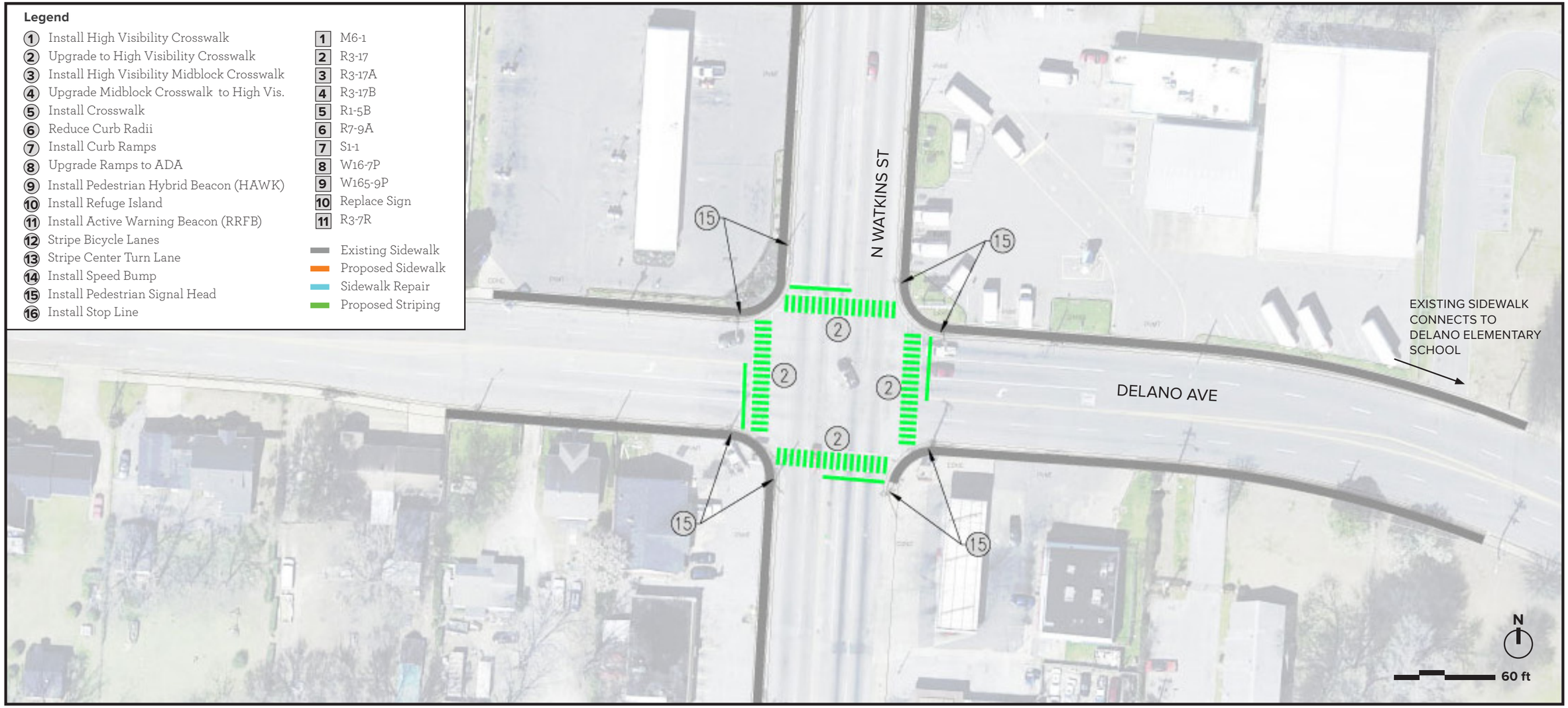
Existing Issues

- One recorded pedestrian crash at the intersection between 2007 and 2011
- Current crosswalk striping is faded and missing in some areas
- No existing pedestrian signal heads
- High vehicle volumes and speeds, high pedestrian traffic area
- Intersection is along a key corridor identified in the *Short Range Transit Plan* and recommended for improved pedestrian access to transit

Destinations Served

- Delano Elementary School
- Area commercial
- Frayser Park

PROPOSED IMPROVEMENTS



Project Components

- Stripe high-visibility crosswalks at all crossings
- Confirm that signal timing provides adequate pedestrian crossing time and retime if necessary
- Install pedestrian signal heads at all crossings

Cost Estimate

Materials: $18,476
Mobilization/Traffic Control: $1,145
Engineering: $1,962
Contingency: $4,317
Total Cost: $25,900

Graham Street Crossing Upgrade

At Bayliss Avenue

PROJECT LOCATION

EXISTING CONDITIONS

Curb ramps at Bayliss Ave & N Graham St have already been upgraded but opportunities exist to further improve pedestrian conditions with high visibility crosswalks and a curb extension.

Project Description

This intersection improvement project will provide enhanced pedestrian facilities to the existing crossing at North Graham Street and Bayliss Avenue. This intersection is a four-way stop with close proximity to several schools. Bayliss Avenue has a posted speed of 35 mph and traffic volumes around 25K at this location, and Graham Street has a posted speed of 40 mph and traffic volumes around 13K. Bayliss Avenue is currently under development as a bicycle boulevard to connect existing bikeways to the east and west.

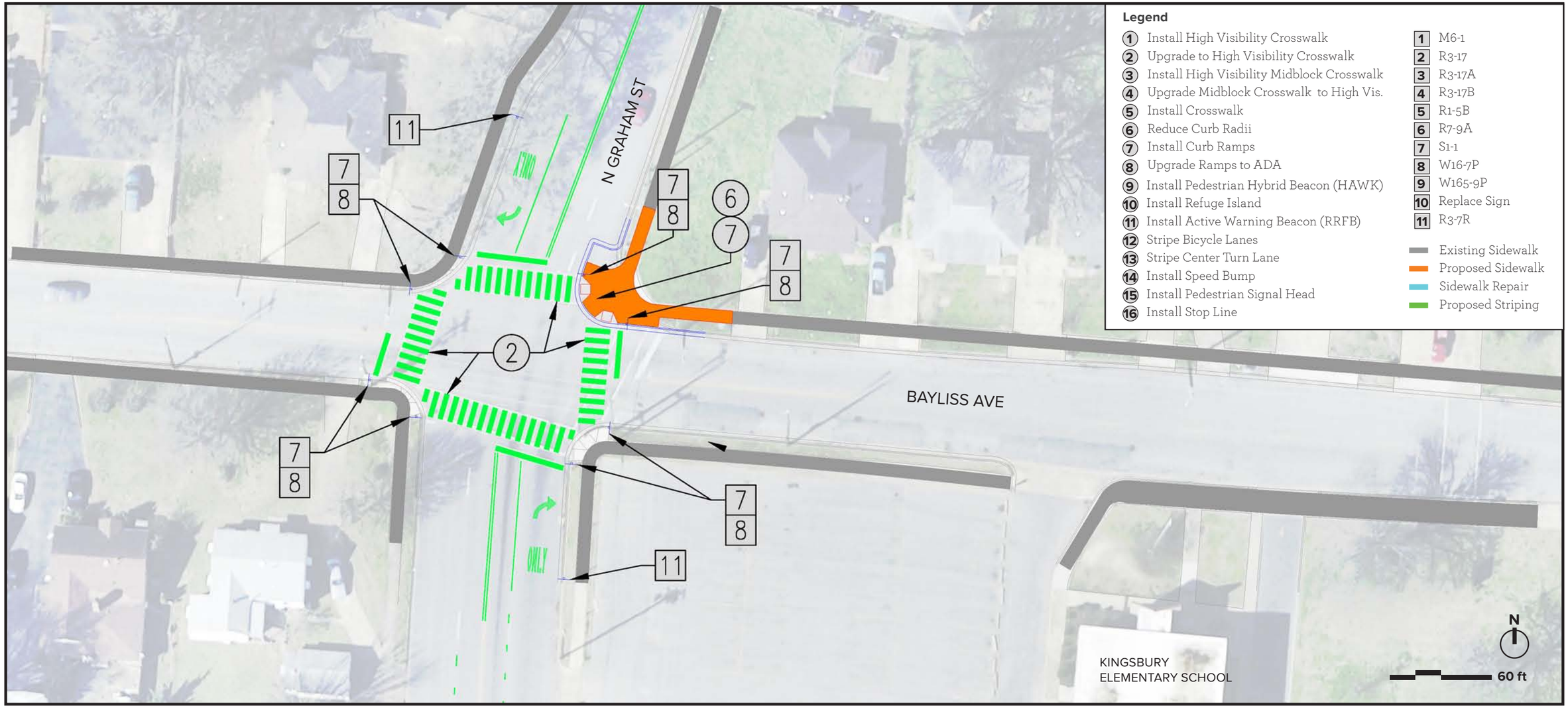
Existing Issues

- Parallel crosswalk markings exist at all legs of the intersection, which are insufficient because of its proximity to four schools.
- Graham Street has a four-lane cross-section through the intersection, creating a long crossing distance for pedestrians.
- Intersection is along a priority pedestrian improvement corridor in the *2014 Regional Bicycle & Pedestrian Plan*.

Destinations Served

- Kingsbury Elementary School
- Kinsgsbury Middle School
- Kingsbury High School
- Kingsbury Vocational School

PROPOSED IMPROVEMENTS



Legend

1. Install High Visibility Crosswalk
2. Upgrade to High Visibility Crosswalk
3. Install High Visibility Midblock Crosswalk
4. Upgrade Midblock Crosswalk to High Vis.
5. Install Crosswalk
6. Reduce Curb Radii
7. Install Curb Ramps
8. Upgrade Ramps to ADA
9. Install Pedestrian Hybrid Beacon (HAWK)
10. Install Refuge Island
11. Install Active Warning Beacon (RRFB)
12. Stripe Bicycle Lanes
13. Stripe Center Turn Lane
14. Install Speed Bump
15. Install Pedestrian Signal Head
16. Install Stop Line

1. M6-1
2. R3-17
3. R3-17A
4. R3-17B
5. R1-5B
6. R7-9A
7. S1-1
8. W16-7P
9. W165-9P
10. Replace Sign
11. R3-7R

- Existing Sidewalk
- Proposed Sidewalk
- Sidewalk Repair
- Proposed Striping

Project Components

- Stripe high-visibility crosswalks at all crossings
- Install a curb extension with accessible curb ramps on the northeast corner of the intersection to reduce the crossing distance for pedestrians
- Stripe right turn only lanes in the northbound and southbound directions of Graham Street
- Install pedestrian signage

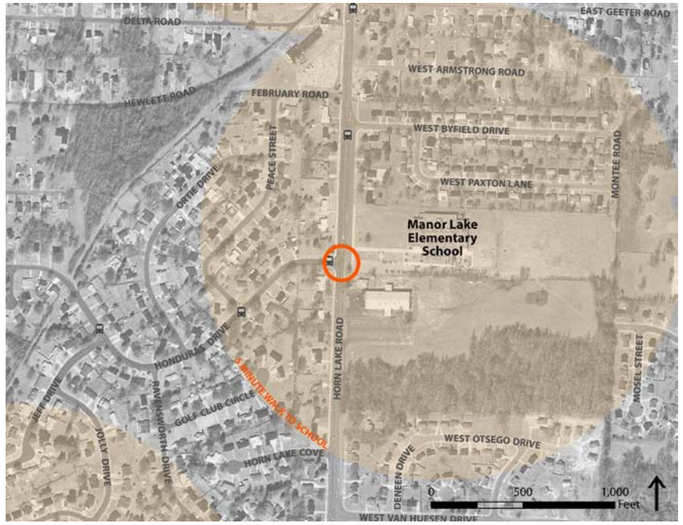
Cost Estimate

Materials: $39,374
Mobilization/Traffic Control: $2,441
Engineering: $4,181
Contingency: $9,199
Total Cost: $55,195

Horn Lake Road Crossing Upgrade

At Honduras Drive

PROJECT LOCATION



EXISTING CONDITIONS

Existing crosswalk pavement markings are barely visible

Honduras Drive at Horn Lake Road is currenly an unmarked crossing

Project Description

This intersection improvement project will increase pedestrian access for those crossing Horn Lake Road in the vicinity of Manor Lake Elementary School. Horn Lake Road is four lanes wide with a posted speed of 45 mph and a school zone speed of 15 mph, and a recorded traffic volume of 7,700 AADT.

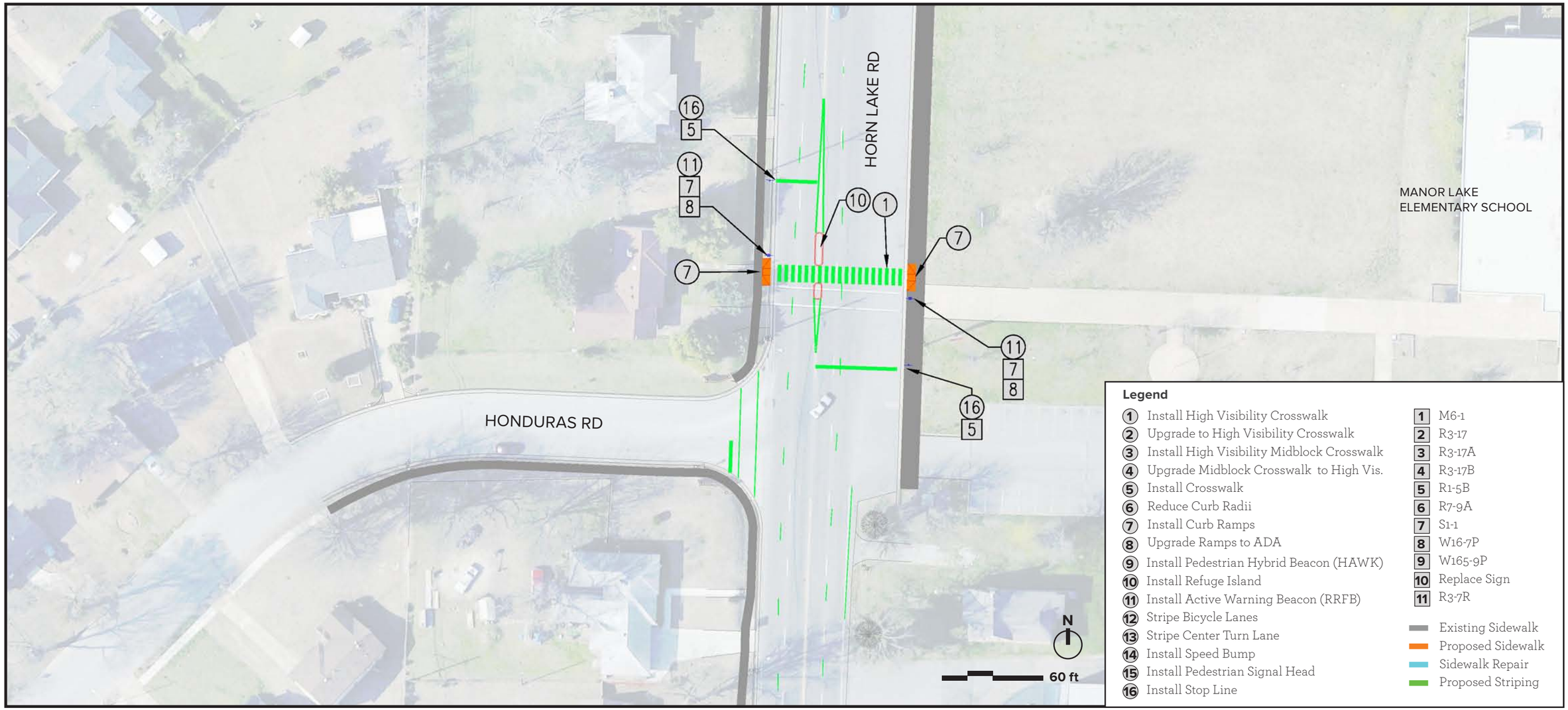
Existing Issues

- Existing crossing is in need of significant maintenance
- Wide cross section of Horn Lake Road makes safe crossing difficult
- Intersection is along a priority pedestrian improvement corridor in the *2014 Regional Bicycle & Pedestrian Plan*

Destinations Served

- Manor Lake Elementary School

PROPOSED IMPROVEMENTS



Project Components

- Shift existing crossing north to allow installation of accessible curb ramps and to make room for vehicles turning left off of Honduras Road to enter Horn Lake Road in advance of new stop lines
- Install a pedestrian-actuated Active Warning Beacon (RRFB) for the crossing of Horn Lake Road
- Reconfigure Horn Lake Road to make room for a median refuge island
- Install high-visibility crosswalk and appropriate signage on Horn Lake Road and stripe the crossing of Honduras Road

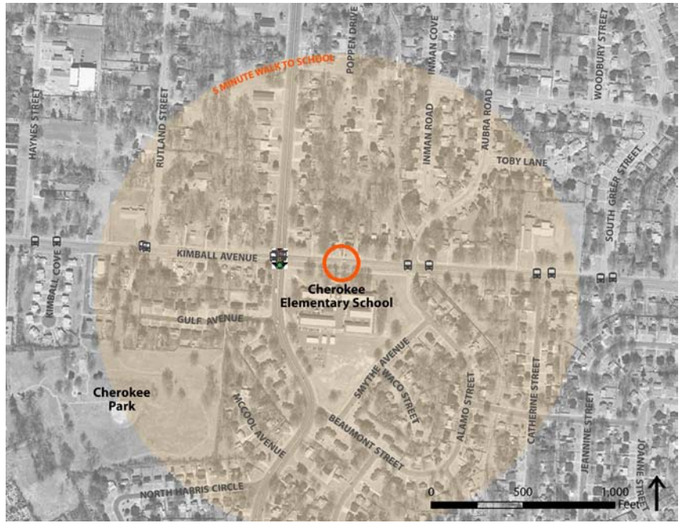
Cost Estimate

Materials: $34,946
Mobilization/Traffic Control: $2,167
Engineering: $3,711
Contingency: $8,165
Total Cost: $48,989

Kimball Avenue Crossing Upgrade

Between Semmes Street and Alamo Street

PROJECT LOCATION



EXISTING CONDITIONS

Existing crosswalk on Kimball Avenue cross four lanes with no refuge

Utility pole blocks a potential curb ramp at the current crossing location

Project Description

This project will upgrade the existing midblock crossing in front of Cherokee Elementary School. While a crossing currently exists, it lacks ADA accessibility and does not provide adequate protection for the roadway context. Kimball Avenue has a posted speed limit of 40 mph, with a reduced speed limit of 15 mph during school times, and a recorded traffic volume of 14,600 AADT.

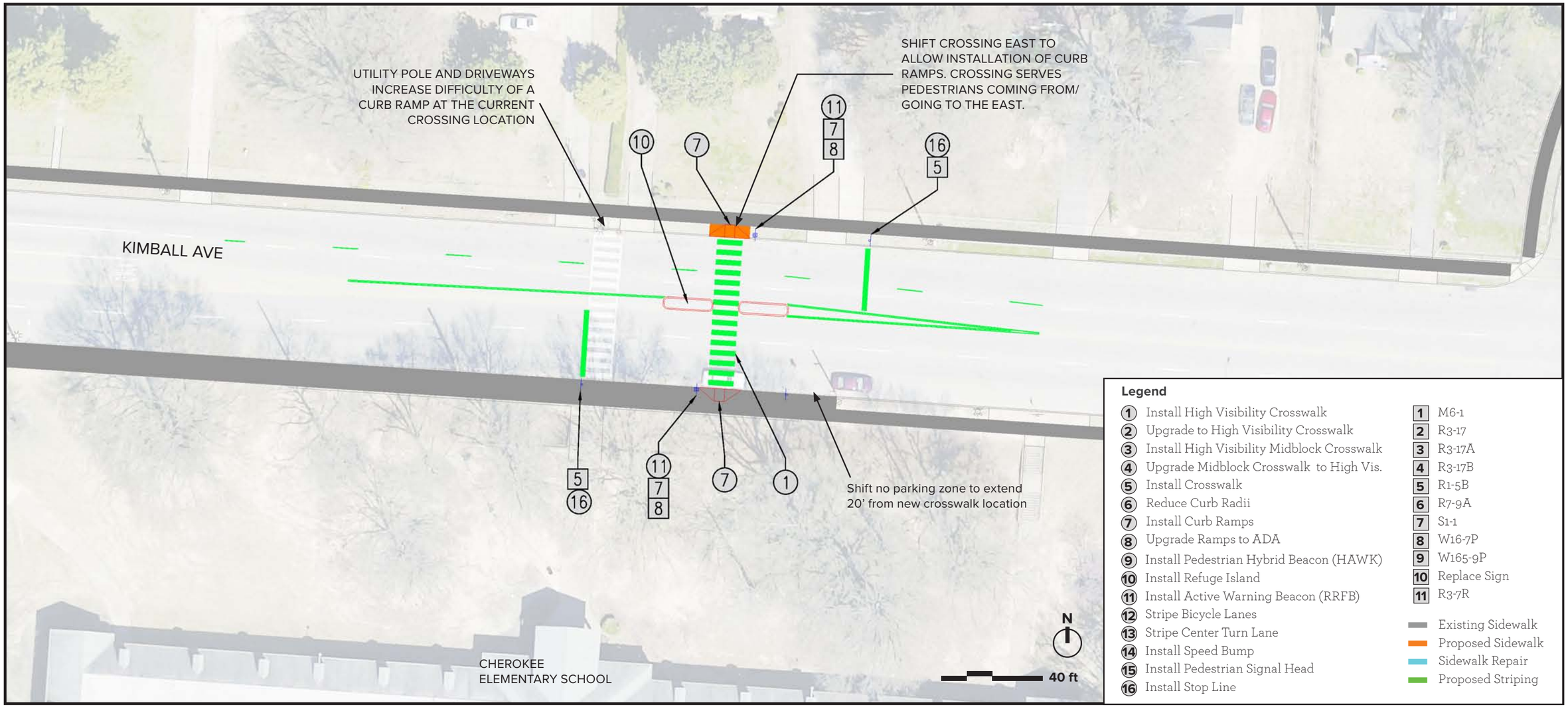
Existing Issues

- Existing crossing is faded and inaccessible
- Crosswalk alone is insufficient for the roadway context
- A pedestrian collision occurred along this block

Destinations Served

- Cherokee Elementary School

PROPOSED IMPROVEMENTS



Project Components

- Install accessible curb ramps and shift the crossing away from driveways and utility pole
- Install a pedestrian-actuated Active Warning Beacon (RRFB) for the crossing of Kimball
- Restripe lanes on Kimball in order to install a median refuge island
- Install a high-visibility crosswalk and appropriate signage

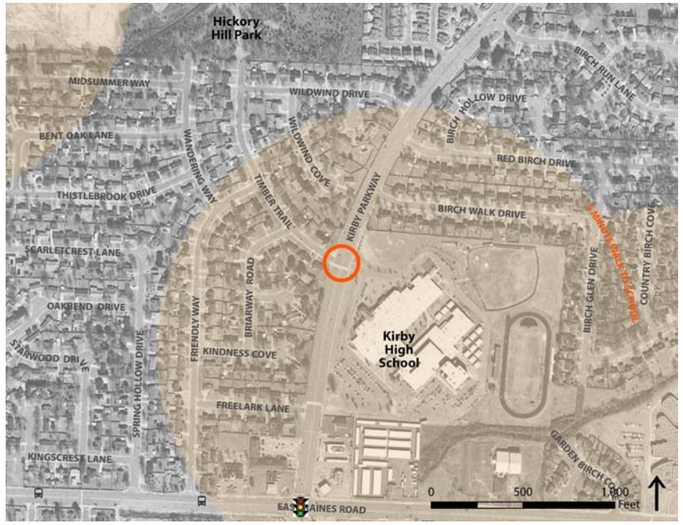
Cost Estimate

Materials: $29,268
Mobilization/Traffic Control: $1,815
Engineering: $3,108
Contingency: $6,838
Total Cost: $41,028

Kirby Parkway Crossing Upgrade

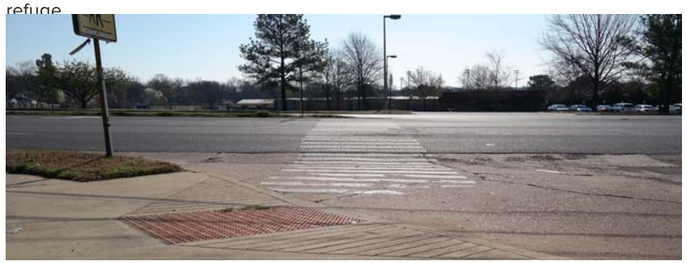
At Timber Trail

PROJECT LOCATION



EXISTING CONDITIONS

Existing median on Kirby Parkway lacks pedestrian accommodation to act as refuge



Crossing Kirby Parkway at Timber Dr provides direct access to Kirby High School

Project Description

This intersection improvement project will upgrade the existing unsignalized crossing in front of Kirby High School, providing access from surrounding residential areas. This 45 mph roadway has a school zone speed of 15 mph and annual average daily traffic around 27,000.

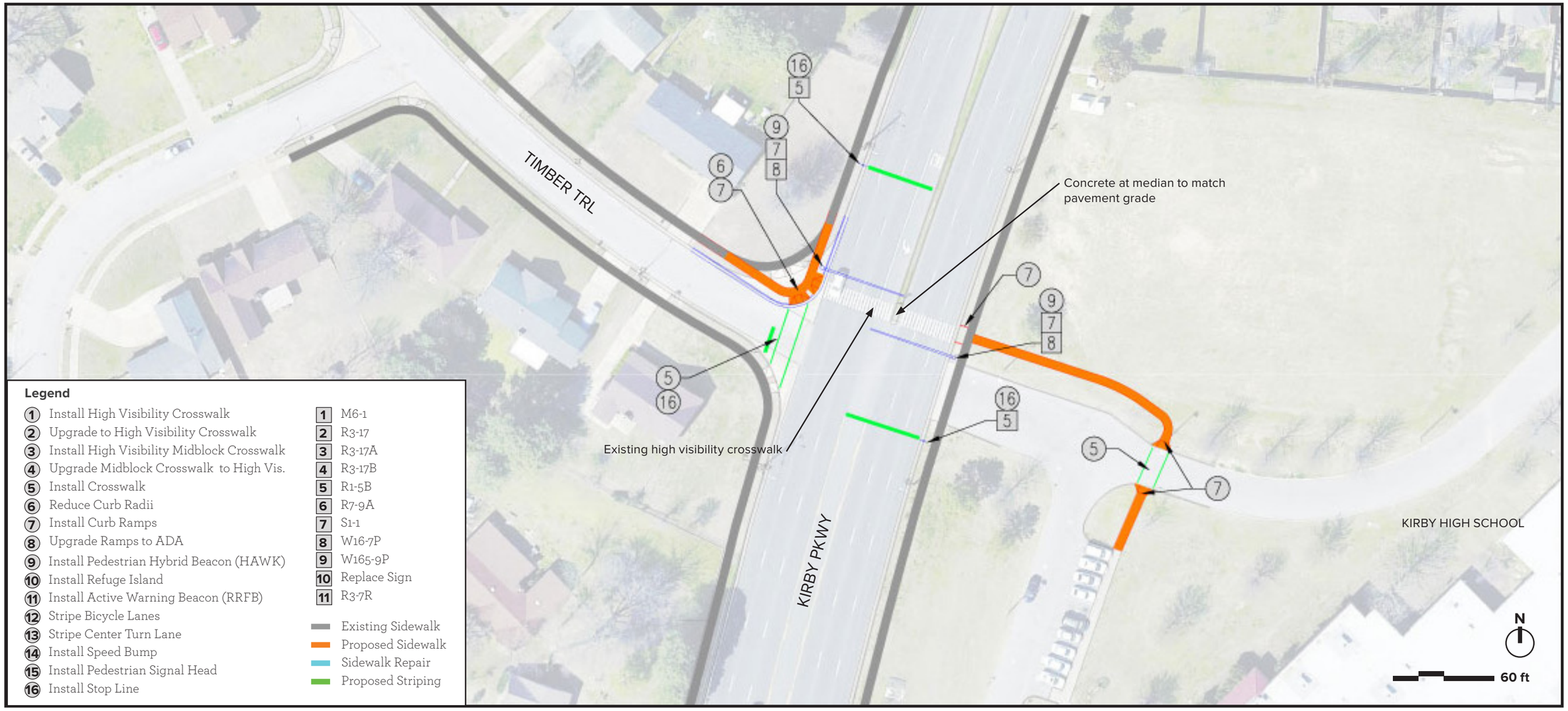
Existing Issues

- Wide cross section of Kirby Parkway makes safe crossing a challenge
- One of two viable crossings in the vicinity of Kirby High School for neighborhoods west of Kirby Parkway
- Inadequate signage warning motorists of upcoming pedestrian crossing

Destinations Served

- Kirby High School
- Hickory Hill Park

PROPOSED IMPROVEMENTS: OPTION A



Project Components

- Install advanced stop lines and signage
- Extend the curb on the northwest corner of the intersection to reduce the crossing distance
- Install a sidewalk connecting the crossing to the existing path in front of Kirby High School
- Install accessible curb ramps

Option A

- Install flush concrete at the median location to match pavement grade
- Install a pedestrian-actuated Hybrid Beacon (HAWK)

Option B

- Reduce the road from 6 lanes to 4 lanes with buffered bike lanes
- Widen existing median to create a formalized 5-foot wide refuge with truncated domes
- Install a pedestrian-actuated Active Warning Beacon (RRFB)

Cost Estimate

Materials: $160,781
Mobilization/Traffic Control: $9,968
Engineering: $17,075
Contingency: $37,565
Total Cost: $225,389

Lamar Avenue Crossing Upgrade

At South Bellevue Boulevard

PROJECT LOCATION

EXISTING CONDITIONS

Lamar Avenue is a heavily utilized transit route

Longitudinal crosswalk markings are difficult to see along both Lamar Avenue and S. Bellevue Boulevard

Project Description

This intersection project will improve pedestrian access for those crossing Lamar Avenue and South Bellevue Boulevard, a skewed intersection where several pedestrian crashes are recorded. Lamar Avenue has a posted speed of 40 mph and recorded traffic of up to 40,000 AADT. Bellevue Boulvard has a posted speed of 35 mph and recorded traffic of 7,000 AADT. A traffic analysis of this intersection was conducted to identify what impacts the recommendations may have on vehicular traffic and found no change in vehicular level of service as a result of the proposed changes.

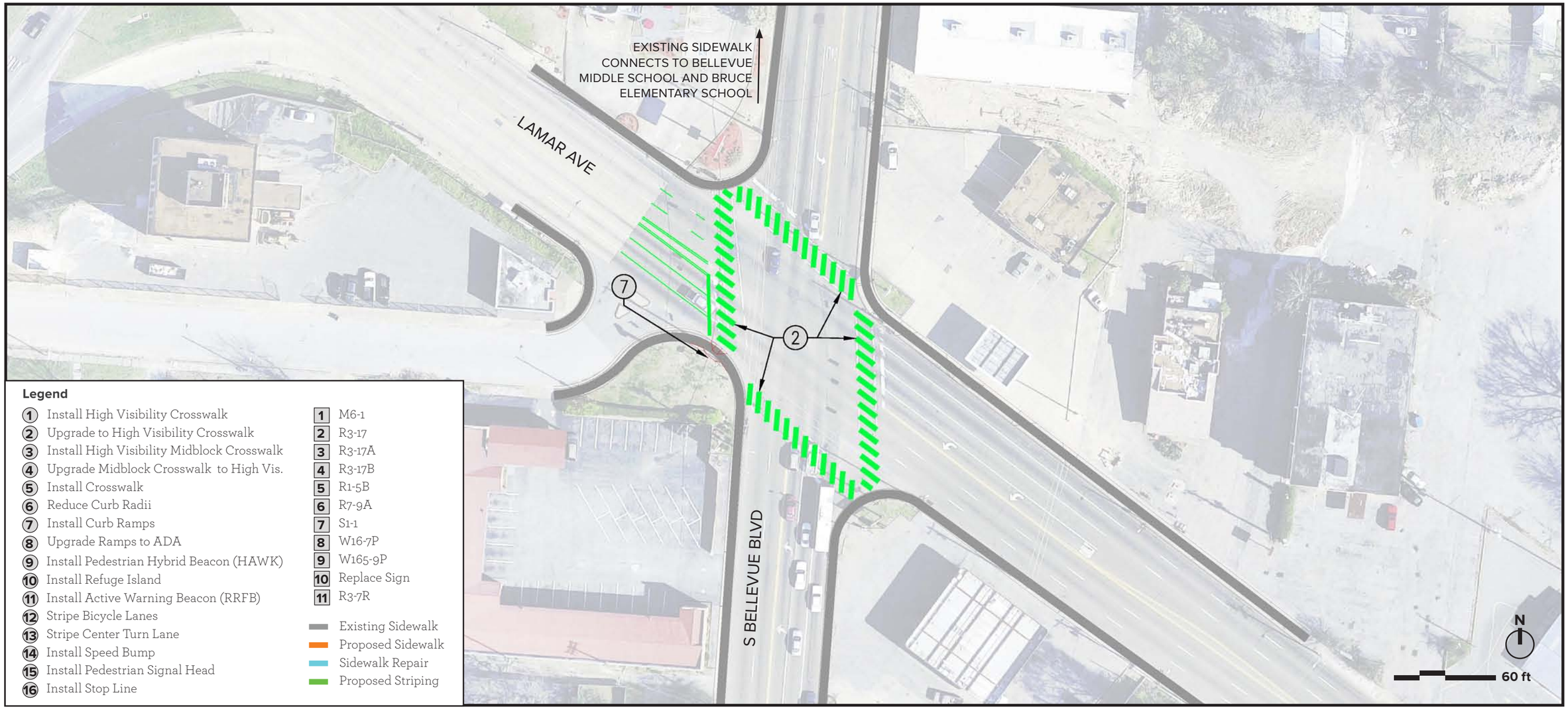
Existing Issues

- Four pedestrian crashes are recorded at or near the intersection between 2007 and 2011
- Crosswalk striping is difficult to see and geometry creates long crossing distances for pedestrians
- Traffic analysis indicates that the current pedestrian clearance intervals are insufficient
- Intersection is along a priority pedestrian improvement corridor in the *2014 Regional Bicycle & Pedestrian Plan*
- Intersection was identified for improvement by a project stakeholder

Destinations Served

- Bruce Elementary School
- Bellevue Middle School
- Area commercial
- Bus stops

PROPOSED IMPROVEMENTS



Project Components

- Modify signal timing to provide adequate clearance interval for pedestrians: 30 s in the EB/WB directions and 34 s in the NB/SB directions.
- Restripe existing crosswalks with high-visibility crosswalks.
- Install an accessible curb ramp on the southwest corner and restripe the stop line for adjusted crosswalk alignment

Cost Estimate

Materials: $17,716
Mobilization/Traffic Control: $1,098
Engineering: $1,881
Contingency: $4,139
Total Cost: $24,835

Mimosa Avenue Crossing Upgrade

At Carpenter Street

PROJECT LOCATION

EXISTING CONDITIONS

Crossings at Mimosa Avenue and Carpenter Street are unmarked

Project Description

This intersection improvement project will provide a safe crossing of Mimosa Avenue at Carpenter Street. Mimosa Avenue has a posted speed limit of 30 mph. Additional traffic calming measures will be implemented in the area to make this neighborhood road-way more walk-friendly in response to several pedestrian crashes

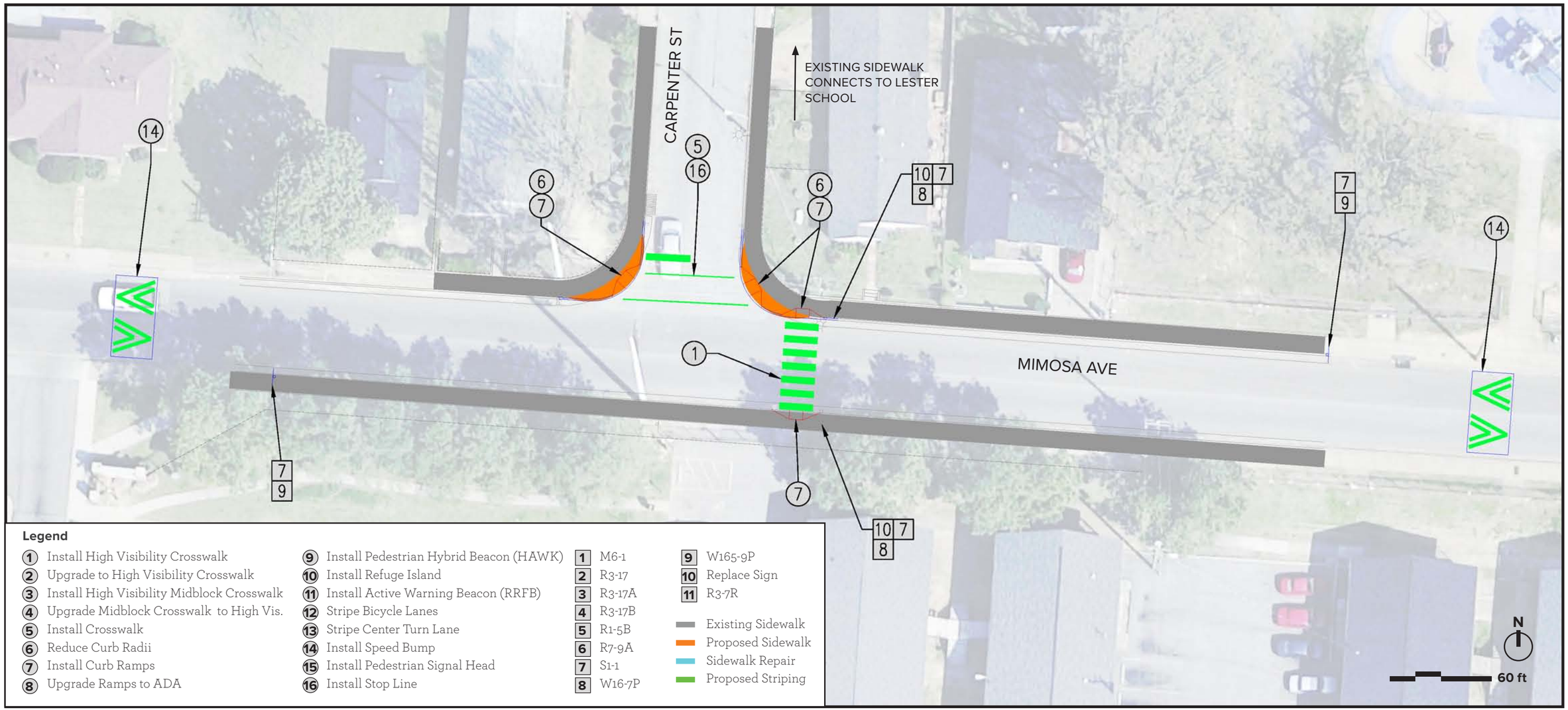
Existing Issues

- Three pedestrian crashes were recorded at or near the intersection between 2007 and 2011
- No crossing facilities exist in the vicinity
- Intersection is surrounded by area residential and parks, and is part of a direct route to Lester School, Cornerstone Prep, Lester Community Center, and Howse Park

Destinations Served

- Lester School
- Cornerstone Prep
- Lester Community Center
- Howse Park

PROPOSED IMPROVEMENTS



Legend

(1) Install High Visibility Crosswalk	(9) Install Pedestrian Hybrid Beacon (HAWK)	[1] M6-1	[9] W165-9P		
(2) Upgrade to High Visibility Crosswalk	(10) Install Refuge Island	[2] R3-17	[10] Replace Sign		
(3) Install High Visibility Midblock Crosswalk	(11) Install Active Warning Beacon (RRFB)	[3] R3-17A	[11] R3-7R		
(4) Upgrade Midblock Crosswalk to High Vis.	(12) Stripe Bicycle Lanes	[4] R3-17B			
(5) Install Crosswalk	(13) Stripe Center Turn Lane	[5] R1-5B		Existing Sidewalk	
(6) Reduce Curb Radii	(14) Install Speed Bump	[6] R7-9A		Proposed Sidewalk	
(7) Install Curb Ramps	(15) Install Pedestrian Signal Head	[7] S1-1		Sidewalk Repair	
(8) Upgrade Ramps to ADA	(16) Install Stop Line	[8] W16-7P		Proposed Striping	

Project Components

- Add high-visibility crosswalk across Mimosa Avenue where no crossing currently exists along with accessible curb ramps
- Install a crosswalk and stop line across Carpenter street
- Decrease curb radii at the intersection to reduce turning speeds
- Add speed humps upstream and downstream of the crossing to decrease vehicular speed in the area

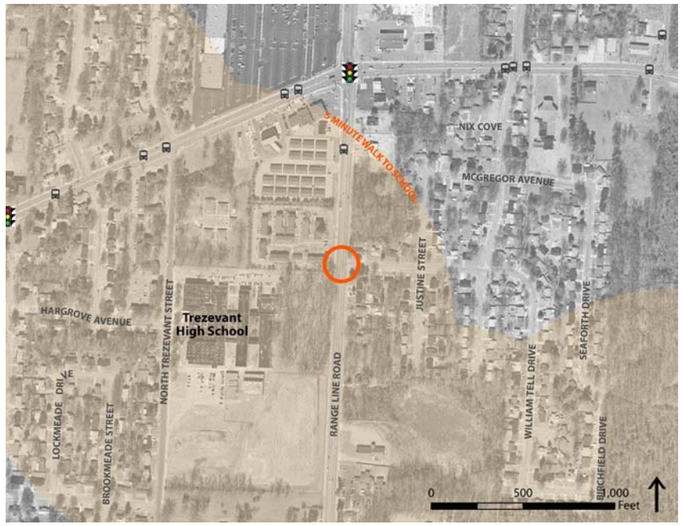
Cost Estimate

Materials: $71,644
Mobilization/Traffic Control: $4,442
Engineering: $7,609
Contingency: $16,739
Total Cost: $100,433

Range Line Road Crossing Upgrade

At Orman Avenue

PROJECT LOCATION



EXISTING CONDITIONS

Range Line Road at Orman Avenue is currently an unmarked crossing with nearby bus stops on both sides of Range Line

Project Description

This intersection improvement project will provide a pedestrian crossing of Range Line Road to students accessing Trezevant High School. Range Line Road is five lanes wide with a posted speed of 40 mph and recorded traffic volumes of 10,300 AADT. Traffic analysis was conducted to analyze the impacts of a pedestrian beacon at this location on vehicular delay and projected a very small delay increase. The new crossing will also serve a highly-utilized bus stop.

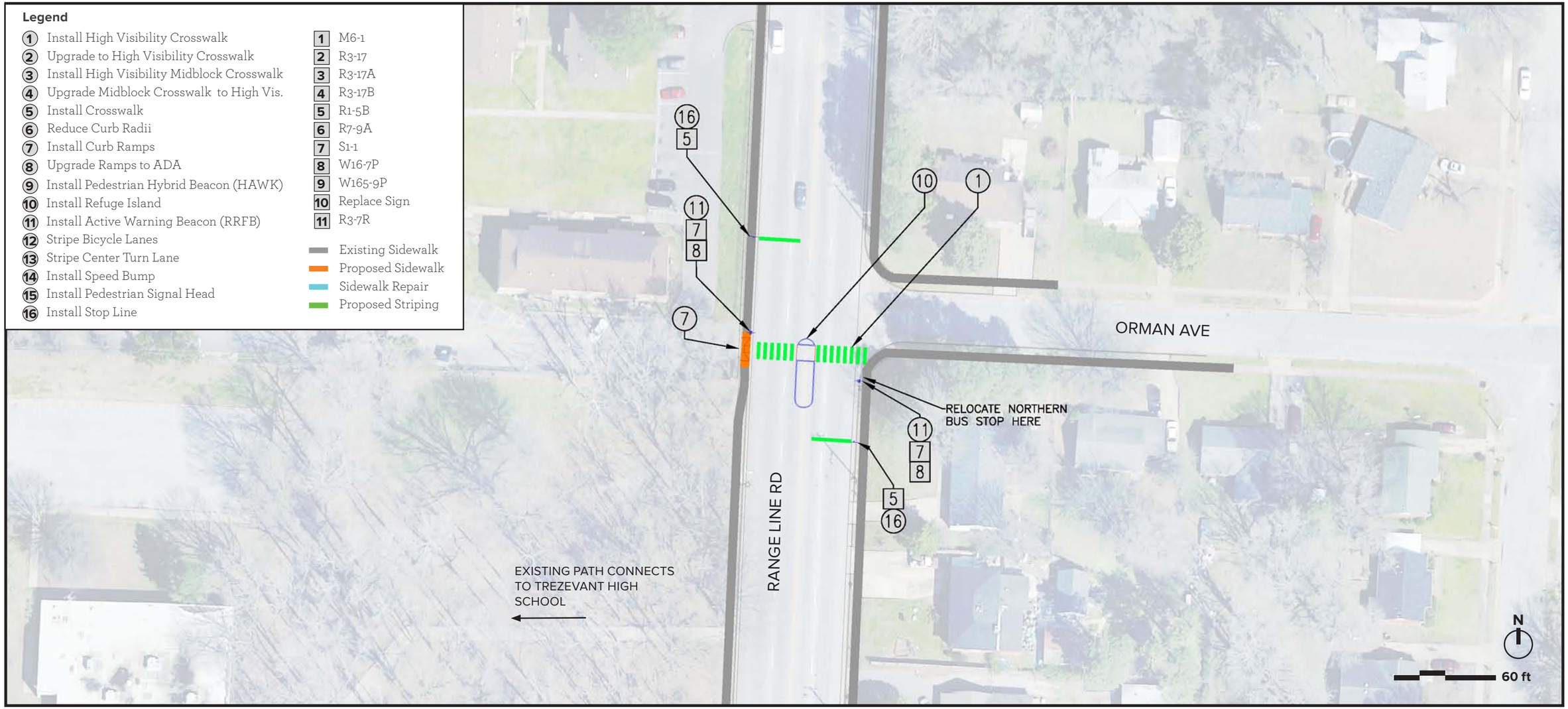
Existing Issues

- Range Line Road divides neighborhoods from Trezevant High School as well as apartments from a highly-utilized bus stop
- Three pedestrian crashes were recorded on Range Line Road in the vicinity of Orman Avenue between 2007 and 2011
- No viable crossing of Range Line Road exists in this vicinity
- Intersection is along a priority pedestrian corridor in the *2014 Regional Bicycle & Pedestrian Plan*

Destinations Served

- Trezevant High School
- Bus stops`

PROPOSED IMPROVEMENTS



Project Components

- Install a high-visibility crosswalk and appropriate signage
- Install a pedestrian-actuated Active Warning Beacon (RRFB) for the crossing of Range Line with a pedestrian clearance interval of 20 s
- Reconfigure Range Line to add a median refuge in the current TWLTL where no left turn is needed
- Shift bus stop currently located to the north of this intersection to serve pedestrians on the west side of Range Line Road accessing that bus stop

Cost Estimate

Materials: $33,863
Mobilization/Traffic Control: $2,100
Engineering: $3,596
Contingency: $7,912
Total Cost: $47,471

Trinity Road Crossing Upgrade

At North Ericson Street

PROJECT LOCATION

EXISTING CONDITIONS

There are no marked crosswalks at the intersection of North Ericson Road and Trinity Road

Project Description

This intersection improvement project will greatly improve pedestrian access for those crossing Trinity Road in the vicinity of several destinations, including Cordova Elementary and the Memphis Public Library. Trinity Road has a posted speed of 45 mph and recorded traffic volumes of 15,000 AADT. Sidewalks and bike lanes exist in the vicinity, but this high-speed, wide road reduces pedestrian and bi-cycle mobility between neighborhoods and these destinations.

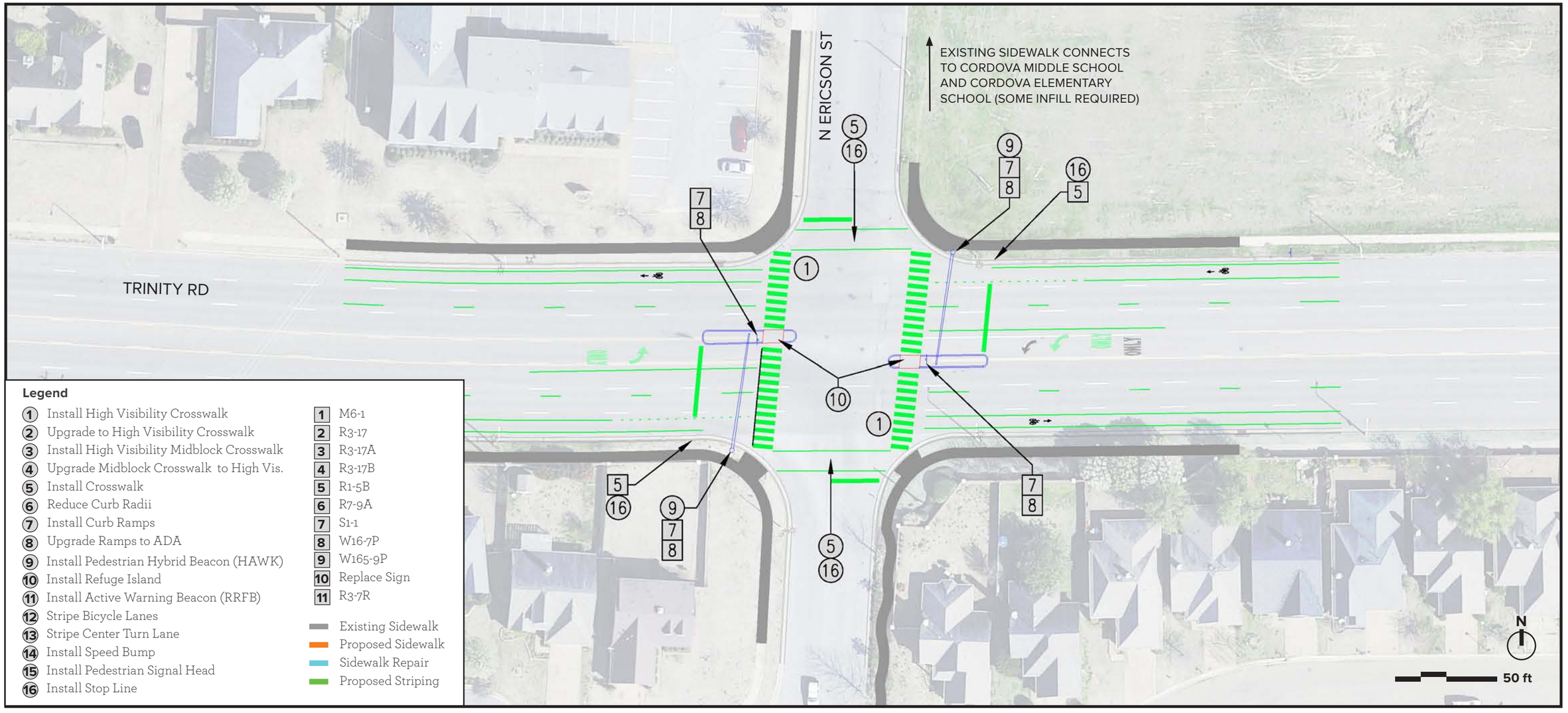
Existing Issues

- No pedestrian crossing is marked at this location
- The wide cross-section of Trinity Road and posted speed make pedestrian crossings difficult
- Important connection between area schools, parks, and public library

Destinations Served

- Cordova Elementary School
- Cordova Middle School
- Bert Ferguson Park
- Memphis Public Library

PROPOSED IMPROVEMENTS



Project Components

- Restripe 12' vehicle lanes and 6' bike lanes near the intersection to allow installation of a median refuge island
- Install a pedestrian-actuated Hybrid Beacon (HAWK)
- Install High visibility crosswalks across Trinity Road and crosswalks across Ericson Road

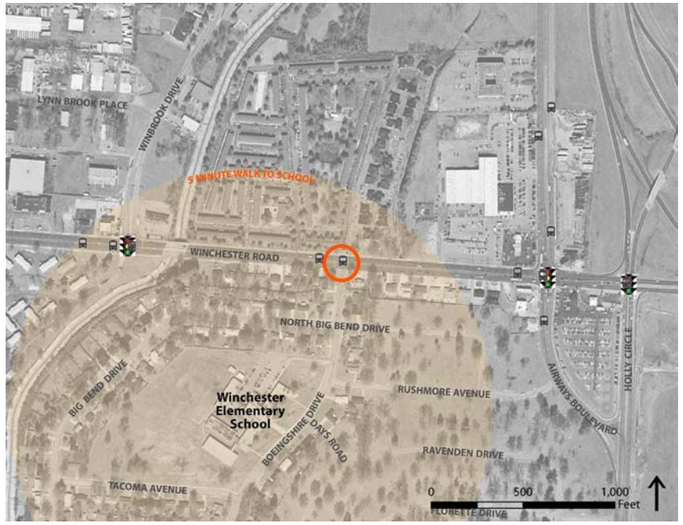
Cost Estimate

Materials: $134,826
Mobilization/Traffic Control: $8,359
Engineering: $14,319
Contingency: $31,501
Total Cost: $189,005

Winchester Road Crossing Upgrade

At Boeingshire Drive

PROJECT LOCATION



EXISTING CONDITIONS

The crossing of Winchester at Boeingshire provides direct access to Winchester Elementary School, while increasing pedestrian mobility for area residents

Project Description

This intersection improvement project will provide pedestrian access between area residential and Winchester Elementary School. Winchester Road is seven lanes wide with a posted speed of 40 mph and recorded traffic volumes of 24,300 AADT. Traffic analysis was conducted to analyze the impacts on vehicular delay of a pedestrian beacon at this location and projected a very small delay increase.

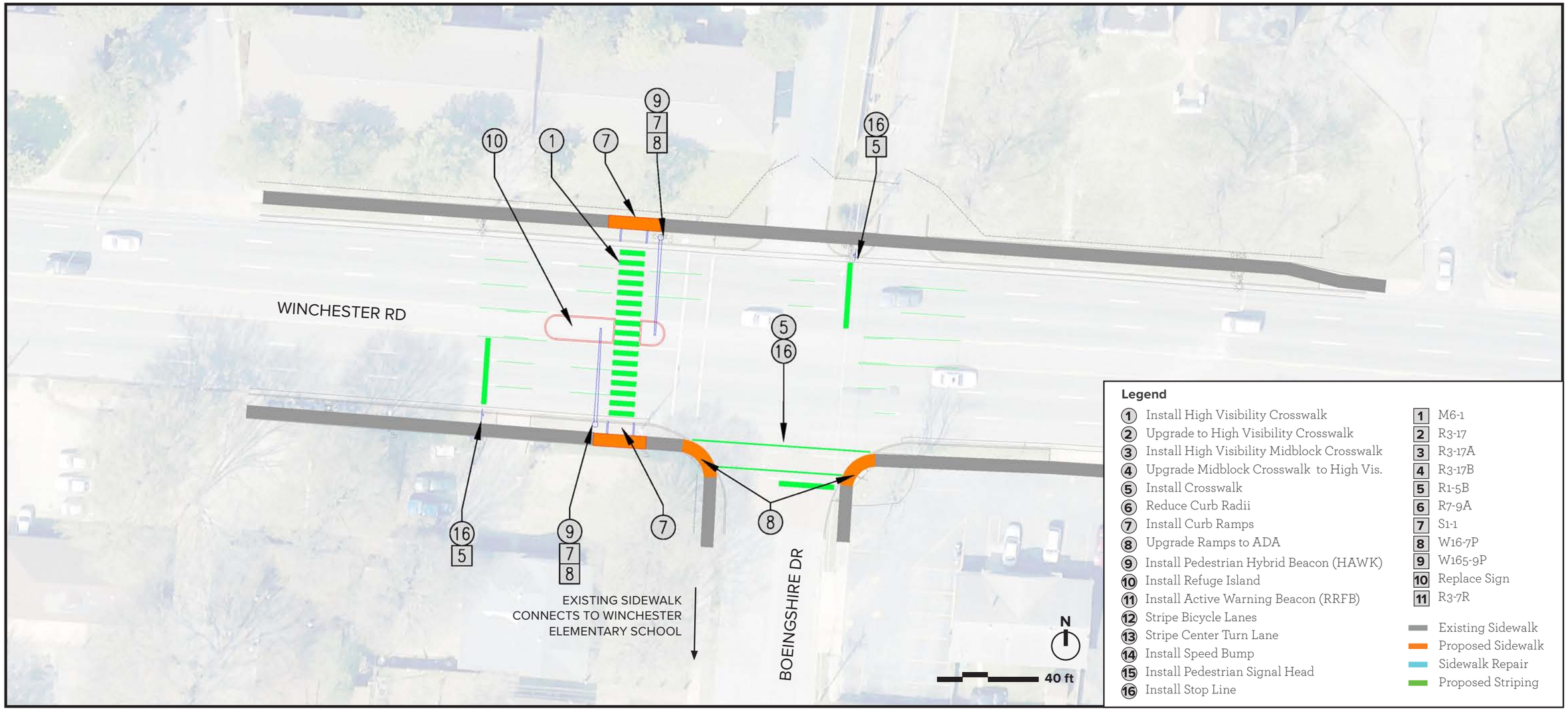
Existing Issues

- Current crossing is not visible and does not include any additional pedestrian safety components
- No viable alternate crossing of Winchester Road in the vicinity
- Crossing is potentially highly used for those traveling to and from Winchester Elementary
- Intersection is along a priority pedestrian improvement corridor in the *2014 Regional Bicycle & Pedestrian Plan*

Destinations Served

- Winchester Elementary School

PROPOSED IMPROVEMENTS: OPTION A



Project Components

- Shift existing crossing west and reconfigure Winchester Road to remove TWLTL and include a median refuge island
- Install a high-visibility crosswalk and appropriate signage for the crossing of Winchester west of Boeingshire
- Add crosswalk striping, signage, and a stop lines at Boeingshire and Winchester

Option A

- Install a pedestrian-actuated Hybrid Beacon (HAWK) with a pedestrian clearance interval of 23 s

Option B

- Reduce the road from 7 lanes to 5 lanes with buffered bike lanes
- Install a pedestrian-actuated Active Warning Beacon (RRFB) with a pedestrian clearance interval of 23 s

Cost Estimate

Materials: $126,255
Mobilization/Traffic Control: $7,828
Engineering: $13,408
Contingency: $29,498
Total Cost: $176,989