

HENDERSONVILLE PEDESTRIAN SAFETY STUDY



SEPTEMBER 2021

Acknowledgements

Several partners collaborated to lead the Hendersonville Pedestrian Safety Study. Representatives from the following agencies and departments worked together to analyze conditions and develop recommendations for the study area described in this report. VHB Engineering NC, P.C. provided technical support to this study as a consultant to NCDOT.



Traffic Safety Unit
North Carolina Department of Transportation



City of Hendersonville

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Hendersonville Tech Memo

Study Purpose

This study is part of a pilot Pedestrian Safety Improvement Program (PSIP) for mid-sized cities in North Carolina¹. The program is one of several programs and projects NCDOT has created to address continued increases in pedestrian fatalities and serious injuries resulting from motor vehicle crashes across North Carolina. Hendersonville was chosen as a priority city for this program due to an overrepresentation of severe injury and fatal pedestrian crashes for both total and per capita pedestrian crashes within the city limits, per the most recent 10 years of crash data.

The primary objective of the study is to develop near-term infrastructure projects that address specific pedestrian safety deficiencies in Hendersonville as identified using both crash- and risk-based approaches. These projects may be candidates for NCDOT safety funding and implementation, but project concepts may also be considered for implementation through other NCDOT activities (i.e. resurfacing) or projects (i.e. programming in the State Transportation Improvement Program (STIP). Hendersonville is encouraged to also integrate the concepts into local capital projects or studies.

In addition to the recommendations in this study, NCDOT intends to maintain a working relationship with Hendersonville, continuing to monitor conditions and identify opportunities for improvement. Likewise, local agency staff and officials should participate in ongoing coordination with NCDOT and French Broad River Metropolitan Planning Organization (FBRMPO), identification of pedestrian safety needs and deficiencies, and implementation of pedestrian safety improvements and proven countermeasures.

Study Approach

The study used several rounds of data analyses and stakeholder input to identify priority locations in Hendersonville. After selecting Hendersonville as a priority city based on an over-representation of fatal and serious injury pedestrian crashes, NCDOT Traffic Safety Unit (TSU) developed a tool to screen the road network in Hendersonville for pedestrian crash risk. From this initial screening, the project team conducted informal field visits at a few, specific locations to observe conditions and behaviors on the ground.

Simultaneously, the consultant team gathered additional information and assessed local plans and projects and conducted stakeholder interviews with local agency and community group representatives to gather additional information/data. The project team then presented the existing conditions to City staff and other stakeholders to gather feedback. The project team then identified locations for further investigation through data counts, TEAAS crash analysis, or field observation. After a second stakeholder meeting to present this additional information, the project team met and discussed findings and recommendations.

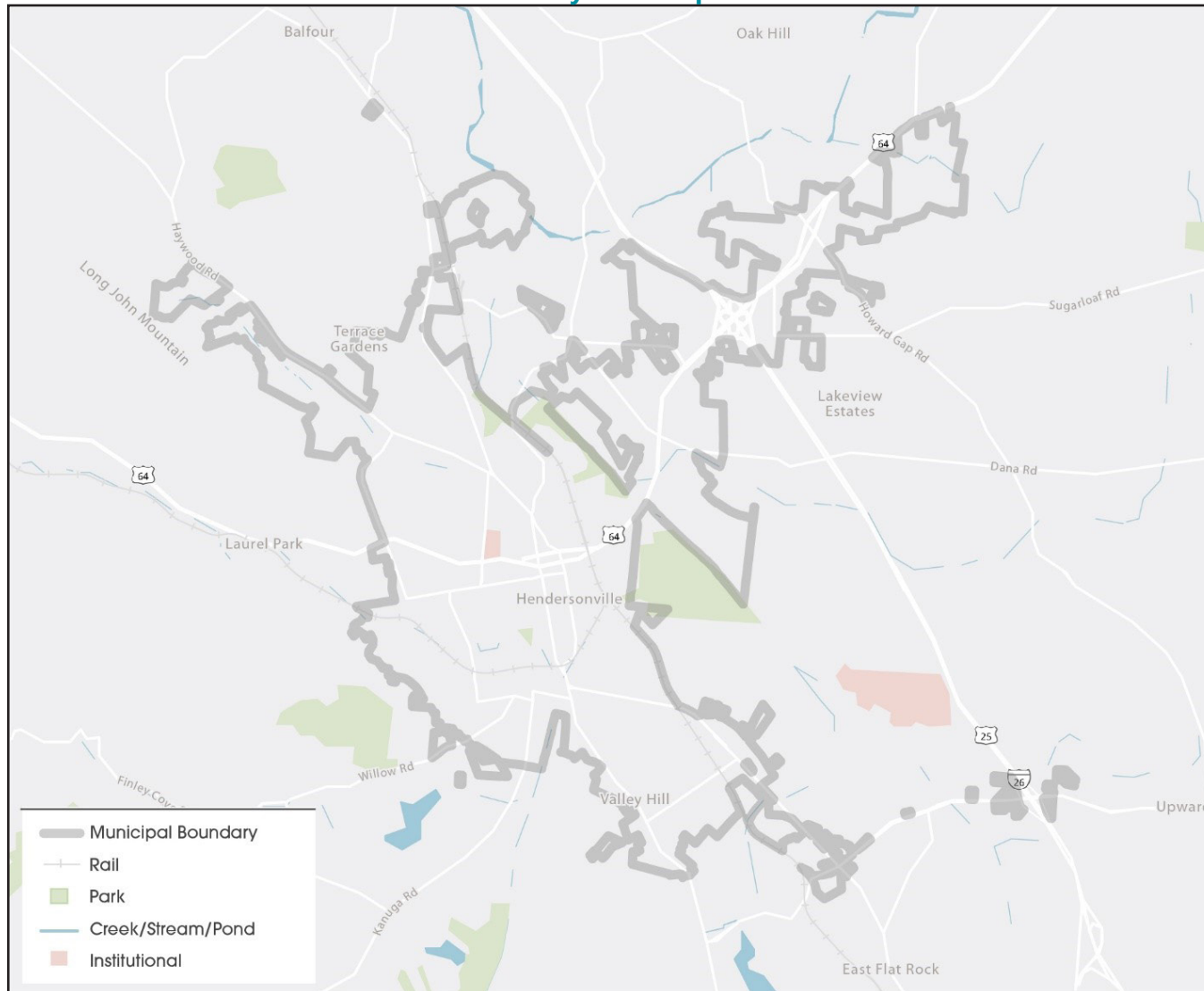
¹For the purposes of this program, mid-sized cities are defined as those with a population equal to or less than 75,000 (as of most recent estimates for the incorporated area).

Existing Conditions

Study Area

The study considered locations within the Hendersonville city limits. While locations outside of the municipal boundary were not analyzed, the potential effects of development and destinations beyond the boundary on transportation within Hendersonville were considered.

Study Area Map



Safety Overview

In addition to reviewing the past ten years of historical bicycle and pedestrian crash data, TSU created a systemic network screening for Hendersonville roads. The network screening considered a variety of factors, including:

Location Specific

- Number of Lanes
- Speed Limit
- Traffic Volume
- Transit Presence
- Pedestrian Crash History

Socio-economic

- Income
- Rentals
- Vehicle Ownership
- Population Density
- Employment Density

Pedestrian Volume Surrogates

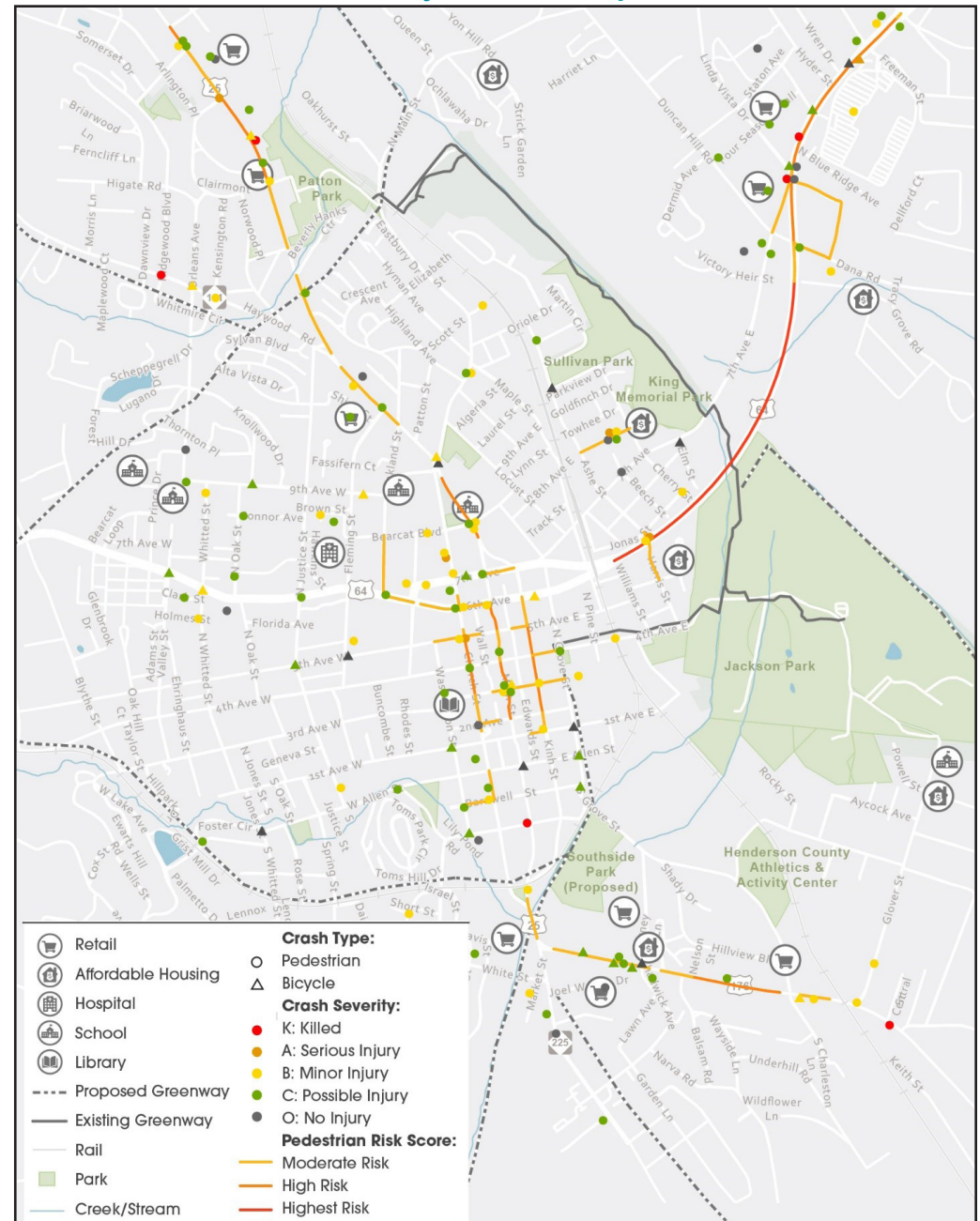
- Stores
- Restaurants
- Schools
- Libraries

The network screening assigned a risk score to each segment of road based on its combination of factors, as visualized in the Safety Map. The roads with the highest scores included several roads downtown and major arterials leading into the city, including: Church and King Streets, US 64 (Four Seasons Boulevard/6th Avenue W), US 176 (Spartanburg Highway), and US 25 (Asheville Highway).

The most recent historic pedestrian and bicycle crash data (2009-2018) was also reviewed to identify crash clusters and fatal and severe injury crash locations. Crash clusters are found on US 64 near Blue Ridge Mall, in downtown, and near the cluster of grocery stores at US 176 and NC 225 (S Main Street). Fatal and severe injury crashes were mostly found on major arterials on the outskirts of the city where speeds tend to be higher, specifically: US 64 near Blue Ridge Mall, on US 25 (Asheville Highway) north of Patton Park, and US 176 east of Grove Street.

This initial analysis guided the project team's selection of locations for site visits and further data collection and in-depth crash analysis. Particular attention was paid to locations near pedestrian destinations (e.g., grocery stores, major retail stores, the hospital, schools, etc.), affordable housing, bus stops, and places existing or future trails cross roadways.

Safety Overview Map



State and Local Projects

Past and Current Projects

City of Hendersonville and Henderson County

- Hendersonville has used two bond initiatives in the past ten years to construct sidewalks and completed a sidewalk and curb ramp inventory in 2019. Projects included the addition of around 3,000 ft of sidewalk and pedestrian signals along US 64 and several phases of downtown sidewalk improvements.
- The City completed a streetscape project on Maple Street (2018) and on 4th Avenue (2020) to provide a more pedestrian friendly route between 7th Avenue and downtown.

NCDOT

- Ongoing NCDOT safety project on a ¼ mi stretch of US 176 (Spartanburg Highway) from Grove Street to Old Spartanburg Road. The project will install pedestrian signals, crosswalks, and curb ramps at both intersections for \$115,000. Was temporarily put on hold. The timetable for completion is currently unknown.
- NCDOT recently installed pedestrian signal heads at several intersections in Hendersonville.

Future Projects

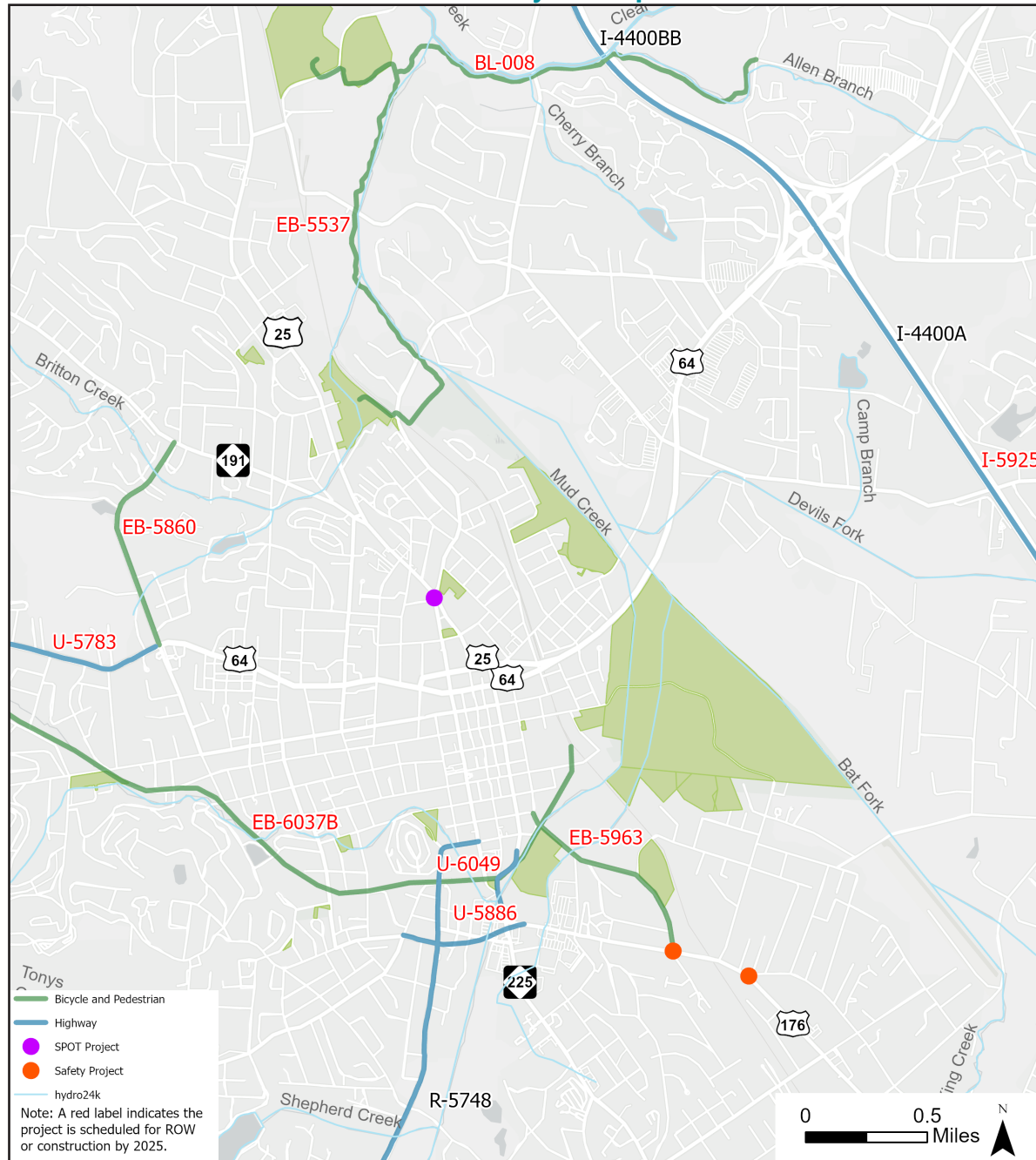
City of Hendersonville and Henderson County

- The City is currently designing a streetscape project along 7th Avenue, including beautification efforts with landscaping and pedestrian amenities like raised crosswalks.
- The City is also working on expanding the Oklawaha Greenway along Mud Creek
- A 1.4 section of Clear Creek Greenway from the existing Oklawaha Greenway at Berkeley Mills Park to the Highland Square Regional Activity Center is funded through FBRMPO (BL-008). Construction is set for 2024. The city is interested in possibilities for crossings at Lakewood Rd and Clear Creek Rd and connections to existing pedestrian facilities and destinations (e.g. Walmart).
- The County is focused on design and construction of the Ecusta Trail west from Kanuga Rd (EB-6037B) and anticipates putting out an RFP in November 2021. The County is currently funding ROW acquisition. The City views connecting the trail to Downtown as a priority.
- The City will be building a parking deck next year along Church St between 4th and 5th Avenues and plans to incorporate concrete bulb-outs at the 5th and Church intersection.
- The City noted there is potential for up to three new hotel developments downtown.

NCDOT

- NCDOT has planned the resurfacing of Church St and King St coming up in the spring of 2022. Curb ramps will be upgraded to be ADA compliant as part of the resurfacing. The City will do underground utility work in 2021, ahead of the paving project, and could incorporate recommended pedestrian safety improvements.
- Relevant State Transportation Improvement Program (STIP) Projects:
 - **U-6049 and U-5886** - Widening of Bridge 440143, over Mud Creek, to 5-lanes and the realignment of White Street from Willow Road to Spartanburg Highway
 - **EB-6037B** - Ecusta Trail, from Brevard Bike Path in Brevard to Kanuga Road in Hendersonville. Construct Multi-use Path.
 - **EB-5537** - Oklawaha Greenway, Patton Park to Balfour Road/Berkley Mills in Hendersonville. Construct Greenway.
 - **BL-0008** - Construct multi-use path from Berkley Mills Park to Lakewood Road.

Future Projects Map



Data Collection and Crash Analysis

Traffic Counts

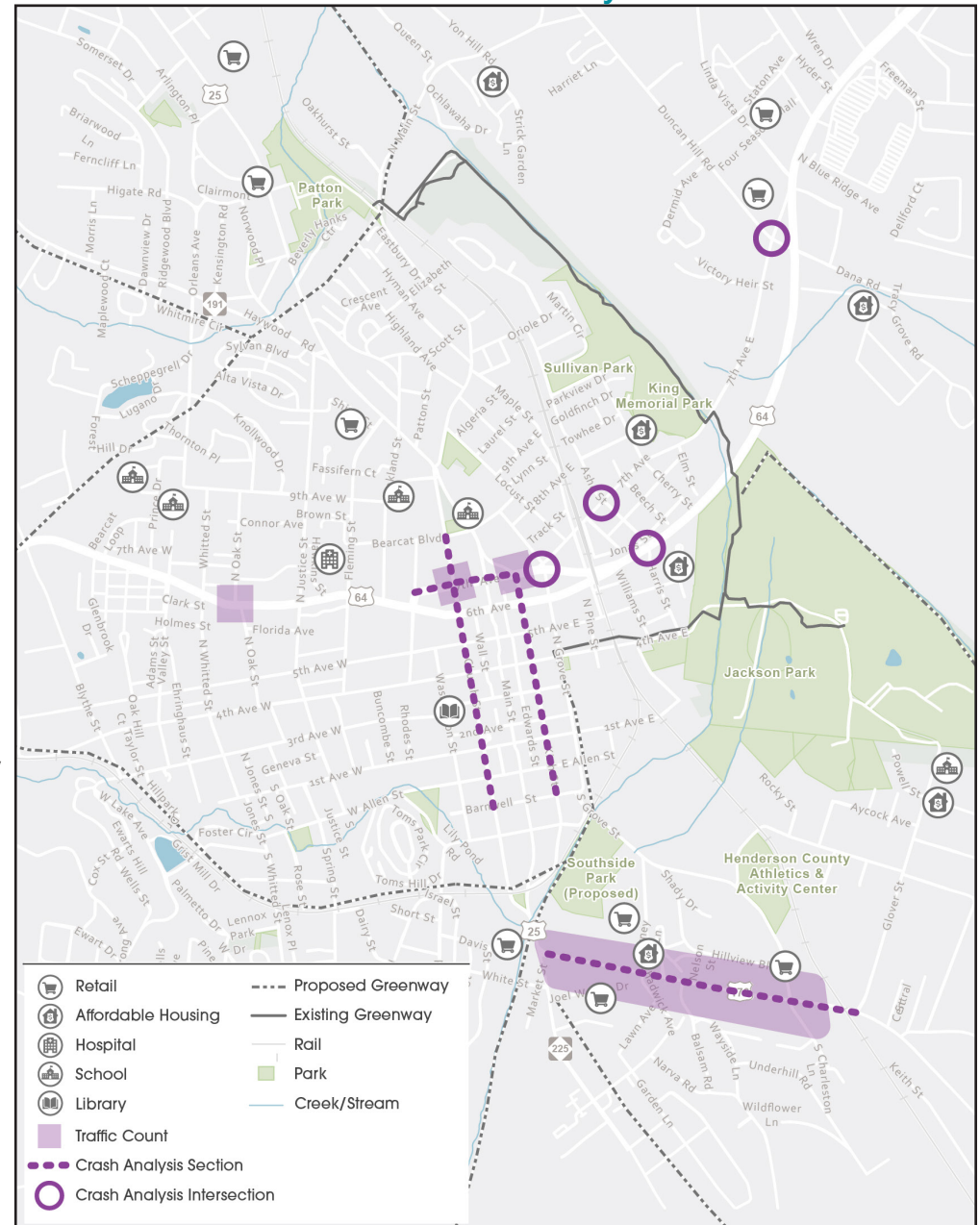
The study team collected 16-hour counts at 6 intersections within the study area and a 24-hour pedestrian count at US 176 (Spartanburg Highway) at Nelson Street, during a typical workweek under acceptable weather conditions. See the Appendix for additional data for pedestrian and vehicle counts for each leg of these intersections, respectively. The highest pedestrian volumes are seen along US 176 (Spartanburg Highway) near Nelson Street and on US 64 (7th Avenue) at Main Street and King Street. Vehicle counts are highest on King Street, Church Street, US 64 (7th Avenue), and US 176 (Spartanburg Highway), with a strong left turning movement from US 64 onto Church Street.

Crash Analysis

The study team also use the Traffic Engineering Accident Analysis System (TEAAS) to more closely analyze crash patterns of all traffic crash types at locations highlighted in the initial crash history and segment risk overview. This analysis was done to identify potential patterns that could pose increased risk to pedestrians at an intersection or along a segment of corridor.

Some crash patterns found were red light running, turning movement, and rear end crashes in downtown locations, and frontal impact crashes on US 176 between Chadwick Avenue and Grove Street. All of these can have harmful implications on pedestrians navigating the intersection. These crash analyses have been summarized in the recommendation section, for a limited number of intersections examined, and detailed TEAAS analyses are in the Appendix.

Data Collection and Crash Analysis Locations



Existing Plan Summary

This section summarizes existing plans relevant to pedestrian safety in the City of Hendersonville. A more detailed summary can be found in the Appendix.

City of Hendersonville Pedestrian Plan

This plan (2007) lays out a 20-year vision for the pedestrian network in Hendersonville. It identifies 15 short-term projects (5 years) and 31 long-term projects (20 years). Two sidewalk projects identified in the plan, on Grove Street and Blythe Street, are included in the Hendersonville Capital Improvement Plan (CIP) for Fiscal Year 2020-2021. The total cost for the two projects are \$1.6 Million and \$2.1 Million, respectively.

City of Hendersonville Bicycle Plan

This plan (2017) aims to encourage bicycling through the construction of bicycle facilities, implementation of local policies, and creation of educational programs. The plan identified nine priority projects, including:

- Bike lanes on 7th Avenue between Grove Street and the Oklawaha Greenway
- Buffered bike lanes on Bearcat Boulevard between Oakland Street and N Main Street
- Bike Lanes on Grove Street between Spartanburg Highway and 5th Avenue.

Henderson County Greenway Master Plan

This plan, adopted in April 2019, lays the foundation for the County's greenway efforts over the next 30 years. Three types of greenways are recommended – Priority Greenways, Destination Greenways, and Connection Greenways. The plan envisions a 71-mile network of trails. The priority greenways are:

- Oklawaha Greenway
- Ecusta Trail
- French Broad River Greenway

The FBRMPO awarded approximately \$5 Million in Surface Transportation Block Grant- Direct Attributable (STBG-DA) funding for the first 5.75 miles of the Ecusta Trail in Hendersonville in August 2020. The Hendersonville terminus will be on South Main Street in downtown Hendersonville.

Other Plans

SPOT 6.0 Project List

The Strategic Prioritization Process (also referred to as SPOT) is used to develop the State Transportation Improvement Program (STIP), which identifies the projects that will be funded across the state during a 10-year period. The relevant SPOT 6.0 bicycle, pedestrian, and highway projects list for Henderson County include:

- Allen Branch Greenway (Clear Creek Greenway): Multi-Use Path from US 64 to I-26.
- Oklawaha Greenway Extension: Multi-Use Path from Jackson Park to Blue Ridge Community College.
- Brooklyn Avenue: Sidewalks from NC 225 to US 176.
- US 64: Sidewalks from Orrs Camp Road to Howard Gap Road.
- Ecusta Trail: Rail-to-Trail from Kanuga Road to Transylvania County Line.
- Intersection improvement at US 25B (Asheville Highway) at North Main Street

Project Plans

U-5886/U-6049

U-5886 will realign and extend the road from Hebron Road to White Street (S.R. 1170) and US 176/Spartanburg Highway. The project will connect White Street to US 176/Spartanburg Highway south of the intersection of NC 225/S Main Street and US 176. U-6049 will widen the bridge over Mud Creek to five lanes and add a roundabout at the junction of South Church Street, South Main Street, and South King Street.

Hendersonville High School Traffic Impact Analysis (2019)

An updated traffic impact analysis (TIA) was done for Hendersonville High School in 2019, supplanting the original 2017 TIA. One recommendation of the TIA was to keep 9th Avenue closed as a through road and use a right-in/right-out school entrance in its place. More recently, a roundabout project was submitted to SPOT 6.0 for the intersection of US 25 Business and 9th Avenue/North Main Street. The initial estimate for the project is about \$3 million.

Stakeholder Interview Themes

Areas of Concern

US 64

- Previous fatal crashes near the mall and South Main Street.
- Signal Hill/Duncan Hill area is growing rapidly and may present equity concerns.
- People cross at Thompson Street to access services at the Interfaith Assistance Ministry.
- There have been serious accidents at the Walmart and Blue Ridge Health intersections. A lot of homeless population camps out behind Walmart/Sam's and camp residents cross to Blue Ridge Health which provides services to the homeless.

Downtown

- Confusion over the one-way streets (King Street and Church Street), particularly from visitors, leads to a lot of wrong way turns/driving. FBRMPO could fund a study that might advance the possibility of a one-way to two-way conversion.
- Red light running crashes are common on Church Street/King Street. This may be exacerbated by signal visibility issues.
- 7th Avenue at Main Street and King Street are close to people crossing between cars sometimes and not at intersection, more traffic on that street are visitors that can get confused with one-way streets and inconsistency with stop sign/traffic light mix. Ease of traffic flow for pedestrians might let them feel they can cross.
- City has talked about incorporating on-street parking on west side of King Street and adding bulb-outs to increase curb radii.
- Asheville High School at NC 191 and North Main Street- FBRMPO has looked at constructing a roundabout there to slow drivers. A previous SPOT cost estimate for the roundabout came to \$3.2 million. The roundabout could potentially be funded by the NCDOT Division and partially or fully with safety funds.

Oak Street

- Whitted & Oak Streets are frequent pedestrian routes between neighborhoods south of US 64 West and the Elementary/Middle Schools with destinations at the YMCA and after school programs.
- Fleming Street is four-way light at US 64/6th Avenue near an internal medicine/orthopedic practice and people park across the street and walk to get there.

7th Avenue

- Many pedestrians use 7th Avenue, there are many pedestrian generators and destinations. 7th Avenue has fewer problems with vehicle speeds or people crossing where they shouldn't because blocks are shorter and (possibly due to new police department presence).

North Main Street

- People speed from near the High School north and the Oklawaha trail crossing is scary with people driving into town down the hill, blind curves, etc.

US 25 (Asheville Highway)

- Connection between Ingles on US 25 – Oklawaha Greenway of interest.
- Demand for pedestrian crossing near Clairmont Drive at US 25 to access the Greenway.

US 176

- US 176 by NC 225 is a problem area because of the prevalence of grocery stores and driveways.
- US 176 at Brooklyn Avenue is four lanes across and can be hard to get across in time and there is a bus stop on only one side.
- Grocery store parking lots are common spots for panhandling.
- US 176 and Upward Road is proximate to affordable apartment complexes like Quail Cove and King Creek apartments; people cross to access the Children and Family Resource Center/other services located across the street.
- US 176 is not highly congested and people will speed; some people will go that way to get to I-26 to avoid US 64.

Recommendations

City-Wide

Some traffic or safety conditions are typical across the study area, such as traffic speeds above posted limits and turning movement conflicts with crossing pedestrians. Some engineering treatments can be applied more consistently in the study area to improve pedestrian safety. The following recommendations apply to wide swathes of the study area:

Improve existing pedestrian crossings

- Add pedestrian countdown signal heads and marked crosswalks at all signalized intersections within locations assessed during the study (i.e., US 64 near I-26, US 25 at Clairmont Drive).
- Improve or remove existing uncontrolled crosswalks along high-risk roads.
- Improve trail crossings with Rectangular Rapid Flashing Beacon (RRFB) and/or refuge islands. See Appendix X for trail crossing best practices.
- Evaluate bus stop placement to maximize safety of pedestrians trying to access public transportation. See Appendix X for bus stop placement best practices.

Add Leading Pedestrian Intervals (LPI) at downtown intersections

- Higher pedestrian exposure across the study area.
- Tourists and older pedestrians are less familiar with the environment and may be slower to cross.

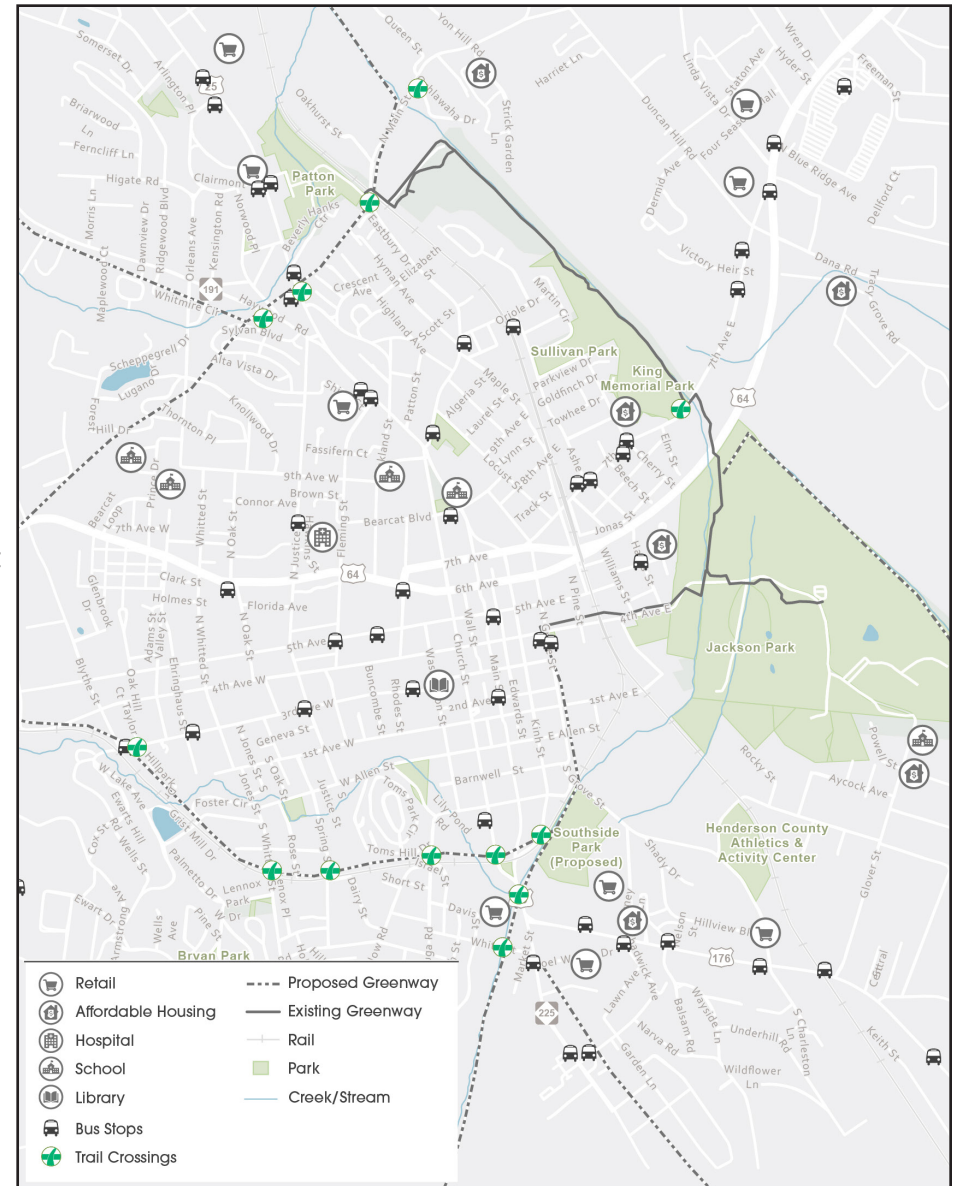
Retime signals in downtown

- One-way roads like King Street, Church Street, 6th Avenue, and 7th Avenue are noted to allow excessive speeds during various times of day.
- Signal timing can be adjusted to balance phase and cycle lengths to reduce excessive speeds, discourage red light running, and provide more frequent pedestrian crossings.

Curb ramps and accessibility improvements

- One-way roads like King, Church, 6th Avenue, and 7th Avenue fall outside of typical pedestrian and driver expectations and can be particularly challenging for pedestrians with vision loss or impairment to navigate.
- Reconstruction or resurfacing projects may trigger accessibility upgrades to pedestrian crossings. In addition to curb ramp upgrades, accessible pedestrian signals (APS) and detectable warning pads can enhance accessibility at pedestrian crossings.

Bus Stop and Trail Crossing Locations



Site Specific

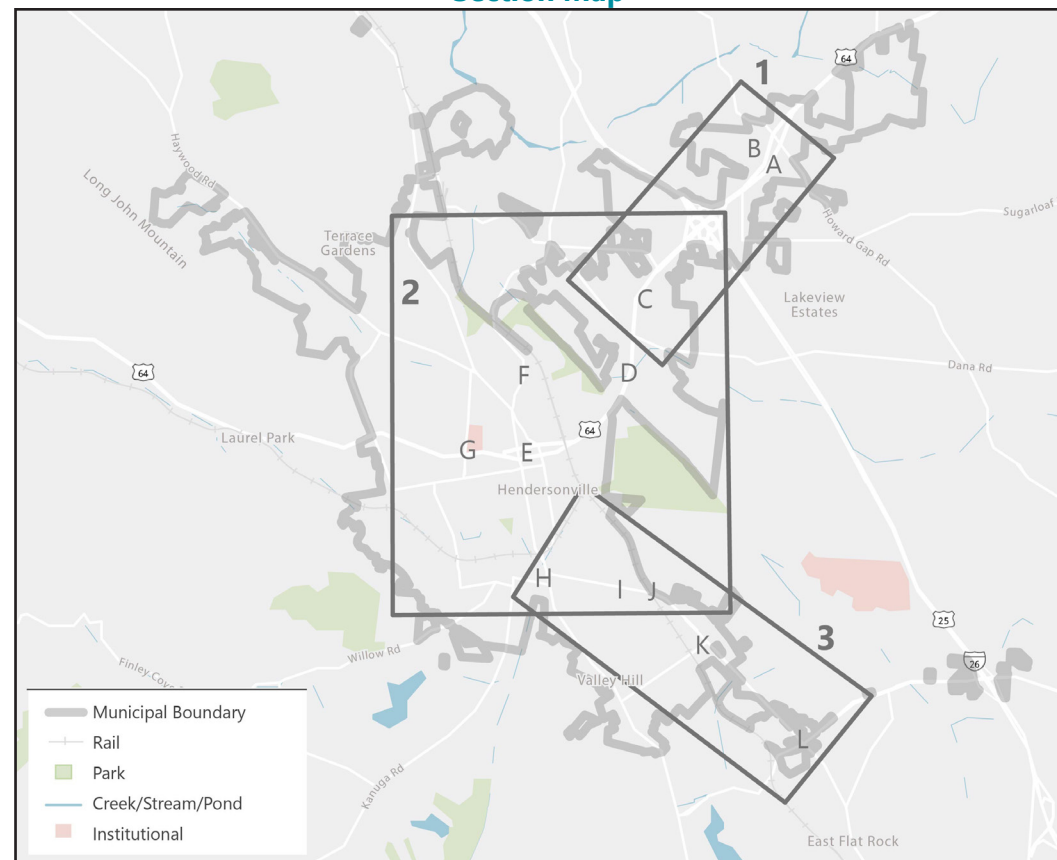
The project team considered each intersection, crossing, and corridor for a more tailored selection of engineering treatments. While the recommendations were informed by field observations, engineering surveys or designs were not prepared as part of this study. As the City of Hendersonville and NCDOT proceed toward implementation of the conceptual recommendations recorded in this study, more detailed engineering studies and plans will be required.

NCDOT and the City of Hendersonville will evaluate each of the site-specific improvements for eligibility through the Highway Safety Improvement Program (HSIP) and other local funding sources. The City of Hendersonville should review this study's findings and incorporate the recommendations into current and future transportation plans, where appropriate. The City and NCDOT should continue to collaborate to move toward consistent application of safety countermeasures elsewhere in the city. The process and criteria described in this summary report may be used as a guide for identifying recommendations for improving pedestrian safety.

Site specific recommendations from this study are grouped into the following sections and described in more detail below:

1. US 64 (Four Seasons Boulevard) Corridor
2. Downtown Hendersonville
3. US 176 (Spartanburg Highway) Corridor

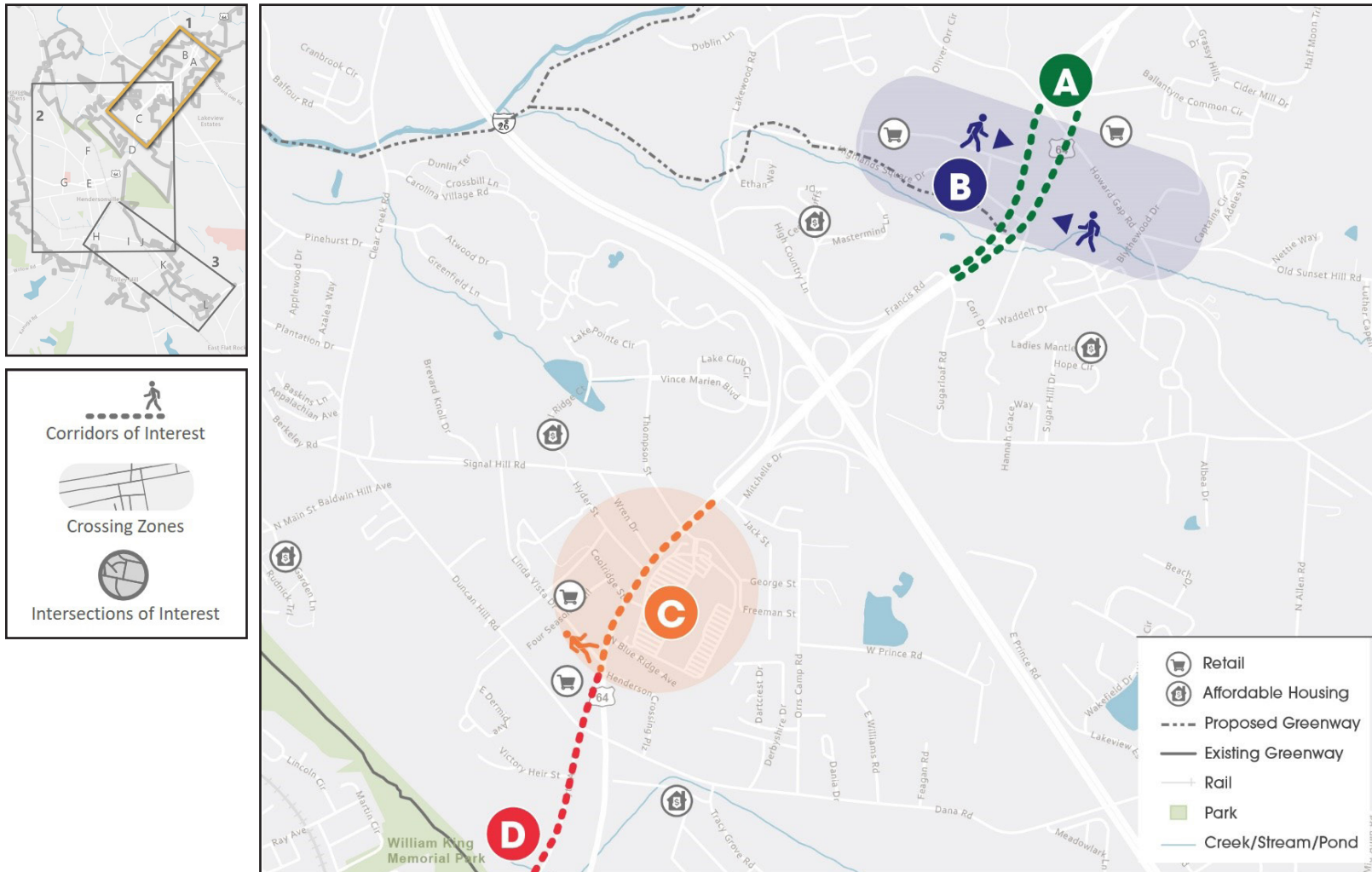
Section Map



Section 1: US 64 (Four Seasons Boulevard) Corridor

Section 1 looks at the US 64 corridor between areas of commercial development north of the I-26 interchange to just south of Dana Road. The corridor has suburban commercial development on either side, with some residential areas to the rear. The corridor has a four lane cross section with a center turn lane south of the interchange. The AADT ranges between 30,000-35,000 and the speed limit is 45 mph. There is complete sidewalk on the west side of the road near Blue Ridge Mall, between the I-26 interchange and downtown, but no sidewalk on the east side of the road. There is intermittent sidewalk on both sides of the road north of the interchange, near Walmart. The only crossings are at Coolridge Street and Howard Gap Road. Vehicle speeds are high, increasing the risk that a pedestrian crash will be fatal or severe injury. Apple Country Transit routes serve the entire length of the US 64 corridor in this area.

Section 1: US 64 Corridor



OPPORTUNITIES

- High vehicle speeds increase risk that a pedestrian crash will be fatal or severe injury.
- Only marked crossing at Howard Gap Road.
- Most pedestrian crossings observed at Highlands Square Drive and Howard Gap Road intersections. These crossings provide important access to destinations like Walmart and Blue Ridge Health, respectively.
- No existing lighting north of the I-26 interchange.

RECOMMENDATIONS

- Pedestrian crossings at signalized intersections between destinations.
- Lighting between I-26 and Howard Gap.

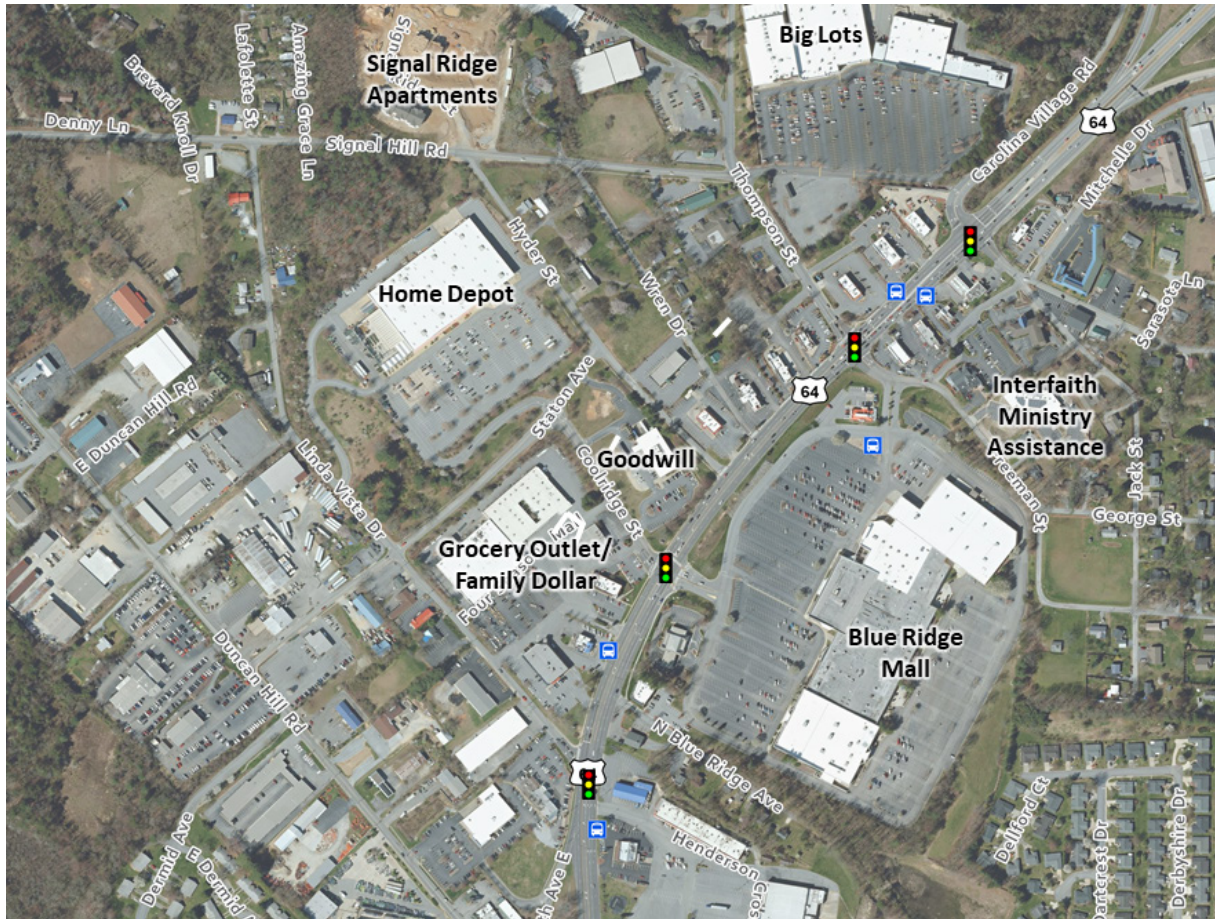


OPPORTUNITIES

- High vehicle speeds increase risk that a pedestrian crash will be fatal or severe injury. Previous fatal crashes at and midblock north of Linda Vista Drive, near an existing bus stop.
- Intersections without pedestrian signal heads or crosswalks.
- People cross at the Thompson Street/Freeman Street intersection to access services at the Interfaith Assistance Ministry.

RECOMMENDATIONS

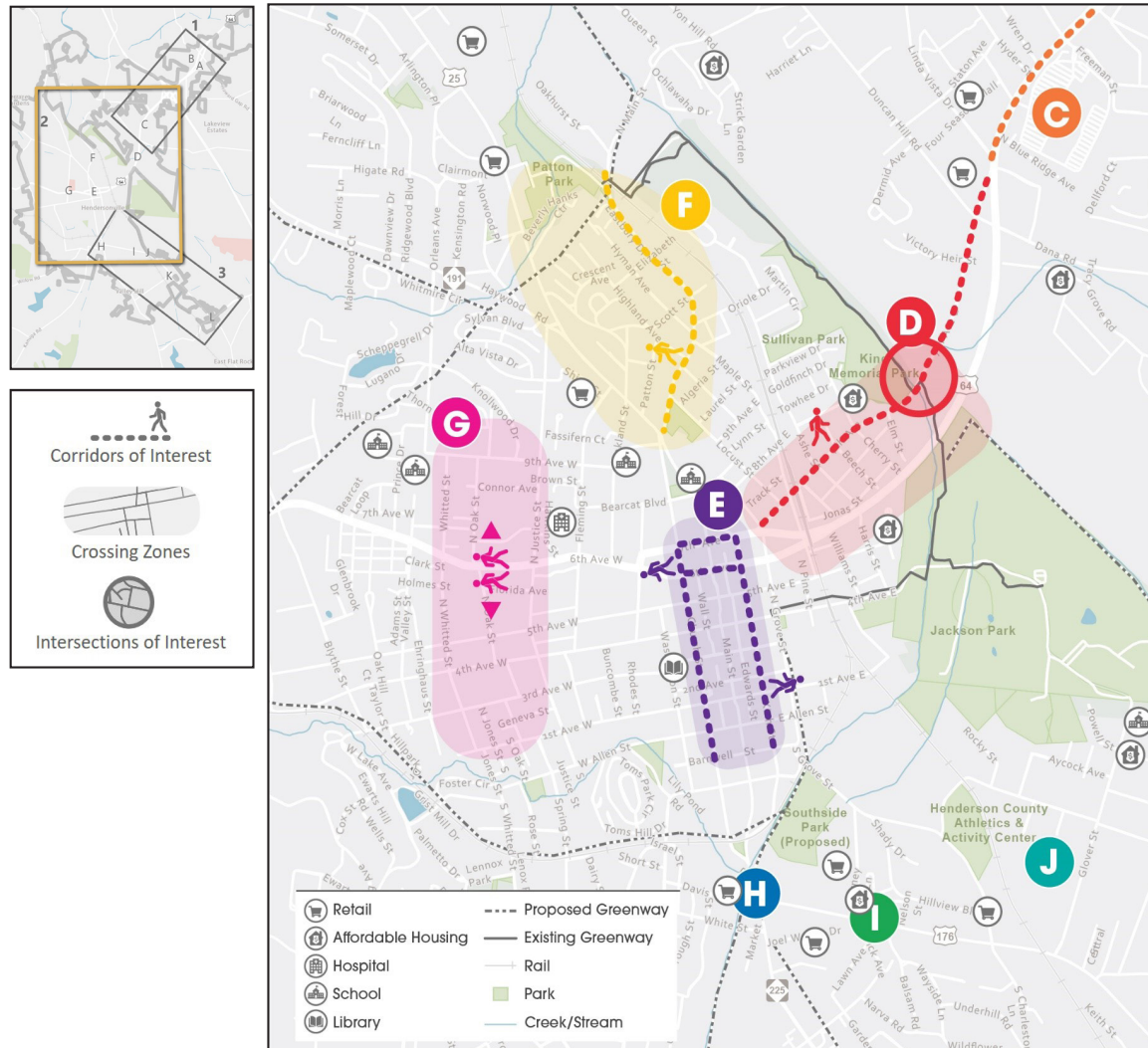
- Pedestrian crossings at signalized intersections.
- Lighting between Linda Vista Drive and I-26.
- Bus stop locations may need to be moved for improved pedestrian crossing.



Section 2: Downtown Hendersonville

Section 2 looks at the downtown Hendersonville area. The major corridors in downtown are King, Church, US 64 (6th Avenue), 7th Avenue, and US 25 (Asheville Highway). King Street, Church Street, 7th Avenue, and a short stretch of US 64 (6th Avenue) are one-way streets. US 25 (Asheville Highway) has the highest 2018 AADT with 28,000 vehicles per day north of the King Street/North Main Street intersection. US 64 (6th Avenue) has the second highest 2018 AADT, with approximately 24,500 vehicles per day east of downtown and 16,000 vehicles per day west of downtown. The AADT on King Street and Church Street are ranges between 14,500-10,000. The speed limit is 20 mph in the heart of downtown (Church Street/King Street/6th Avenue/7th Avenue) and 35 miles on the outskirts (US 25/7th Avenue/US 64 west of downtown). Existing infrastructure downtown forms a mostly complete network, with sidewalks on both sides of the streets and pedestrian heads at most signals. Apple Country Transit has three routes with service that overlaps in downtown.

Section 2: Downtown Hendersonville

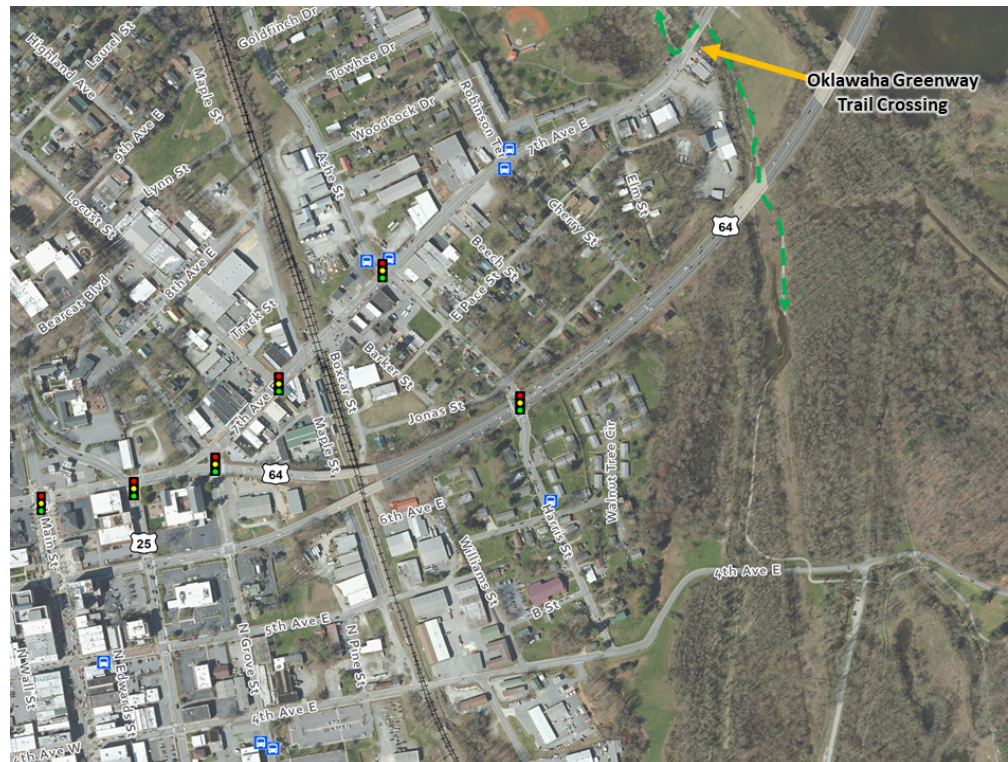


OPPORTUNITIES

- 7th Avenue is an important corridor with many pedestrian destinations, on-going redevelopment, and a pedestrian-friendly route that allows pedestrians to safely parallel US 64.
- A future city streetscape and beautification project is planned on 7th Ave. Previous projects were completed on Maple Street (2018) and 4th Avenue (2020) to improve access between 7th Avenue and downtown.
- The Oklawaha greenway crossing is uncontrolled and in a curve in the road where visibility for drivers is diminished.
- The Ashe Street/Harris Street intersection with US 64 is an important connector between neighborhoods north of 7th Avenue and neighborhoods south of US 64.

RECOMMENDATIONS

- Consistent pedestrian crosswalk markings and signal head installations at intersections on the corridor.
- Formalize painted curb extensions.



Drivers entering downtown west on 7th Avenue from US 64 experience an abrupt transition from an expressway-like road to the downtown grid. Common problems include high vehicle speeds, red-light running, and confusion over the one-way streets, which leads to wrong way turns. In order to address the safety problems these factors create for pedestrians, the following scenarios were analyzed:

- Scenario 1 - Provide a leading pedestrian interval at North Church Street and North King Street. Provide a protected left phase at N King St.
- Scenario 2 - Scenario 1 and remove westbound through-right lane from N Church Street to N King Street.
- Scenario 3 - Provide an exclusive pedestrian phase and geometric improvements at North Grove Street.

US 64 WESTBOUND VEHICLE QUEUE LENGTH (feet) 2040 PM			
Location	Scenario 1	Scenario 2	Scenario 3
N King St	488	607	383
N Main St	178	305	333
N Church St	480	513	446
N Grove St	---	---	281

For each scenario, the peak queue lengths were determined for the year 2040 for each network road. Scenario 2 had the longest future queue lengths of any scenario.



7th Avenue in Downtown Hendersonville, showing existing block lengths and scenario elements.

Scenario 1 and 2: U.S. 64 (7TH Avenue) at King Street

OPPORTUNITIES

- Pattern of red light running crashes.
- Most pedestrians cross on the north leg where there are no pedestrian signal heads.
- Westbound left turn conflicts and visibility issues with vehicles turning very quickly from King onto 7th Avenue.

US 64 WESTBOUND VEHICLE QUEUE LENGTH (feet) 2040 PM			
Location	Scenario 1	Scenario 2	Scenario 3
N King St	488	607	383
N Main St	178	305	333
N Church St	480	513	446
N Grove St	---	---	281

For each scenario, the peak queue lengths were determined for the year 2040 for each network road. Scenario 2 had the longest future queue lengths of any scenario.



Photo of the intersection of 7th Avenue with King Street taken from the southern approach. The skewed intersection reduces sight distance for drivers turning left onto 7th Avenue, decreasing the visibility of pedestrians crossing the west leg.

RECOMMENDATIONS

- Provide protected northbound left turn, which can be switched to a red arrow when pedestrians are crossing the west leg.
- Provide a pedestrian signal head on northern leg with a Leading Pedestrian Interval (LPI).
- With the addition of a protected left turn and LPI, the intersection would remain at an acceptable Level of Service (LOS) in 2030, increasing intersection peak hour delay by 15-20 seconds and queuing by ~100 feet. There is greater potential for spillback into upstream intersection in 2040.
- An exclusive pedestrian phase and lane reduction were also tested but resulted in queue spillback into upstream intersections.



Scenario 1 and 2: U.S. 64 (7TH Avenue) at Church Street

OPPORTUNITIES

- Pattern of red-light running crashes and angle crashes
- Heavy turning movement from 7th onto Church Street.
- Balanced pedestrian crossing counts on all legs of intersection.

US 64 WESTBOUND VEHICLE QUEUE LENGTH (feet) 2040 PM			
Location	Scenario 1	Scenario 2	Scenario 3
N King St	488	607	383
N Main St	178	305	333
N Church St	480	513	446
N Grove St	---	---	281

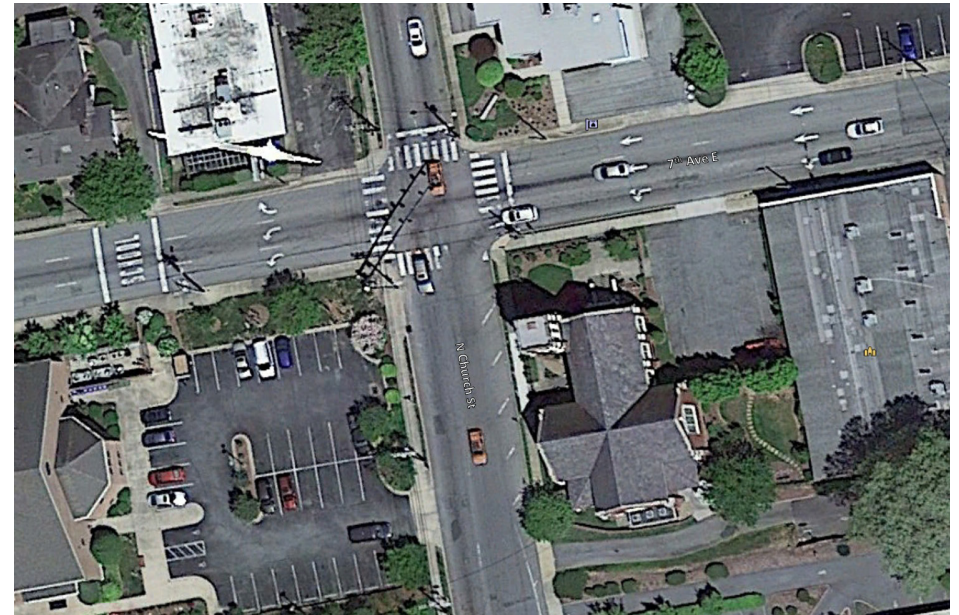
For each scenario, the peak queue lengths were determined for the year 2040 for each network road. Scenario 2 had the longest future queue lengths of any scenario.



7th Avenue at Church Street taken from the western approach. The heavy turning movement of vehicles onto Church Street gives pedestrians less opportunity to cross.

RECOMMENDATIONS

- Provide a LPI.
- With the addition of an LPI, the intersection remains at an acceptable LOS in 2030, increasing intersection peak delay by ~10 seconds and queuing by ~50 feet. The intersection remains at acceptable LOS in 2040, however greater potential for spillback into upstream intersections in 2040 PM peak.
- An exclusive pedestrian phase and lane reduction were also tested, however resulted in queue spillback into upstream intersections
- Potential future improvements include a protected left turn phase and tighter turn radii or curb extension to slow vehicle turning speeds.



Scenario 3: U.S. 64 (7TH Avenue) at Grove Street

OPPORTUNITIES

- Complex intersection with long crossing at US 64 and 7th Ave
- Pattern of rear end crashes and wrong-way crashes, with vehicles turning right on 64.
- Most pedestrians walking along the north leg (across Grove)
- No buffer between sidewalks and major roads.

US 64 WESTBOUND VEHICLE QUEUE LENGTH (feet) 2040 PM			
Location	Scenario 1	Scenario 2	Scenario 3
N King St	488	607	383
N Main St	178	305	333
N Church St	480	513	446
N Grove St	---	---	281

For each scenario, the peak queue lengths were determined for the year 2040 for each network road. Scenario 2 had the longest future queue lengths of any scenario.



Photo of the intersection of 7th Avenue at Grove Street taken from the eastern approach. The skewed intersection increases the crossing distance and makes it more difficult to navigate for pedestrians.

RECOMMENDATIONS

- Remove 7th Avenue section west of North Grove Street, and tie street directly into US 74
- Add narrow island to enforce right-in, right-out movement to North Grove Street
- Simplifies vehicular and non-motorized travel through the intersection, shortens the crossing distance and increase the directness of the pedestrian route between downtown and 7th Ave East.
- Has minimal impact to traffic operations with overall delay within a second or two of No-Build Operations



General Deficiencies

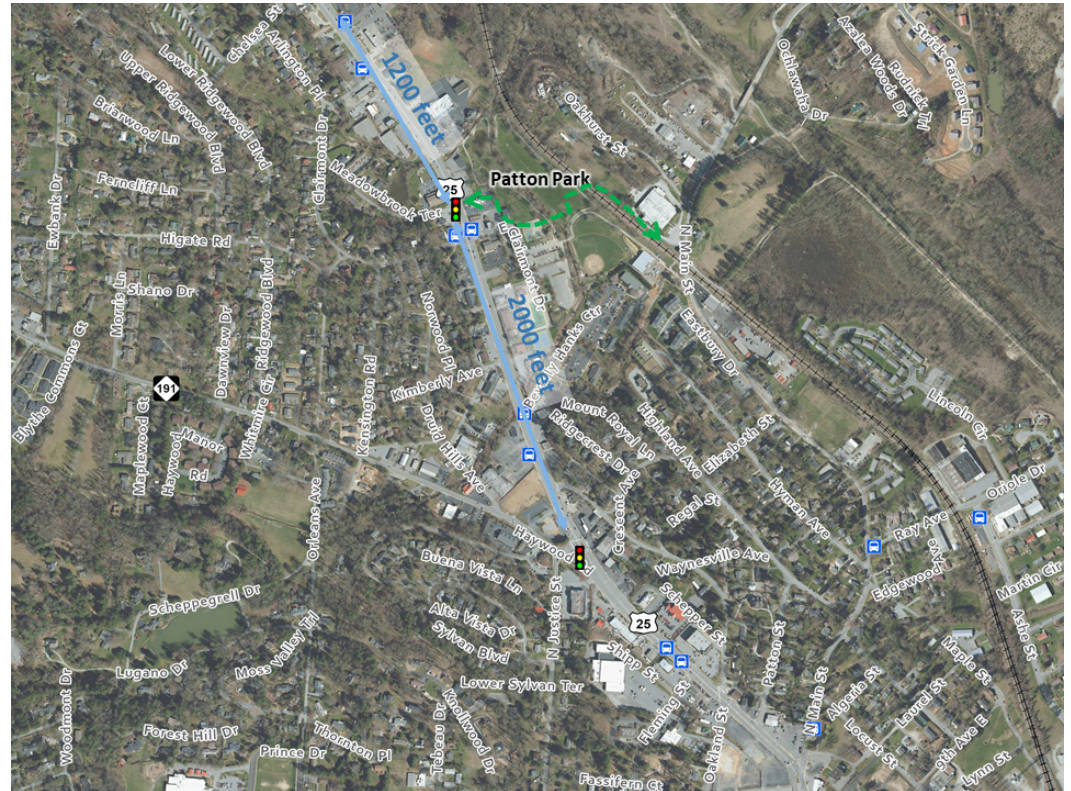
- High vehicle speeds on N Main, traveling north of the High School and near the trail crossing.
- Confusing vehicle and pedestrian movements at the intersection at US 25/North Main Street/9th Avenue make it difficult to navigate as a pedestrian.
- The pedestrian walkway does not currently connect through the island to cross south of intersection at US 25/North Main Street/9th Avenue.
- Existing project will modify the intersection to improve access to the high school. A roundabout was previously submitted for SPOT but not selected.

General Recommendations

- Evaluate WALK phase conflicts at Haywood and US 25 (Asheville Highway).
- Add pedestrian crosswalks and pedestrian signal heads across all approaches at Clairmont Drive and US 25 (Asheville Highway).



Existing intersection at US 25/N Main/9th Ave is challenging for pedestrians to cross.



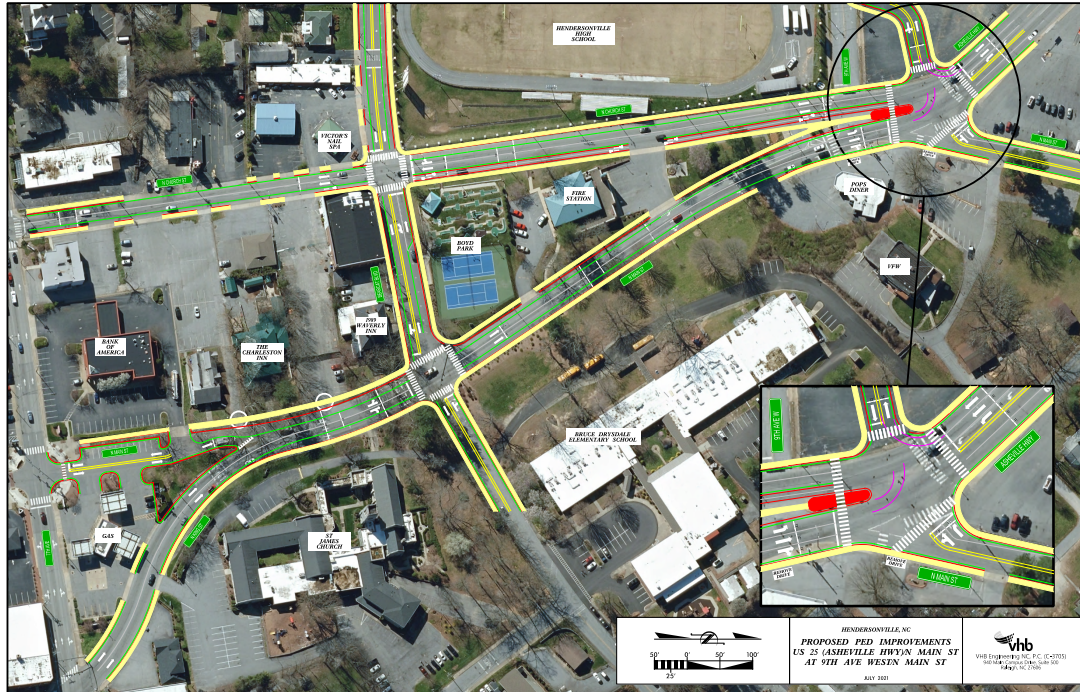
OPPORTUNITIES

- The pedestrian walkway does not currently connect through the island to cross south of intersection at US 25/North Main/9th Avenue.
- Existing project will modify the intersection to improve access to the high school. A roundabout was previously submitted for SPOT but not selected.

RECOMMENDATIONS

To address the safety issues described above, the intersection was reviewed for potential additional improvements. The design concept below was developed to visualize those improvements. A full-scale image can be found in Appendix X. The design concept shows the following recommendations:

- Narrow Main Street and Church Street to two lanes south of the intersection. The extra space can be re-allocated for additional pedestrian and bicycle facilities. (The design shows a two-way separated bike lane on the east side of Church Street and improved sidewalks on both sides of Main Street)
- Extend the pedestrian walkway through the island south of the intersection
- Provide a pedestrian refuge island on the southern leg crossing.
- Close the two driveways to Pop's Diner just south of the intersection.



Potential redesign option for US 25/North Main Street/9th Avenue. Highlights include narrowing Main Street and Church Street south of the intersection and installing a refuge island for pedestrians on the southern crossing.

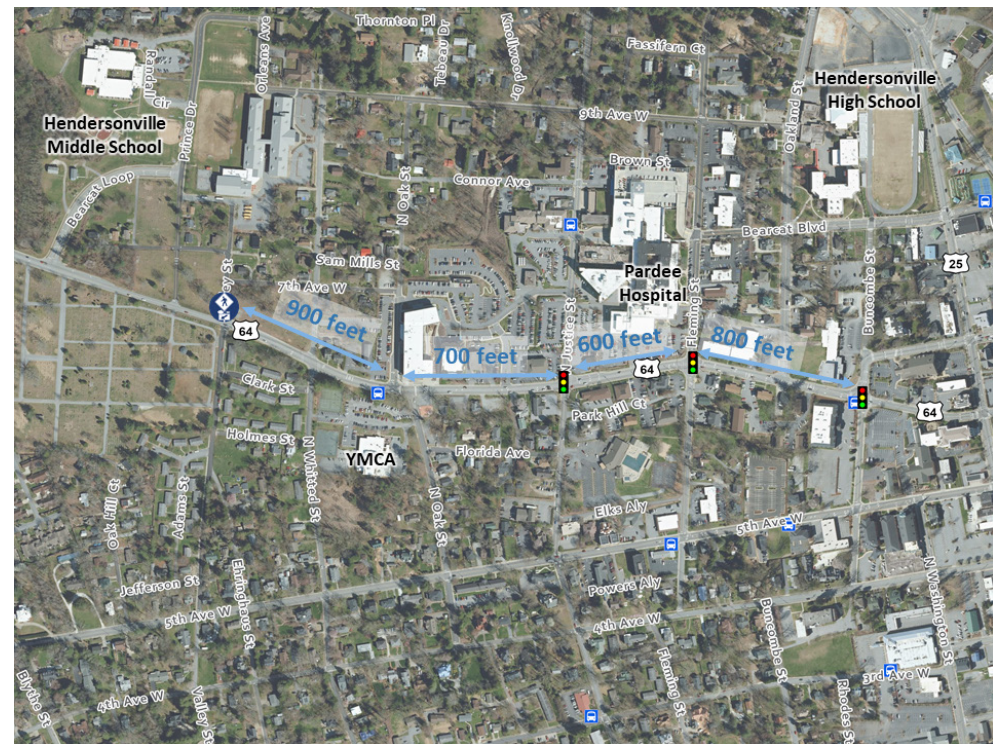
OPPORTUNITIES

- Pedestrian crossings between Blythe Street and Justice Street to access schools, YMCA, and senior center.
- Concerns about vehicle speeds along US 64.
- Large distance between controlled crossings.
- Whitted & Oak Streets are frequent pedestrian routes between neighborhoods south of US 64 West and the Elementary/Middle Schools.
- Future Ecusta trail crossing west of city along US 64.



RECOMMENDATIONS

- Manage speeds along the corridor.
- Make geometric improvements at uncontrolled crossings.
- Review bus stop locations for optimal placement.
- Provide consistent crosswalk markings and enhancements.

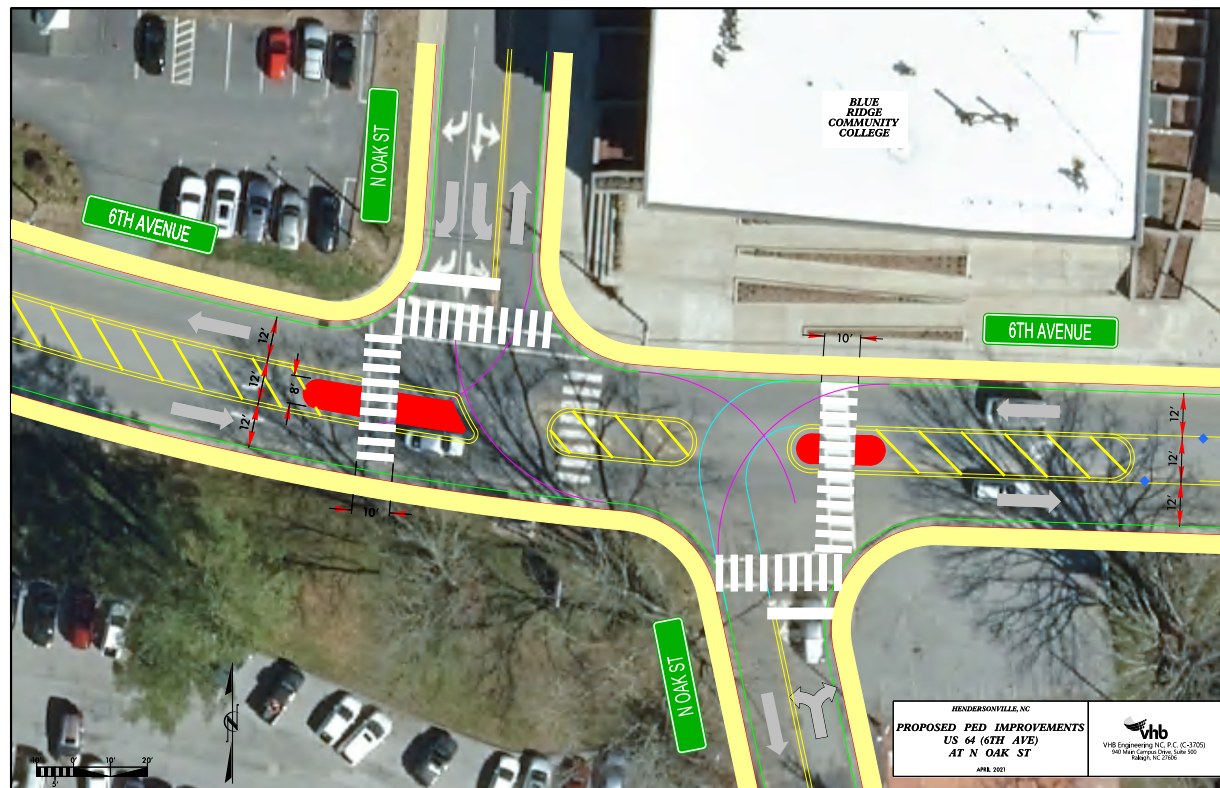


The intersection of 6th Avenue and Oak Street has several unique challenges, including:

- Noted crossing location for pedestrians of all ages.
- Multiple marked crosswalks in close proximity to each other.
- Offset intersection.
- Limited sight distance.

To address the safety issues described above, the intersection was reviewed for potential additional improvements. The design concept below was developed to visualize those improvements. A full-scale image can be found in Appendix X. The design concept shows the following recommendations:

- Remove the middle crosswalk.
- Upgrade other existing crosswalks to a high visibility pattern.
- Install pedestrian refuge islands at both crosswalks across 6th Avenue.
- Install pavement markings to visually narrow the roadway near the intersection and indicate how drivers should navigate the intersection.



Potential redesign option for US 64/6th Avenue at Oak Street. Highlights include removing the center crosswalk and restriping and adding refuge islands to both remaining crosswalks.

Section 3: US 176 (Spartanburg Highway) Corridor

Section 3 looks at the US 176 (Spartanburg Highway) corridor between NC 225 (South Main Street) and Upward Road. The corridor has suburban commercial development and residential areas on both sides of the corridor. The corridor has a five lane cross section with a center turn lane. The Annual Average Daily Traffic (AADT) ranges between 19,000-23,000 and the speed limit is 35 mph, transitioning to 45 mph south of Shepherd Street. The sidewalk network is complete on both sides of the corridor between NC 225 and Shepherd Street, with intermittent sidewalk south of Shepherd Street. There are few marked pedestrian crossings and intersections are far apart. The corridor is used as a parallel route to US 64 to get to I-26 and vehicle speeds are high outside of peak hours, increasing the risk that a pedestrian crash will result in a fatality or severe injury. Apple Country Transit has one route that provides service to this section of US 176 (Spartanburg Highway) and there are bus stops present on both sides of the street.

Section 3: US 176 (Spartanburg Highway) Corridor

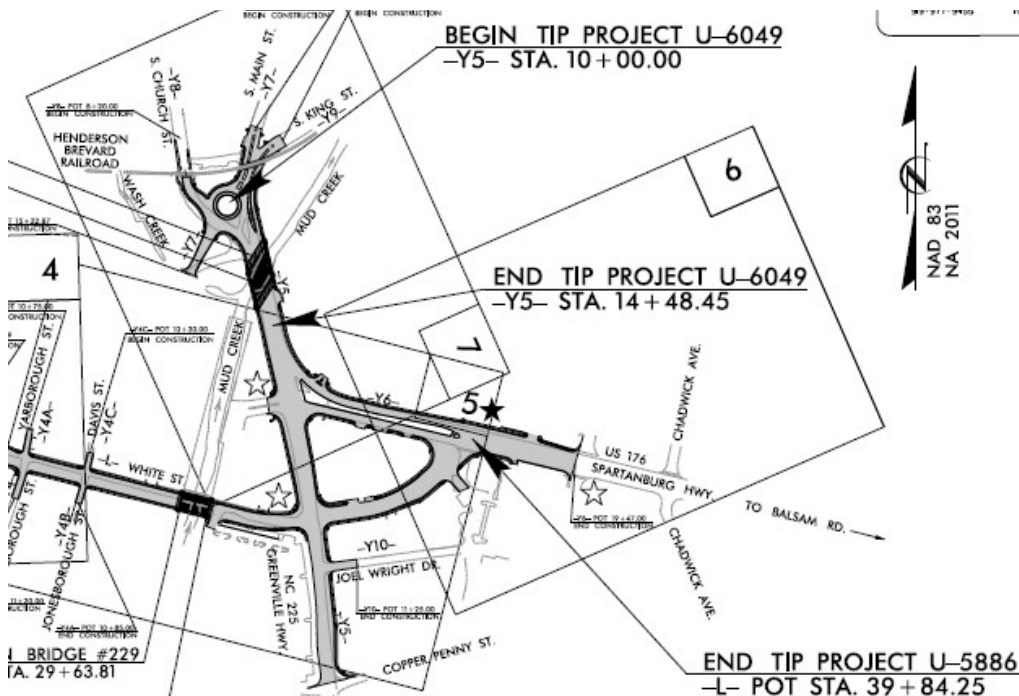


OPPORTUNITIES

- Marked crosswalks and pedestrian signal heads on the north and east legs.
- Potential future trail crossing north of intersection.
- U-5886 will realign and connect White Road to US 176/Spartanburg Highway south of the intersection of NC 225/South Main Street and US 176. Construction scheduled for 2026.
- U-6049 will widen the bridge over Mud Creek to five lanes and add a roundabout at the junction of South Church Street, South Main Street, and South King Street. Construction scheduled for 2026 (to coincide with U-5886).

RECOMMENDATIONS

- Review U-5886 channelized northbound turn lanes for opportunities to improve pedestrian safety.
- Review extent of planned median along US 176 east toward Chadwick Avenue.



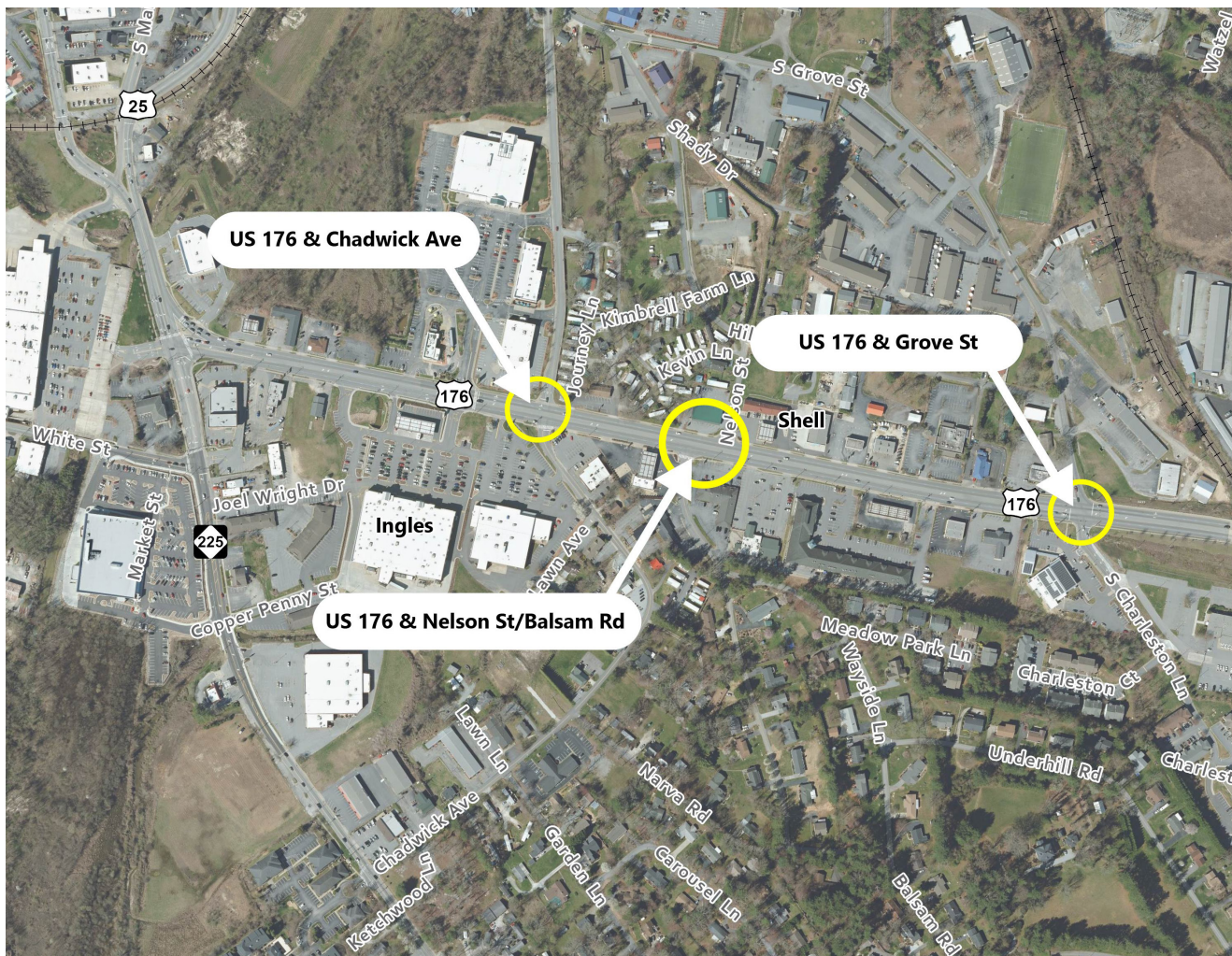
Current design for the future U-6049 and U-5886 STIP projects



This section of US 176 (Spartanburg Highway) was reviewed as a whole and at specific intersections. Additionally, data collection and crash analyses were done at multiple points along the corridor. Opportunities are described both generally for the corridor and at each specific intersection below.

General Opportunities:

- Prevalence of grocery stores and commercial development means many driveways present along the corridor and poor access management.
- Pattern of frontal impact crashes at Nelson Street/Balsam Road, the Shell station driveway, and Chadwick Avenue.
- No signal or pedestrian crossing between Grove Street and the Ingles (approximately .5 mi).



US 176 AT CHADWICK AVENUE

- Pattern of frontal impact crashes.
- Large number of left turns (westbound) vehicles from Spartanburg Highway onto Chadwick.
- Most pedestrians travelling across north leg of intersection.



Photo of the intersection of US 176 with Chadwick Avenue taken from the southern approach. Mobile homes and low-income communities present on both sides of the road (visible right) generate pedestrian traffic. Commercial development (left) in the area attracts pedestrians and creates potential access management issues where driveways are frequent.

US 176 AT NELSON STREET/BALSAM ROAD

- Several pedestrians were seen crossing and walking along the sidewalk during the field visit.
- Pattern of frontal impact crashes.
- Heaviest pedestrian activity along US 176 is east-west. Pedestrian volumes are relatively consistent during the day with a peak in the early afternoon and a significant amount between 11 PM and 1 AM.
- Apple Country Transit operates Route 2 along US 176 and has stops in this portion of the corridor.



Photo of the intersection of US 176 with Balsam Road taken from the southern approach. This location had the highest pedestrian count of the areas studied, with pedestrians frequently crossing the road between neighborhoods to the north and south of the Speedway.

US 176 AT SOUTH GROVE STREET

- Several pedestrians seen crossing and walking along US 176 near Grove Street during the field visit.
- Ongoing NCDOT safety project on a ¼ mi stretch of US 176 (Spartanburg Highway) from SR 1764 (South Grove Street)/South Charleston Lane to SR 1722 (Old Spartanburg Road), in Hendersonville. The project will install pedestrian signals, crosswalks, and curb ramps at the intersections of US 176 at SR 1764 and US 176 at SR 1722.
- Apple Country Transit Route 2 has a stop in this area; Hendersonville Community Co-op present (small grocery store).



Photo of the intersection of US 176 with Balsam Road taken from the southern approach. This location had the highest pedestrian count of the areas studied, with pedestrians frequently crossing the road between neighborhoods to the north and south of the Speedway.

The westernmost part of the US 176 (Spartanburg Highway) corridor will be undergoing substantial changes in the near future due to the U-6049/U-5886 projects. To incorporate these changes and address the safety issues described above, three potential alternatives were analyzed. Each alternative focused on potential median configurations, which would provide pedestrians with more crossing opportunities. The alternatives analysis included probable impacts each alternative would have on traffic operations.



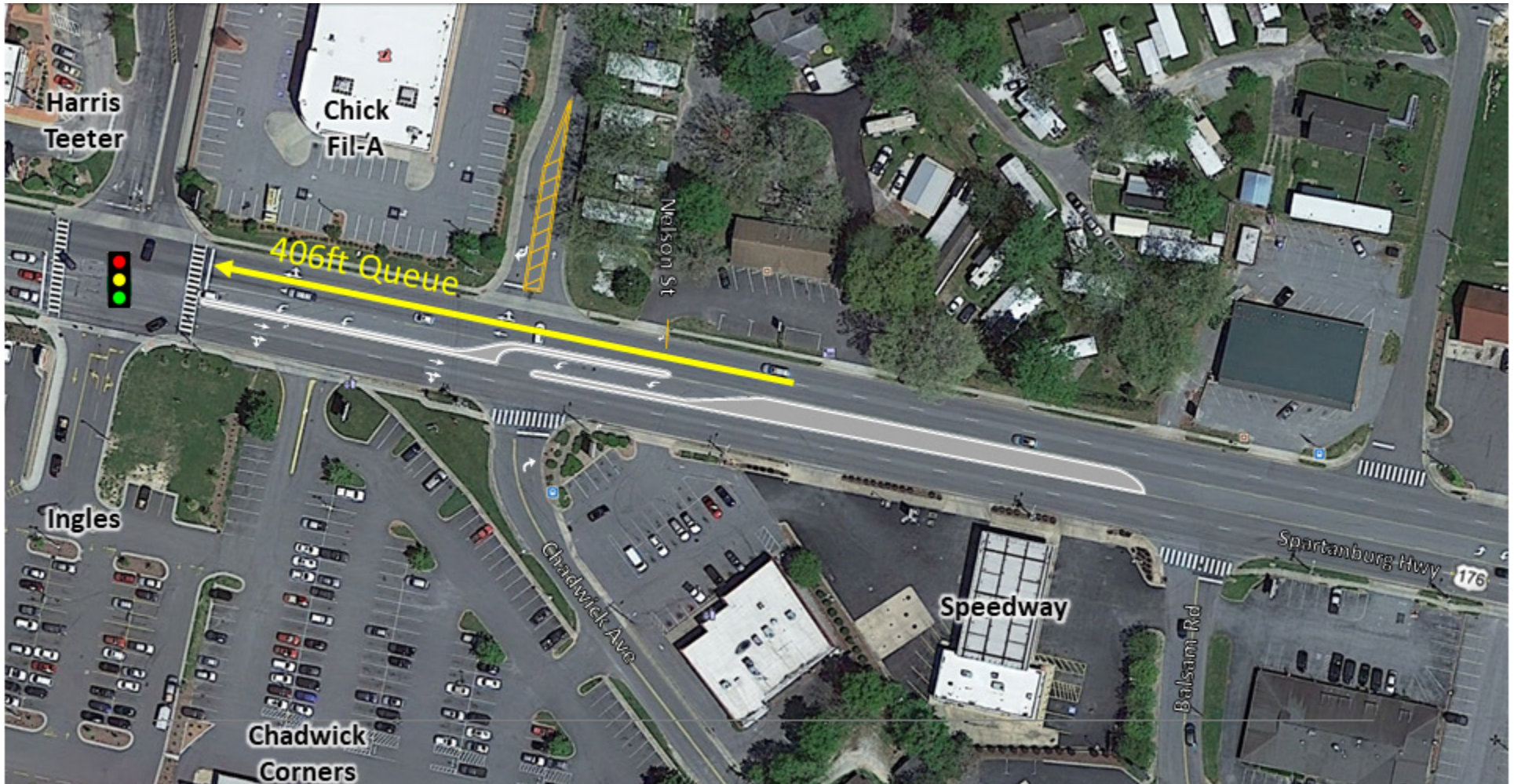
- Construct a raised median from South Grove Street to, and including, Chadwick Avenue
- Creating right turn exit only for Chadwick Avenue, Nelson Street and South Balsam Road
- Provides refuge space for crossing pedestrians
- Signal westbound queue is 406 feet and Chadwick Avenue queue lengths are less than 15 feet



- Construct a raised median between existing signal and Balsam Road
- Will reduce potential for crashes at Chadwick Avenue, particularly angle and left-turn crashes
- Provides refuge space for crossing pedestrians
- Shifting of signal from Ingles/HT is another option

Traffic Operations

- Improves operations at Chadwick from LOS F in 2030 AM and PM peak to LOS B
- Increases delay by 3-4 seconds at the existing signal due to re-routed movements, however remains LOS C



OPPORTUNITIES

- The Brooklyn Avenue intersection is difficult to cross with the existing pedestrian signal time.
- Bus stops at Henderson County Social Services (midblock) and Probation & Parole Department.

RECOMMENDATIONS

- Review pedestrian signal crossing time at Brooklyn Avenue.
- Review bus stop placement.



OPPORTUNITIES

- Crosswalks and pedestrian signal heads on all legs.
- High vehicle speeds near the intersection and a 100 ft crossing distance.
- Several pedestrian destinations are on either side of the road including grocery stores, the Family and Child Resource Center, and low-income housing at the Quail Cove and King Creek apartments.

RECOMMENDATIONS

- Review pedestrian signal crossing time and for potential future improvements (e.g., pedestrian refuge island).



Location	Description	Short Term	Long Term	Appendix
A/B	Howards Gap Road (A) and Highland Square Drive (B)	<ul style="list-style-type: none"> • Pedestrian crossings at signalized intersections between destinations. • Lighting between I-26 and Howard Gap Road. 		
C	Blue Ridge Mall		<ul style="list-style-type: none"> • Bus stop locations may need to be moved for improved pedestrian crossing. • Pedestrian crossings at signalized intersections. • Lighting between Linda Vista Drive and I-26. 	
D	7th Avenue	<ul style="list-style-type: none"> • Consistent pedestrian crosswalk markings and signal head installations at intersections on the corridor. 	<ul style="list-style-type: none"> • Formalize painted curb extensions. 	
E	Downtown: US 64 and Grove Street		<ul style="list-style-type: none"> • Remove 7th Avenue section, west of North Grove Street, and tie street directly into US 74. • Add narrow island to enforce right-in, right-out movement to N Grove Street to simplify travel through the intersection and shorten the crossing distance of the pedestrian route between downtown and 7th Ave East. 	
E	Downtown: US 64 and King Street	<ul style="list-style-type: none"> • Provide a pedestrian signal head on northern leg leading pedestrian interval. • Provide protected northbound left-turn, which can be switched to a red arrow when pedestrians are crossing the west leg. 		
E	Downtown: US 64 and Church Street	<ul style="list-style-type: none"> • Provide a LPI. 	<ul style="list-style-type: none"> • Potential future improvements include a protected left turn phase and tighter turn radii or curb extension to slow vehicle turning speeds. 	
F	Asheville Highway	<ul style="list-style-type: none"> • Evaluate WALK phase conflicts at Haywood Road and US 25 (Asheville Highway). • Add pedestrian crosswalks and pedestrian signal heads across all approaches at Clairmont Drive and US 25 (Asheville Highway). 		

Location	Description	Short Term	Long Term	Appendix
F	US 25/North Main Street/9th Ave Intersection	<ul style="list-style-type: none"> Extend the pedestrian walkway through the island south of the intersection. Provide a pedestrian refuge island on the southern leg crossing. Close the two driveways to Pop's diner just south of the intersection. 	<ul style="list-style-type: none"> Narrow Main Street and Church Street to two lanes south of the intersection. The extra space can be re-allocated for additional pedestrian and bicycle facilities. 	
G	US 64 west of Downtown	<ul style="list-style-type: none"> Manage speeds along the corridor. Provide consistent crosswalk marking and enhancements. 	<ul style="list-style-type: none"> Make geometric improvements at uncontrolled crossings. Review bus stop locations for optimal placement. 	
G	6th Avenue and Oak Street	<ul style="list-style-type: none"> Remove the middle crosswalk. Install pedestrian refuge islands at both crosswalks across 6th Avenue. Install pavement markings to visually narrow the roadway near the intersection and indicate how drivers should navigate the intersection. 	<ul style="list-style-type: none"> Upgrade other existing crosswalks on corridor to a high visibility pattern. 	
H	US 176 (Spartanburg Highway) at NC 225 (S Main Street)	<ul style="list-style-type: none"> Review U-5886 channelized northbound turn lanes for opportunities to improve pedestrian safety. Review extent of planned median along US 176 east toward Chadwick. 		
I/J	US 176 (Spartanburg Highway) between Ingles Driveway and Glover Street	<ul style="list-style-type: none"> Construct a raised median between existing signal at the Ingles Driveway and Balsam Road or Grove Street. 		
K	US 176 (Spartanburg Highway) between Old Spartanburg Highway and Shepherd Street	<ul style="list-style-type: none"> Review pedestrian signal crossing time at Brooklyn Avenue. 	<ul style="list-style-type: none"> Review bus stop placement. 	
L	US 176 (Spartanburg Highway) at Upward Road	<ul style="list-style-type: none"> Review pedestrian signal crossing time and for potential future improvements (e.g., pedestrian refuge island). 		