Integrated Mobility Division

N.C. DEPARTMENT OF TRANSPORTATION

Twelve Mile Creek Greenway Feasibility Study

Town of Waxhaw

NCDOT IMD

April 1, 2025

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Acronym	Definition
AASHTO	American Association of State Highway and Transportation Officials
ABC	Aggregate Base Course
ADA	Americans with Disabilities Act
AFP	Accessibility for Parks
BFE	Base Flood Elevation
CIP	Capital Improvement Program
CLOMR	Conditional Letter of Map Revision
CMAQ	Congestion Mitigation and Air Quality
CRTPO	Charlotte Regional Transportation Planning Organization
CTP	Comprehensive Transportation Plan
CTT	Carolina Thread Trail
EPA	Environmental Protection Agency
FAST	Fixing America's Surface Transportation
FEMA	United States Federal Emergency Management Act
IMD	Integrated Mobility Division

Acronym	Definition
ISTEA	Intermodal Surface Transportation Efficiency Act
LWCF	Land and Water Conversation Fund
MPO	Metropolitan Planning Organization
NCDOT	North Carolina Department of Transportation
NCLWF	North Carolina Land and Water Fund
NFIP	National Flood Insurance Program
NIMBY	"Not in My Back Yard"
PARTF	Parks and Recreation Trust Fund
PROWAG	Public Rights-of-Way Access Guidelines
ROW	Right of Way
RPO	Rural Planning Organization
RTP	Recreational Trails Program
SPOT	Strategic Prioritization Office of Transportation
STI	Strategic Transportation Investment
STIP	State Transportation Improvement Program

Integrated Mobility Division

N.C. DEPARTMENT OF TRANSPORTATION

Section 1 // Executive Summary

Twelve Mile Creek Greenway Feasibility Study

Town of Waxhaw

NCDOT IMD

1.1 // Study Overview

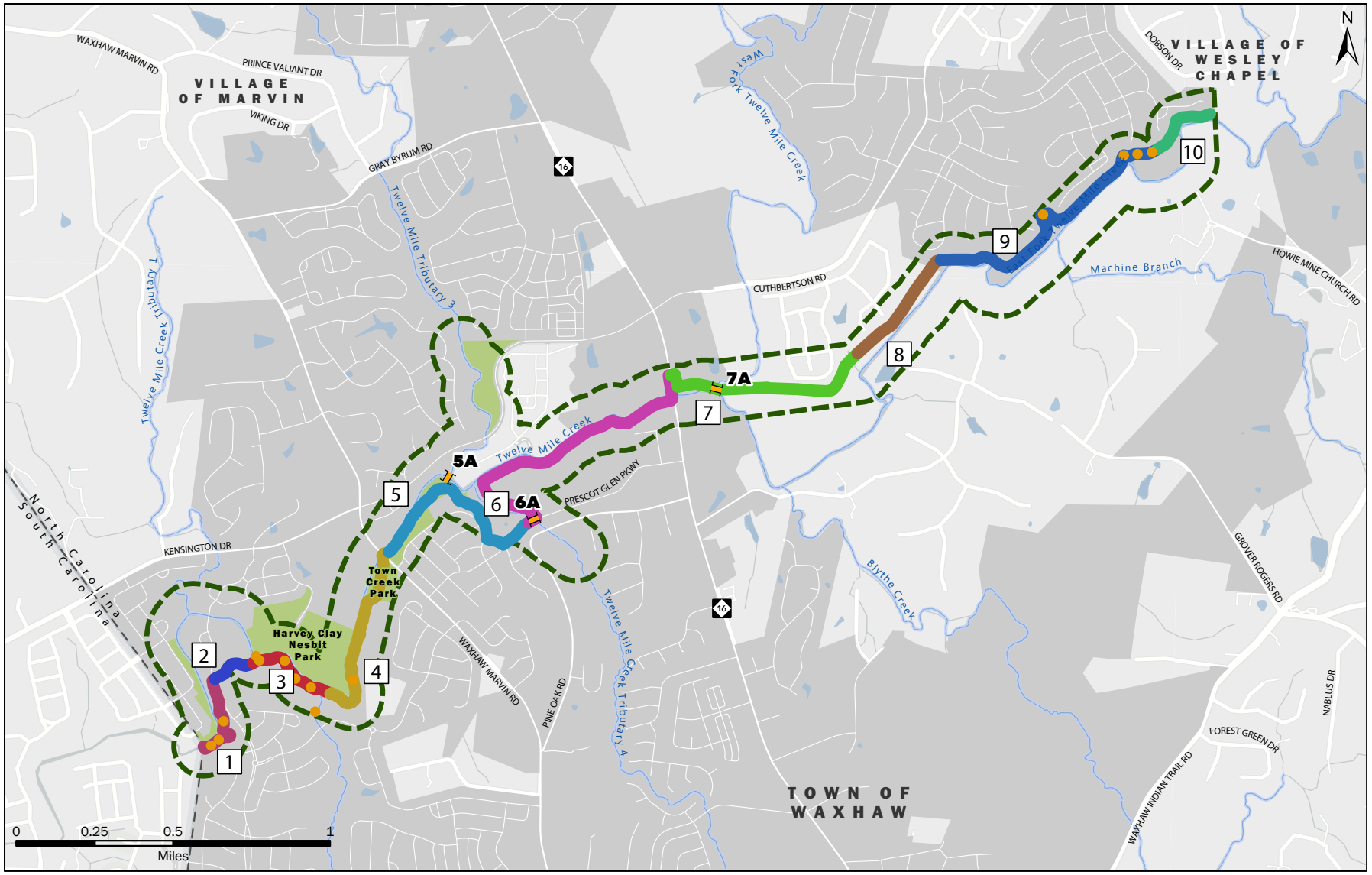
The Twelve Mile Creek Greenway Feasibility Study examines the necessary steps to complete the east-west spine of the Twelve Mile Creek Greenway system through Waxhaw, NC, as part of the Carolina Thread Trail System. The greenway, as envisioned, would serve as both a recreational and an active transportation facility and offer an alternative to vehicular travel for east-west trips in north Waxhaw with future connections to additional planned multimodal corridors.

This study was undertaken as part of the North Carolina Department of Transportation's (NCDOT) Integrated Mobility Division (IMD) Paved Trails and Sidewalks Feasibility Study Grant program. The study evaluated the proposed greenway corridor, which was previously identified by Carolina Thread Trail and has been included in prior planning documents, by documenting the existing conditions, constraints and considerations along the corridor, technical requirements, and cost estimates of each section.

1.2 // Recommended Greenway Corridor

The recommended path for the Twelve Mile Creek Greenway generally follows the creek it is named for and connects existing greenway segments with new and/or improved paved multiuse paths. From west to east, the corridor begins at the South Carolina state line.

- *Segment 1:* This segment of natural trail travels steep terrain from the suspension bridge to Millbridge Parkway in the Millbridge subdivision (approximately 0.25 mi).
- *Segment 2:* This short gravel and pavement section connects from Millbridge Parkway to H. C. Nesbit Park (approximately 0.25 mi).
- *Segment 3:* This segment is an existing paved greenway through the Millbridge neighborhood to just north of Creekview Drive (approximately 0.35 mi).
- *Segment 4:* This segment is an unpaved section of cleared natural path running through property owned by the Millbridge Homeowners Association and connecting to the existing paved path at Town Creek Park (approximately 0.6 mi).
- *Segment 5:* From Town Creek Park, the path crosses Waxhaw-Marvin Road by way of accommodations incorporated into a future replacement of the NCDOT roadway bridge over Twelve Mile Creek (BP10.R017). A "greenway shelf" under the replacement structure will accommodate the greenway alongside the creek. Continuing, the trail includes a paved section along the creek, recently restored by the Town, adjacent to the Prescot neighborhood. This segment also includes a proposed bridge connecting to the proposed Sonny Way north/south greenway (5A). (approximately 0.8 mi).
- *Segment 6:* This segment makes use of a section of existing sidewalk in the Prescot neighborhood along Prescot Glen Parkway to a new proposed structure crossing of a tributary of Twelve Mile Creek (6A), connecting to the eastern portion of Prescot Glen Parkway, which runs through the Prescot Village commercial area. On the Prescot Village commercial development, the path would curve to the north and east around the planned Artisan townhouse development and run adjacent to Twelve Mile Creek toward the intersection with NC 16/Providence Road (approximately 0.8 mi).
- *Segment 7:* At NC 16/Providence Road, the path would rise to the roadway grade to cross Twelve Mile Creek using the sidewalk incorporated into the future replacement of the NCDOT bridge (part of the NC 16/Providence Road widening project, U-5769B). A pedestrian crossing of NC 16/Providence Road would bring the path to an undeveloped parcel where the paved trail would continue until reaching the West Fork of Twelve Mile Creek. This tributary would be crossed by a proposed new bridge (7A), bringing the trail onto the Encore neighborhood development. A portion of this segment is currently under construction by the Encore developer and extends to the point where a northbound footpath leads to the neighborhood's clubhouse (approximately 0.6 mi).
- *Segment 8:* From the end of the developer-installed greenway eastward to the Lawson subdivision, the remainder of the connection to the existing Lawson walking path is the responsibility of the Town of Waxhaw, though the land is dedicated by the Encore developer (approximately 0.4 mi).
- *Segment 9:* This segment makes use of the existing walking path at the Lawson subdivision (approximately 1 mi).
- *Segment 10:* The path would from the easternmost point of the existing Lawson walking path to the border with the Village of Wesley Chapel (approximately 0.25 mi).



TWELVE MILE CREEK GREENWAY FEASIBILITY STUDY

SEGMENTS

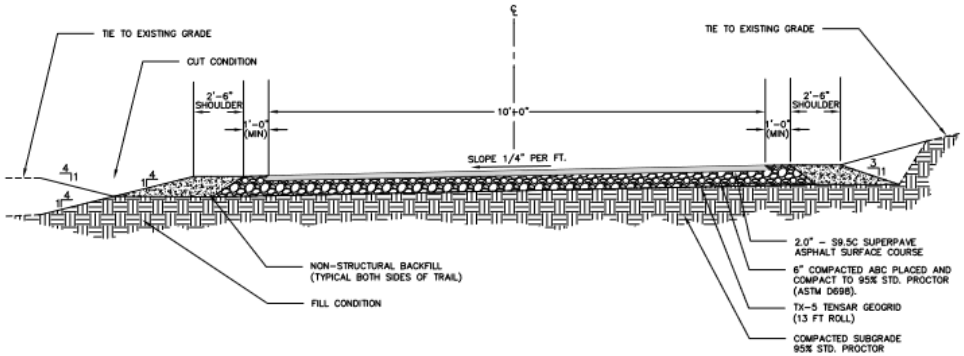
Study Area
Planned Trail Bridge
Existing Timber Bridge
Stream / Pond
Park
Town of Waxhaw

1.3 // Greenway Design

Several trails, greenway, and path types are encountered or planned along the Twelve Mile Creek Greenway, including natural surface trail, existing paved surfaces and sidewalks incorporated into the greenway, and new paved greenway. The proposed surface for new greenway sections is a 10-foot paved asphalt surface with 2-foot stone shoulders. The recommended typical section would include a base of 6" of aggregate base course (ABC) with geogrid for stabilization and 2" of asphalt.

The proposed surface for new greenway sections follows the Town of Waxhaw standards of a 10-foot paved asphalt surface with minimum 1 foot stone shoulders and 2.5 foot turf shoulders. The recommended typical section includes 2 inches of asphalt on 5 inches of aggregate base course (ABC) with compacted subgrade. TX-5 Tensar geogrid is placed between the ABC and subgrade. This is standard and should be evaluated based on individual geotechnical conditions during final design. Accessibility guidance from the Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) will be utilized depending on the trail location and surface type - paved or natural surface.

In flood zones a Waxhaw-preferred alternative incorporates geoweb in 4" (floodplain) or 6" (floodway) depth reinforced with #57 stone. Final design will detail the typical section based on specific site conditions. See geoweb detail in the appendix. Typically, this will include 8.5' wide cells, with 1' shoulders for 10.5' of overall path width.



10' ASPHALT TRAIL SECTION

1.4 // Community and Stakeholder Engagement

This feasibility study builds upon what was heard from extensive community engagement efforts undertaken with several recent planning efforts, including the 2019 Collaborative Growth Strategy, the 2022 Pedestrian Plan Update, and the 2040 Comprehensive Plan Update (2023). These efforts included open house public input sessions, steering committees, virtual and in-person public meetings, focus groups, and public surveys. Among the major themes heard through this engagement were a desire for increased walkability and connectivity in Waxhaw, concern for pedestrian and bike safety, a desire for more parks and greenways, and an expectation to fulfill the plans set forth by the Carolina Thread Trail. The Twelve Mile Creek Greenway was one of the priority projects identified by the public in these planning efforts.

A Steering Committee was assembled and met four times through the duration of this feasibility study. The Steering Committee consisted of representatives from the Town of Waxhaw, Charlotte Regional Transportation Planning Organization (CRTPO), NCDOT, Union County, Carolina Thread Trail, neighborhood associations, and local business owners. Each Steering Committee meeting provided an opportunity for participants to hear study updates and provide feedback on direction and progress. The feedback from the Steering Committee informed study considerations and prioritization recommendations.

1.5 // Evaluation Considerations

This study evaluated various site conditions, constraints and considerations that might influence the feasibility of completing the greenway route. These included:

- New and existing creek and tributary crossings
- Floodplains and floodways
- Flooding, resiliency, and maintenance
- Incorporation of existing greenway sections
- Connections to commercial, residential, recreational, and institutional points of interest
- Connections to future planned greenways
- Incorporation into planned NCDOT projects

1.6 // Prioritization

The general alignment of the Twelve Mile Creek Greenway was identified through previous planning by Carolina Thread Trail, existing neighborhood greenways, availability of Town-owned properties, planned private developments, and the location of the creek itself. This alignment has also been included in several rounds of public planning documents, including the Parks and Recreation Strategic Master Plan (2019) and the Town of Waxhaw Pedestrian Plan (2023). While the general alignment corridor for the Twelve Mile Creek Greenway was largely agreed-upon at the outset, the study aimed to aid the Town in identifying which segment(s) of the corridor the Town should focus time and resources on first on the way to completing the corridor. An evaluation of criteria identified by the Steering Committee and informed by previous public input was used to identify the three top-priority greenway segments. Each of these segments scored high in the areas of connectivity (creating connection between trail segments, users, and points of interest) and ease of implementation.

- *Segment 4: Creekview Drive Trailhead to Town Creek Park/Waxhaw-Marvin Road*
  - » Completing this segment of greenway would create a contiguous 1.25-mile stretch of greenway with an additional quarter mile of natural trail (Segment 1) and continuation of the Carolina Thread Trail beyond the border with South Carolina.
  - » Along with connections to planned pedestrian infrastructure on Waxhaw-Marvin Road and points of interest such as two Town parks, Segment 4 scored high for the Connectivity criteria. This segment also scored highest for addressing existing trail issues, as the area suffers from frequent flooding and washout.
- *Segment 6: Prescot Glen Parkway West to NC 16/Providence Road*
  - » Completing this segment would provide the essential multimodal connections between Prescot neighborhood and the Prescot Village commercial area via a stream crossing, This stream crossing, along with integration into NCDOT's bridge replacement at NC 16/Providence Road would help overcome the major hurdles to creating the east-west spine of Waxhaw's greenway network. For these reasons, Segment 6 scored highest for the Connectivity prioritization criteria.
- *Segment 8: Encore at Streamside – East Side*
  - » Completing this segment would connect the Encore at Streamside and Lawson neighborhoods with approximately 1.7 miles of greenway. Segment 8 scored well for ease of implementation and connectivity. This short segment would connect two large neighborhoods with existing neighborhood greenways on a developer-dedicated easement.

Completion of each of these segments would have independent utility and provide valuable bicycle and pedestrian connections before the contiguous greenway corridor's completion.

1.7 // Implementation Highlights

Successful implementation of Waxhaw's Twelve Mile Creek Greenway will require cooperation between a variety of entities, including the Town of Waxhaw, Union County, NCDOT, CRTPO, Carolina Thread Trail, neighborhood homeowners' associations, and private developers. Funding sources to be explored include federal grants allocated through CRTPO's Discretionary Grants Program, State grant programs, and NCDOT's State Transportation Improvement Program (STIP). Maintenance agreements will need to be developed and agreed upon by cooperating partners.

Integrated Mobility Division

N.C. DEPARTMENT OF TRANSPORTATION

Section 2 // Introduction

Twelve Mile Creek Greenway Feasibility Study

Town of Waxhaw

NCDOT IMD

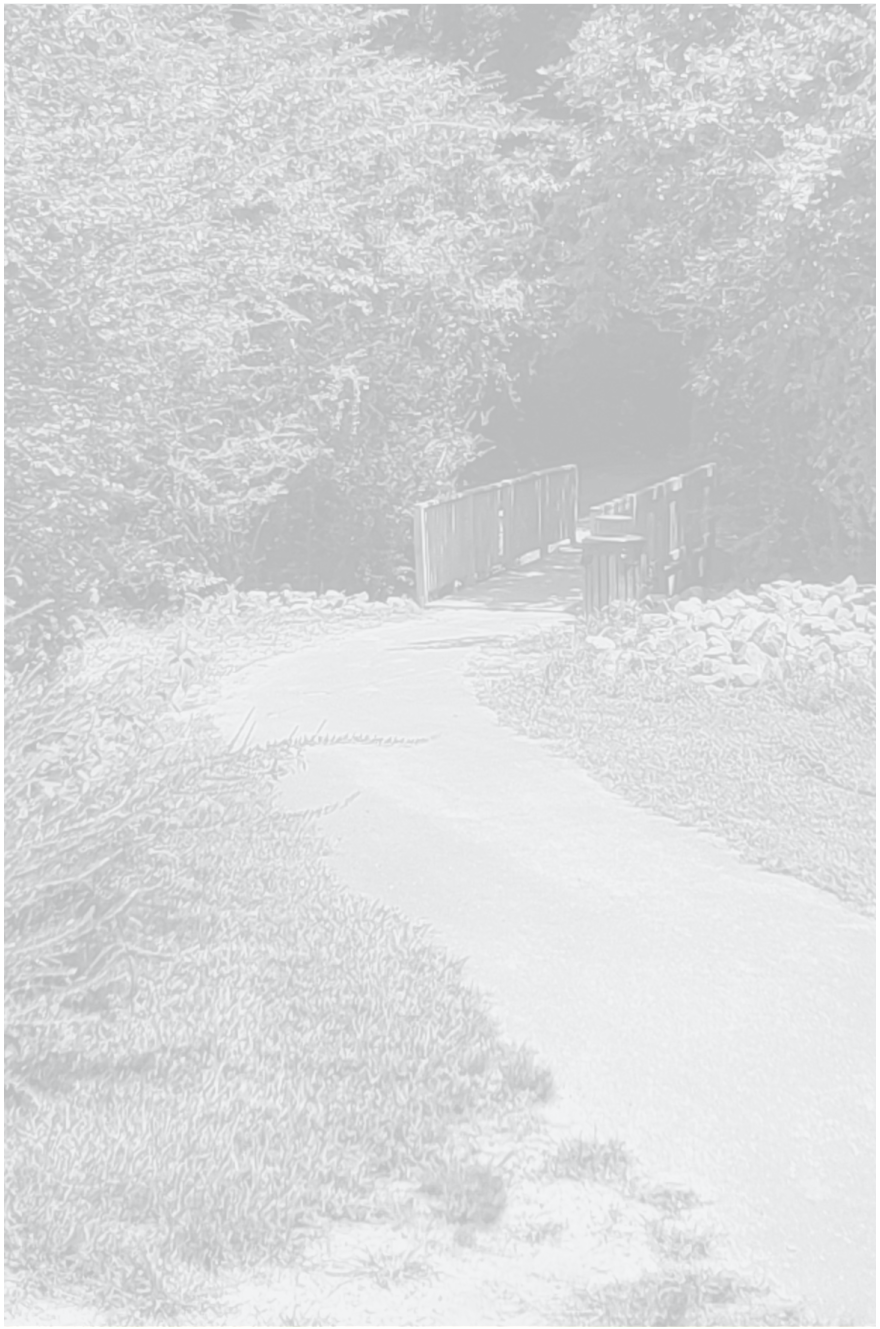
The Twelve Mile Creek Greenway Feasibility Study examines the necessary steps to complete the east-west spine of the Twelve Mile Creek Greenway system through Waxhaw, NC, as part of the Carolina Thread Trail System. The greenway, as envisioned, would serve as both a recreational and an active transportation facility and offer an alternative to vehicular travel for east-west trips in north Waxhaw with future connections to additional planned bike and pedestrian corridors.

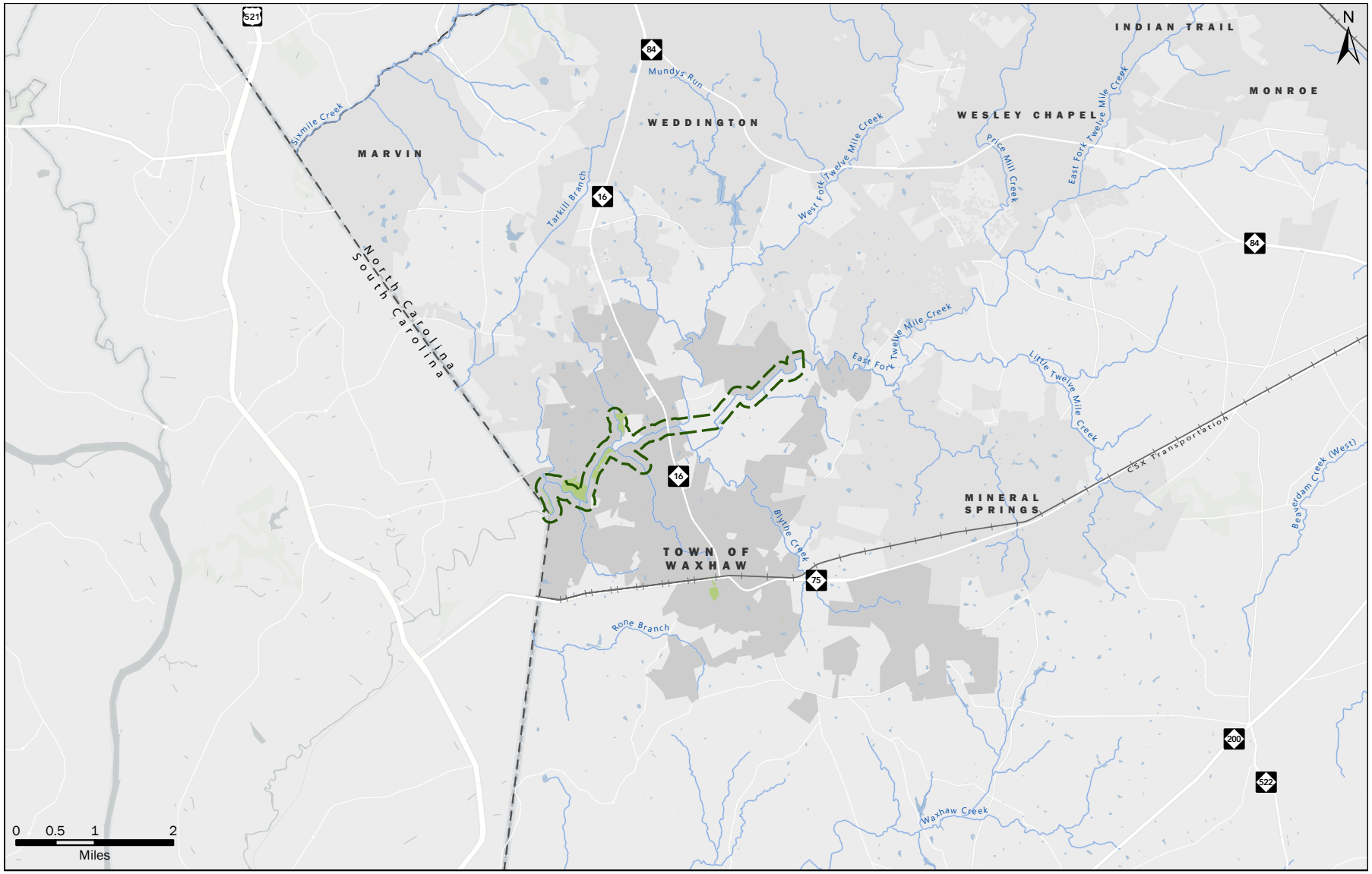
2.1 // Waxhaw Setting and History

Waxhaw is in Union County, North Carolina, about 20 miles south of Charlotte. As a part of the Charlotte metropolitan area, Waxhaw has experienced significant growth over the past decade, transforming from a small, historic railroad town into a vibrant residential community. The Town boasts a rich cultural heritage and a strong commitment to preserving its historical character while embracing modern development. Waxhaw covers about 13 square miles, with a population that has rapidly grown over the years. As of the 2020 United States Census, the Town had a population of 20,534 residents. The community primarily consists of middle to upper-income households, and the Town's demographic makeup is diverse, representing a blend of age groups and backgrounds. Waxhaw is known for its highly rated schools, safe neighborhoods, and a keen sense of community.

The economy of Waxhaw has been bolstered by its proximity to Charlotte, as many residents commute to the city for work. Local businesses, boutique shops, and restaurants contribute to the Town's economy, making it an attractive destination for both residents and visitors. The preservation of historical architecture and the establishment of a vibrant downtown have further promoted tourism and economic growth.

Waxhaw's transportation infrastructure is primarily centered around road networks, with major routes including NC 16/Providence Road and North Carolina Highway 75. Access to Interstate 485, the Charlotte beltway, is crucial for the Town's connectivity to the larger Charlotte area. The Town's growth and increasing commuter traffic necessitate a comprehensive analysis of transportation requirements to ensure sustainable mobility solutions for the community.





TWELVE MILE CREEK GREENWAY FEASIBILITY STUDY

VICINITY

Study Area
Stream / Pond
Park
Town of Waxhaw

2.2 // Trails Vision

The Town of Waxhaw expressed the vision for the Twelve Mile Creek Greenway in their application for the NCDOT Integrated Mobility Division (IMD) Paved Trails and Sidewalks Grant:

"...to establish a safe, convenient, and expansive system of greenways, blueways, and trails that provide non-vehicular connectivity to neighborhoods, shopping areas, schools, parklands, and other community destinations, and connect to the state-wide and interstate greenway network...Critical to this comprehensive vision is the ***establishment of an east-west spine along Waxhaw's portion of the Twelve Mile Creek system*** *which is designated as the Carolina Thread Trail."*

Greenways play a pivotal role in Waxhaw's vision for a multimodal transportation network. Connecting neighborhoods, community resources, and commercial nodes with a network of multimodal greenways will offer non-vehicular transportation opportunities to Waxhaw's population and reduce automobile dependency. The Twelve Mile Creek Greenway proposed by Waxhaw is the initial step to creating a multimodal network by forming a primary east-west greenway spine which connects to existing and planned multimodal infrastructure. With most of Waxhaw's development on the north side of downtown, the Twelve Mile Creek Greenway will address the pressing need of multimodal connectivity in this area.

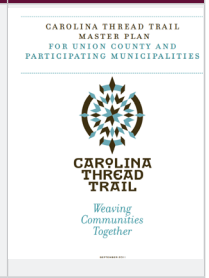
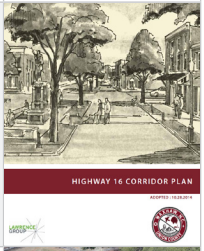
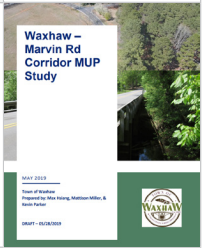
Greenways serve as recreational resources and offer many benefits for communities. Greenways provide safe and accessible pathways that connect neighborhoods, schools, parks, and other key destinations, reducing the need for vehicle travel. This connectivity fosters a sense of community, promoting social interaction and reducing social isolation. Additionally, greenways can become significant economic drivers by attracting tourists and encouraging investment in nearby businesses. Furthermore, greenways provide health benefits, as they offer opportunities for physical activity, promote active lifestyles, and enhance public health. The integration of greenways into the transportation system aligns with Waxhaw's commitment to a sustainable, livable, and thriving community.

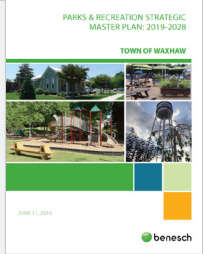
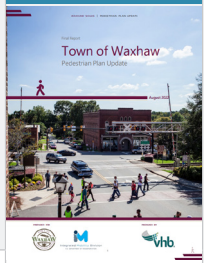
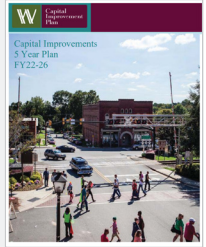
2.3 // Previous Planning Efforts

Table 2.1 provides a summary of key findings and considerations from previous plans and studies that may inform or influence the Twelve Mile Creek Greenway Feasibility Study. The plan review is organized by date of when the plan was developed or adopted. Below is a list of plans that were reviewed:

- 2011 – Carolina Thread Trail Master Plan (Agency: Union County and Town of Waxhaw)
- 2012 – Waxhaw Comprehensive Pedestrian Plan (Agency: Town of Waxhaw)
- 2014 – Highway 16 Corridor Plan (Agency: Town of Waxhaw)
- 2018 – Waxhaw-Marvin Road Corridor Study (Agency: Town of Waxhaw)
- 2019 – Parks and Recreation Strategic Master Plan (Agency: Town of Waxhaw)
- 2020 – Charlotte Regional Transportation Planning Organization (CRTPO)
  2022 – Great Trails State Plan (Agency: NCDOT)
- 2022 – Waxhaw's Five-Year Capital Improvement Plan (Agency: Town of Waxhaw)
- 2022 – Town of Waxhaw Pedestrian Update (Agency: Town of Waxhaw through NCDOT IMD Multimodal Planning Grant Program)
- 2023 – Waxhaw 2040 Comprehensive Plan

Table 2.1 Plans Review

EXISTING PLAN	Definition	
Carolina Thread Trail Master Plan, Union County 2011 Agency: Carolina Thread Trail	This plan articulates a vision for Union County focused on enhancing and ensuring a high quality of life for residents, utilizing the county's unique social, natural, and built assets. Led by the Carolina Thread Trail initiative, representatives from municipal and county governments, as well as vested organizations and individuals, worked together in an intensive planning process to prioritize important destinations and transportation routes within the county. The result of their efforts is a proposed system of greenways and trails linking together many of the existing trails, parks, town centers, historic sites, and natural features that define Union County. The study corridor can be found in these sections of the Carolina Thread Trail Master Plan: • The Carolina Thread Trail alignments show the proposed Twelve Mile Creek Greenway (Pages 28 and 39). • River corridor proposed trail from Lancaster County, South Carolina to Wesley Chapel, North Carolina (Page 29). Document Link: https://www.carolinathreadtrail.org/wp-content/uploads/2018/05/Union_County_Master_Plan.pdf	
Comprehensive Pedestrian Plan, 2012 Agency: Town of Waxhaw	The 2012 Comprehensive Pedestrian Plan provides a framework for policy revision, financial assistance, promotion, and education aimed at achieving the Town's stated pedestrian vision. The plan evaluates concerns and constraints affecting local pedestrian safety and accessibility and outlines specific, practical solutions. Detailed descriptions and cost estimates of a broad range of recommended pedestrian projects are provided and ranked. These projects include street crossing improvements, as well as sidewalk and trail segments that work together to provide a safe and inviting pedestrian system. The plan further recommends specific programmatic actions including the creation of a pedestrian action committee to encourage implementation. The study corridor can be found in these sections of the 2012 Pedestrian Plan: • Primary project recommendation for multi-use trail crossing under Highway 16 at Twelve Mile Creek (Page 48). • Planned Facilities - Shows planned east-west greenway along Twelve Mile Creek to the Prescot Commercial Development (Page 95). • Proposed Improvements – Shows an alignment of the east-west multi-use trail connecting the South Carolina border and Wesley Chapel (Page 96). Document Link: https://www.waxhaw.com/home/showpublisheddocument/884/637556027092207671	
Highway 16 Corridor Plan, 2014 Agency: Town of Waxhaw	Highway 16 is a key commuter corridor in Waxhaw. Prioritizing infrastructure improvements along Highway 16 will support increasing demand, development, and diversity in the Town. The proposed Thread Trail extension crosses Highway 16 at two locations: Twelve Mile Creek and Downtown Waxhaw. The plan proposes the construction of a multi-use path along Highway 16 to offer more transportation choices and better connectivity from Downtown Waxhaw to Old Hickory and Cureton. The multi-use path would connect to the proposed Carolina Thread Trail extension through Trailhead Park at Twelve Mile Creek. The plan also recommends the construction of a Trailhead Park between Prescot and Cureton to provide easy access to the Carolina Thread Trail and a gathering place for trail users. Document Link: https://waxhawnc.prod.govaccess.org/home/showdocument?id=754	
Waxhaw-Marvin Road Corridor Study, 2018 Agency: Town of Waxhaw	The study notes that the bridge area over Twelve Mile Creek, south of Kensington Drive, is within the 100-year floodplain and poses a 1% chance of significant flooding risk each year. The Town is in coordination with NCDOT in efforts to address this issue through NCDOT's bridge replacement project (B-5791) over Twelve Mile Creek. This bridge replacement was identified as a need in the Waxhaw Comprehensive Pedestrian Plan (2012) and the Charlotte Regional Transportation Planning Organization Comprehensive Transportation Plan (2017). The study also highlights Town Creek Park, which is accessible off Waxhaw-Marvin Road, just south of the Twelve Mile Creek Bridge. This park includes a trail head for the Carolina Thread Trail, and a small parking lot. Document Link: https://waxhaw.civicweb.net/document/51277/	

EXISTING PLAN	Definition	
Parks and Recreation Strategic Master Plan, 2019 (update currently in progress as of this report) Agency: Town of Waxhaw	The 2019 – 2028 Parks and Recreation Strategic Master Plan identifies recreational needs, standards, key funding, and revenue sources; recognizes partnership opportunities; outlines park development and facilities upgrades and maintenance initiatives. The plan also strategizes economic development goals, cites tourism attractors, outlines a revenue plan, identifies methods for land acquisition and dedication, recommends the Downtown Park and further greenway development, and proposes facility updates. The study corridor can be found in these sections of the Parks and Recreation Strategic Master Plan: EX-8 – Projects outlined for consideration include the extension of the Twelve Mile Creek Greenway. Pages 4-75 – Proposed trail and proposed Carolina Thread Trail alignments are shown. Document Link: https://www.waxhaw.com/home/showpublisheddocument/2018/637939856902670000	
Great Trails State Plan, 2022 Agency: NCDOT	The Great Trails State Plan identifies Cidentifies the Carolina Thread Trail Network as one of the systems that were considered as part of the Great Trails State Trail Network. The proposed Twelve Mile Creek trail is identified as part of the proposed trail network in the GTS Plan. Document Link: https://www.ncdot.gov/divisions/integrated-mobility/multimodal-planning/great-trails-state/Documents/great-trails-plan.pdf	
Town of Waxhaw Pedestrian Plan Update, Adopted 2023 Agency: Town of Waxhaw	The plan recommends the following projects: • Twelve Mile Creek Greenway from County limits to Highway 16. • A greenway bridge as part of Twelve Mile Creek Greenway and Millbridge Trails. • Greenway crossing under a bridge at Highway 16- and Twelve-Mile Creek Greenway. • Twelve Mile Creek Greenway bridge shown at Intersection 18 to continue the greenway expansion. • Twelve Mile Creek Greenway crossing under Highway 16 at Intersection 34. • Twelve Mile Creek Greenway path 10 from H. C. Nesbit Park to Waxhaw Marvin Road. Then, from Waxhaw Marvin Road, Twelve Mile Creek Greenway path 9 continues to Highway 16. Document Link : https://www.waxhaw.com/home/showpublisheddocument/2714/638273556958330000	
Charlotte Regional Transportation Planning Organization (CRTPO) 2020 Comprehensive Transportation Plan	This plan promotes connectivity of current and future neighborhoods and destinations; improves pedestrian safety, accessibility, and walking conditions; highlights historic resources, natural parks, and cultural sites; promotes healthier lifestyles; and fosters activity downtown. The study corridor can be found in the Charlotte Regional Transportation Planning Organization (CRTPO) 2020 Comprehensive Transportation Plan. • The CRTPO transportation plan calls for a bicycle project along the Twelve Mile Creek Greenway from the South Carolina border to Newtown Road. Document Link: https://crtpo.org/projects-plans-programs/comprehensive-transportation-plan/	
Waxhaw's Five-Year Capital Improvement Plan (2022-2027) Agency: Town of Waxhaw	Waxhaw showed a population of 20,534 people in the 2020 US Census, representing a 108% increase in population from 2010. While this type of population increase naturally leads to an ever-growing demand for increased services and operating expenses, it has shown that the Town is lagging in keeping up with capital needs. The Town's operations have outgrown many of its current buildings as service demands have increased. Existing Park infrastructure has not been repaired as often as it should, and smaller-scale transportation and pedestrian projects require completion. The Budget for FY 2021-22 focused on the Town's expanding operational demands and provided a long-term plan for funding Waxhaw's numerous capital project needs, which would serve its residents decades into the future. The study corridor can be found in this section of the Town's Five-Year Capital Improvement Plan: • Accounts for a future $750,000 investment in improvements for the existing Twelve Mile Creek Greenway from American Rescue Plan funds and a Carolina Thread Trail grant. Improvements include reconstruction and improvement of drainage systems and stabilization and replacement of existing trails. (Page 7) Document Link: https://www.waxhaw.com/home/showpublisheddocument/1176/637604769879770000	

2.4 // Policy Review

The following table provides a summary of key state and local policies from NCDOT, Union County, and the Town of Waxhaw that may guide or influence the development of the Twelve Mile Creek Greenway Feasibility Study. Below is a list of policies that were reviewed:

- 2016 – Waxhaw Comprehensive Plan (Agency: Town of Waxhaw)
- 2019 – NCDOT Complete Streets Policy (Agency: NCDOT)
- 2000 – NCDOT Bridge Policy (Agency: NCDOT)
- 2021 – Waxhaw Land Development Code (Agency: Town of Waxhaw)
- 2021 – NCDOT Roadway Design Manual (Agency: NCDOT)
- 2023 – Town of Waxhaw ADA Transition Plan (Agency: Town of Waxhaw)
- 2023 –Waxhaw 2040 Comprehensive Plan (Agency: Town of Waxhaw)

Table 2.2 Policy Review

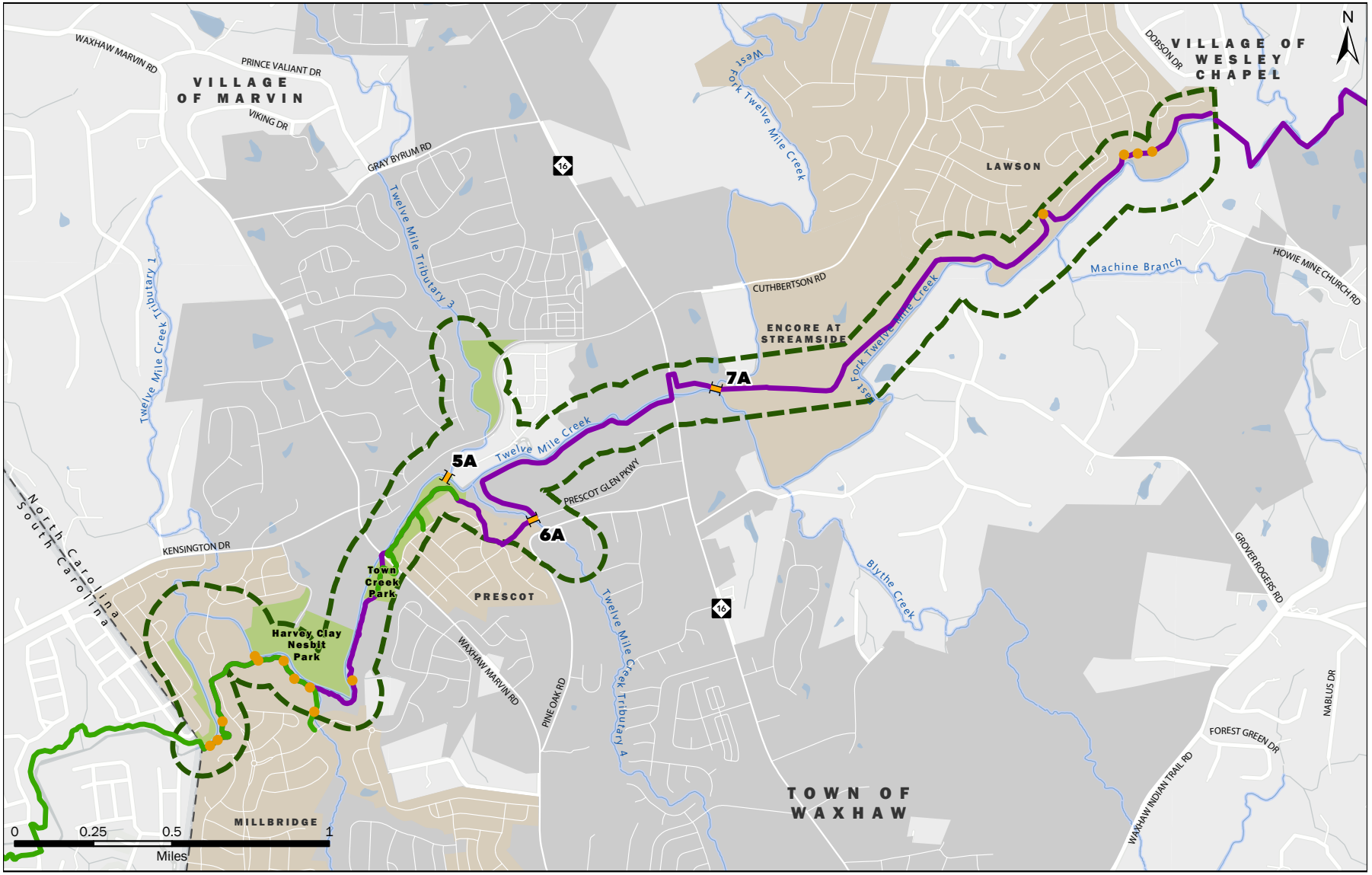
EXISTING POLICY	KEY RECOMMENDATIONS RELATED TO THE TWELVE MILE CREEK GREENWAY FEASIBILITY STUDY
Waxhaw Comprehensive Plan, 2016 Agency: Town of Waxhaw	Section 2.2.3 illustrates the Town's adopted Growth Sector Map. Sectors shown in this map correspond more closely to the Town's preferred development strategy and desired regulatory framework. The Growth Sector Map details the geographic framework that seeks to focus future growth to the appropriate scale and intensity based upon a combination of the character, transportation capacity, and utility infrastructure availability within the planning area. G3 Intended Growth Sector is applied to land situated within the Twelve Mile Creek Basin, where transportation routes and utility infrastructure are present or can be easily extended to support urban development. Within this sector, the Town intends to focus its efforts on planning for and funding high priority infrastructure investments to facilitate urban growth over the short to medium term. The Parks and Recreation recommendations include: • Planning for and building the infrastructure necessary to support an active living community, including bike lanes, sidewalks, and greenways to make physical activity safe, accessible, and well connected to existing and planned trail segments that provide convenient access to all areas of Town. • Continuing to plan for and develop the Twelve Mile Creek corridor as the central connecting spine of the town-wide greenway system.
NCDOT Complete Streets Policy, 2019 Agency: NCDOT	The NCDOT Complete Streets Policy Update was adopted by the Board of Transportation in August 2019. This policy requires NCDOT to consider and incorporate multimodal facilities in the design and improvement of all transportation projects in North Carolina. Bicycle, pedestrian, and public transportation facilities that are in a published state, regional, or local plan and have been determined to have an existing or future need for multimodal facilities as part of the Complete Streets Review process, will be included as part of the proposed roadway project. Any multimodal facility that is determined to be needed as part of the complete streets review process but not identified in an adopted plan or study, will be included in the NCDOT project but may require a cost share with the local jurisdiction based on population threshold, which is outlined in The Complete Streets Implementation Guide. The policy also establishes maintenance responsibility for active transportation facilities. Bicycle, pedestrian, and transit improvements inside a municipal boundary are subject to local maintenance.
Waxhaw Land Development Code, 2021 (revised in 2023) Agency: Town of Waxhaw.	One stated purpose of Section 6 – Design Standards is to promote connectivity of transportation modes, including streets, sidewalks, bike lanes, greenways, and trails to provide a variety of transportation choices/opportunities for residents and visitors. Section 7.4 states that greenway locations and alignments are required to be approved by the Zoning Administrator as depicted on the Town's adopted plans. The section also adds that "public greenways may be located along Town right-of-way adjacent to streets or through private property if an easement for public maintenance is acquired."

EXISTING POLICY	KEY RECOMMENDATIONS RELATED TO THE TWELVE MILE CREEK GREENWAY FEASIBILITY STUDY
NCDOT Roadway Design Manual, 2021 (Updated May 2023) Agency: NCDOT	The Roadway Design Manual provides general design information, design criteria, and plan preparation guidance for NCDOT roadways. Guidance on multimodal design elements can be referenced in Part 1, Chapter 4, Sections 4.14, 4.15, and 4.16. Guidance states that shared-use paths, often referred to as greenways, are paths physically separated from motor vehicle traffic and used by pedestrians, bicyclists, wheelchair users, and other nonmotorized users. Most shared-use paths are designed for two-way travel. Sidepaths are shared-use paths located adjacent to and parallel to the roadway or within the ROW. Sidepaths and other shared-use paths are wider than sidewalks, accommodating both bicyclists and pedestrians and are used for both transportation and recreational uses. The width of a shared-use path may vary based on expected user volumes and context. Minimum widths do not include graded areas or buffers on either side of the pathway. • Desirable width – 12 to 14 feet • Minimum width – 10 feet; 8 feet in exceptionally constrained areas • Vertical clearance, minimum – 8 feet Shared-use paths follow federal requirements for accessibility per the U.S. Access Board and the U.S. Department of Justice. Refer to PROWAG Chapter 3 Section R302.5 and R302.6. Minimum requirements follow the 2010 American with Disabilities Act (ADA) Standards for Accessible Design. Refer to NCDOT Minimum Design Recommendations for Greenways for pavement design, when applicable. Refer to the American Association of State Highway and Transportation Officials (AASHTO) Guide for the Planning, Design, and Operation of Pedestrian Facilities, and AASHTO Guide for the Development of Bicycle Facilities 2012 Fourth Edition, Chapter 5 for more detailed information. For Pedestrian Roadway Crossing, refer to NCDOT Roadway Standard Drawings Std. Nos. 848.05 and 848.06 for detailed dimensions for pedestrian refuge islands, crossing islands at channelized right turn lane intersections, curb extensions and raised crossings.
Town of Waxhaw ADA Transition Plan, Created 2021, Updated 2023 Agency: Town of Waxhaw	ADA Transition Plans are required by the ADA and provide a plan for removal of physical barriers to accessibility in transportation systems and facilities for people with disabilities. Waxhaw's ADA Transition Plan will be updated periodically until the inventory of all accessibility barriers is eliminated.
Waxhaw 2040 Comprehensive Plan (Adopted November 2023) Agency: Town of Waxhaw	The 2040 Comprehensive Plan recommends adding new and expanding current recreational facilities so that every resident lives within a 10-minute walk to a public park.
2024 Waxhaw Master Transportation Plan Agency: Town of Waxhaw	The 2024 Master Transportation Plan is a locally driven plan that identifies critical transportation improvements, reates a defensible implementation strategy and includes an action plan that outlines priorities, funding options and partnership needs.

2.5 // Corridor Description

The Carolina Thread Trail identified the general corridor alignment for the Twelve Mile Creek Greenway in its 2011 Master Plan for Union County. The proposed corridor for the Twelve Mile Creek Greenway is just over 5 miles long and generally follows Twelve Mile Creek east to west, approximately two miles north of Waxhaw's downtown, flowing from the state border with Lancaster County, South Carolina to the Village of Wesley Chapel. The corridor is primarily within Waxhaw's town limits, apart from a portion that runs through unincorporated Union County. The proposed greenway connects existing and developing residential areas, commercial nodes, schools, and parks and incorporates existing trail and greenway segments. The proposed greenway intersects with major north-south roadway corridors and planned components of additional future trails. Through the planning and policies listed in Tables 2.1 and 2.2, the Town of Waxhaw has been a staunch steward of the future Twelve Mile Creek Greenway corridor. The Town has communicated with homeowners' associations along the corridor, discussed greenway development requirements with developers, coordinated with Union County Water about the use of easements, and advocated for integration of the greenway into state transportation projects.

While this project is similar in public popularity to Sonny Way, the Twelve Mile Creek Greenway corridor has far fewer ownership constraints than Sonny Way. Because of this, it can take advantage of more existing segments and funded improvements to facilitate completion. These elements make the Twelve Mile Creek Greenway project an attractive priority in developing the Town's multimodal network.



TWELVE MILE CREEK GREENWAY FEASIBILITY STUDY

STUDY AREA

- Study Area
- Existing Carolina Thread Trail
- Planned Carolina Thread Trail
- Planned Trail Bridge
- Existing Timber Bridge
- Stream / Pond
- Park
- Subdivision
- Town of Waxhaw

2.6 // Study Goals

The Town of Waxhaw wishes to establish a safe, convenient, and expansive system of greenways and trails that provide non-vehicular connectivity to neighborhoods, shopping areas, schools, parklands, and other community destinations and connect to the state-wide and interstate greenway network. This system will provide a practical, enjoyable, and healthful alternative to vehicular dependence, serving all ages, abilities, and economic levels, and will help establish, preserve, and protect vital corridors of the natural environment.

Critical to this comprehensive vision is the establishment of an east-west spine along Waxhaw's portion of the Twelve Mile Creek system, designated as the Carolina Thread Trail. The Twelve Mile Creek Greenway corridor will provide a much needed, centrally located facility to meet these challenges. This crucial east-west spine will connect multiple economically and racially diverse neighborhoods across Waxhaw with destinations that meet common commercial, recreational, and civic needs. The corridor will provide multiple opportunities for all ages to experience Waxhaw's natural environment, inviting access through a broad network of spur trails and adjacent developed parklands.

The goals of the study are to:

- Develop a plan that highlights needed improvements and corresponding investments over the next five years
- Identify and characterize the proposed greenway corridor
- Provide key information about existing conditions
- Offer technical analysis, including
  - » Environmental conditions and constraints
  - » Hydraulic analysis
- Estimate magnitude of costs
- Offer prioritization and implementation recommendations
- Provide information on funding sources
- Discuss requisite permitting and environmental compliance
- Identify an action plan toward implementation

Integrated Mobility Division

N.C. DEPARTMENT OF TRANSPORTATION

Section 3 // Considerations and Constraints

Twelve Mile Creek Greenway Feasibility Study

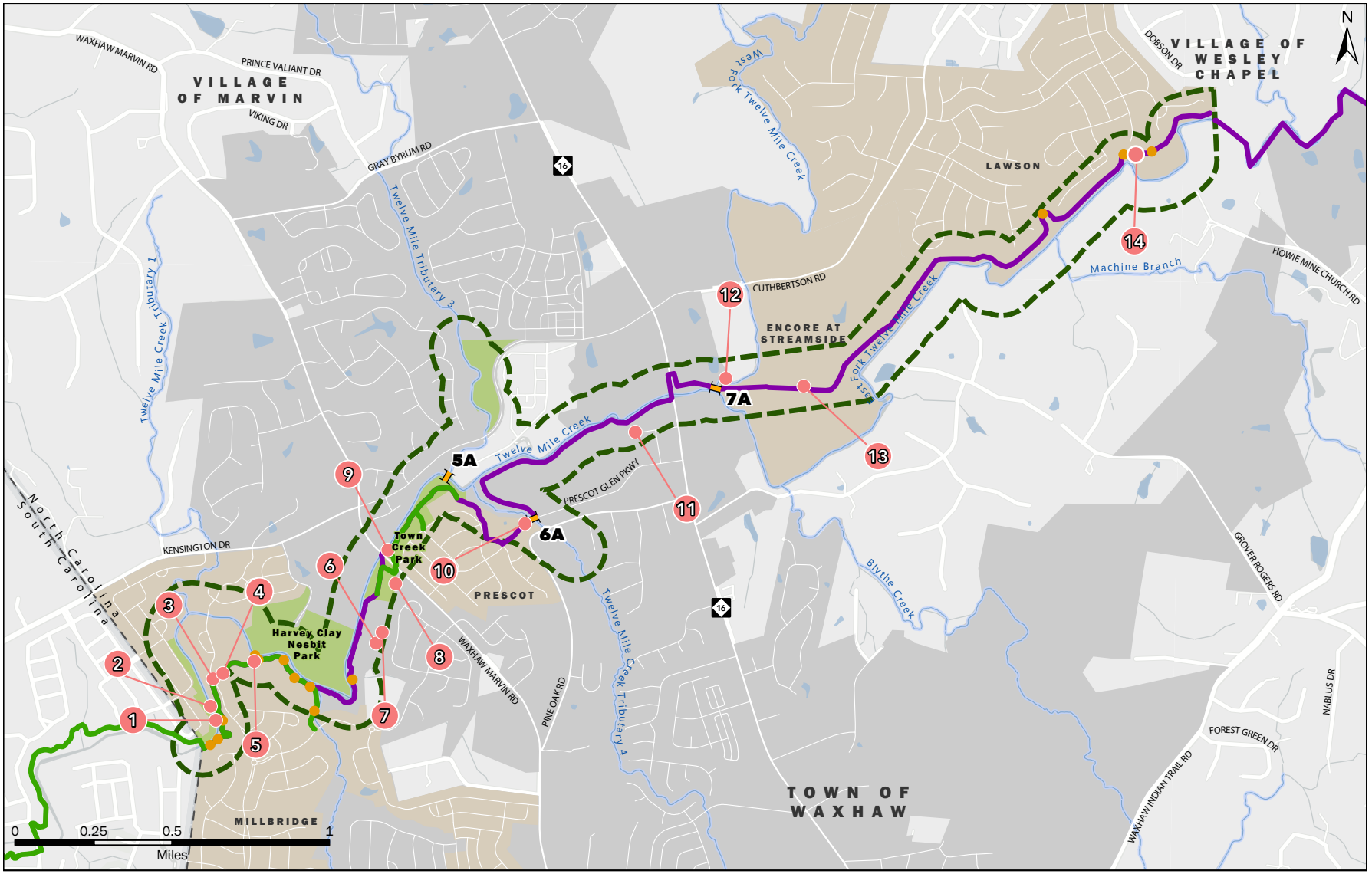
Town of Waxhaw

NCDOT IMD

3.1 // Site Visit

A site visit was conducted on July 27, 2023. Town staff joined the consultant team to visit key areas along the proposed corridor to view constraints and gain context for the proposed trail. This tour allowed the team to observe:

- Neighborhood context
- Existing greenways
- Current issues with flooding and drainage
- NCDOT bridges in the corridor
- Locations of potential connections to additional trails
- Points of major crossing needs
- Commercial areas and points of interest
- Potential kayak launch areas

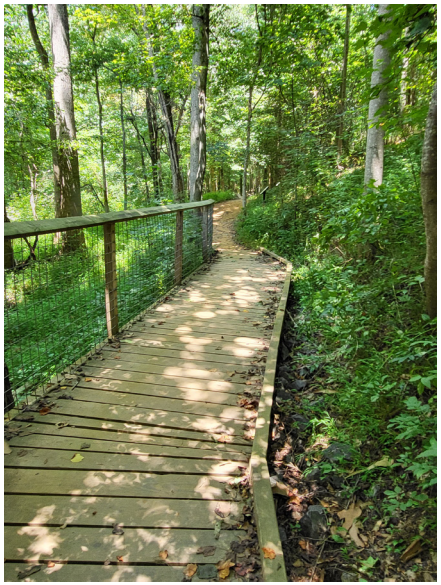


TWELVE MILE CREEK GREENWAY FEASIBILITY STUDY

PHOTO POINTS

- Study Area
- Existing Carolina Thread Trail
- Planned Carolina Thread Trail
- Planned Trail Bridge
- Existing Timber Bridge
- Photo Point
- Stream / Pond
- Park
- Subdivision
- Town of Waxhaw

WAXHAW Est. 1889



1. Existing boardwalk (Segment 1)

2. Unpaved, natural section (Segment 1)

3. Themed CTT crosswalk at Millbridge Parkway (Segment 2)

4. Existing CTT route through Millbridge Neighborhood on former construction access road (Segment 2)

5. Existing greenway path in Millbridge Neighborhood with CTT markers (Segment 3)

6. Wet, rutted area south of Town Creek Park (Segment 4)

7. Potential wetland vegetation south of Town Creek Park (Segment 4)

8. Approaching Town Creek Park amenities (Segment 4)

9. Looking toward Waxhaw-Marvin Bridge from trail (Segment 5)

10. Sidewalk segment in Prescot Neighborhood (Segment 5)

11. Viewing terrain from Prescot Village Commercial area (Segment 6)

12. West Fork Twelve Mile Creek Crossing (Segment 7)

13. Encore neighborhood under development, looking toward future trail area (Segment 7)

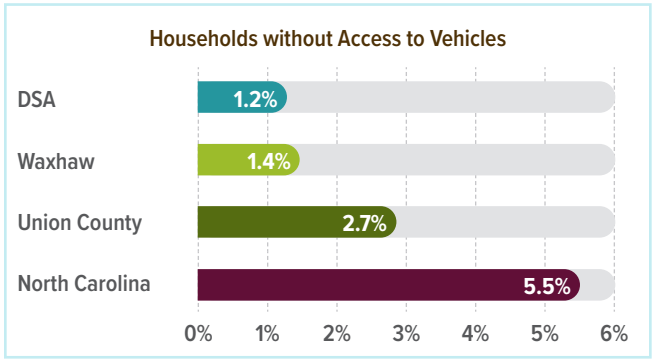
14. Bridge on existing Lawson Walking Path (Segment 9)

3.2 // Existing Conditions - Human Environment

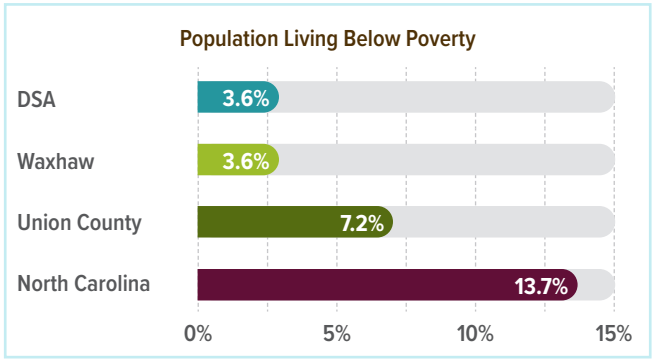
Demographics for the population near the Twelve Mile Creek Greenway study area are presented below. The demographic study area (DSA) comprises the census block groups contained in or intersected by the study area. Census block groups block groups included in the DSA for this study are the following:

- Census Tract 210.12, Block Groups 1, 2, & 3
- Census Tract 210.13, Block Groups 1, 2, & 3
- Census Tract 210.17, Block Group 1

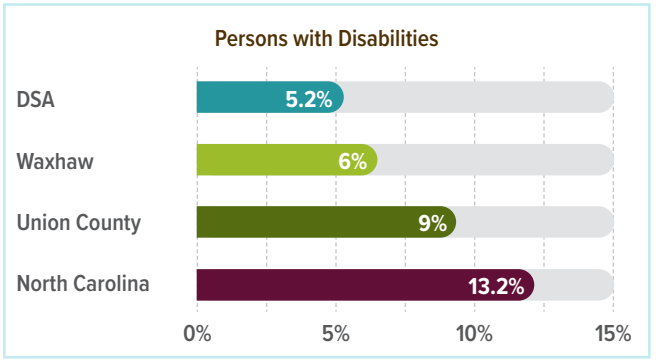
Demographics



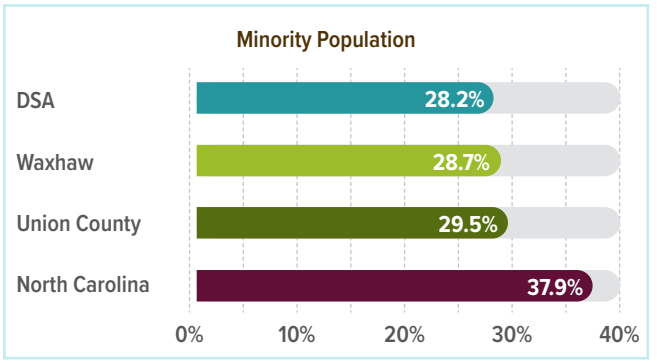
Source: US Census Bureau, American Community Survey 5-year Estimates (2017-2021), Table B25044, "Tenure by Vehicles Available."



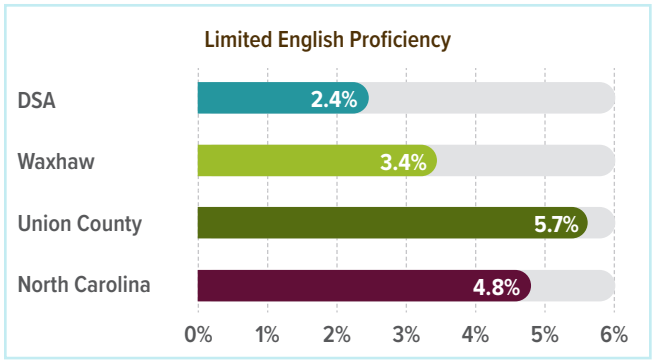
Source: US Census Bureau, American Community Survey 5-year Estimates (2017-2021), Table C17002, "Ratio of Income to Poverty Level in the Past 12 Months."



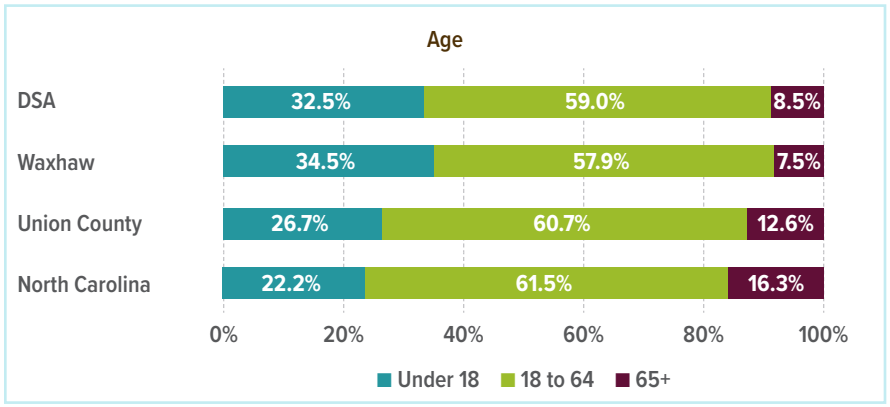
Source: US Census Bureau, American Community Survey 5-year Estimates (2017-2021), Table B18101, "Sex by Age by Disability Status."



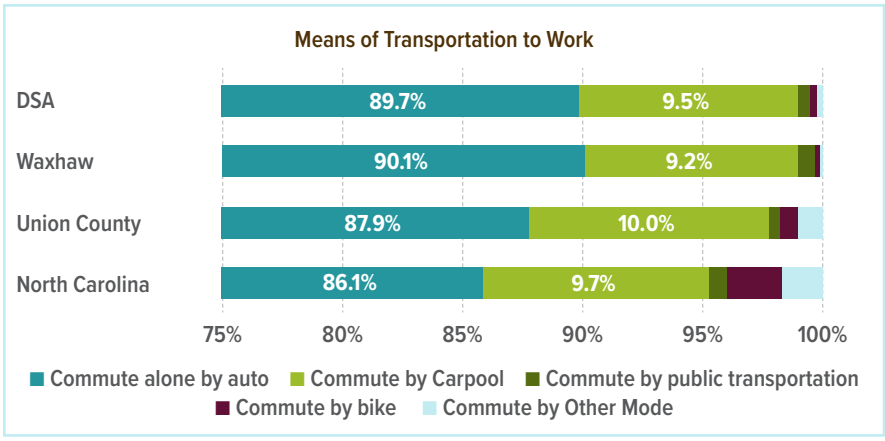
Source: US Census Bureau, American Community Survey 5-year Estimates (2017-2021), Table B02001, "Race."; US Census Bureau, American Community Survey 5-year Estimates (2017-2021), Table B03002, "Hispanic or Latino Origin by Race."



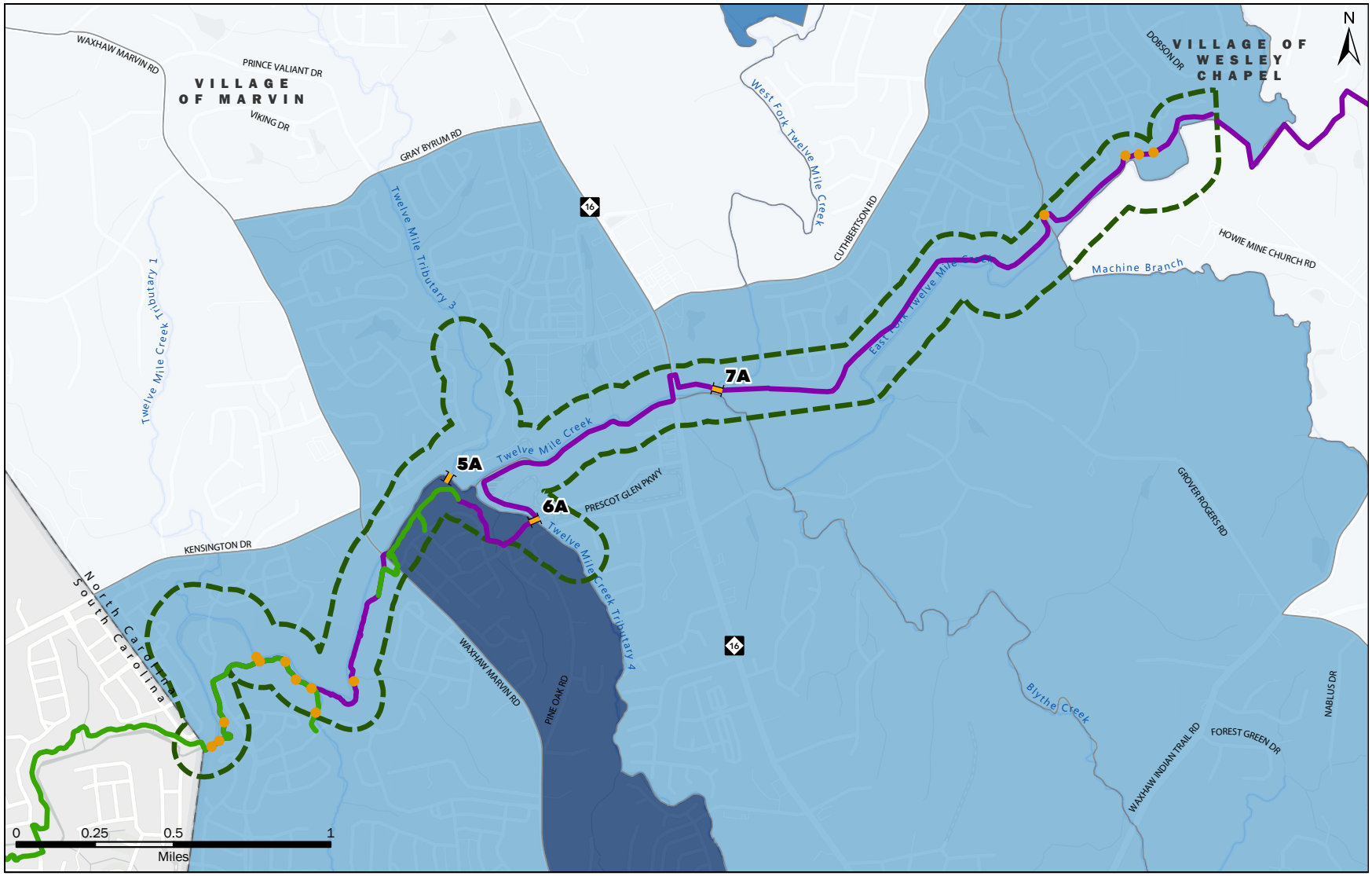
Source: US Census Bureau, American Community Survey 5-year Estimates (2017-2021), Table B16004, “Age by Language Spoken at Home by Ability to Speak English for the Population 5 Years and Over.”



Source: US Census Bureau, American Community Survey 5-year Estimates (2017-2021), Table B01001, “Sex by Age.”



Source: US Census Bureau, American Community Survey 5-year Estimates (2017-2012), Table B08006, "Sex of Workers by Means of Transportation to Work".



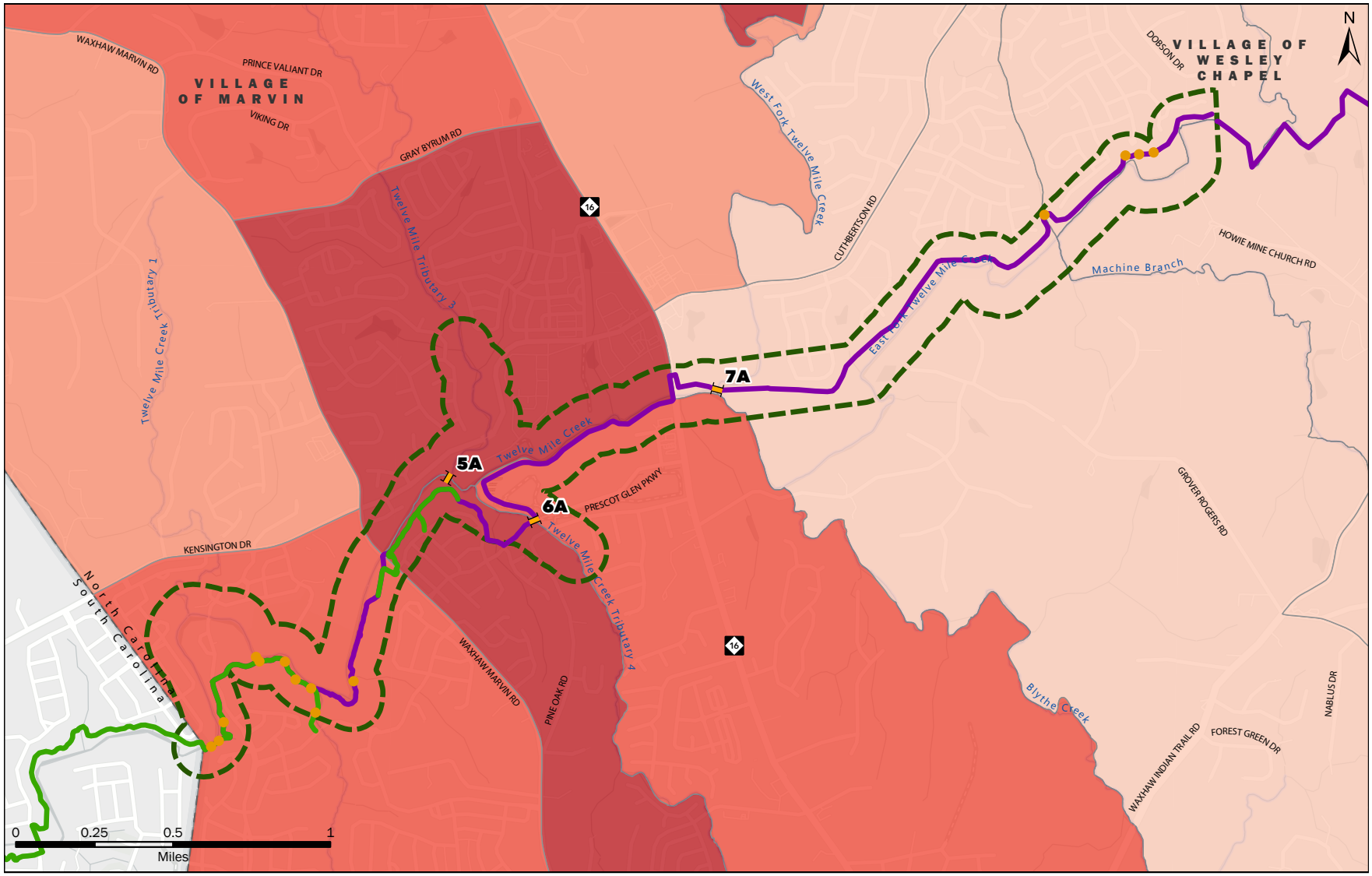
TWELVE MILE CREEK GREENWAY FEASIBILITY STUDY

POVERTY

Study Area
Existing Carolina Thread Trail
Planned Carolina Thread Trail
Planned Trail Bridge
Existing Timber Bridge

Percentage of Households in Poverty
Greater Than 10%
5 - 10%
2 - 5%
1 - 2%
0 - 1%

Source: US Census Bureau, American Community Survey 1-Year Estimates (2022), Table B17101, "Poverty Status in the Past 12 Months of People in Housing Units."



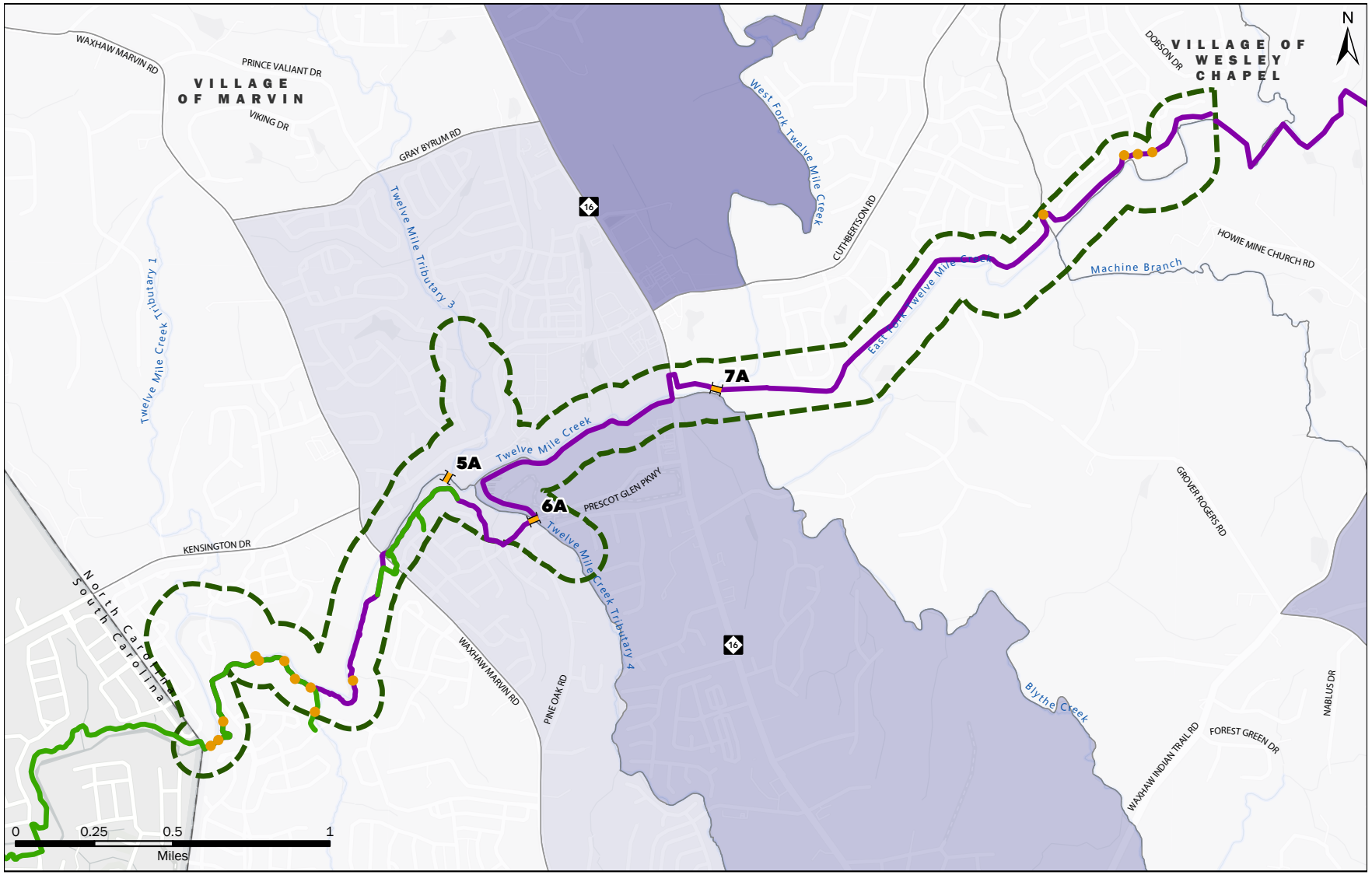
TWELVE MILE CREEK GREENWAY FEASIBILITY STUDY

RACE

Study Area
Existing Carolina Thread Trail
Planned Carolina Thread Trail
Planned Trail Bridge
Existing Timber Bridge

Minority Population
Greater Than 50%
40 - 50%
30 - 40%
20 - 30%
10 - 20%
0 - 10%

Source: US Census Bureau, American Community Survey 1-Year Estimates (2022), Table B03002, “Hispanic or Latino Origin by Race.”



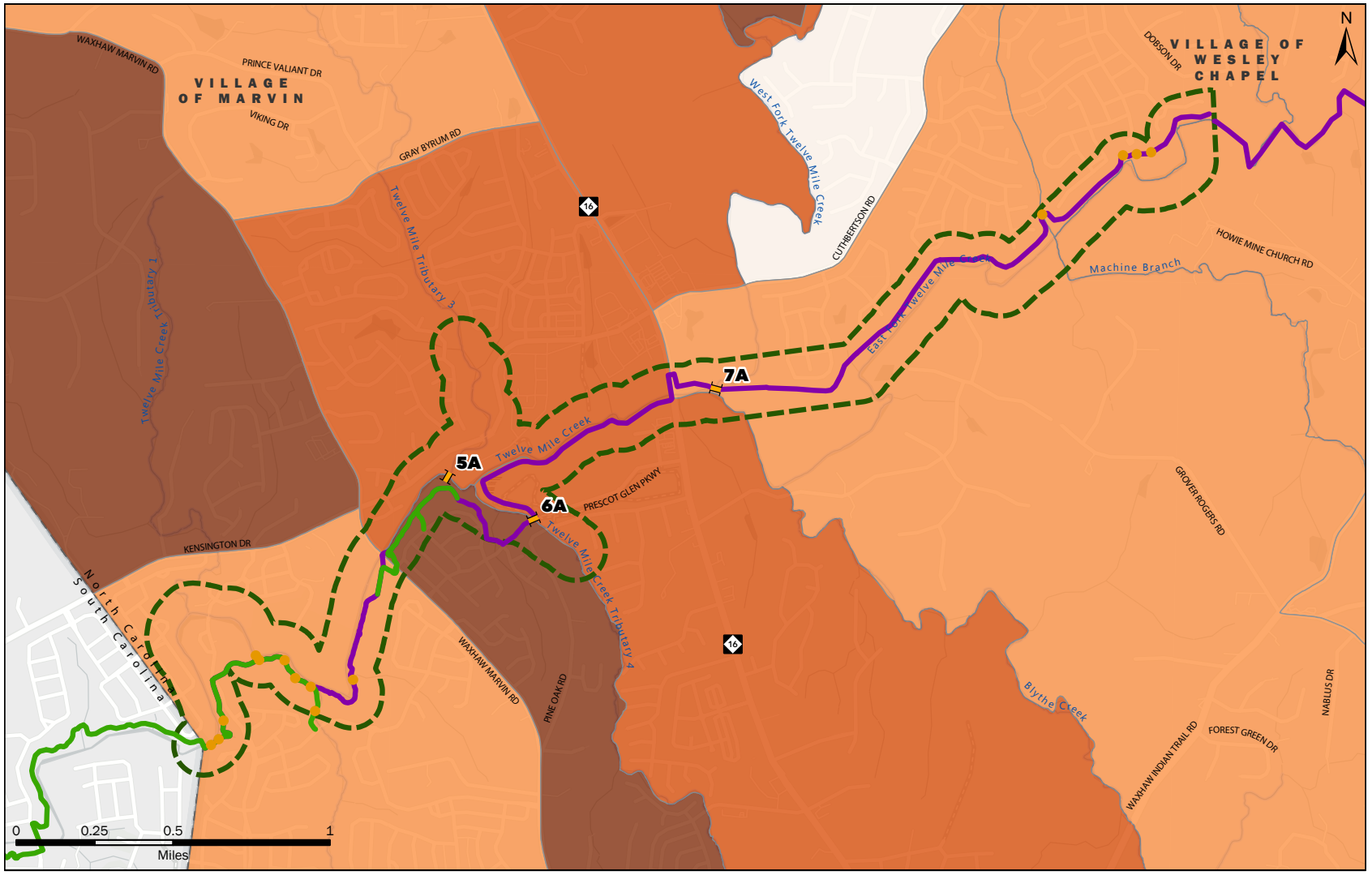
TWELVE MILE CREEK GREENWAY FEASIBILITY STUDY

HOUSEHOLDS WITH NO VEHICLE ACCESS

Study Area
Existing Carolina Thread Trail
Planned Carolina Thread Trail
Planned Trail Bridge
Existing Timber Bridge

Households With No Vehicle Access
Greater Than 5%
4 - 5%
3 - 4%
2 - 3%
1 - 2%
0 - 1%

Source: US Census Bureau, American Community Survey 1-Year Estimates (2022), Table B25044, "Tenure by Vehicles Available."



TWELVE MILE CREEK GREENWAY FEASIBILITY STUDY

TRANSPORTATION DISADVANTAGE INDEX (TDI)

- Study Area
- Existing Carolina Thread Trail
- Planned Carolina Thread Trail
- Planned Trail Bridge
- Existing Timber Bridge

Transportation Disadvantage Index Score

- Greater Than 11
- 10.5 - 11
- 9.5 - 10
- 8.5 - 9
- Less Than or Equal to 8

Source: US Census Bureau, American Community Survey 5-Year Estimates (2018-2020), Transportation Disadvantage Index; "Zero Vehicle Ownership.", "Poverty Level.", "Youth Aged 15 and Under.", "Seniors Aged 65 and Older.", "Mobility Impairments.", "Black, Indigenous, and Persons of Color." Accessed via NCDOT TDI Tool, https://storymaps.arcgis.com/stories/7e3bbd00fe014a77b5f1620334209712.

3.2.1 // Community Features

Neighborhoods

Four existing neighborhoods are directly connected to the Twelve Mile Creek Greenway corridor: Millbridge, Prescot, Encore at Streamside (currently under construction), and Lawson. Each of these subdivisions includes segments of their own greenways on property owned and controlled by homeowners' associations. An additional residential development located adjacent to the greenway, Artisan Prescot, is under review at the east side of Twelve Mile Creek off Prescot Glen Parkway.

Parks

Two town-owned parks are located along the proposed greenway corridor: H.C. Nesbit Park, a 40-acre park that features soccer, baseball, and softball fields and is adjacent to Kensington Elementary School and the Millbridge neighborhood, and Town Creek Park, which has frontage on Waxhaw-Marvin Road and offers open green space and a playground. Both parks along the proposed greenway have parking areas and currently serve as trailheads.

Schools

Kensington Elementary School is located adjacent to H.C. Nesbit Park, near the Millbridge neighborhood.

Commercial areas

Two major shopping centers are found along the proposed greenway corridor, including Prescot Village and Cureton Town Center. Prescot Village is partially built out and is continuing to develop. Cureton is just north of the proposed corridor on the north side of Twelve Mile Creek, at the southwest quadrant of the intersection between NC 16/Providence Road and Kensington Drive.

3.2.2 // Property and Easements

Neighborhood Homeowners Associations-Owned

The greenway passes through land owned by neighborhood homeowners associations, both with existing greenway paths and in undeveloped areas where the greenway is planned.

Town Owned Areas

Several areas are already owned by the Town of Waxhaw, including at H.C. Nesbit Park and Town Creek Park and the creek-adjacent parcel along Twelve Mile Creek bordering the Prescot neighborhood.

Private Development

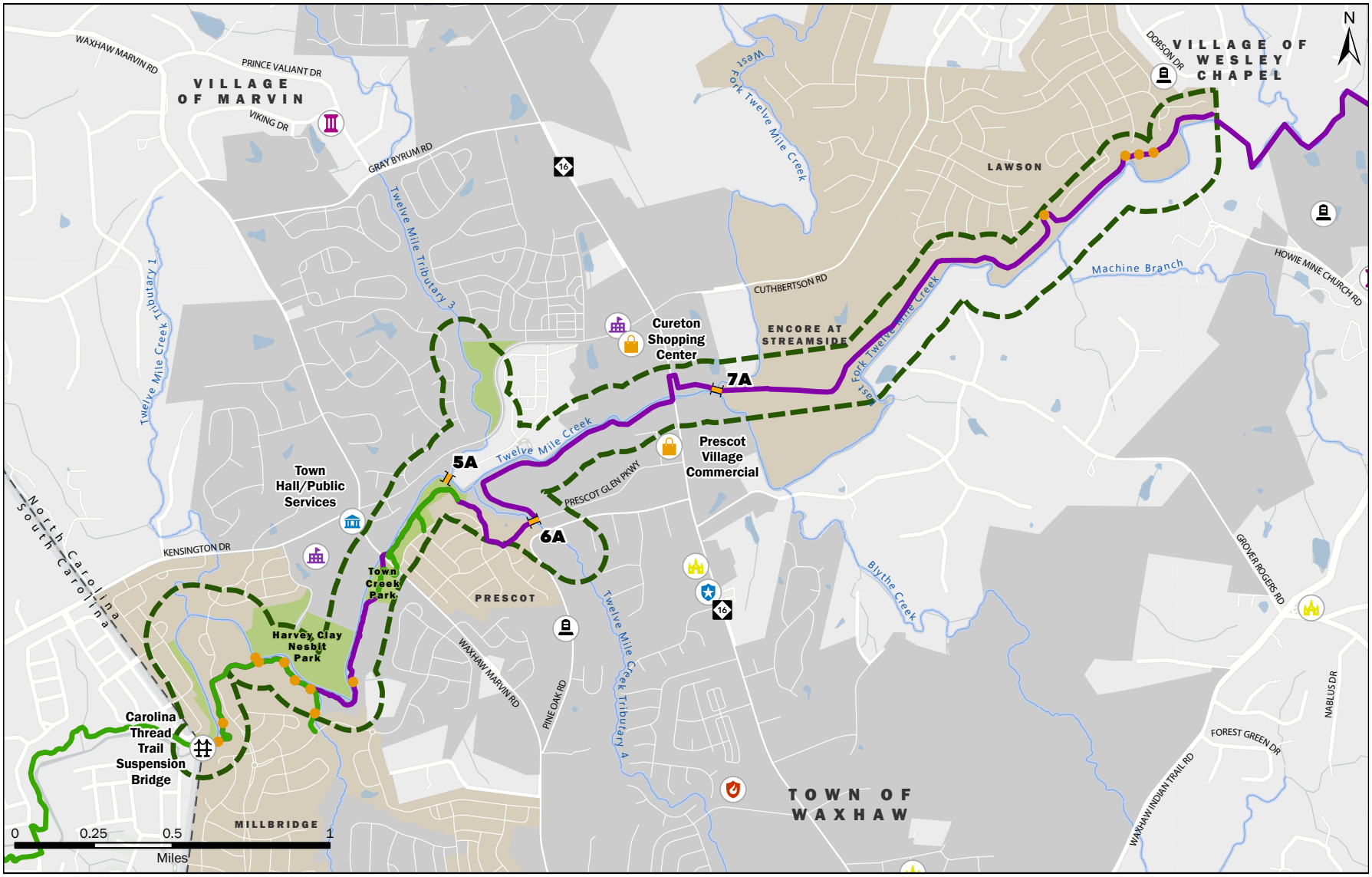
Several sections of the proposed greenway travel through parcels that are either under development or zoned and/or planned for development. The inclusion of the Twelve Mile Creek Greenway in adopted plans obligates private developers to ensure the completion of greenways on these parcels.

NCDOT Right-of-Way

Portions of the proposed greenway cross or run along NCDOT right of way. Key areas are NCDOT Bridge 890224 over Twelve Mile Creek on Waxhaw-Marvin Road (Project BP10.R017), NCDOT Bridge 890033 over Twelve Mile Creek on NC 16/Providence Road (Project U-5769B), and sidewalk and a proposed pedestrian bridge connecting two segments of Prescot Glen Parkway. Both NCDOT bridge replacements are to be built with shelves to carry the greenway beneath the roadway bridge.

County Easements

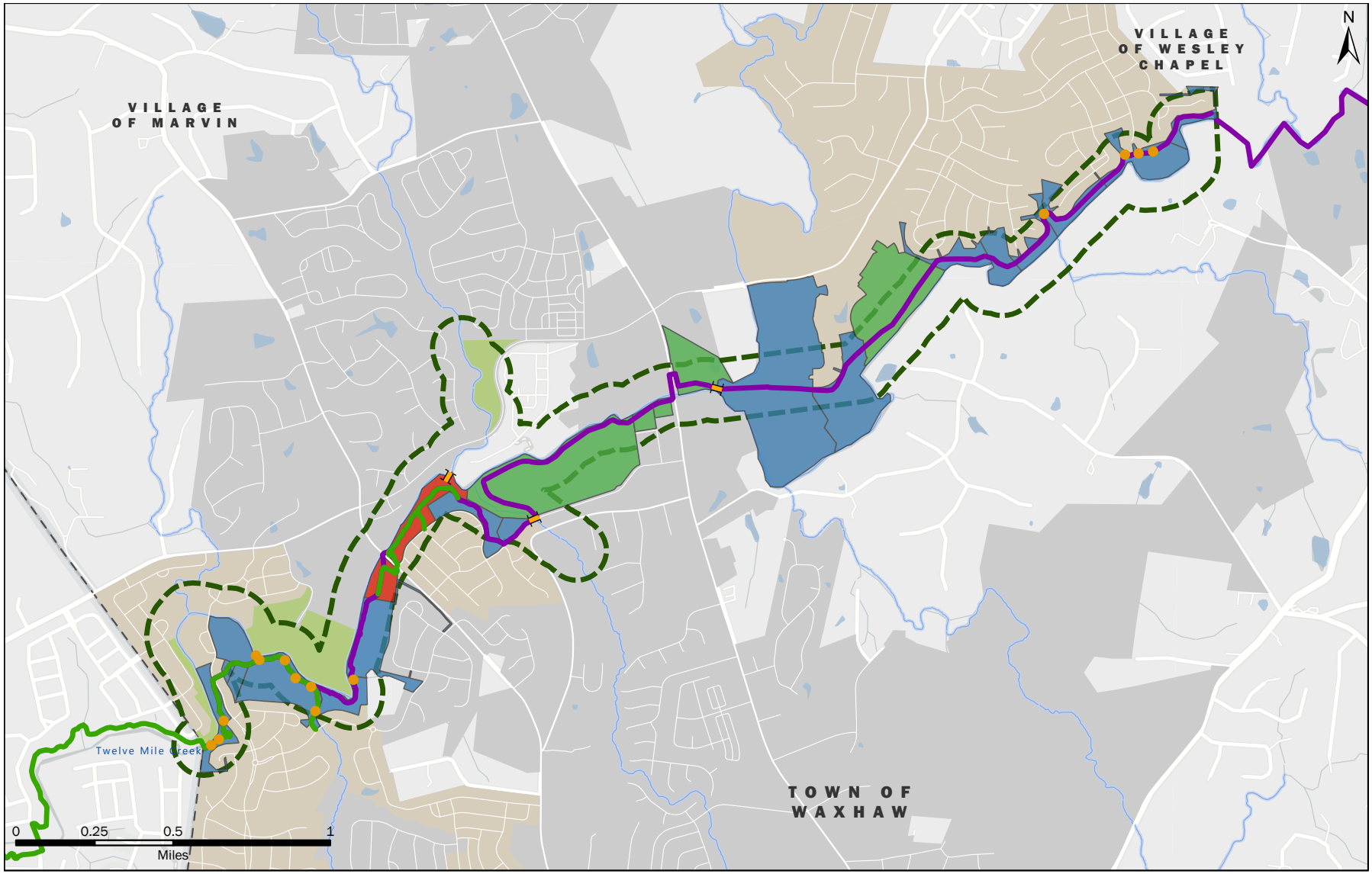
Coordination with Union County to utilize their existing sewer easements will be necessary along portions of the trail. The Union County Public Works staff will allow the Town to build a greenway within their easement, but new encroachment agreements and a survey will be needed to allow the greenway to use a 20-foot-wide portion of the easement. Future developments will include the Town on the utility easements granted to Union County Public Works or Union Power/Duke.



TWELVE MILE CREEK GREENWAY FEASIBILITY STUDY

HUMAN ENVIRONMENTAL FEATURES

- Study Area
- Existing Carolina Thread Trail
- Planned Carolina Thread Trail
- Planned Trail Bridge
- Existing Timber Bridge
- School
- Place of Worship
- State Listed Historic Site
- Waxhaw Police Department
- Fire Stations
- Cemetary
- Stream / Pond
- Park
- Subdivision
- Town of Waxhaw



TWELVE MILE CREEK GREENWAY FEASIBILITY STUDY

ADJACENT PARCELS

- Study Area
- Existing Carolina Thread Trail
- Planned Carolina Thread Trail
- Planned Trail Bridge
- Existing Timber Bridge

Adjacent Parcels

- Developer Owned
- HOA Owned
- Town Owned

- Stream / Pond
- Park
- Subdivision
- Town of Waxhaw

3.2.3 // Transportation Network

Roadway

The proposed Twelve Mile Creek Greenway crosses two primary north-south roadways: Waxhaw-Marvin Road (SR 1301) and NC 16/Providence Road. The primary east-west vehicular corridor near the proposed greenway is Kensington Drive (west of NC 16/Providence Road) and Cuthbertson Road (east of NC 16/Providence Road).

Existing Bike and Pedestrian Infrastructure

The existing bike and pedestrian infrastructure in Waxhaw consist primarily of neighborhood greenways and sidewalks. Newer developments are required to include sidewalk infrastructure. Along the Twelve Mile Creek Greenway corridor, existing neighborhood greenways, park pathways, and small segments of sidewalk are used where possible.

Future Bike and Pedestrian Infrastructure

The Town of Waxhaw's 2023 Pedestrian Plan Update includes several planned greenway paths. Those that would intersect or connect with the Twelve Mile Creek Greenway are listed here:

Sonny Way (Paths 1 ,5, 14, and 15 from the 2023 Pedestrian Plan Update)

Sonny Way is the north-south greenway spine on the west side of NC 16/Providence Road planned by the Town of Waxhaw and was included in the 2023 Pedestrian Plan Update as Paths 1, 5, 14, and 15. This planned greenway will run from the center of downtown to the Town's northern limits. The completion and connection of Sonny Way and the Twelve Mile Creek Greenway will be the primary multimodal transportation spines connecting the Town of Waxhaw. Sonny Way would meet the Twelve Mile Creek Greenway at the east side of Bridge 6A (at Artisan Prescot), the two paths would run concurrently through a portion of the Prescot neighborhood, then Sonny Way would diverge to the north with a crossing over Twelve Mile Creek (Bridge 5A) near the Kensington Drive roadway bridge.

Blythe Creek Greenway (Paths 24, 25, and 32 from the 2023 Pedestrian Plan Update)

The Blythe Creek Greenway is a north-south greenway on the east side of NC 16/Providence Road and is included in the Town's 2023 Pedestrian Update as Paths 24, 25, and 32. This greenway would follow Blythe Creek from an intersection with Old Waxhaw-Monroe Road (SR 1111) to the intersection with the Twelve Mile Creek Greenway just east of NC 16/Providence Road. Blythe Creek Greenway will require a greenway bridge to cross Twelve Mile Creek near the end of Ski Trail Lane and could connect to the Twelve Mile Creek Greenway on the east side of the proposed bridge over West Fork of Twelve Mile Creek.

West Fork Greenway (Path 18 from the 2023 Pedestrian Plan Update)

The West Fork Greenway is included in the Town's 2023 Pedestrian Update as Path 18. This planned greenway travels north from the Twelve Mile Creek along the east bank of the West Fork of Twelve Mile Creek, connecting with northwest side of the Lawson neighborhood and the east side of the Providence Grove neighborhood.

Machine Branch Greenway (Path 22 from the 2023 Pedestrian Plan Update)

The Machine Branch Greenway is included in the Town's 2023 Pedestrian Update as Path 22. This path would connect at its south end to sidewalks planned along Waxhaw Indian Trail Road (SR 1008) south of Howie Mine Church Road and follow Machine Branch Tributary north to Twelve Mile Creek. Here, a greenway bridge will be needed to cross the creek and connect to Segment 9 of the Twelve Mile Creek Greenway in the Lawson neighborhood.

The Town also plans for the inclusion or addition of multimodal infrastructure along roadways, per the 2023 Pedestrian Plan Update. Those that would intersect with or connect to the Twelve Mile Creek Greenway are listed here:

NC 16/ Providence Road

Under STIP project U-5769B, NCDOT plans to widen NC 16/Providence Road from Bonds Grove Church Road (SR 1307) in Marvin to Waxhaw Parkway (SR 3530) in Waxhaw. The project includes a replacement of the bridge over Twelve Mile Creek. Both the bridge and the roadway associated with this project would include a sidewalk on the west side of the roadway and a 10-foot multiuse path on the east side of the roadway. Right of way is scheduled to begin on this project in 2025 and construction is scheduled to begin in 2029.

Waxhaw-Marvin Road (SR- 1301)

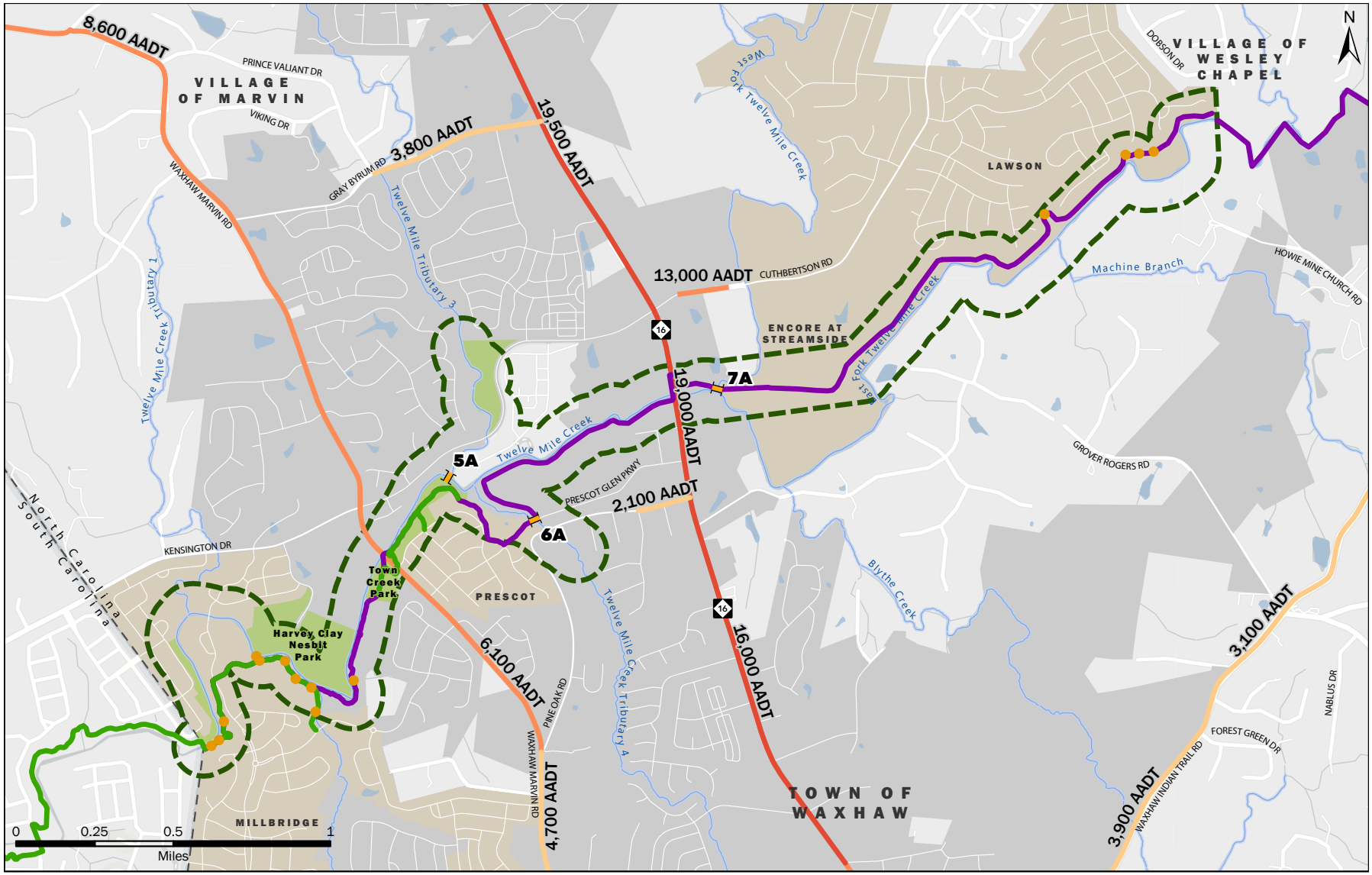
The NCDOT replacement of Bridge 890224 on Waxhaw-Marvin Road over Twelve Mile Creek (BP10.R017) is planned to incorporate the greenway underpass for the Twelve Mile Creek Greenway. The replacement bridge also includes 5-foot sidewalk on the north side of the roadway and a 10-foot multiuse path on the south side of the roadway. The 2023 Pedestrian Plan Update calls for the continuation of the sidewalk and multiuse path along Waxhaw-Marvin Road between Haveron Street to the north and Coldwater Mill Drive to the south, with multiuse path continuing south into downtown Waxhaw. The project is scheduled for Right-of-Way Certification in 2025 and has a Let date for 2026.

Pine Oak Drive Sidewalk

Sidewalks are planned along Pine Oak Drive, a portion of which would be constructed as part of the of the Artisan Prescot development. The 2023 Pedestrian Plan Update calls for the completion of sidewalks along the remainder of Pine Oak Drive to the intersection with NC 16/Providence Road. This project is currently unfunded.

Kensington Drive/Cuthbertson Drive Sidewalks

The 2023 Pedestrian Plan Update includes sidewalks along the entirety of Kensington Drive (SR 1305) from the South Carolina state line to the intersection with NC 16/Providence Road and sidewalks and shared use path along Cuthbertson Road traveling east from the NC 16/Providence Road intersection to the intersection with Waxhaw Indian Trail Road (SR 1008). This project is a candidate for a future CRTPO discretionary grant submittal.



TWELVE MILE CREEK GREENWAY FEASIBILITY STUDY

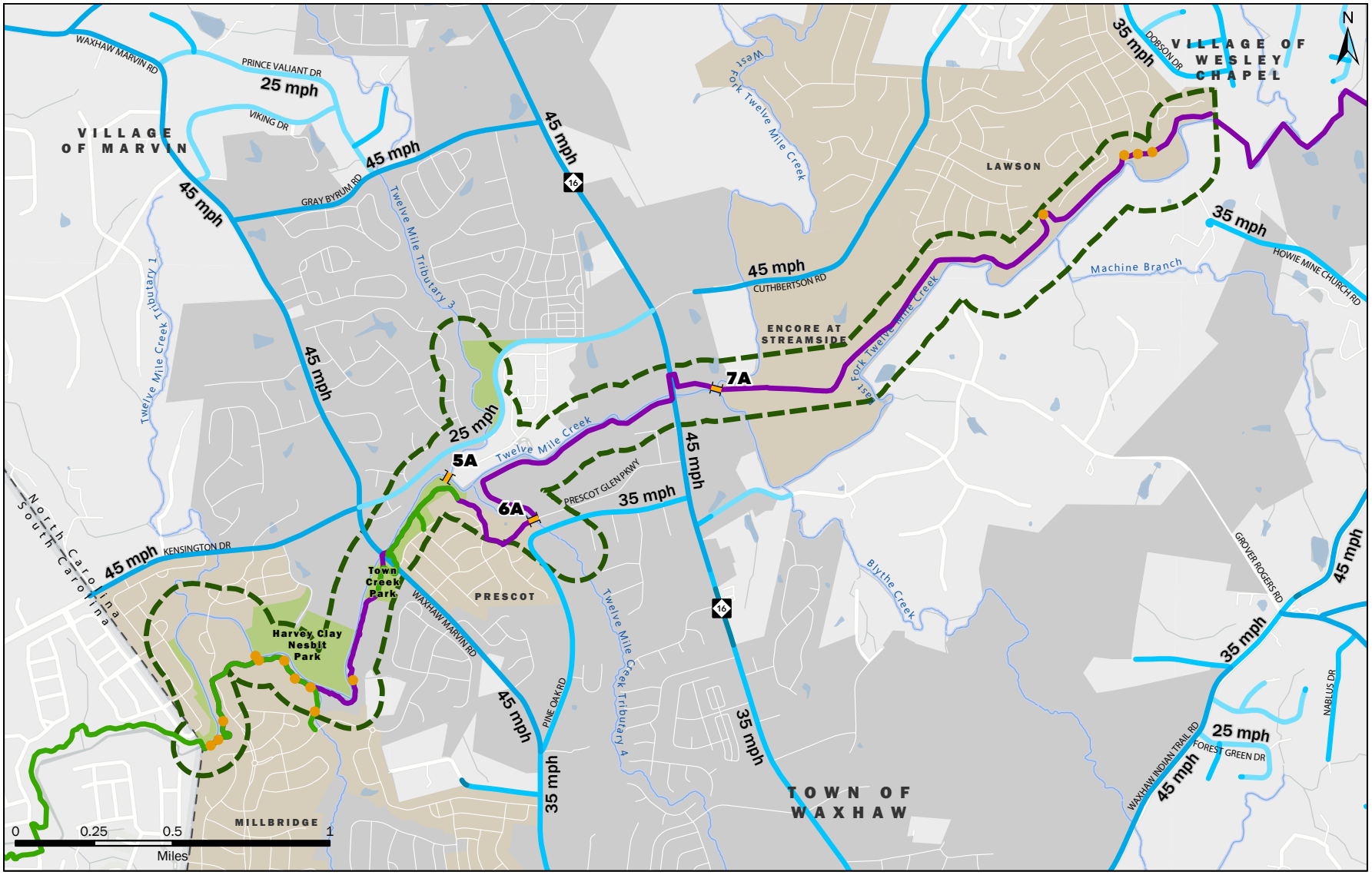
ANNUAL AVERAGE DAILY TRAFFIC

- Study Area
- Existing Carolina Thread Trail
- Planned Carolina Thread Trail
- Planned Trail Bridge
- Existing Timber Bridge

2021 AADT

- 15,001 - 25,000
- 5,001 - 15,000
- 501 - 5,000

- Stream / Pond
- Park
- Subdivision
- Town of Waxhaw



TWELVE MILE CREEK GREENWAY FEASIBILITY STUDY

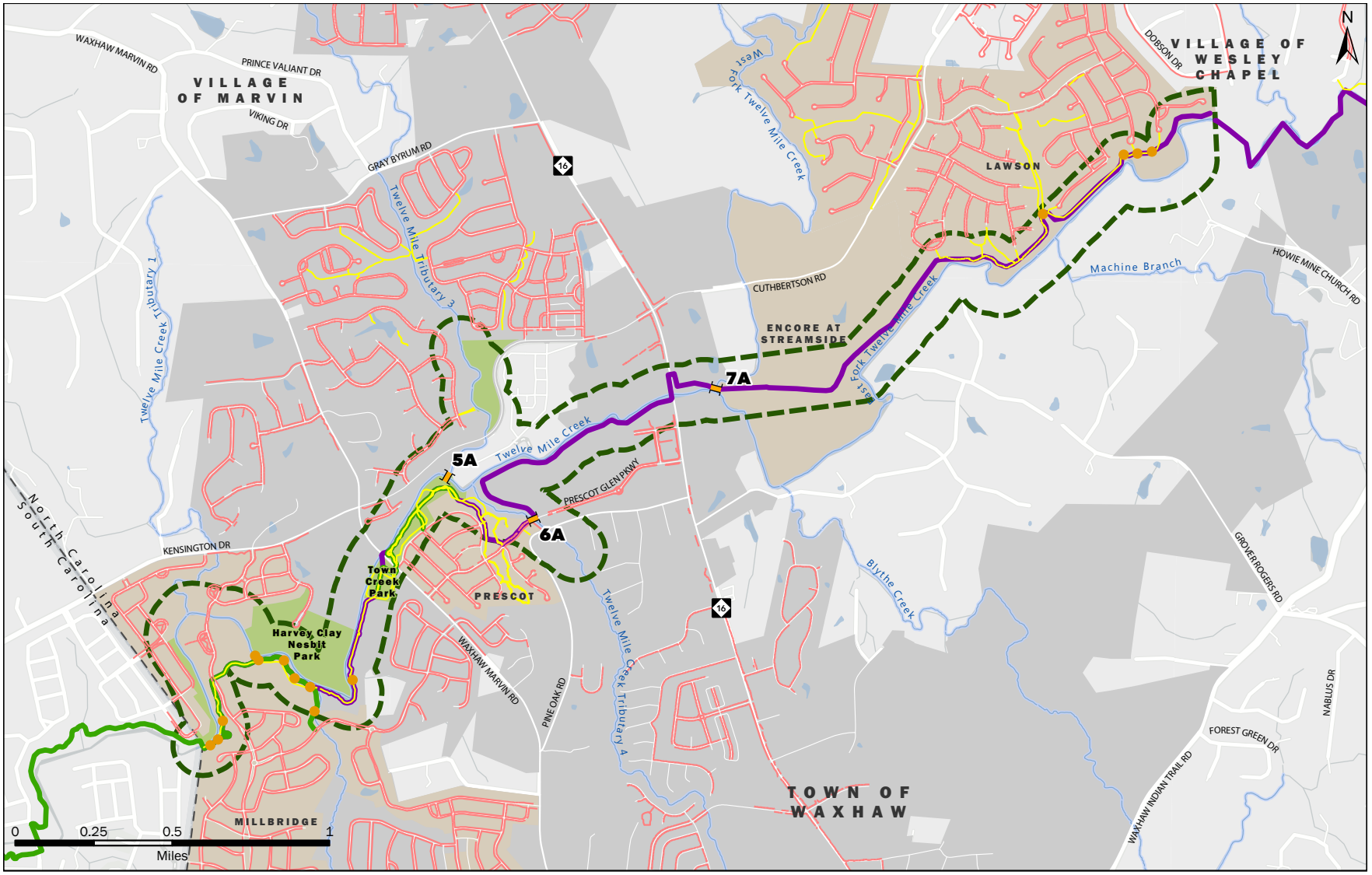
SPEED LIMITS

- Study Area
- Existing Carolina Thread Trail
- Planned Carolina Thread Trail
- Planned Trail Bridge
- Existing Timber Bridge

Speed Limits

- 50 - 55 mph
- 40 - 45 mph
- 30 - 35 mph
- 15 - 25 mph

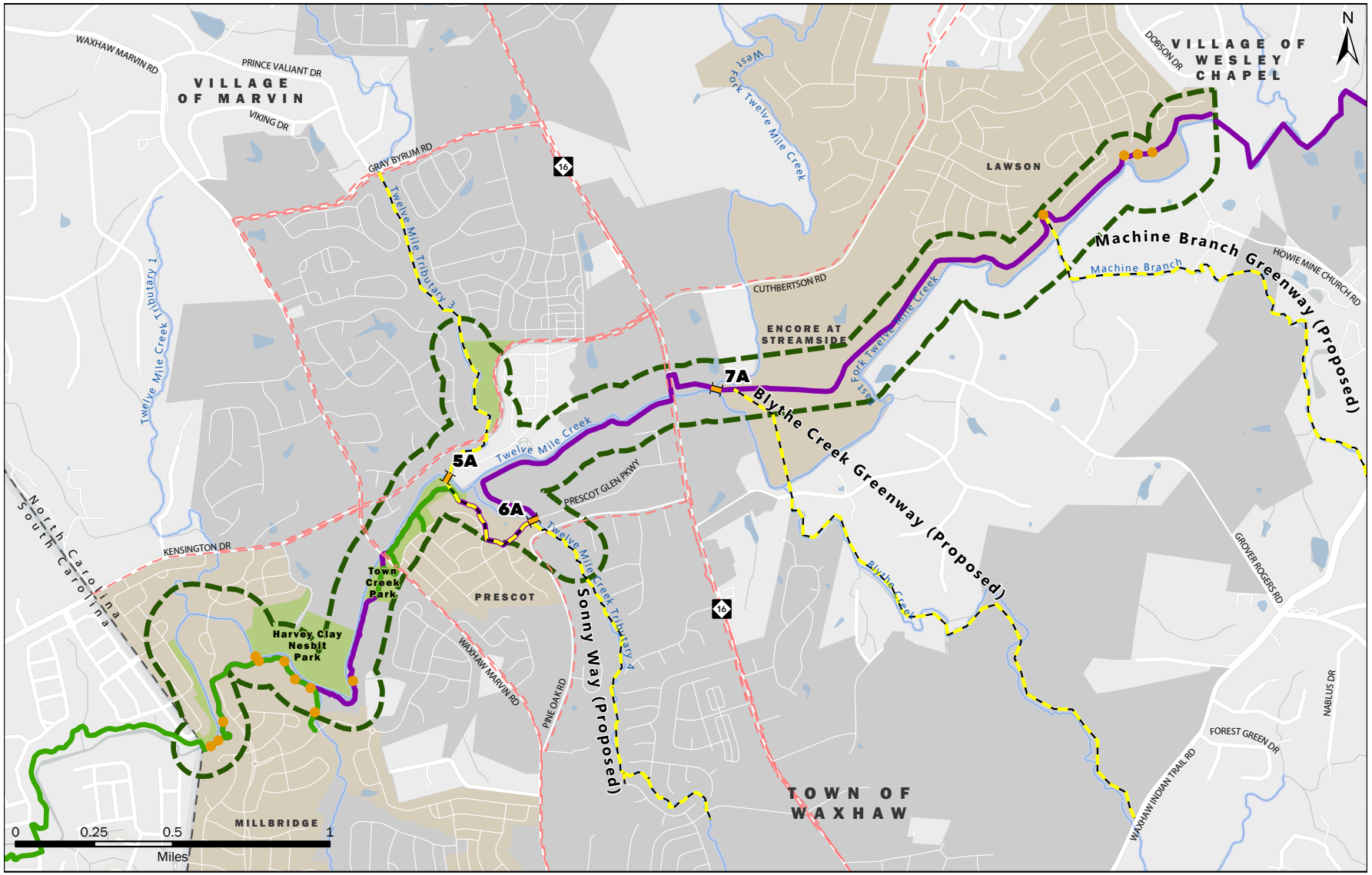
- Stream / Pond
- Park
- Subdivision
- Town of Waxhaw



TWELVE MILE CREEK GREENWAY FEASIBILITY STUDY

EXISTING BICYCLE AND PEDESTRIAN FACILITIES

- Study Area
- Existing Carolina Thread Trail
- Planned Carolina Thread Trail
- Planned Trail Bridge
- Existing Timber Bridge
- Multiuse Path - Existing
- Sidewalk - Existing
- Stream / Pond
- Park
- Subdivision
- Town of Waxhaw



TWELVE MILE CREEK GREENWAY FEASIBILITY STUDY

PROPOSED BICYCLE AND PEDESTRIAN FACILITIES

- Study Area
- Existing Carolina Thread Trail
- Planned Carolina Thread Trail
- Planned Trail Bridge
- Existing Timber Bridge
- Multiuse Path - Proposed
- Sidewalk - Proposed
- Stream / Pond
- Park
- Subdivision
- Town of Waxhaw

3.3 // Existing Conditions - Natural Environment

The Twelve Mile Creek Greenway study area faces several significant constraints in the natural environment, most notably the wide floodplain of Twelve Mile Creek and the steep terrain gradients that must be navigated in some areas. The environmental constraints are significant as floodplains are pervasive through the project corridor, as are several stream crossings of diverse sizes and potential habitat sensitivity, requiring a deliberate balance between required structural components and natural preservation. A major component of the planning effort will be evaluation of the corridor to address all regulatory permitting requirements.

Twelve Mile Creek and Tributaries

The Town of Waxhaw and the study area for the Twelve Mile Creek Greenway are in the Catawba River Basin. The Catawba River Basin, along with the Broad River Basin, forms the headwaters of the Santee-Cooper River system. This river system begins on the eastern slopes of the Blue Ridge Mountains in NC, flows through the NC piedmont to the NC-SC border near Charlotte, and continues to flow through South Carolina to the Atlantic Ocean.

The mainstem of the Catawba River is regulated by a series of seven hydropower reservoirs: Lake James, Lake Rhodhiss, Lake Hickory, Lookout Shoals Lake, Lake Norman, Mountain Island Lake, and Lake Wylie. Lake Wylie crosses the border of NC and SC. Twelve Mile Creek and the several tributaries located within the project study area are part of the 3,005 miles of named and classified freshwater streams and over 60,000 freshwater impoundment acres within the NC portion of the Basin.

Flooding/floodplains

The floodplain is approximately 2,000 feet wide at its widest area. Several segments of existing trails are in areas that flood frequently, at a detriment to the trail surface and causing maintenance concerns and damage to existing infrastructure. The majority of the proposed Twelve Mile Creek Greenway corridor is within the 100-year floodplain, or the area that is likely to flood during a 100-year storm, which has a 1% chance of happening in any given year.

Wetlands

Several areas of wetlands, or areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year, are identified along the proposed project corridor. Segments 4, 6, 9, and 10 all include some presence of wetlands included in preliminary mapping. Avoiding impacts to these wetlands will be important to the implementation phase for the project and will simplify permitting. In some cases, design or surface types may be modified to avoid wetland impacts, such as the use of boardwalks instead of paved at-grade surface.

Threatened and Endangered Species

Table 3.1 includes the species listed by the US Fish and Wildlife Service (USFWS) as threatened or endangered for Union County.

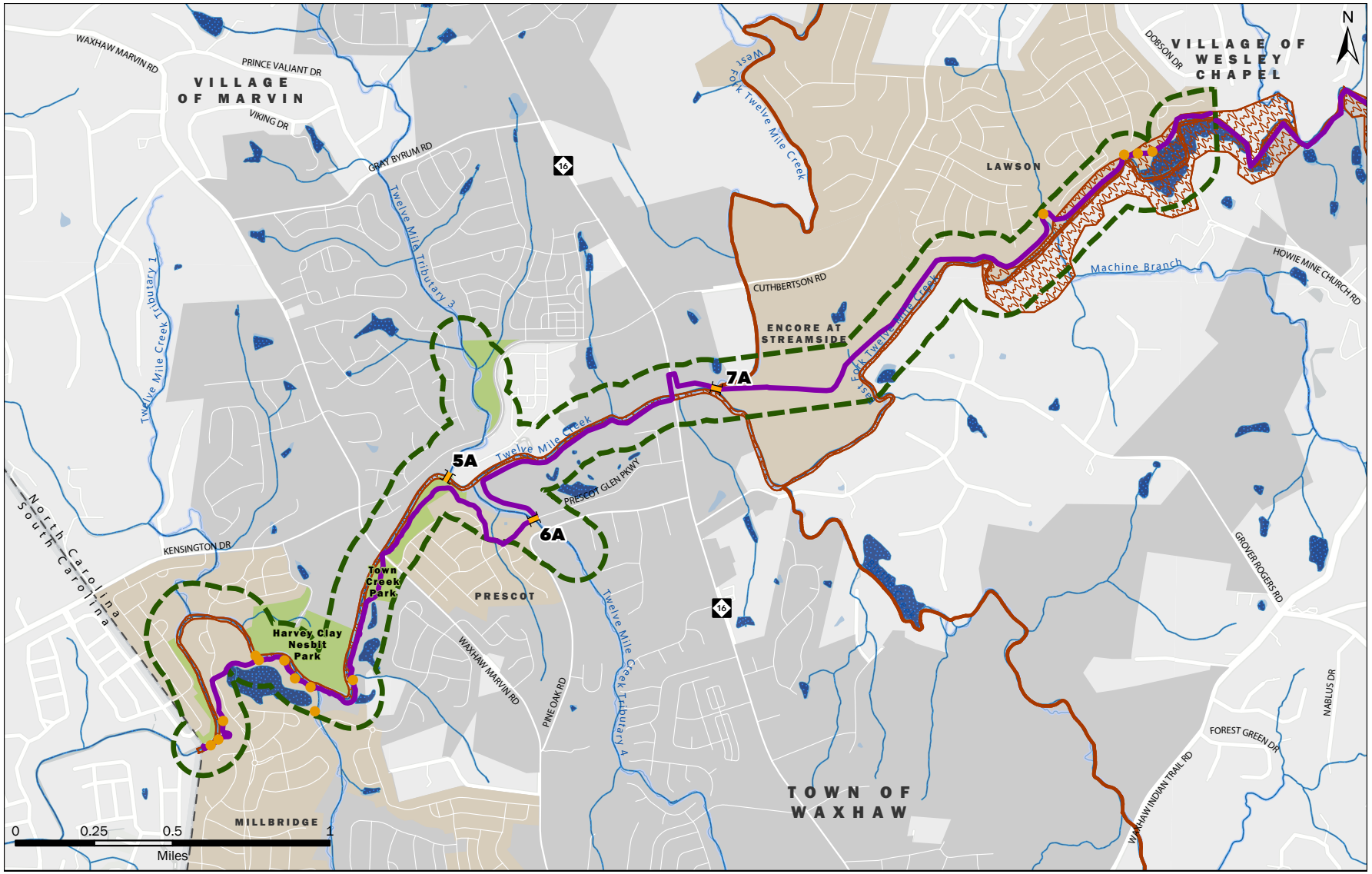
Table 3.1

Common Name	Scientific Name	Where Listed	Status
Atlantic pigtoe	Fusconaia masoni	Wherever found	Threatened
Carolina heelsplitter	Lasmigona decorata	Wherever found	Endangered
Michaux's sumac	Rhus michauxii	Wherever found	Endangered
Schweinitz's sunflower	Helianthus schweinitzii	Wherever found	Endangered

Additionally, USFWS lists the tricolored bat (Perimyotis subflavus) as Proposed Endangered, the Little brown bat (Myotis lucifugus) and Ravine sedge (Carex impressinervia) as Under Review, and the Pee Dee crayfish ostracod (Dactylocythere peedeensis) and Piedmont Aster (Eurybia mirabilis) as Species of Concern, and the monarch butterfly (Danaus plexippus) as a candidate species.

Topography

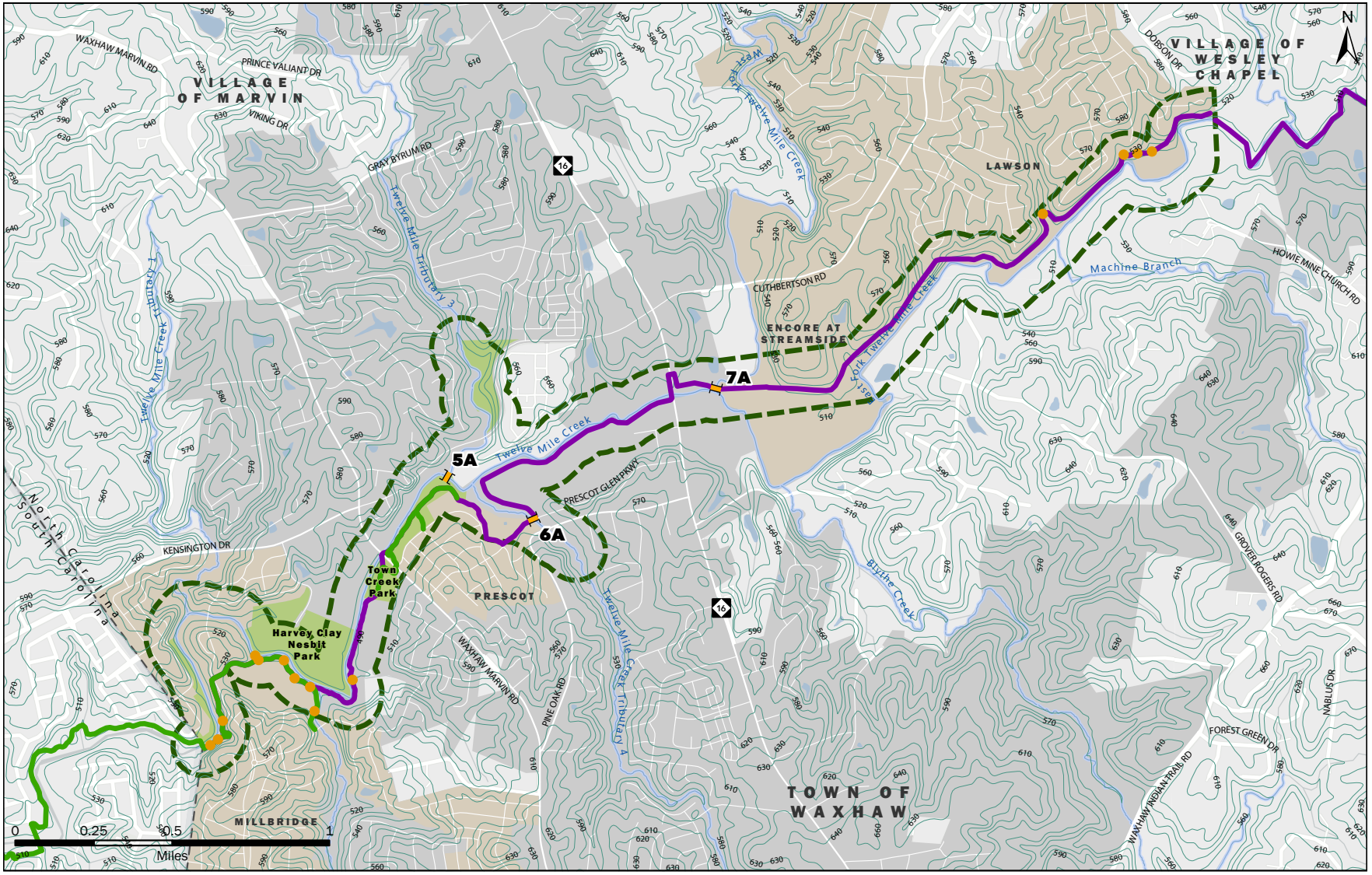
Topography is varied throughout the project corridor. In Segment 1, steep terrain has influenced the choice to maintain the pathway as a natural trail rather than a paved greenway surface. The central segments of the corridor travel through flat terrain, except at tributary crossings. In Segment 9, the existing greenway corridor abuts slopes toward the Lawson neighborhood. In Section 10, at the eastern end of the greenway corridor, terrain is rocky and hilly like Segment 1.



TWELVE MILE CREEK GREENWAY FEASIBILITY STUDY

NATURAL ENVIRONMENTAL FEATURES

- Study Area
- Planned Carolina Thread Trail
- Planned Trail Bridge
- Existing Timber Bridge
- Natural Heritage Areas
- Natural Heritage Areas Creekside
- Wetlands
- Stream / Pond
- Park
- Subdivision
- Town of Waxhaw



TWELVE MILE CREEK GREENWAY FEASIBILITY STUDY

TOPOGRAPHY

- Study Area
- Existing Carolina Thread Trail
- Planned Carolina Thread Trail
- Planned Trail Bridge
- Existing Timber Bridge
- Topographic Contours 10 Feet
- Stream / Pond
- Park
- Subdivision
- Town of Waxhaw

3.4 // Hydraulic Considerations

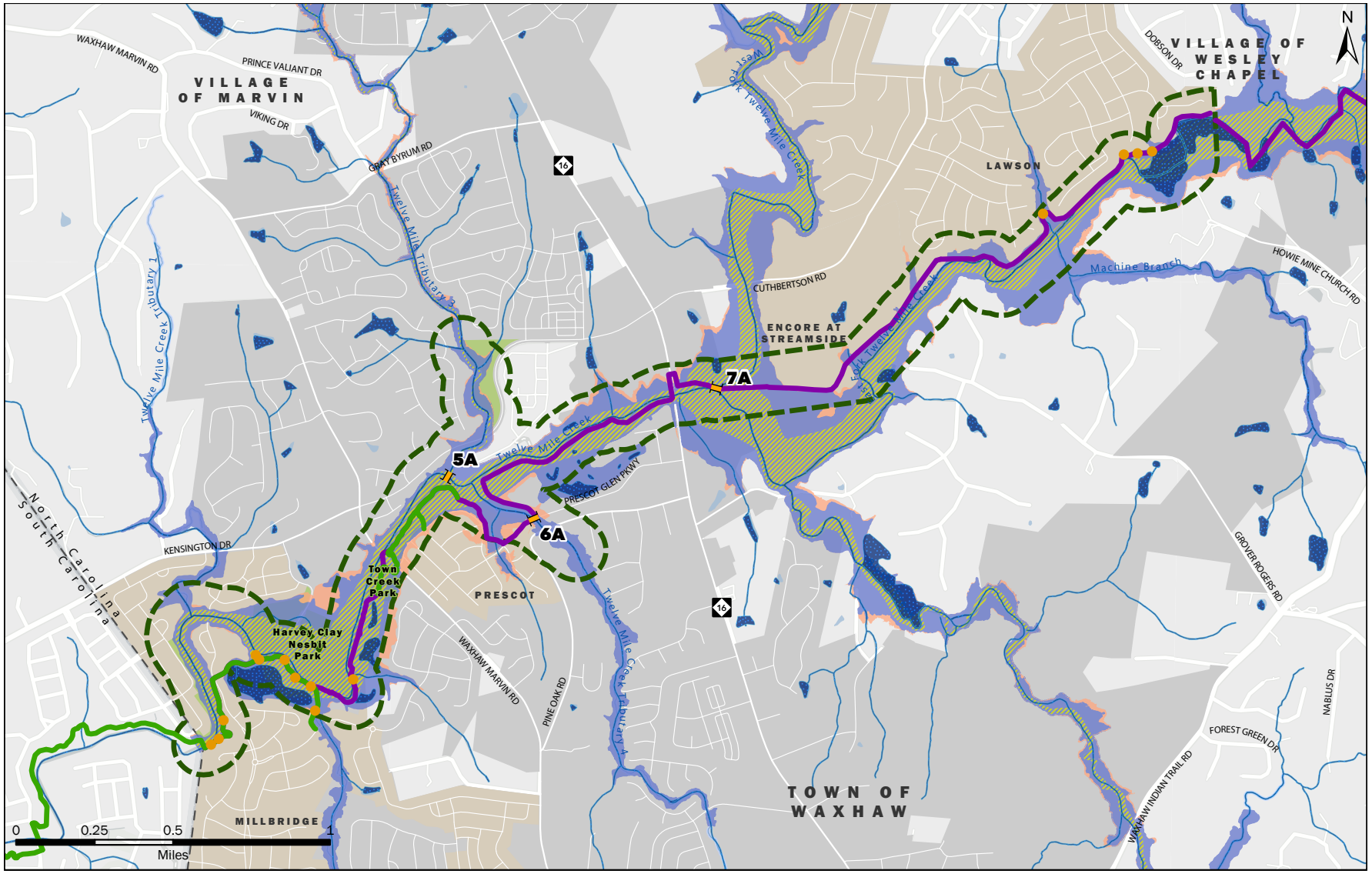
Floodplains and floodways provide opportunities for trail development because restricted development has left undeveloped land in scenic, creek side settings. However, developing greenway trails in these areas requires additional permitting and special consideration of sensitive wetlands and other ecological resources, along with the threat of frequent flooding, and associated maintenance concerns.

Twelve Mile Creek and its tributaries are the primary hydrologic feature in and around Waxhaw. Flowing westward just south of Kensington Drive and Cuthbertson Road, the creek divides the Town's northern and southern portions with a floodplain measuring between 0.1 and 0.4 miles across. Branches of the Creek and floodway extend into areas throughout Town and into the surrounding area. These floodways are designated by the U.S. Federal Emergency Management Agency (FEMA) and are included in the Town's Flood Hazard Overlay District, which restricts the development of these areas. When a project has the potential to cause changes to local flood insurance rate maps, a Conditional Letter of Map Revision (CLOMR) from FEMA commenting on whether the project meets minimum National Flood Insurance Program (NFIP) standards is required. The process of obtaining a CLOMR adds time to a project schedule and incurs fees in the tens of thousands of dollars.

The proposed Twelve Mile Creek Greenway faces several challenges related to stream and floodway crossings. Feasibility study-level hydraulic modeling was conducted to evaluate what types of structures would meet the needs of the greenway, and whether the inclusion of those structures would cause a change to base flood elevation (BFE). More detail on the hydraulic analysis conducted for this study can be found in Appendix A. The major crossings evaluated are described below:

- Crossing 5A - A bridge connection to Sonny Way from Segment 5 would require a major crossing of Twelve Mile Creek in an area with wide floodway involving a bridge length of 150 feet. Preliminary hydraulic analysis indicates the addition of this bridge would cause a rise in BFE of 0.06 feet, suggesting a CLOMR should be anticipated.
- Crossing 6A - Pedestrian Crossing from Prescot Glen Parkway (west) to Prescot Glen Parkway (east): Hydraulic modeling indicates that a 100-foot bridge would cause a rise of 1.6 feet, suggesting a CLOMR would be necessary. A 6'x6' box culvert was also modeled as an alternative crossing at this location, which could result in cost savings.
- Crossing 7A - Crossing of West Fork Twelve Mile Creek from the undeveloped commercial property into the Encore property to the east: A 110-foot bridge is recommended here. Preliminary hydraulic modeling indicates that this bridge would cause a BFE rise of 0.02 feet, necessitating a CLOMR.

As part of the preliminary drainage analysis, existing data from the state of North Carolina and FEMA was used to create and or update effective hydraulic models. At the crossing of Tributary 4 of Twelvemile Creek the city indicated that existing vehicular structures were overtopped during the 100-YR storm event and that it would be reasonable to assume that pedestrian structures may also be overtopped. With this understanding, Benesch reviewed alternatives that included low-water crossings such as circular and concrete box culvert structures. For the crossings of Twelve Mile Creek the team felt that it would not be desirable to install low water crossings given the existing size of the floodway (approx. 425 feet). Currently all of the crossing alternatives do not indicate a no-rise condition and recommend that a CLOMR be submitted. However, it is feasible that with more detailed existing information and a fully designed crossing structure that a CLOMR may not be required. It is our recommendation that the project include the scope to address the need for a CLOMR which will include more detailed modeling and further coordination with the local floodplain manager.



TWELVE MILE CREEK GREENWAY FEASIBILITY STUDY

HYDROLOGY

- Study Area
- Existing Carolina Thread Trail
- Planned Carolina Thread Trail
- Planned Trail Bridge
- Existing Timber Bridge
- FEMA Effective Floodway
- 100 Year Floodplain
- 500 Year Floodplain
- Wetlands
- Stream / Pond
- Park
- Subdivision
- Town of Waxhaw

Integrated Mobility Division
N.C. DEPARTMENT OF TRANSPORTATION

Section 4 // Stakeholder and Community Engagement

Twelve Mile Creek Greenway Feasibility Study

Town of Waxhaw

NCDOT IMD

4.1 // Previous Public Engagement Efforts

This feasibility study builds upon what was learned from extensive community engagement efforts undertaken with several recent planning efforts, including the 2019 *Collaborative Growth Strategy*, the 2023 *Pedestrian Plan Update*, and the *2040 Comprehensive Plan Update* (2023). These efforts included open house public input sessions, steering committees, virtual and in-person public meetings, focus groups, and public surveys. Among the major themes heard through this engagement were a desire for increased walkability and connectivity in Waxhaw, concern for pedestrian and bike safety, and a desire for more parks and greenways. The Twelve Mile Creek Greenway was one of the priority projects identified by the public in these planning efforts. There were some citizens who wanted more information as to how greenway development impacts crime, safety, and property values.

Town of Waxhaw Collaborative Growth Strategy (2019)

The Town's Collaborative Growth Strategy started with gathering input directly from the Waxhaw community. Over four months in 2019, the Planning Department provided four opportunities for residents to weigh in with their comments and ideas, including two "open house" style public input sessions and two online surveys. From this input, four key themes emerged, one being walkability. When asked, "I want to see more opportunities for..." residents expressed active and passive recreation parks as two of the top five wants for the community. When asked follow-up questions of "What areas are of concern for growth;" parks, greenways, and pedestrian/bike safety scored in the top four.

Town of Waxhaw Pedestrian Plan Update (adopted 2023)

Public involvement for the Town's Pedestrian Plan Update (adopted 2023) included a steering committee, virtual and in-person public meetings, public surveys, and stakeholder interviews.

The Phase I public survey received 450 responses and focused on current walking conditions in Waxhaw, barriers to walking, and preferred programs and initiatives to increase walking. When asked about safety concerns, respondents indicated concern about the lack of pedestrian infrastructure, high vehicle speeds, and lack of visibility along Kensington Drive/Cuthbertson Road, which is the vehicular east-west spine in the area of the proposed Twelve Mile Creek Greenway. Survey responses about facility types revealed that the highest rated pedestrian facilities were trails and greenways. The survey also identified barriers to pedestrians. The top three barriers to pedestrian activity were identified as unsafe crossings, a disconnected network, and unsafe vehicle behavior.

The Phase II public survey requested input on the draft pedestrian network plan. Respondents overall strongly supported adding sidewalks and greenways, especially those connected to schools, the Downtown, and to the Carolina Thread Trail. Among four high-profile proposed pedestrian improvement projects (including Sonny Way Greenway, Waxhaw-Marvin Road Sidewalk and Shared-use Path, Kensington Drive Sidewalks), the Twelve Mile Creek Greenway received the highest levels of support.

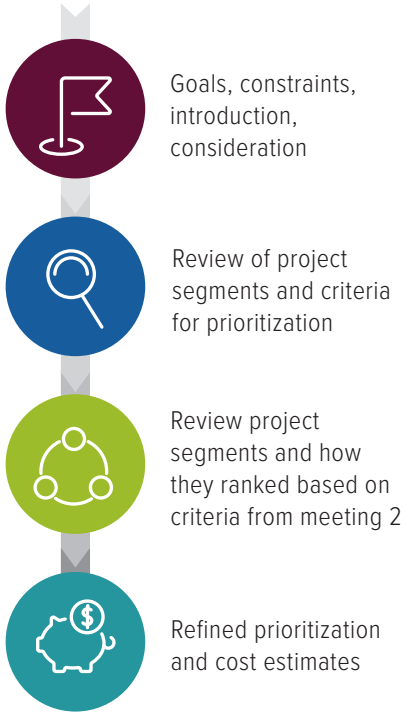
Survey responses from the Phase II public survey indicated high levels of support for the Twelve Mile Creek Greenway project. Wells Way Greenway from survey is now Sonny Way Greenway.

2040 Comprehensive Plan Update (2023)

The 2023 Draft Comprehensive plan has a key focus on multimodal and non-vehicular transportation. Public outreach was conducted throughout 2022, including public input events, focus groups, public board presentations, and a public survey.

4.2 // Steering Committee

A Steering Committee was assembled and met four times during this study process. The Steering Committee consisted of representatives from the Town of Waxhaw, NCDOT, Union County, Carolina Thread Trail, neighborhood associations, local business owners, and citizens. Each Steering Committee meeting provided an opportunity for participants to hear study updates and provide feedback on direction and progress. The feedback from the Steering Committee informed study considerations and prioritization recommendations.



The Steering Committee included various stakeholders throughout Waxhaw and Union County with an interest in and valuable knowledge about the Twelve Mile Creek Greenway corridor. Steering Committee members included representatives from:

- Town of Waxhaw's Planning, Parks and Recreation, and Engineering Departments
- CRTPO
- Union County
- NCDOT IMD and Division 10
- Carolina Thread Trail
- Neighborhood homeowners' associations
- Local businesses owners

Study Area Site Visit - July 27, 2023

Steering Committee members were invited to join Town and project staff for the site visit conducted on July 27, 2023. Key areas along the proposed corridor were visited to view constraints and gain context for the proposed trail. The site visit is described in section 3.1.

Steering Committee Meeting # 1 – September 7, 2023

The first Steering Committee meeting was held virtually and featured an introduction of committee members and an overview of the IMD feasibility study program, study goals, corridor study area, and known constraints and considerations to look at in the study.

Key input:

Committee members offered the following suggestions for constraints and considerations that should be studied:

- Property owners/utilities
- Flooding
- Trail surfacing
- ADA
- Easements
- Trail types
- Access points
- NIMBY ("Not in My Back Yard")
- Cross sections
- Trail cross sections
- Bridges
- Coordination with NCDOT
- Tree preservation
- HOA support

Committee members noted that STIP projects planned on the corridor could potentially impact the greenway project.

The committee was polled on what the greenway project should accomplish once completed. Responses were:

- Connectivity
- Social interaction
- Outdoor recreation
- Regional greenway significance
- Commercial benefits
- Environmental benefits
- Blueway connection
- Recreational extension
- Regional facility
- Wildlife corridor
- Water quality
- Waxhaw's Emerald Necklace
- Park system connectivity
- Health and wellness
- Transportation
- Pedestrian activity
- Alternative transportation
- Increase in employment
- Recreational choice
- Pedestrian transportation
- Community interaction
- Easy access to other areas
- Opportunities for communities to engage outdoors.

Steering Committee Meeting # 2 – October 5, 2023

The second Steering Committee meeting was held virtually and included a walkthrough of the ten identified segments along the proposed greenway corridor. In some segments, the rationale for the greenway placement was discussed in detail. The meeting also included an overview of the bridges inventoried along the project corridor and plans for hydraulic analysis.

Key input:

A poll asking what prioritization criteria were most important to committee members. The top three criteria were connectivity, ease of implementation, and addressing problems on existing trail segments.

Opportunities for educational interpretation along the greenway were discussed.

Steering Committee Meeting # 3 – November 16, 2023

The third Steering Committee meeting was held virtually and included an initial ranking of segment priority based on connectivity, an overview of preliminary cost estimate assumptions, bridge design assumptions, and an overview of potential funding sources.

Key input

The committee discussed expanding and quantifying criteria as the priority rankings are refined.

The committee learned that study representatives would be attending the next meeting of the Lawson Community Association to discuss the study and hoping to gain further support for the greenway connection within the community.

Steering Committee Meeting # 4 – January 17, 2024

The fourth Steering Committee meeting was held virtually and included a refined prioritization of the greenway segments based on the criteria prioritized by Steering Committee feedback. Results of the hydraulic analysis were shared, including recommendations for major new crossings of Twelve Mile Creek and tributaries necessary to connect the Greenway. Preliminary cost estimates of the greenway segments were also shared with the committee.

Key Feedback:

It was suggested that cost information should be paired with potential funding sources to help alleviate the sticker shock of some costs.

The Town is pursuing a pilot project to explore the use of geostabilized gravel in areas of chronic flooding.

Integrated Mobility Division

N.C. DEPARTMENT OF TRANSPORTATION

Section 5 // Alternative Development

Twelve Mile Creek Greenway Feasibility Study

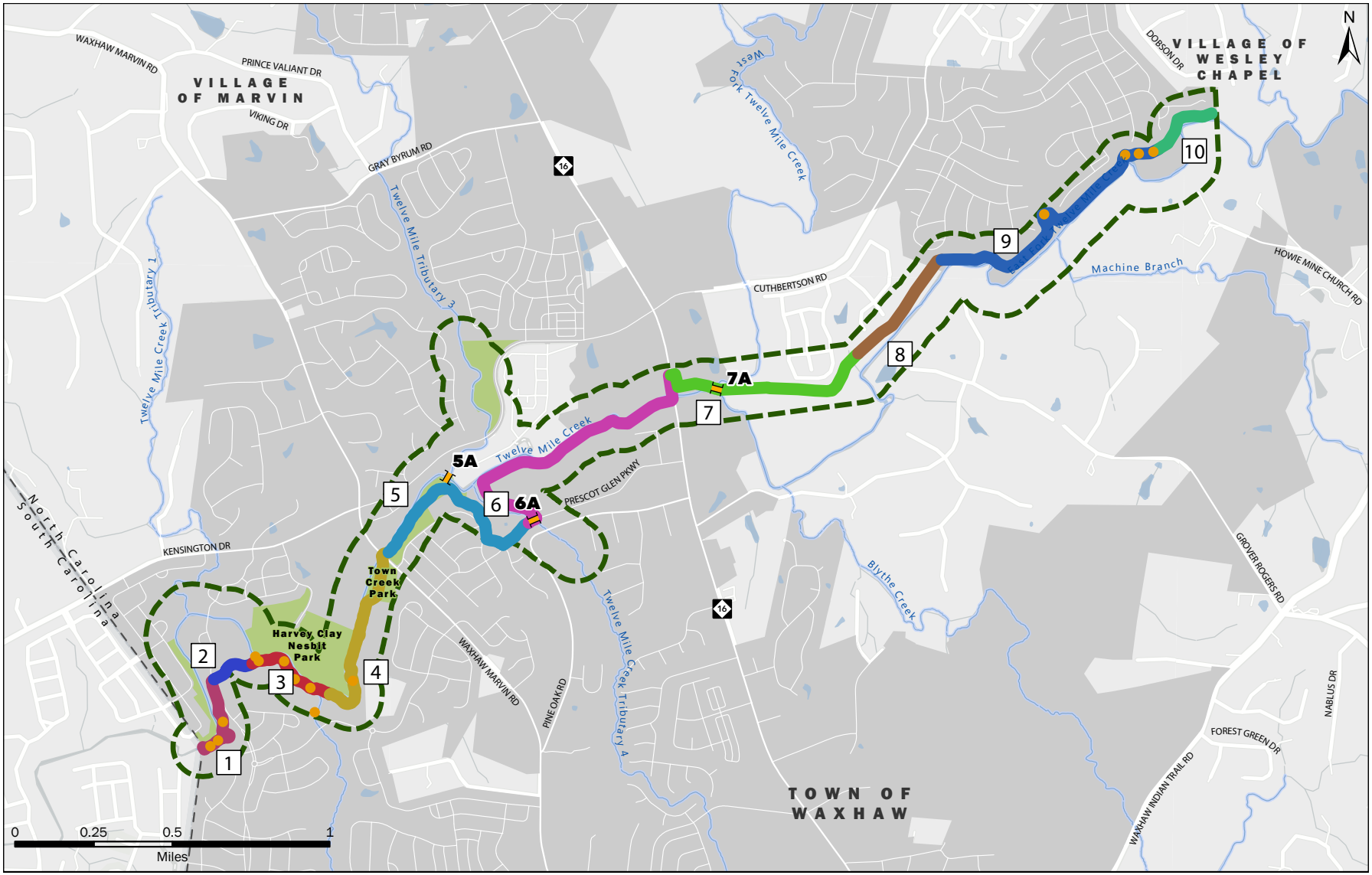
Town of Waxhaw

NCDOT IMD

5.1 // Greenway Segments

The proposed Twelve Mile Creek Greenway corridor was divided into ten segments for analysis and prioritization. These segments are differentiated by characteristics such as roadway or water body crossings, trail surface needs, or breaks in property ownership or control. The ten greenway segments are shown on the map on the following page.

Segment	Description
1	South Carolina Border to Millbridge Parkway
2	Millbridge Parkway to Nesbit Park Trailhead
3	H.C. Nesbit Park Connection to Creekview Drive Trailhead
4	Creekview Drive Connection to Town Creek Park/Waxhaw-Marvin Road
5	Waxhaw-Marvin Road to End of Prescot Glen Parkway West
6	Prescot Glen Parkway West to Encore at NC 16/Providence Road
7	NC 16/Providence Road to Encore at Streamside
8	Encore at Streamside – East Side
9	Lawson Walking Path
10	End of Lawson Community Walking Path to Project End



TWELVE MILE CREEK GREENWAY FEASIBILITY STUDY

SEGMENTS

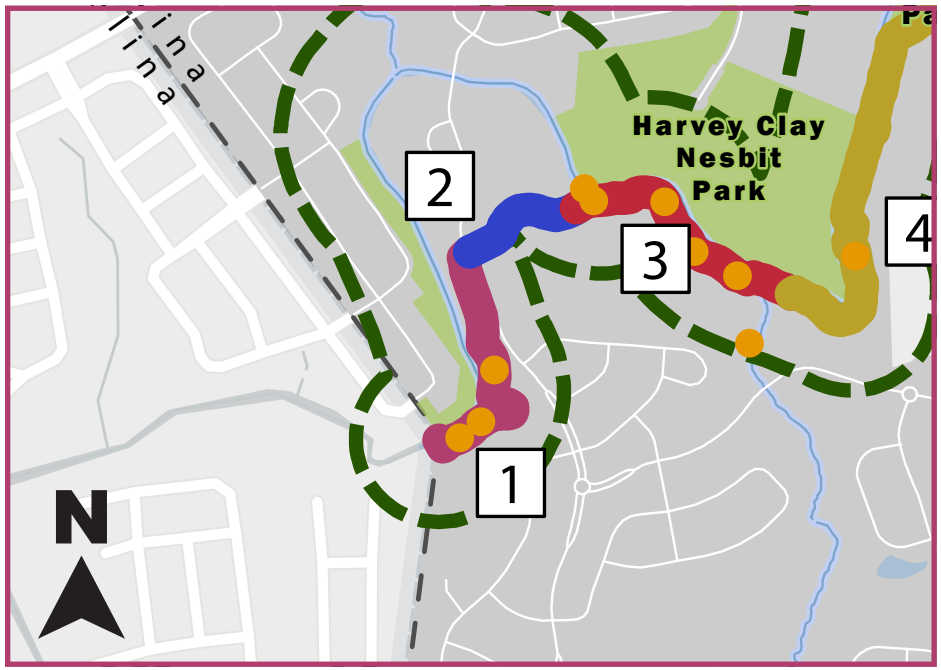
- Study Area
- Planned Trail Bridge
- Existing Timber Bridge
- Stream / Pond
- Park
- Town of Waxhaw

1. South Carolina Border to Millbridge Parkway

Weighted Priority Rank 7

At its western terminus, the corridor begins on the Carolina Thread Trail at the 170-foot-long suspension bridge over Twelve Mile Creek, which marks the border between South Carolina and North Carolina. This segment features a natural trail winding through steep, wooded terrain.

- Length: approximately 0.25 mile
- Existing trail/surface: Natural surface (unpaved) with several footbridges and portions of boardwalk
- Proposed surface: Trail surface to remain a natural mixture of rock and soil. While remaining natural, this segment of trail is recommended to be brought up to standard with the Architectural Barriers Act (ABA), Section 1017 Trails, which speaks to access on natural surface trails.
- Existing Bridges:
  - » 2 ~10' timber footbridges
  - » 1 ~40' timber footbridge
- Key connections: This designated Carolina Thread Trail segment provides a gateway to the South Carolina portions of the Thread Trail.
- Ownership/Control/Easement: This segment traverses property owned by the Millbridge Homeowners Association but is maintained by Town of Waxhaw Parks & Recreation Department. The Town of Waxhaw owns the suspension bridge and controls a 20-foot easement in this segment.
- Needs:
  - » Trail repair: Narrow sections and areas affected by erosion through the steep topography require repair, such as regrading and slope stabilization.
  - » Cleanup: Erosion control devices left from previous nearby construction should be cleared out.
  - » Bridge replacement: Three existing timber footbridges should be inspected and evaluated for replacement.



Segment 1			
	Option 1	Option 2	Option 3
	Path Repair Only	Path Repair + Replace Bridges: 2 small timber/ composite, 1 40' bridges with timber/composite	Path Repair + Replace Bridges: 2 small timber/ composite, 1 40' steel prefab bridge
Estimated Total	$36,000.00	$449,000.00	$640,000.00

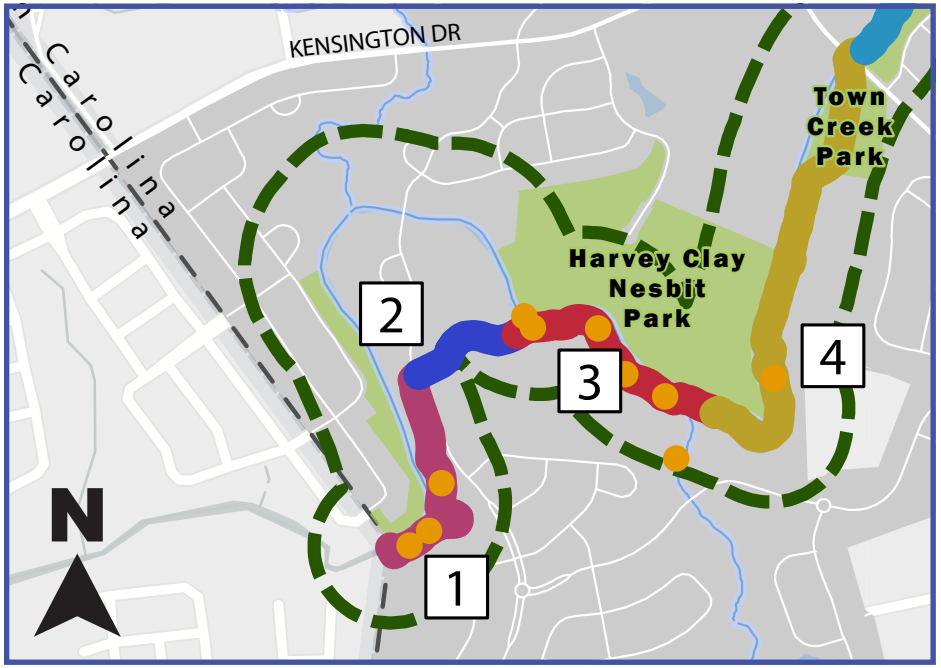
Estimated Total includes 25% Contingency and 15% Engineering
See Appendix A for more detailed cost information.

2. Millbridge Parkway to Nesbit Park Trailhead

Weighted Priority Rank 8

At Millbridge Parkway, the trail crosses the roadway at an improved crosswalk and then follows a former construction road path that forms the connection between the Parkway and the trailhead at H.C. Nesbit Park.

- Length: approximately 0.25 mile
- Existing trail/surface: combination of gravel and older pavement
- Proposed surface: 10-foot paved asphalt path
- Existing Bridges: 1 bridge at H.C. Nesbit Park Trailhead; this bridge is primarily for greenway use, but is vehicle-rated.
- Key connections: This segment connects the Millbridge neighborhood to H.C. Nesbit Park and the adjacent Kensington Elementary School.
- Needs:
  - » The footbridge at H.C. Nesbit Park Trailhead floods periodically. This bridge should be inspected and evaluated for replacement.
- Ownership/Control/Easement: Except for the trailhead at H.C. Nesbit Park Trailhead, this segment of the designated Carolina Thread Trail is on property owned by the Millbridge Homeowners Association but is maintained by Town of Waxhaw Parks & Recreation.



Segment 2			
	Option 1	Option 2	Option 3
	Repair Existing Path Only	Pave Path without Bridge Replacement	Pave Path Replace Bridge
Estimated Total	$37,000	$216,000.00	$703,000.00

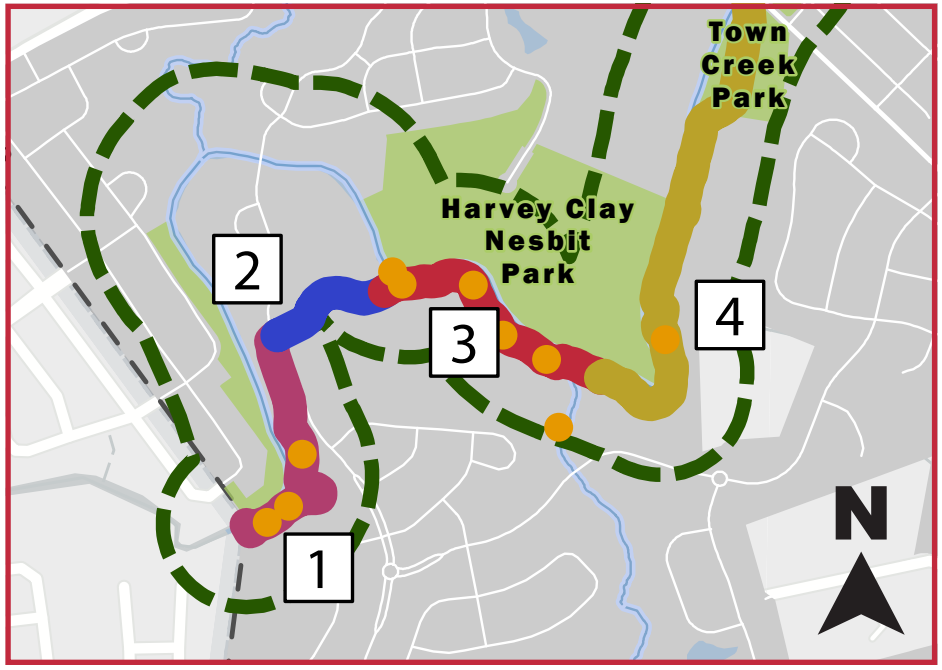
Estimated Total includes 25% Contingency and 15% Engineering
See Appendix A for more detailed cost information.

3. H.C. Nesbit Park Connection to Creekview Drive Trailhead

Weighted Priority Rank 9

From the trailhead at H.C. Nesbit Park, a 0.35 mile length of existing paved neighborhood greenway travels through wooded HOA-owned land on the south side of Twelve Mile Creek Greenway. This segment includes five timber footbridges.

- Length: approximately 0.35 mi
- Existing trail/surface: 6-foot asphalt paved path
- Proposed surface: Existing paved surface would remain
- Existing Bridges: 4 timber footbridges
- Key connections: This segment provides one of two connections for the Millbridge neighborhood to H.C. Nesbit Park and Kensington Elementary School.
- Needs: Assess bridges for existing damage and recurrent flooding; evaluate for footbridge replacements as needed.
- Ownership/Control/Easement: Owned & maintained by the Millbridge Homeowners Association.



Segment 3			
	Option 1	**Option 2**	**Option 3**
	Replace Existing Structures with Timber/ Composite Bridges	Replace Existing Structures with Prefabricated Steel Bridges	Replace pavement + Replace Bridges with Prefab Steel Bridges
Estimated Total	$420,000.00	$974,000.00	$1,268,000.00

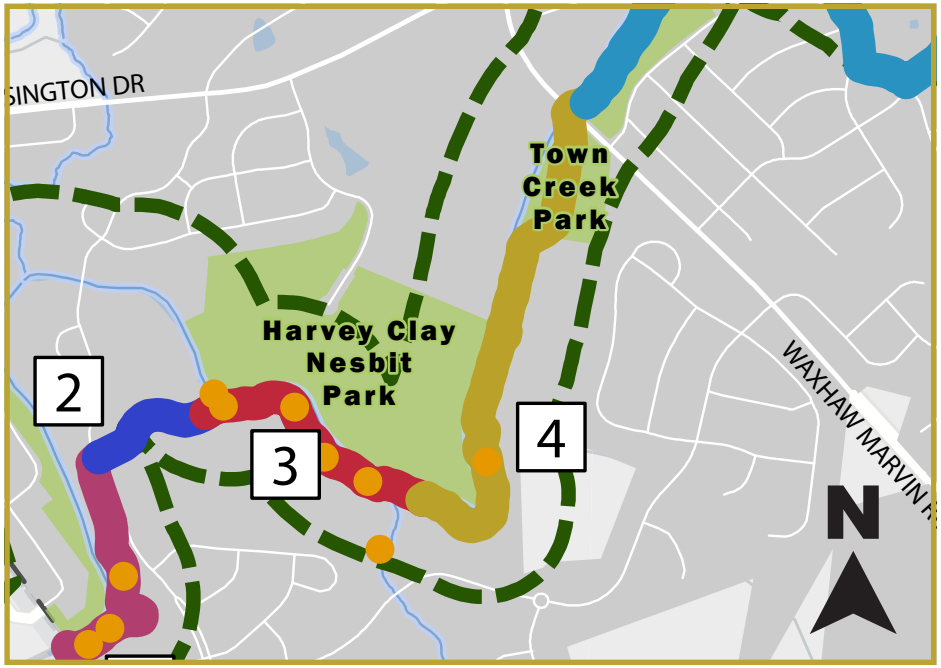
Estimated Total includes 25% Contingency and 15% Engineering
See Appendix A for more detailed cost information.

4. Creekview Drive Connection to Town Creek Park/Waxhaw-Marvin Road

Weighted Priority Rank 1

This segment breaks from the existing Millbridge neighborhood greenway just north of Creekview Drive, traveling north and east through wooded land between Twelve Mile Creek to the west and homes along Shadowbrook Road to the east. At the southeast corner of the town-owned Town Creek Park property, the greenway would tie into the existing 6-foot paved asphalt path that continues toward the park's parking area and Waxhaw-Marvin Road. At the northwest corner of Town Creek Park, a new segment of trail would bring the greenway to cross under the NCDOT Bridge 890224 (discussed in Segment 5).

- Length: Approximately 0.6 mile
- Existing trail/surface:
  - » Millbridge HOA property: Cleared, unpaved
  - » Town Creek Park: 6-foot paved asphalt path
- Proposed surface: 10-foot paved asphalt path, boardwalk or alternative where necessary
- Existing Bridges: 1 timber footbridge, crossing an unnamed tributary to Twelve Mile Creek
- Key connections: Improving this section would establish a key connection between two town-owned parks. The segment would also tie into the future sidewalk and multiuse path on Waxhaw-Marvin Road and provide a connection to the new Waxhaw Town Hall campus at the corner of Waxhaw-Marvin Road and Kensington Drive.
- Needs:
  - » Flood-resilient pathway: This segment faces frequent major flooding that renders the current trail surface muddy, rutted, and impassible in places, even days after rain events. A trail surface here would be required to either avoid or withstand flood waters and quickly recover to a usable condition.
  - » Wetlands in this area present a potential need for boardwalk.
  - » Bridge replacement/repair: The existing timber footbridge in this segment has suffered damage and must be evaluated for repair or replacement.
- Ownership/Control/Easement:
  - » Millbridge HOA
  - » Town Creek Park: Owned and maintained by Town of Waxhaw



Segment 4		
	Option 1	Option 2
	100% Geogrid Surface + Existing Bridge Replacement	50%/50% Boardwalk and Asphalt Pavement + Existing Bridge Re-placement
Estimated Total	$623,000.00	$6,859,000.00

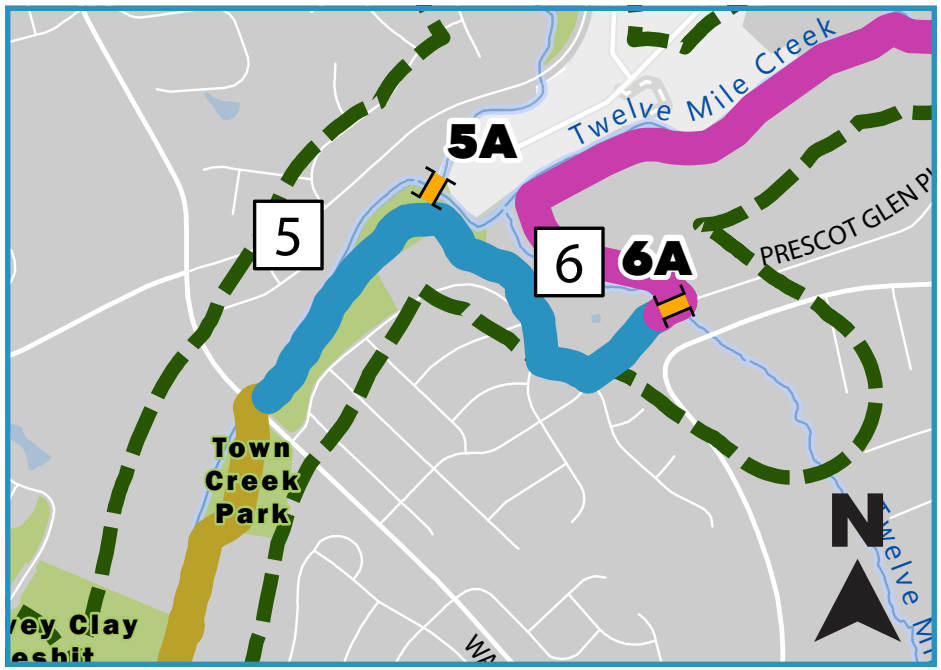
Estimated Total includes 25% Contingency and 15% Engineering
See Appendix A for more detailed cost information.

5. Waxhaw-Marvin Road to End of Prescot Glen Parkway West

Weighted Priority Rank 4

From Town Creek Park, this segment would cross Waxhaw-Marvin Road to tie into the neighborhood greenway trail in the Prescot residential subdivision. The programmed NCDOT replacement of Bridge 890224 on Waxhaw-Marvin Road over Twelve Mile Creek (BP10.R017) is planned to incorporate the greenway underpass. In lieu of this bridge replacement, trail users cross Waxhaw-Marvin Road at-grade at Exbury Gardens Drive. Here, the greenway follows the section of trail running along the south bank of Twelve Mile Creek (recently restored by the Town of Waxhaw), then curves south, running along the existing Prescot neighborhood pathway to Prescot Glen Parkway. A section of sidewalk takes the trail past the Prescot clubhouse and playground to the dead end of Prescot Glen Parkway.

- Length: Approximately 0.8 mi
- Existing trail/surface: 6-foot paved asphalt path, 9-foot paved asphalt path, 5-foot sidewalk
- Proposed surface: 10-foot paved asphalt path (any new path needed)
- Existing Bridges: NCDOT Union County Bridge #224
- Key connections: This segment provides an opportunity to connect with the Town's planned north-south spine greenway "Sonny Way," which would provide a key connection to downtown Waxhaw and the wider greenway network. A pedestrian bridge that would allow Sonny Way to cross Twelve Mile Creek and continue north toward Kensington Drive was analyzed during this study. An approximately 150-foot structure would allow the trail to cross the creek and floodway, but a CLOMR may be needed, depending on final design. While not included in the Segment 5A costs for the Twelve Mile Creek Greenway, the project team estimates the proposed Bridge 5A to cost just over 800k.
- A greenway connection between Prescot Glen Parkway and the Grove Manor neighborhood is nearing completion.
- Ownership/Control/Easement: Town of Waxhaw, Prescot Homeowners Association, NCDOT Right-of-Way



Segment 5	
	Option
	Replace .3 mi asphalt pavement
Estimated Total	$200,000.00

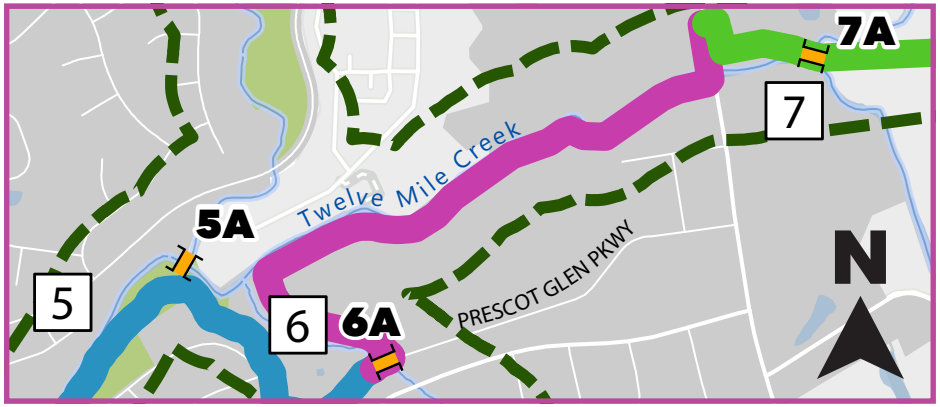
Estimated Total includes 25% Contingency and 15% Engineering
See Appendix A for more detailed cost information.

6. Prescot Glen Parkway West to Encore at NC 16/Providence Road

Segment 6 begins at the end of Prescot Glen Parkway (West), where a pedestrian bridge is proposed to cross Twelve Mile Creek Tributary 4 to connect to the corresponding eastern section of Prescot Glen Parkway. The Prescot Village commercial area is on the east side of the tributary; some development has occurred on this parcel, and more is planned, including the Artisan Prescot residential development currently under site review. The segment of the planned greenway travels north from this tributary crossing to follow the south side of Twelve Mile Creek toward the intersection with NC 16/Providence Road. This greenway section is identified as Path-09 in the Pedestrian Plan Update (2023); as such, the developer is responsible for ensuring that this section of greenway is built. Topography presents a major challenge as the proposed greenway travels through a heavily vegetated, deep ravine in the floodway. Wetlands are present in this section.

- Length: Approximately 0.8 mile
- Existing trail/surface: n/a
- Proposed surface: Bridges or boardwalks to be evaluated through this area
- Existing Bridges: Crossing of NC 16/Providence Road depends on NCDOT widening/replacement project, which includes a multiuse path underpass for the Twelve Mile Creek Greenway
- Key connections:
  - » NC 16/Providence Road is a formidable barrier to east-west pedestrian travel north of downtown Waxhaw. Completing the greenway and creating the necessary roadway and bridge crossings in this segment is critical to providing a continuous, safe east-west pedestrian connection.
  - » This segment intersects with major pedestrian infrastructure planned as part of the NC 16/Providence Road widening project (NCDOT U-5769), which includes a 5-foot sidewalk on the west side and a 10-foot shared-use path on the east side. These planned facilities would form a continuous north-south pedestrian and bike route from Waxhaw Parkway (approximately 1.5 miles south of Twelve Mile Creek) to Rea Road (approximately 4.3 miles north of Twelve Mile Creek).
  - » Blythe Creek Greenway (Paths 24, 25, and 32 from the 2023 Pedestrian Plan Update) is a potential future connection to this segment.
- Needs: Two major bridges are required to form the needed crossings to connect Segment 6:
  - » Bridge 6A - Pedestrian Crossing from Prescot Glen Parkway (west) to Prescot Glen Parkway (east): Hydraulic modeling for this crossing indicates that a 100-foot bridge would cause a rise of 1.6 feet, suggesting a CLOMR would be necessary at this location. Alternative crossings were modeled, including a 6'x6' concrete box culvert and a 36" corrugated metal pipe. Both the culvert and the pipe crossings could achieve a no-rise condition, thus avoiding a CLOMR for this location. Opting for a box culvert or pipe would also result in cost savings. Pipes and culverts often carry additional environmental impacts when compared to bridging over a stream.
- Ownership/Control/Easement:
  - » Widewaters Prescot LLC (Prescot Village); 30-foot Union County Water sanitary sewer easement running parallel to Twelve Mile Creek Tributary 4 at the southwestern boundary of the parcel
- Additional Features: The Town has proposed a kayak launch and associated trailhead/parking area at the commercial property east of NC 16/Providence Road.

Weighted Priority Rank 2



Segment 6		
	Option 1	Option 2
	New Culvert Crossing (6A)	New Prefabricated Bridge Crossing (6A)
Estimated Total	$451,000.00	$886,000.00

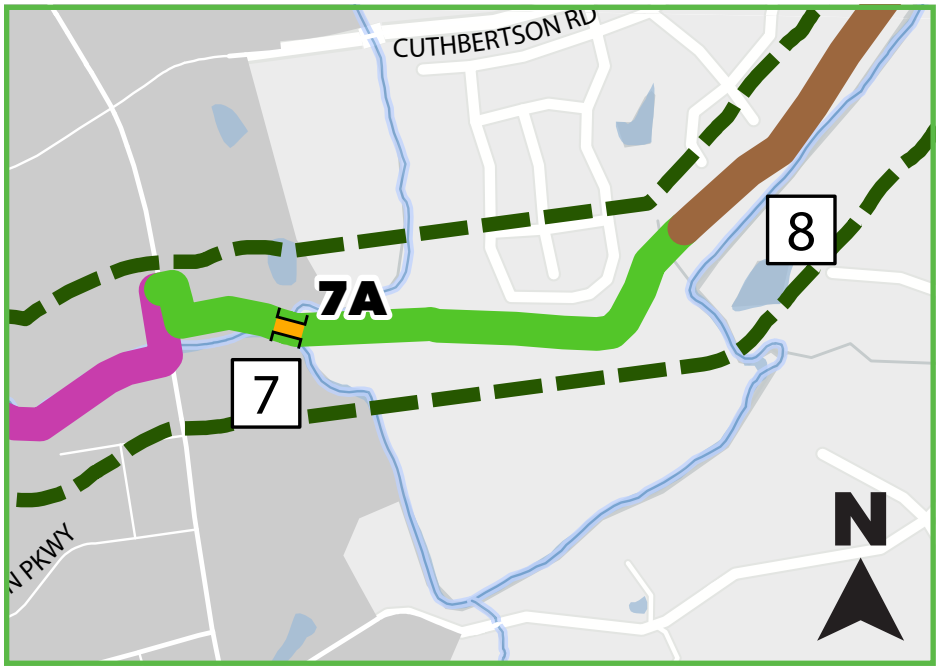
Estimated Total includes 25% Contingency and 15% Engineering
See Appendix A for more detailed cost information.

7. NC 16/Providence Road to Encore at Streamside

Segment 7 begins at the intersection of Twelve Mile Creek and NC 16/Providence Road, the path would rise to the roadway grade to cross Twelve Mile Creek using the sidewalk incorporated into the future replacement of the NCDOT bridge (part of the NC 16 widening project, U-5769B). A pedestrian crossing of NC 16 would bring the path to an undeveloped parcel where the paved trail would continue until reaching the West Fork of Twelve Mile Creek. This tributary would be crossed by a proposed new bridge (7A), bringing the trail onto the Encore Neighborhood Development. A portion of this segment is currently under construction by the Encore developer and extends to the point where a northbound footpath leads to the neighborhood's clubhouse. (approximately 0.6 mi).

- Length: Approximately 0.6 mile
- Existing trail/surface: Gravel path
- Proposed surface: 10-foot paved asphalt path
- Key connections: NC 16/Providence Road is a formidable barrier to east-west pedestrian travel north of downtown Waxhaw. Completing the greenway and creating the necessary roadway and bridge crossings in this segment is critical to providing a continuous, safe east-west pedestrian connection.
  - » This segment intersects with major pedestrian infrastructure planned as part of the NC 16/Providence Road widening project (NCDOT U-5769), which includes a 5-foot sidewalk on the west side and a 10foot shared-use path on the east side. These planned facilities would form a continuous north-south pedestrian and bike route from Waxhaw Parkway (approximately 1.5 miles south of Twelve Mile Creek) to Rea Road (approximately 4.3 miles north of Twelve Mile Creek). As a standalone project completed by the developer, this project serves as a neighborhood greenway for the residents of the Encore neighborhood. Completion of Segments 6 and 8 are necessary to form connections outside of the immediate neighborhood.
- Bridge 7A - Crossing of West Fork Twelve Mile Creek from the undeveloped commercial property into the Encore property to the east: A 110-foot bridge is recommended at this location. Preliminary hydraulic modeling indicates that this bridge would cause a BFE rise of 0.02 feet, necessitating a CLOMR.
- Ownership/Control/Easement: Encore at Streamside Homeowners Association
  - » East of NC 16/Providence Road: Providence Road Dev. Group LLC (South Creek)
  - » A 40-foot easement is designated for the greenway on this site. An agreement between the Town of Waxhaw and the Encore at Streamside Homeowners Association officially dedicating an easement permitting public access and transferring maintenance responsibilities to the Town will be required.

Weighted Priority Rank 5



Segment 7	
	Option
	New Prefabricated Bridge (7A) and .6 mi of Geogrid Path
Estimated Total	$924,000.00

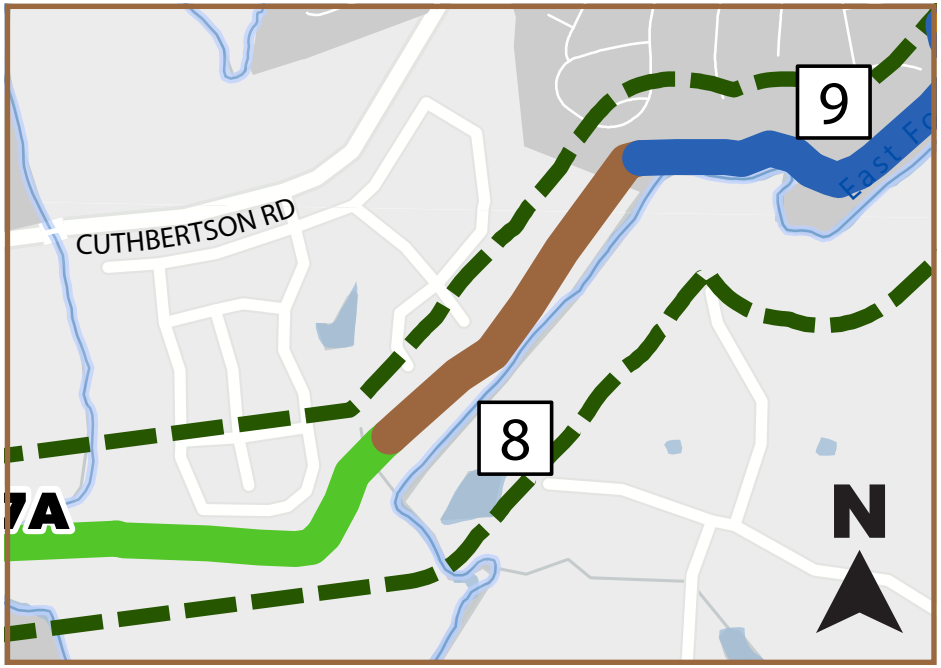
Estimated Total includes 25% Contingency and 15% Engineering
See Appendix A for more detailed cost information.

8. Encore at Streamside – East Side

Weighted Priority Rank 3

Segment 8 continues eastward from the clubhouse path at the Encore at Streamside neighborhood. This segment is on an easement designated for the greenwayl but is not a commitment to build by the developer. The Town of Waxhaw would be responsible for funding and constructing this segment. At the eastern boundary of the Encore property, a short section of new trail would be built on property owned by the Lawson Community Association to tie into the existing walking path.

- Length: Approximately 0.4 mile
- Existing trail/surface: n/a
- Proposed surface: 10-foot paved asphalt path
- Key connections: Constructing this segment would connect the Encore at Streamside and Lawson neighborhoods, creating a continuous greenway almost 2 miles long.
- Needs:
  - » One small footbridge, pipe, or culvert would be needed to cross a small tributary to Twelve Mile Creek.
- Ownership/Control/Easement: Encore at Streamside Homeowners Association and Lawson Community Association. An agreement between the Town of Waxhaw and the Encore at Streamside Homeowners Association officially an easement permitting public access and transferring maintenance responsibilities to the Town will be required.



Segment 8		
	Option 1	Option 2
	Geogrid Surface and 1 footbridge	Asphalt Pavement and 1 footbridge
Estimated Total	$367,000.00	$643,000.00

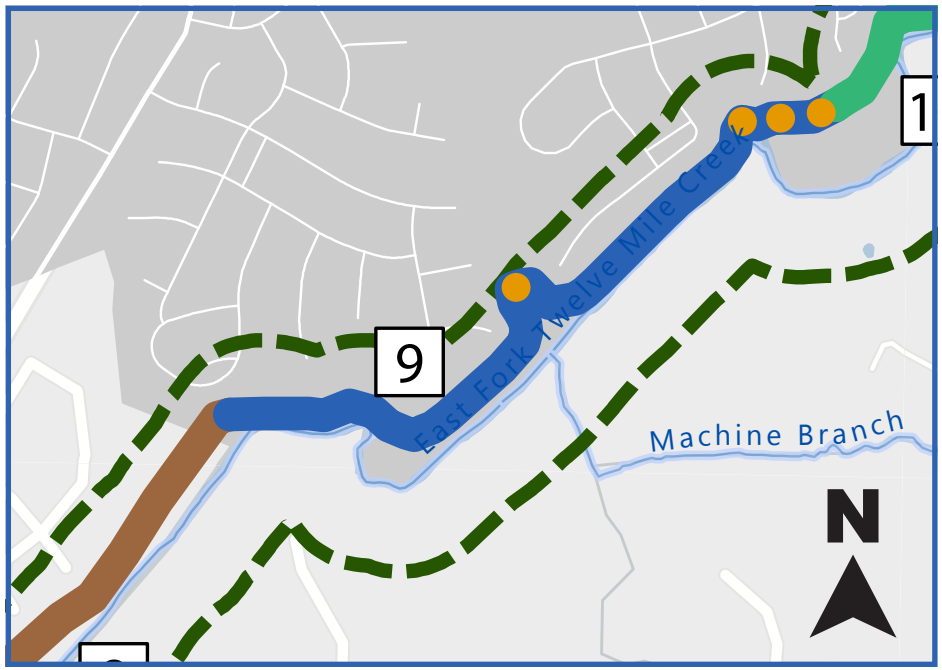
Estimated Total includes 25% Contingency and 15% Engineering
See Appendix A for more detailed cost information.

9. Lawson Walking Path

Weighted Priority Rank 5

Segment 9 is the existing section of the Lawson Community walking path, which runs along the north side of Twelve Mile Creek on property owned by the Lawson Community Association.

- Length: Approximately 1 mile
- Existing trail/surface: 6-foot concrete path. The existing path surface is considered to be in good condition. If future circumstances require concrete replacement, the project team estimates replacement at approximately $72 per linear foot.
- Proposed surface: Existing path would remain
- Existing Bridges/Crossings: 4 timber footbridges and 3 drainage pipes
- Key connections:
  - » The proposed Machine Branch Greenway (Path-22 from the 2023 Pedestrian Plan Update) could eventually tie into this segment.
- Ownership/Control/Easement: Lawson Community Association
  - » An easement transferring a 20-foot easement to the Town of Waxhaw will be required. An agreement between the Town of Waxhaw and the Lawson Community Association permitting public access and transferring maintenance responsibilities to the Town will be required.



Segment 9		
	Option 1	**Option 2**
	Replace Existing Structures with Boardwalk	Replace Existing Structures with Prefabricated Steel Bridges
Estimated Total	$431,000.00	$974,000.00

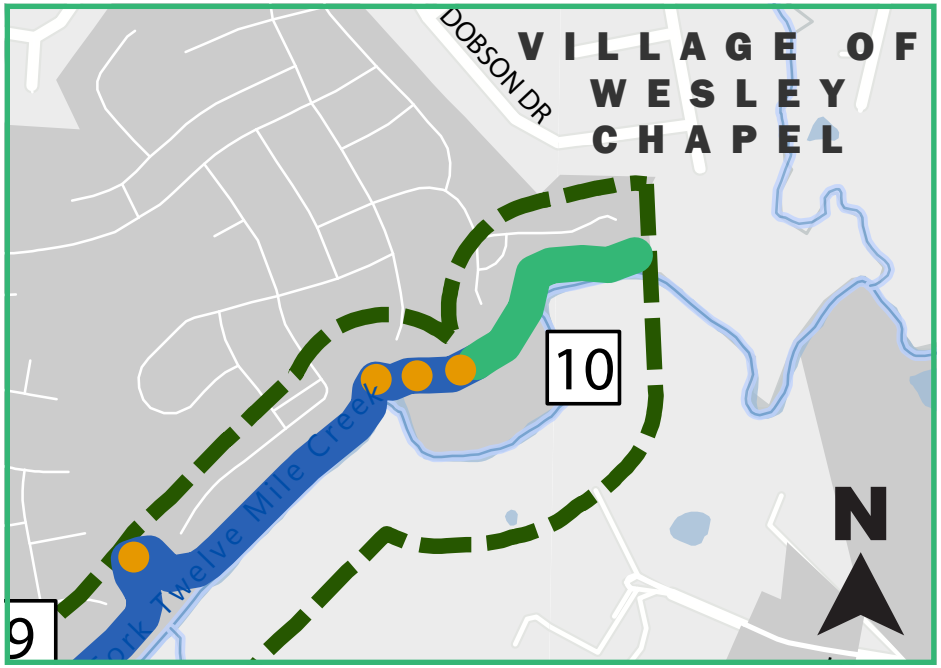
Estimated Total includes 25% Contingency and 15% Engineering
See Appendix A for more detailed cost information.

10. End of Lawson Community Walking Path to Project End

Weighted Priority Rank 9

Segment 10 is the final segment of proposed Waxhaw portion of the Twelve Mile Creek Greenway. This segment would extend the trail from the easternmost extent of the Lawson Community Walking Path at Ringtail Drive to the border with the Village of Wesley Chapel.

- Length: Approximately 0.25 mile
- Existing trail/surface: n/a
- Proposed surface: 10-foot paved asphalt path
- Key connections: This terminal piece to the Waxhaw segments of the Twelve Mile Creek Greenway would serve as a gateway to future greenway development on the part of the Village of Wesley Chapel and Union County, continuing along the proposed Carolina Thread Trail.
- Ownership/Control/Easement: Lawson Community Association
  - » An easement transferring a 20-foot easement to the Town of Waxhaw will be required. An agreement between the Town of Waxhaw and the Lawson Community Association permitting public access and transferring maintenance responsibilities to the Town will be required.
  - » Depending on the Town's future preferences for the exact alignment of this segment, easement may also be required from the Old Methodist Church cemetery property along the path to Dobson Drive in the Champion Forest neighborhood.



Segment 10	
	Option
	Asphalt Paving .25 Mile Continuation of Trail
Estimated Total	$650,000.00

Estimated Total includes 25% Contingency and 15% Engineering
See Appendix A for more detailed cost information.

Integrated Mobility Division
N.C. DEPARTMENT OF TRANSPORTATION

Section 6 // Evaluation and Recommendations

Twelve Mile Creek Greenway Feasibility Study

Town of Waxhaw

NCDOT IMD

Table 6.1. Unweighted Prioritization Scores and Ranking of Greenway Segments

Prioritization Criteria		Trail Segment									
		1	2	3	4	5	6	7	8	9	10
Connectivity	Would building this segment notably increase the connection between existing trail segments and neighborhoods? 1 = less new connection, 5 = more new connection	2	1	1	4	4	5	2	4	2	2
Ease of Implementation	How challenging will this section be to complete? Based on need for property acquisition or control, constructability, and coordination. 1 = more challenging, 5 = less challenging	2	3	4	3	2	2	5	3	5	3
Equity	Does this segment provide connection to underserved populations? 1 = less equitable, 5 = more equitable	3	3	3	4	5	4	3	3	3	3
Relative Cost Score	What is the cost estimate for this segment? 1 = most expensive, 5 = least expensive	4	4	5	2	3	1	5	3	5	3
Address existing trail issues	Does working on this segment address current problems on existing trails/greenways? 1 = does not address existing issues, 5 = addresses most pressing issues	4	3	1	5	1	1	1	1	1	1
	Unweighted Total	15	14	14	18	15	13	16	14	16	12

Table 6.2. Unweighted Prioritization Scores and Ranking of Greenway Segments

Prioritization Criteria	Weight	Trail Segment									
		1	2	3	4	5	6	7	8	9	10
Connectivity	0.4	0.8	0.4	0.4	1.5	1.5	1.9	0.8	1.5	0.8	0.8
Ease of Implementation	0.3	0.6	0.8	1.1	0.8	0.6	0.6	1.4	0.8	1.4	0.8
Equity	0.1	0.4	0.4	0.4	0.5	0.6	0.5	0.4	0.4	0.4	0.4
Relative Cost Score	0.1	0.2	0.2	0.3	0.1	0.2	0.1	0.3	0.2	0.3	0.2
Address existing trail issues	0.2	0.7	0.5	0.2	0.9	0.2	0.2	0.2	0.2	0.2	0.2
Weighted Total		2.58	2.30	2.28	3.75	3.00	3.20	2.93	3.03	2.93	2.28
Rank		7	8	9	1	4	2	5	3	5	9

6.1 // Prioritization

The first step to identifying an implementation framework is to identify which segments of the trail are priorities for completion. While the general alignment corridor for the Twelve Mile Creek Greenway was largely agreed-upon from the start of this study, one major goal of this feasibility study is to assist the Town in prioritizing the segment(s) for implementation. An evaluation of criteria identified by the Steering Committee and informed by previous public input was used to identify the three top-priority greenway segments. The Steering Committee discussed various prioritization criteria and ranked them by importance. The top criteria identified were Connectivity, Ease of Implementation, and Addressing existing trail issues. Project cost and equity also identified as important factors. Using these criteria, the ten greenway segments were scored and ranked. Table 3.1 demonstrates the criteria scoring and the unweighted ranking among greenway segments. Table 3.2 provides a weighted score by greenway segment for each criteria. Weighting is based on the priorities identified by the project Steering Committee.

Weighted score values were calculated based on Steering Committee's rankings for most important prioritization criteria (10/5/2023). For example, Connectivity received 40% of the selection for most important criteria, so scores in this category were multiplied by 0.40 to apply a weight reflective of the Steering Committee's stated priorities.

The three highest-ranking project segments were:

- Segment 4: Creekview Drive Trailhead to Town Creek Park/Waxhaw-Marvin Road (weighted score: 3.75)
- Segment 6: Prescot Glen Parkway West to NC 16/Providence Road to Encore at Streamside (weighted score: 3.20)
- Segment 8: Encore at Streamside – East Side (weighted score: 3.03)

Completion of each of these segments would have independent utility and provide valuable bicycle and pedestrian connections in advance of the eventual completion of the contiguous greenway corridor.

6.2 // Priority Segment STI and CRTPO Scoring Metrics

STI and STIP

North Carolina's Strategic Transportation Investments (STI) Law, passed in 2013, established a needs-based, data-driven methodology to prioritize transportation projects considered for project funding. Every two years, NCDOT Strategic Prioritization Office of Transportation (SPOT) conducts a prioritization process to develop the State Transportation Improvement Program (STIP), which outlines the projects planned for implementation over the next ten years.

Bicycle and pedestrian projects are scored in a specific manner. Independent bicycle and pedestrian projects are programmed in the Division Needs category. Eligible bicycle and pedestrian projects submitted for prioritization must be included in a locally adopted plan and have a minimum project cost of $100,000. Eligible activities include ROW acquisition, design, and construction. Additionally, the STI law prohibits the use of state funding for bicycle and pedestrian projects, requiring independent bike ped projects to utilize federal funds, which require a 20% match from the local municipality. For scoring purposes, project criteria include safety, accessibility/ connectivity, demand/density, and cost effectiveness.

Scoring criteria are accounted for as follows:

- Safety – 20%
- Accessibility/Connectivity – 15%
- Demand/Density – 10%
- Cost-effectiveness – 5%

Transportation Alternatives Program (TAP)

CRTPO TAP Scoring

CRTPO's TAP methodology scores projects according to the following criteria, which support the transportation goals of the MPO.

- Trip Generation and Connectivity
  - » Destinations of interest
  - » Connectivity to existing facilities
  - » Identification in previous planning documentation
  - » Placemaking amenities
  - » Demonstrated Need/Desire

- Safety
  - » Documented Safety Challenge
  - » Reduce Human Exposure
  - » Traffic Calming
  - » Vehicle Traffic
- Health and Environment
  - » Emission and Pollutant Reduction
  - » Social Equity
  - » Environmental Quality
  - » Health Equity
- Feasibility and Cost
  - » Effective use of federal funds
  - » Right of Way Previously Acquired/Available
  - » Cost-Benefit

Relevant Scoring Criteria for Proposed Twelve Mile Creek Greenway Projects
Completion of Segment 4

- Points of interest:
  - » Public parks
  - » Kensington Elementary School
  - » Town Hall Campus
- Safety
  - » Entirely separated from roads
- Connections
  - » Planned sidewalks and multiuse path on Waxhaw-Marvin Road
  - » Planned Sonny Way Greenway connection (north-south greenway spine connecting to downtown Waxhaw)
  - » Connection between Prescot neighborhood and Prescot Village Commercial/Artisan Prescot neighborhood and future sidewalks on Pine Oak

Completion of Segment 6

- Points of interest:
  - » 2 grocery stores
  - » 2 commercial centers (Prescot Village and Cureton)
    - Cureton includes services such as dentist, hair salon, bank, pharmacy/drug store with UPS access point, Forest Hill Church/North Point Christian Academy, Walmart, Lowes.
    - Prescot Village currently hosts a doggie daycare and several fast service restaurants, with a grocery store and additional commercial uses planned.
- Safety
  - » Little road interaction, only shares road at dead-end of Prescot Parkway west (crossing with NC 16/Providence Road would be grade-separated)
- Connections
  - » Planned sidewalk and multiuse path on NC 16/Providence Road

Completion of Segment 8

- Safety:
  - » Entirely separated from roads
- Connections:
  - » Connects two existing greenways and large neighborhoods, including Encore's 55+ community
  - » Connection to future Machine Branch Greenway and Blythe Creek Greenway

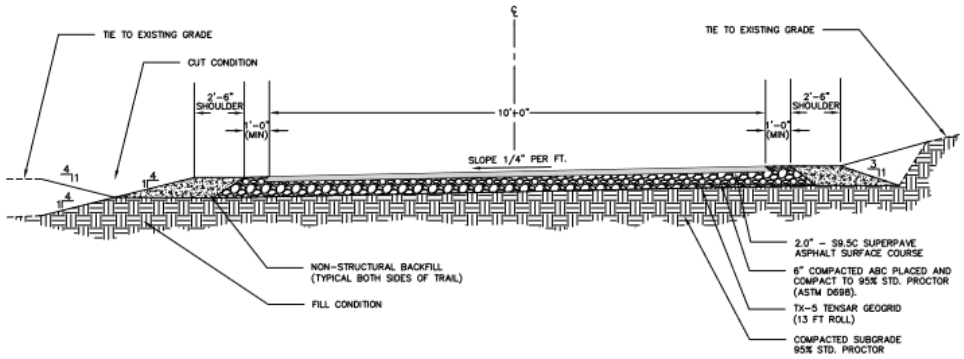
6.3 // Design recommendations

6.3.1 // Greenway Path Surface

Several varieties of trail, greenway, and path types are encountered or planned along the Twelve Mile Creek Greenway in Waxhaw.

1. Natural trail

Segment 1 is the only portion of the greenway corridor that is a natural surface and is intended to remain so. This segment goes through steep terrain where paving would not be practicable without a major environmental impact. The natural surface fits the character and user experience established with the existing Carolina Thread Trail suspension bridge at the SC/NC state line.



10' ASPHALT TRAIL SECTION

2. Existing Paved Surfaces

One key to implementing the Twelve Mile Creek Greenway corridor is to make use of existing greenway and path segments as much as possible. In neighborhoods such as Millbridge and Lawson and Town Creek Park, existing paved asphalt path segments will be retained and incorporated into the overall contiguous greenway.

An existing timber footbridge along the Millbrook Neighborhood Greenway.

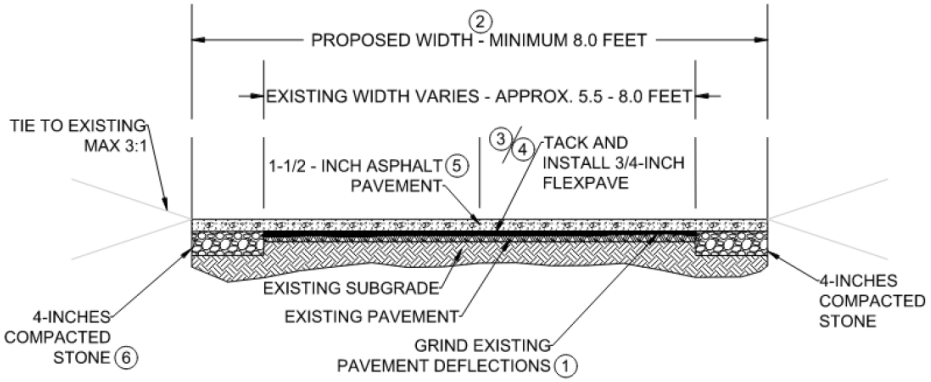
3. Sidewalk

Like the use of existing paved greenways, in certain areas, such as a portion of the Prescot neighborhood, short lengths of existing sidewalks are envisioned to provide the Greenway connection. In these areas, sidewalks would move pedestrians while bikes would use the adjacent roadway. On-road bike lanes or explicit markings and signage should be implemented to facilitate safe bike travel through these areas.

Example of pre-cast steel truss pedestrian bridge

4. New Paved Greenway Path

In areas where new greenway will be added, the recommended typical section is a 10-foot paved asphalt path, with 1-foot stone shoulders. For the majority of new trail paving, the recommended pavement base is 6" of aggregate base course (ABC) with geogrid. The depth of ABC and addition of geogrid is to enhance stability in the 100-year floodplain, which encompasses the majority of the proposed greenway corridor. In Segment 2, where the new paving is in an area where a previous gravel construction road currently serves as the trail, 4" of new base course is recommended over the existing gravel.



DETAIL 2.2 - TYPICAL TRAIL IMPROVED SECTION

6.3.2 // Bridges

1. Existing bridges: Various timber footbridges are found along the greenway, where segments include existing paths, such as the Millbridge and Lawson neighborhoods. In some cases, flooding, damage, and maintenance issues have occurred. For the purposes of this study, estimates are provided for the replacement of existing timber footbridges with pre-cast steel truss bridges and, in some cases, boardwalk structures with concrete decking. This material would be longer-lasting and much lower maintenance than the existing timber bridges. In further stages of project implementation, these bridges should be inspected and assessed for repair or replacement. Near-term replacement is likely unnecessary for many of the existing bridges.

2. New bridges and crossings: Three locations along the proposed greenway corridor have been identified as needing new crossing structures over FEMA-regulatory floodways. Feasibility-level hydraulic modeling was conducted for each crossing to identify impacts to the floodway. Final modeling will need to be performed to confirm this once structural details are engineered.
    a. Bridge 5A: This crossing of Twelve Mile Creek would connect Segment 5 north of the Prescot Neighborhood to the planned north-south greenway corridor known as Sonny Way. Hydraulic modeling indicates that a 150-foot single-span structure could effectively cross the floodway but a BFE rise of 0.06 feet may result, requiring a CLOMR.
    b. Bridge 6A: This pedestrian bridge would cross Twelve Mile Creek Tributary 4 between Prescot Glen Parkway (west) and Prescot Glen Parkway (east). Several crossing structures were evaluated at this location, including a 100-foot bridge, a 6'x6' box culvert, and a 36" corrugated metal pipe. Feasibility-level hydraulic modeling indicates that each of these options could achieve a no-rise condition. A 6'x6' box culvert crossing structure could provide the necessary infrastructure at a lower cost than the bridge option. However, culverts and pipes may carry increased environmental impacts to the stream as compared to a bridge.
    c. Bridge 7A: A 110-foot bridge is recommended at this crossing of West Fork Twelve Mile Creek from the southeast corner of the currently undeveloped Southcreek Commercial Development parcel into the Encore at Streamside property to the east. Preliminary hydraulic modeling indicates that this bridge would cause a BFE rise of .02 feet, indicating a need for a CLOMR.

Integrated Mobility Division

N.C. DEPARTMENT OF TRANSPORTATION

Section 7 // Implementation

Twelve Mile Creek Greenway Feasibility Study

Town of Waxhaw

NCDOT IMD

6.4 // Cost estimates

Construction cost estimates are provided in Table 6.3. Detailed construction cost tables are found in Appendix B.

Table 6.3 - Construction cost estimates

Segment	Option 1		Option 2		Option 3	
1	Path Repair Only	$ 36,000.00	Path Repair + Replace Bridges: 2 small timber/composite, 1 40' bridges with timber/composite	$449,000.00	Path Repair + Replace Bridges: 2 small timber/ composite, 1 40' steel prefab bridge	$640,000.00
2	Repair Existing Path Only	$37,000	Pave Path without Bridge Replacement	$216,000.00	Pave Path Replace Bridge	$703,000.00
3	Replace Existing Structures with Timber/Composite Bridges	$420,000.00	Replace Existing Structures with Prefabricated Steel Bridges	$974,000.00	Replace pavement + Replace Bridges with Prefab Steel Bridges	$1,268,000.00
4	100% Geogrid Surface + Existing Bridge Replacement	$623,000.00	50%/50% Boardwalk and Asphalt Pavement + Existing Bridge Re-placement	$6,859,000.00		
5	Replace .3 mi asphalt pavement and replace X foot bridges	$200,000.00				
6	New Culvert Crossing (6A)	$451,000.00	New Prefabricated Bridge Crossing (6A)	$886,000.00		
7	New Prefabricated Bridge (7A) and .6 mi of Geogrid Path	$924,000.00				
8	Geogrid Surface and 1 footbridge	$367,000.00	Asphalt Pavement and 1 footbridge	$643,000.00		
9	Replace Existing Structures with Boardwalk	$431,000.00	Replace Existing Structures with Prefabricated Steel Bridges	$974,000.00		
10	Asphalt Paving .25 Mile Continuation of Trail	$650,000.00				

7 // Implementation

Strategies to move the Twelve Mile Creek Greenway toward implementation and completion are described in this section by defining partner roles, recommended project phasing, potential funding resources, maintenance considerations, and an action plan detailing implementation tasks through a 10-year project development horizon.

7.1 // Implementation Partners

Implementation of Waxhaw's Twelve Mile Creek Greenway will require commitment and cooperative effort between various entities, as listed below.

Town of Waxhaw

As the project sponsor, the Town of Waxhaw will pursue project funding, coordinate with local, regional, and state partners, and oversee the completion of project design and construction. The Town will also assume maintenance responsibilities over the approximately 5 miles of greenway upon completion.

Union County

The County will partner with the Town of Waxhaw and coordinate in segments outside of Waxhaw's town limits. The County will coordinate with the Town to establish new encroachment agreements and a survey will be needed to allow a 20-foot-wide portion of the easement to be dedicated to greenway access and use. Union County is also a potential co-sponsor when pursuing outside funding sources.

Lancaster County, SC

The Town of Waxhaw will work closely to coordinate with Lancaster County, SC, on greenway and trail connectivity at the west extent of the Twelve Mile Creek Greenway.

Village of Wesley Chapel

The Town of Waxhaw will coordinate with the Village of Wesley Chapel, which borders Waxhaw to the east and abuts the eastern extent of the proposed Twelve Mile Creek Greenway.

Charlotte Regional Transportation Planning Organization (CRTPO)

As the federally designated Metropolitan Planning Organization (MPO) for Iredell, Mecklenburg, and Union Counties, CRTPO is a facilitator as needed with local officials to develop plans and projects with NCDOT. CRTPO receives discretionary funding to be allocated to member jurisdictions for specific projects on a competitive basis. The Town of Waxhaw will likely pursue this funding from CRTPO (See Appendix D).

NCDOT

NCDOT projects on the Twelve Mile Creek corridor include NC 16/Providence Road widening project (NCDOT U-5769) and the replacement of the Waxhaw-Marvin Road bridge over Twelve Mile Creek (BP10.R017). Continuing local involvement and coordination with these projects will help ensure that local priorities and planning are considered when incorporating bike and pedestrian facilities into the design. Coordination with NCDOT Division 10 and NCDOT's IMD will be crucial to success, and will ensure that proper facilities are installed as part of these projects that are in line with the Twelve Mile Creek proposed typical section.

Carolina Thread Trail

Carolina Thread Trail supports local governments in their planning and implementation efforts as part of a larger goal to weave together a network of bike and pedestrian trail connections across a 15-county region in North and South Carolina.

Homeowners Associations

Segments of the proposed greenway run through properties currently owned and maintained by local neighborhood associations, including the Millbridge Homeowners Association, Prescot Homeowners Association, Encore at Streamside Homeowners Association, the Lawson Community Association, and any additional homeowner's associations for future greenway-adjacent developments. To be included on the greenway as part of the Twelve Mile Creek Greenway and the Carolina Thread Trail, dedication of easement will be required for these greenway segments. Maintenance agreements with the homeowner's associations will need to be enacted.

Private Developers

Several segments along the greenway corridor traverse land that is either in the process of private development or expected to be developed in the future. A key component of local planning and code development, the Town of Waxhaw will coordinate with private developers to ensure their fulfillment of requirements to include planned greenway facilities on those parcels.

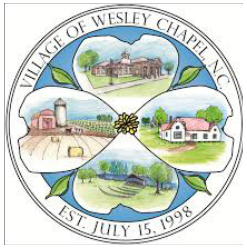

TOWN OF
WAXHAW
Est. 1889
UNION COUNTY, NORTH CAROLINA


CAROLINA
THREAD TRAIL

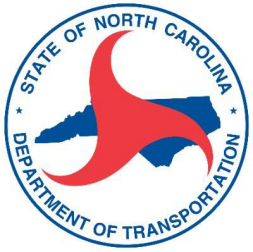

Integrated Mobility Division
N.C. DEPARTMENT OF TRANSPORTATION


UNIONCOUNTY


CRTPO
charlotte regional transportation planning organization


VILLAGE OF WESLEY CHAPEL, N.C.
EST. JULY 15, 1998


Lancaster
County
South Carolina


STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

7.2 // Phasing

Considering the diverse features of the Twelve Mile Creek Greenway corridor, it would be beneficial to develop the greenway in phases rather than as a singular undertaking. While some segments are already owned by the Town of Waxhaw and need repair or revision, others will require transfer of easements from homeowner's associations, and some segments will be completed by developers in conjunction with residential or commercial projects. At two locations, the trail must be incorporated into planned NCDOT projects. Though some phases may be worked on concurrently or in a different order, the list below outlines the general recommended sequence for approaching the completion of Waxhaw's Twelve Mile Creek Greenway.

Phase 1 - Developer Coordination

Continue coordination with property developers on projects in process to ensure connectivity to existing and future segments, communicate standards, and ensure compatibility. Upon completion and connection of these segments to additional greenway segments, easements and maintenance agreements will need to be agreed to.

Site planning is currently underway for the Prescot Village parcel which includes much of Segment 6 of the greenway. The developer is committed to building the length of greenway through this parcel. The Town will coordinate closely on plans so that the built path is compatible with future greenway elements, including the proposed greenway bridge at the end of Prescot Glen Parkway.

Phase 2 - Segment 4

Segment 4 connects from the existing greenway in Millbridge Neighborhood to Town Creek Park through a partially cleared, but unpaved wooded section along the creek. Completing this segment of greenway would create a contiguous greenway stretch of 1.25 mile, with an additional quarter mile of natural trail (Segment 1) and continuation of the Carolina Thread Trail beyond the border with South Carolina. This segment has a relatively low need for property acquisition and/or access. Much of this segment is on property owned by the Millbridge Homeowners Association, with the remainder already under Town ownership. The Town of Waxhaw has been in the process of a pilot project to test the use of geotextiles which could withstand the frequent flooding and washouts that occur throughout this segment.

The Town should work with NCDOT to improve the pedestrian crossing of Waxhaw Marvin Road at Exbury Gardens Drive for connectivity until the Waxhaw-Marvin Road bridge over Twelve Mile Creek is replaced.

Phase 3 - Segment 6

Segment 6 includes the completion of the tributary crossing between the east and west sections of Prescot Parkway (6A) and greenway construction through the proposed Artisan Prescot development on the east side of Twelve Mile Creek Tributary 4.

Development of the Artisan Prescot property in this segment is progressing, with site plans currently underway. The developer is incorporating the greenway into their site plans and is potentially dedicating easement and providing a payment-in-lieu to the Town for its development.

To complete this phase, the Town of Waxhaw should focus on identifying funding mechanisms to pursue planning, detailed engineering, and construction of crossing 6A.

Phase 5 - Segment 8

Completing Segment 8, the eastern portion of the greenway through Encore at Streamside, would connect the Encore at Streamside and Lawson neighborhoods with approximately 1.7 miles of greenway.

Connections to points of interest outside of the Encore at Streamside and Lawson neighborhoods will require the completion of at least one other major project. The most direct connection to the commercial destinations at NC 16/Providence Road – via the Twelve Mile Creek Greenway corridor – would require completion of NCDOT project U-5769B and the installation of a greenway bridge crossing over West Fork Twelve Mile Creek. Alternatively, sidewalks through the Encore at Streamside could provide a connection northward to Cuthbertson Road, where sidewalks are proposed in the 2023 Pedestrian Plan Update. However, no project is currently funded or programmed to install sidewalks along Cuthbertson Road.

Phase 6 - Existing Bridge and Existing Surface Evaluation

With Segments 4, 6, and 8 complete, a contiguous greenway approximately 5 miles long will be available to users. This phase would begin to address

infrastructure on segments of the greenway that incorporate existing pathways. An evaluation of existing bridges and paved surfaces along the corridor should be conducted and necessary repairs or replacements assessed. The Town reports maintenance and safety concerns related to flooding with the existing wooden footbridges along sections of the greenway that incorporate existing neighborhood and greenways. A thorough inspection of existing bridges could bring light to the cost-effectiveness of replacement with bridges that may be more resilient to flooding that occurs within the floodplain. This phase could also include design and construction of resurfacing of the greenway surface through Segment 2, which is currently partially gravel surface.

Phase 7 - Segment 5

With the Town's recent trail restoration project along Twelve Mile Creek north of the Prescot neighborhood, the Twelve Mile Creek Greenway corridor through Segment 5 is substantially complete.

The major project proposed in Segment 5 is the completion of a new bridge crossing Twelve Mile Creek that would carry the future Sonny Way north-south greenway and provide a direct connection to the Twelve Mile Creek Greenway.

Timing of this phase is closely tied to the future development of Sonny Way and/or proposed sidewalk infrastructure on Kensington Road to ensure connectivity to the multimodal network.

Phase 8 - Segment 10

Extending the Twelve Mile Creek Greenway east beyond the easternmost extent of the existing Lawson Walking Trail will increase the miles of greenway available for travel and recreation and will continue the development of the greenway corridor outlined in the Carolina Thread Trail Union County Master Plan. This segment will also eventually be a gateway to the Village of Wesley Chapel. Developing this segment will require identification and procurement of funding, detailed planning, engineering, and construction.

7.3 // Funding Resources

The connection to compatible funding sources is essential to completing the Twelve Mile Creek Greenway project. In North Carolina, funding for recreational trails primarily comes from state-level programs and federal grant initiatives. At the state level, North Carolina administers the Recreational Trails Program (RTP), funded through the Federal Highway Administration. RTP provides grants to local communities, non-profit organizations, and government agencies for the development, improvement, and maintenance of recreational trails. Additionally, the state's Parks and Recreation Trust Fund (PARTF) supports trail projects as part of broader park and recreational initiatives. Federally, the Land and Water Conservation Fund (LWCF) is a crucial source of support for trail development in North Carolina. LWCF grants aid in acquiring and developing public lands, ensuring that communities across the state have access to well-designed and maintained recreational trails. These funding programs collectively contribute to enhancing outdoor recreation opportunities and preserving natural landscapes in North Carolina.

NCDOT - Strategic Transportation Investments (STI)

The Strategic Transportation Investments law was passed in 2013 with the intent to equip NCDOT to use funding efficiently and effectively to enhance infrastructure while advancing economic growth, job creation, and a higher quality of life. STI law establishes the Strategic Mobility Formula, which allocates available funding based on data-driven scoring and local input. This Mobility Formula is used to develop the State Transportation Improvement Program (STIP). The allocation of funding is described in the table below. Bicycle and pedestrian projects can only fall within the Division Needs category, which is allocated 30 percent of revenue distribution.

Funding Category	Revenue Distribution	Description
Division Needs	30%	Revenue in this category is shared equally over NCDOT's 14 transportation divisions. Project scores are based 50 percent on data and 50 percent on rankings by local planning organizations and the NCDOT transportation divisions.
Regional Impact	30%	Projects on this level compete within regions made up of two NCDOT transportation divisions, with funding based on population. Data makes up 70 percent of the project scores in this category. Local rankings account for the remaining 30 percent.
Statewide Mobility	40%	Projects in this category are based 100 percent on data.

Federal Law requires a STIP at least every four years, and NCDOT updates the STIP every two years to ensure it accurately reflects the department's current financial status. The 2024-2033 State Transportation Improvement Program includes 2,362 projects, 381 of which are for bicycle/pedestrian projects. It takes two years to develop the STIP program, and this effort is comprised of three steps:

1. Strategic Prioritization (SPOT): NCDOT receives potential improvement projects scored and ranked based on numerous factors at the state, regional, and municipal level.
2. Programming and scheduling: Draft STIP review: Once the improvement projects are scored and ranked, they are then prioritized based on additional factors such as funding restrictions and environmental plans.
3. Draft STIP review and approval: Those projects programmed and scheduled become part of a draft STIP released to the public for review and then submitted for approval to the NC Board of Transportation.

During the Strategic Prioritization phase, NCDOT receives potential improvement projects to be scored and ranked at the statewide, regional, and division levels based on approved criteria such as safety, congestion, benefit-cost and local priorities. These scores and other factors are used to determine whether a project receives funding.

Matching funds: Twenty percent (20%) match. NCDOT cannot provide the 20% local match.
Link: https://www.ncdot.gov/initiatives-policies/Transportation/stip/Pages/about.aspx

Federal Grants

The following federal grants are allocated through CRTPO's Discretionary Grants Program (see Appendix D). Federal grants typically include a funding percentage and a local match percentage, with most programs using an 80/20 (federal/local) split.

Transportation Alternatives Program (TAP)

TAP is a program funded through the Federal Highway Trust Fund aimed at funding transportation-related alternatives, which can include trails, pedestrian and bicycle facilities, historic preservation, and other community enhancement projects. TAP is administered by CRTPO. The TAP Criteria Scoring Guide is found in Appendix D of this report.

Congestion Mitigation and Air Quality funding (CMAQ)

Congestion Mitigation & Air Quality (CMAQ) is a federal program started in 1991 under the Intermodal Surface Transportation Efficiency Act (ISTEA) and continues under the current transportation funding legislation, Fixing America's Surface Transportation (FAST) Act. The program's purpose is to fund projects that help achieve compliance with the national air quality standards established under the Clean Air Act. Union County is in a designated "maintenance" area for ozone as designated by the Environmental Protection Agency (EPA). Any project proposed for CMAQ funding must be able to demonstrate that its implementation will contribute to a reduction in harmful emissions.

Carbon Reduction Program (CRP)

The Carbon Reduction Program was established through the Bipartisan Infrastructure Law, also known as the Infrastructure Investment and Jobs Act of 2021. The program is administered through the Federal Highway Administration and provides $6.4 billion in formula funding over a five-year period. This program provides funds for projects that reduce carbon dioxide (CO2) emissions from the transportation sector. According to the 2005-2018 North Carolina Greenhouse Gas (GHG) Inventory, the transportation sector accounts for 35.9% of the greenhouse gas emissions.

Sixty five percent of the state's CRP funds are obligated to projects based on population size, while thirty five percent can be obligated on projects anywhere in the state. CRP funds may be obligated for projects that support the reduction of transportation emissions, including, but not limited to– [except as noted, § 11403; 23 U.S.C. 175(c)(1)]

- a project described in 23 U.S.C. 149(b)(4) to establish or operate a traffic monitoring, management, and control facility or program, including advanced truck stop electrification systems;
- a public transportation project eligible under 23 U.S.C. 142;
- a transportation alternative (as defined under the Moving Ahead for Progress under the 21st Century Act [23 U.S.C. 101(a)(29), as in effect on July 5, 2012]), including, but not limited to, the construction, planning, and design of on-road and off-road trail facilities for pedestrians, bicyclists, and other nonmotorized forms of transportation.

Funding match: projects require a 20% non-federal match. The estimated annual

CRP funding for FY2024 is $1.283B, FY2025 - $1.309B, and FY2026 - $1.335B.
Link: https://www.transportation.gov/priorities/climate-and-sustainability/carbon-reduction-program

Surface Transportation Block Grant (Direct Allocation) [STBG-DA]

The Surface Transportation Block Grant program provides flexibility funding that may be used by States and localities for projects to preserve and improve the conditions and performance on any Federal-aid highway, bridge and tunnel projects on any public road, pedestrian and bicycle infrastructure, and transit capital projects, including intercity bus terminal. STBG requires that planning projects be identified in the STIP and be consistent with the Long-Range Statewide Transportation Plan and Metropolitan Transportation Plan. STBG projects eligible planning purposes must be reflected in the statewide work program or Metropolitan Unified Planning Work Program. (UPWP). Under the STBG program, there is Direct Allocation (STBG-DA) and Set-Aside (STBG-SA).

- STBG-DA provides flexible funding that may be used for projects to preserve and improve the conditions and performance on any Federal-aid highway; bridge and tunnel projects on any public road; pedestrian and bicycle infrastructure; and transit capital projects, including intercity bus terminals.
- STBG-SA provides funding for a variety of projects such as pedestrian and bicycle facilities; construction of turnouts; overlooks and viewing areas; community improvements such as historic preservation and vegetation management; environmental mitigation related to storm water and habitat connectivity; recreational trails; safe routes to school projects; and vulnerable road user safety assessments.

Under STBG program, eligible activities include:

- Maintenance and restoration of existing recreational trails, pedestrian, and bicycle projects in accordance with 23 U.S.C. 217 as amended by the BIL (including modifications to comply with accessibility requirements under the Americans with Disabilities Act), and the Safe Routes to School Program under 23 U.S.C. 208 as amended by the BIL.
- The addition or retrofitting of structure or other measures to eliminate or reduce crashes involving vehicles and wildlife.
- Projects to enhance travel and tourism

Federal Share: The federal share is 80%. For projects on the Interstate System, the federal share increases to 90%. The estimated annual STBG funding for FY2024 is $14.394B, FY2025 - $14.682B, and FY2026 - $14.976B.
Link: https://www.fhwa.dot.gov/specialfunding/stp/

State Grants

Rebuilding American Infrastructure with Sustainability and Equity (RAISE)

The RAISE grant is a U.S. Department of Transportation (USDOT) program that provides funding for transportation infrastructure projects. This grant supports a wide range of surface transportation initiatives, including roads, bridges, transit, rail, ports, and intermodal projects. It is designed to enhance safety, sustainability, mobility, and economic competitiveness, while emphasizing equity and climate change resilience.The RAISE grant can be applicable to trail projects that serve transportation purposes, such as multi-use trails for walking, cycling, and other non-motorized transportation. These trails often provide critical connections between communities, schools, workplaces, and recreational areas, helping reduce vehicle congestion, promote healthy lifestyles, and decrease carbon emissions.

NC Parks and Recreation Trust Fund PARTF Program

PARTF provides 1:1 matching grants to local governments for parks and recreational projects to serve the public. PARTF is the primary source of funding for building and renovating facilities and buying land for new and existing parks.
https://www.ncparks.gov/more-about-us/parks-recreation-trust-fund/parks-and-recreation-trust-fund

North Carolina Land and Water Fund (NCLWF)

The NCLWF (formerly known as the Clean Water Management Trust Fund) was created in 1996 by the General Assembly to conserve North Carolina's streams, rivers, and open space. The NCLWF funds land acquisition, stream restoration, stormwater, and planning projects that protect and conserve riparian buffers to provide environmental protection for surface waters and urban drinking water supplies and to establish a network of riparian greenways for environmental, educational, and recreational uses. NCLWF also funds mini grants of up to $25,000 for donated property or the value of the conservation donation to pay transaction costs associated with the donation of property in fee simple or a permanent conservation agreement. NCLWF has one grant cycle per year. Applications are available in early January and close in February. Final award

decisions are made in the fall.
Link: https://nclwf.nc.gov/apply

Accessible Parks Grant

The Accessible Parks Grant Program provides $12.5 million in matching grants for parks and recreation to benefit people with disabilities across North Carolina. Counties, incorporated municipalities, and public authorities are eligible to apply for this grant. The program is administered through the Division of Parks and Recreation and the North Carolina Parks and Recreation Trust Fund. Matching grants can be used for the construction of special facilities or adaptation of existing facilities that meet the unique needs of persons with disabilities or enable them to participate in recreational activities. An applicant must own, or have at least a 25-year signed lease or easement for the property where the project will be located. The facility should also be available for public recreational use for at least 25 years.

Funding Match: Applications are open in January and applicants can apply for up to $500,000 with each application. The match must be at least $1 for every $5 in grant funds.
Link: https://www.ncparks.gov/about-us/grants/accessible-parks-grant#Eligibility-7543

Recreational Trails Program

The Recreational Trails Program has provided funding for the construction of new trails, maintenance, and repair of existing trails, land acquisition, purchase of trail tools, and planning, legal, environmental, and permitting costs.
Link: https://trails.nc.gov/trail-grants

Great Trails State (GTS) Program

The Great Trails State (GTS) Program funded $25 million through a competitive grant program for new trail development and extension of existing trails, including paved trails, greenways, and natural surface trails for biking, hiking, walking, equestrian use, and paddling. The fund is administered by the North Carolina Department of Natural and Cultural Resources (NCDNCR). While there is no guarantee of future funding through this program, the Town should monitor for the addition of future funding cycles.
Link: https://www.ncparks.gov/about-us/grants/great-trails-state-program

Private and Non-Profit

Carolina Thread Trail Regional Trail Implementation Grant Program

Carolina Thread Trail (CTT) periodically offers grant funding with the goal of helping communities plan and implement trail projects along the Carolina Thread Trail. In the past, project types eligible for CTT funding have been trail construction, trail project design, land acquisition, detailed corridor planning, and canoe/kayak launch construction.
Link: https://www.carolinathreadtrail.org/resources/grant-program-funding-sources/

The Blue Cross Blue Shield Foundation (BCBSF)

The Blue Cross Blue Shield Foundation (BCBSF) supports initiatives that promote health and wellness, including outdoor activities like trail building. Their grant programs are designed to improve community health, and they recognize that access to outdoor spaces encourages physical activity, which in turn leads to better overall health outcomes. The foundation often supports local projects that aim to improve public health infrastructure. This includes grants to community organizations, municipalities, or nonprofits involved in building or maintaining walking, hiking, or biking trails.
Link: https://www.bcbsncfoundation.org/overview-and-opportunities/

Z. Smith Reynolds Foundation

The Z. Smith Reynolds Foundation (ZSR), based in North Carolina, provides grants that aim to improve the quality of life for residents through various community-based initiatives. ZSR grant programs support projects that align with environmental sustainability, community development, and health promotion, which can include trail building initiatives. The Foundation supports local, regional and/or statewide efforts that: prevent and mitigate the impacts of climate change; ensure healthy air and water quality and water quantity; promote access to the green economy; address the impact of environmental hazards on human health; and protect significant ecosystems while meeting the growth demands of the state in environmentally sound ways.
Link: https://www.zsr.org/grants-programs

Bank of America Charitable Foundation

The BoA Charitable Foundation issues grant opportunities in line with core values of health, removing barriers to employment, affordable housing, and neighborhood revitalization, including the creation or restoration of open space and parks.

Link: https://about.bankofamerica.com/en/making-an-impact/charitable-foundation-fundings

Local Funding Mechanisms

Local Deveopment Requirements and Fees

Through State Statute, the Town of Waxhaw authorizes impact fees (exactions) for transportation improvements and recreational land. New developments are required to undergo Traffic Impact Analysis that determines how the developer must pay for projects that mitigate increased traffic caused by the development. In new developments, the Town requires public dedication of recreation areas and open space land or a fee-in-lieu to pay for these in other parts of town. Through each new development, the Town requires a dedication of land for public parks, greenways, facilities, and open spaces to serve the recreational needs of Waxhaw residents.

Link: https://www.waxhaw.com/home/showpublisheddocument/3206/638515558682030000

Capital Improvement Program (CIP)

The Town of Waxhaw develops the Capital Improvement Plan as a long-term plan (around 4-5 years). The plan identifies large scale project and equipment needs and provides an anticipated schedule for completing them. The Plan is updated every year to incorporate any expected or unexpected financial circumstances. The CIP Plan has a corresponding CIP Budget focusing on the town's expanding operational demands and provides a long-term plan for funding Waxhaw's numerous capital project needs. The Twelve Mile Greenway from Prescot to Eastern Town Limits is listed in the CIP scheduled in the next five years and beyond.

Link: https://www.waxhaw.com/home/showpublisheddocument/1900/638180146234170000

Other Local Sources

Funding and campaign drives, local company donations and sponsorships, private developer and land owner donations can all be used to match federal dollars.

7.4 // Maintenance Considerations

Maintaining greenways is crucial for ensuring their long-term sustainability within the network. Consistently maintained greenways incur lower costs over time and provide a safe, positive trail experience compared to those needing significant rehabilitation due to neglect. Effective maintenance practices also extend the lifespan of greenways, foster positive relationships with neighboring landowners, and cultivate community stewardship.

This plan proposes a comprehensive maintenance approach, including the development of a maintenance plan to prioritize funding and responsibilities across jurisdictions. The maintenance plan should undergo annual review and updates to incorporate lessons learned and adapt to evolving operational policies, standards, and maintenance objectives. Key components of the greenway system maintenance plan include:

- Assessing anticipated maintenance needs and evaluating the capacity of Town staff to meet those needs.
- Creating a facility inventory to identify routine and major maintenance requirements for greenway signage, amenities, bridges, culverts, and pavement.
- Estimating baseline maintenance costs by identifying essential activities such as mowing, landscaping, trash removal, debris clearing, lighting, drainage, seasonal upkeep, sealcoating, repaving, patching, and bridge repairs.
- Evaluating labor costs to determine which maintenance tasks can be handled in-house versus outsourced.
- Exploring available technologies for data collection on facility conditions and to enhance maintenance operations.
- Establishing a methodology to prioritize annual maintenance based on facility conditions and available funding.
- Addressing emergency services including designated entry and exit points, mile-marker signage for location identification, and emergency notification systems.

This approach ensures that greenways remain well-maintained, enhancing their functionality and community benefit over time.

7.5 // Action Plan

The following list summarizes the critical steps to be taken by project partners to implement the completion of the Twelve Mile Creek Greenway as part of the Carolina Thread Trail network through Waxhaw.

Task #	Action	Lead	Partners	Timeline	Performance Measures
1	Adopt the Twelve Mile Creek Greenway Feasibility Study. This action allows the study to become the official planning document for the Twelve Mile Creek Greenway and demonstrates intent to support project implementation.	Waxhaw Board of Commissioners	Town of Waxhaw, NCDOT IMD, Div. 10, CRTPO, Carolina Thread Trail	Fall 2024	Plan Adoption, Meeting Minutes
2	Request an administrative modification to the CRTPO CTP to reflect the preferred alignment for the Twelve Mile Creek Greenway as discussed in this plan.	CRTPO	Town Waxhaw, NCDOT IMD, Div. 10, Union County	Fall 2024	Informal presentation to CRTPO Board and TCC, Administrative modification to CTP maps, Meeting Minutes
3	Union County should adopt a resolution of support for the Twelve Mile Creek Greenway Plan.	Union County	Town of Waxhaw, NCDOT IMD, Carolina Thread Trail	Fall 2024	Resolution of Support
4	Develop a formalized Maintenance Plan for the Twelve Mile Creek Greenway that outlines maintenance roles and responsibilities.	Town of Waxhaw	Neighborhood HOAs, Union County, Developers	Winter 2024	Meeting Agendas, Minutes, and Draft Maintenance Plan
5	Coordinate with HOAs along the corridor to transfer easements to the Town or put an agreement in place to transfer easements at a later date.	Town of Waxhaw	Neighborhood HOAs: Millbridge, Lawson, Encore at Streamside	Winter 2024	Memoranda of agreement
6	Coordinate with NCDOT Division 10 on the programmed bridge replacements at Marvin-Waxhaw Road (BP10.R017) and NC 16/Providence Road (U-5769B) to ensure that bridge and approach design accommodates TMCG as needed.	Town of Waxhaw	NCDOT Division 10, NCDOT IMD, Carolina Thread Trail	Ongoing through project construction, begin Summer 2024	Meeting Agendas, Minutes, NCDOT design and construction
7	Pursue design of Segment 4 and develop a grant procurement and fundraising plan using cost estimates developed in this study to identify funding for construction.	Town of Waxhaw	NCDOT IMD, Carolina Thread Trail, Millbridge HOA	Fall 2024	
8	Pursue design of Segment 6 and develop a grant procurement and fundraising plan using cost estimates developed in this study to identify funding for construction.	Town of Waxhaw	Union County, NCDOT IMD, Carolina Thread Trail, Prescot HOA, Artisan Prescot	2025	
9	Pursue design of Segment 8 and develop a grant procurement and fundraising plan using cost estimates developed in this study to identify funding for construction.	Town of Waxhaw	Union County, NCDOT IMD, Carolina Thread Trail, Encore at Streamside HOA	2027	

Integrated Mobility Division

N.C. DEPARTMENT OF TRANSPORTATION

Section 8 // Appendix

Twelve Mile Creek Greenway Feasibility Study

Town of Waxhaw

NCDOT IMD

8 // Appendix

- Hydraulic Analysis
- Opinion of Probable Costs
- CRTPO Discretionary Funding Resource

Feasibility Hydraulic Analysis

Twelve Mile Creek Feasibility Study

Town of Waxhaw

NCDOT Integrated Mobility Division

July 15, 2024

benesch

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INTRODUCTION

Benesch has been tasked by the town of Waxhaw to perform a feasibility study for the Carolina Thread Trail connection project. The Town of Waxhaw proposes a greenway alignment along Twelvemile creek connecting the Carolina Thread Trail. The proposed work includes three possible FEMA Crossings, including two crossing Twelvemile Creek and one crossing a smaller tributary of Twelvemile Creek.

Twelvemile Creek is a FEMA detailed study (Zone AE) with a regulatory floodway. For this feasibility study, a preliminary alignment has been established based on the alignments of the existing private trails. All necessary alignment crossings of FEMA studied streams have been incorporated into this narrative. This feasibility study does not include survey, therefore, only a Preliminary Effective model and Preliminary Revised model was developed for each reach.

Though this narrative is a description of the revisions to FEMA data given for this feasibility study, The purpose of this study is to evaluate the impacts of potential crossings and floodplain changes to the Base Flood Elevations (BFE). Therefore, the revisions and evaluations will only be to further the study of feasibility of this overall project and not to determine if this project should or should not qualify for a No Rise or No Impact. Further analysis will need to take place during the structural and hydraulic design phase of this project.

METHODOLOGY

The following effective models were downloaded from FEMA via the Flood Risk Information System (FRIS) website in a digital format (HEC-RAS) on September 19, 2023:

- Westfork Twelvemile Creek
- Eastfork Twelvemile Creek
- Twelvemile Creek
- Twelvemile Tributary 3
- Twelvemile Tributary 4

The proposed models are being developed within HEC-RAS 6.4.1, two models were prepared:

- *Preliminary Conditions Model 6.4.1* – This consists of input and output from the model received from FEMA in HEC-RAS Version 3.1.3 and modifed into an appropriate starting point for the Preliminary Revised models.
- *Preliminary Revised Model 6.4.1*– In this model the proposed conditions were modeled including the proposed stream crossings.

Due to the feasibility status of this project, all added cross sections and bridges were modified via the RAS Mapper tool of HEC-RAS version 6.4.1. As stated previously, survey information was not provided for this project. Therefore, only terrain data provided by USGS is used to observe topography for this model. The data and HEC-RAS model are shown on NAVD 88 datum. Therefore, no datum conversion or adjustment was required. All water surface summary tables are shown using the NAVD 1988.

FIS Data

The data consists of data contained within the Flood Insurance Study (FIS) for Union County which has an effective date of October 16, 2008. Two active LOMRs were found to exist in the project vicinity, LOMR 15-04-4099P and LOMR 13-04-3703P. LOMR 13-04-3703P reports revisions along Twelvemile Creek from the Union County State boundary to approximately 520 feet downstream of Waxhaw Marvin Road. These revisions include increases and decreases in the Base Flood Elevations (BFE) and Floodway elevations. The LOMR includes revisions to Twelvemile Creek Tributary 1 from the confluence with Twelvemile creek to approximately 220 feet upstream of Kensington Drive (SR 1305) as well as Twelvemile Creek Tributary 2 from the confluence of Twelvemile creek to approximately 1500 feet upstream. Increases and decreases in the BFE were observed in these tributaries as well. The effective was revised to reflect this LOMR on October 10, 2013.

LOMR 15-04-4099P reports revisions along Twelvemile Creek Tributary 3 from the confluence with Twelvemile Creek to approximately 3,650 feet upstream and Twelvemile Creek Tributary 4 from the confluence with Twelvemile Creek to approximate 280 upstream of Pine Oak Road. These tributaries are Zone AE streams that do not include regulatory Floodways. Only increases were reported in the BFE in these tributaries. The effective was revised to reflect this LOMR on March 10, 2016.

Both LOMRs included revised models that have been captured with the effective models available. This information was obtained via the FRIS website.

The Detailed Study models which contain the crossing of the Carolina thread trail were downloaded from FRIS in an electronic HEC-RAS format on September 19, 2023. The new crossings needed were identified near stations on the appropriate streams as outlined below:

Bridge Number	Stream Name	approximate River Station
5A	Twelvemile Creek Tributary 4	1269
6A	Twelvemile Creek	10444
6B	West Fork Twelvemile Creek	205

As previously noted, Twelvemile Creek Tributary 4 is contained within Limited Detailed Studies as Twelvemile Creek and West Fork Twelvemile Creek are Detailed Flood Studies with regulatory Floodways. The models for all three streams were downloaded and compared with the available FIS data. These bridges were analyzed with two separate models, the methodology for these models is outlined below.

TWELVEMILE CREEK TRIBUTARY 4: BRIDGE 5A

Duplicate Effective model

The Limited Detail Study model which contains the crossing of bridge 5A was downloaded from FRIS in an electronic HEC-RAS format on September 19, 2023. The Effective model output matches the FIS Data. Bridge 5A was identified at cross section 1269. The Duplicate Effective Model is simply a duplicate of the effective model provided.

Preliminary Conditions Model

The following revisions were made from the Duplicate Effective model to create the Preliminary Existing Conditions Model:

- Cross Section 1206 was deleted.
- Cross Section 1243 was added using RAS Mapper
- Cross Section 1321 was added using RAS Mapper
    - Tops of banks and channel modifications were made to each added cross section reflect consistency with effective upstream and downstream cross sections.

Preliminary Revised Model

The following revisions were made from the Preliminary model to reflect the Preliminary revised model:

- Bridge 5A was added at cross section 1269.
    - the Low Flow Method section was set t to include the drag coefficient to 1.2.
    - The contraction and expansion coefficients at cross sections 1243 and 1321 were set to 0.3 and 0.5. Ineffective flow areas were added to these cross sections as well.
    - Ineffective flow areas were added to cross sections 1243 and 1321.

Alternative crossings were modeled to observe the impacts this proposed crossing may have on the existing floodplain. The alternatives as well as their impacts are listed in the table below:

Structure	WSEL at 1338 (ft)	Existing Conditions WSEL at 1338 (ft)	Impact (ft)
100-foot Bridge	503.73	502.13	1.6
6'x6' Box Culvert	501.06	502.13	-1.1
36" Corrugated Metal Pipe	501.02	502.13	-1.1

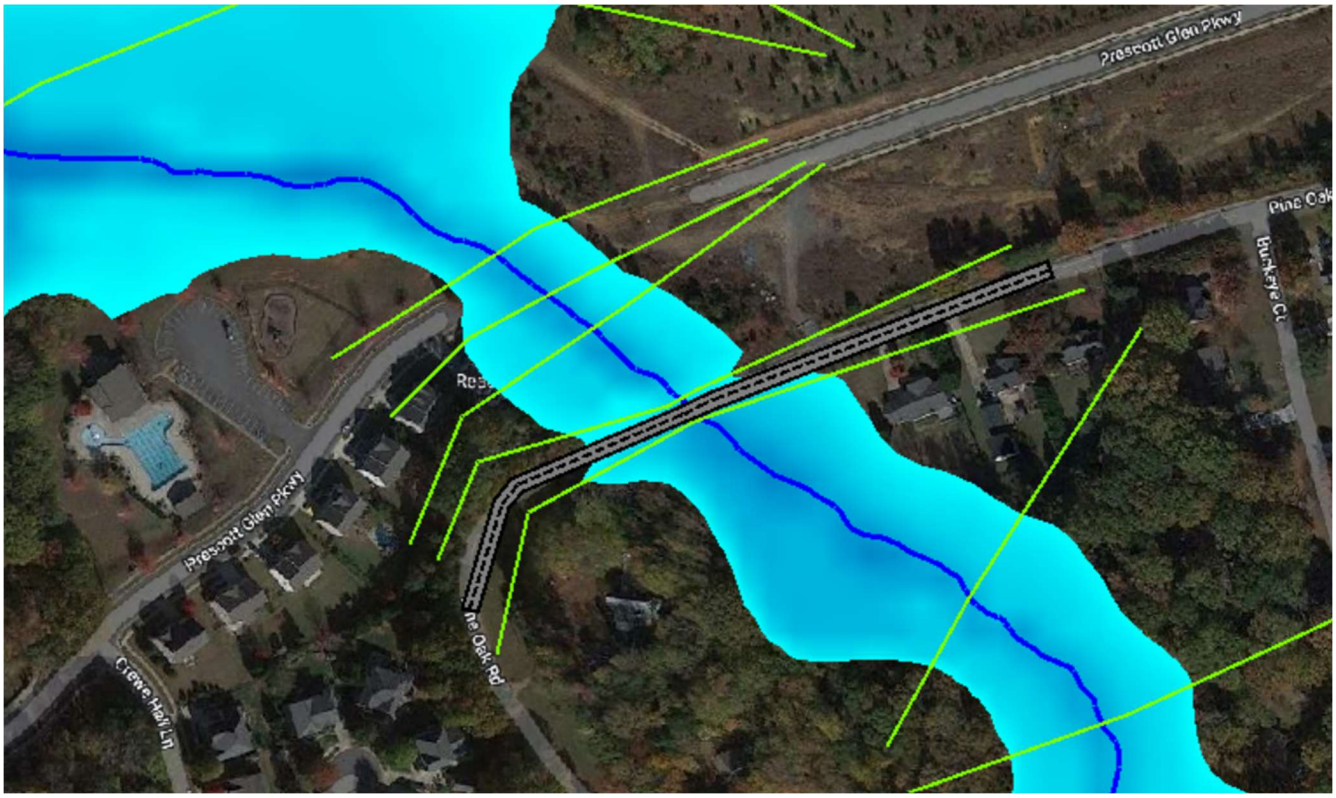

FIGURE 2 BFE FOOTPRINT OF THE PRELIMINARY EFFECTIVE MODEL FOR TRIBUTARY 4

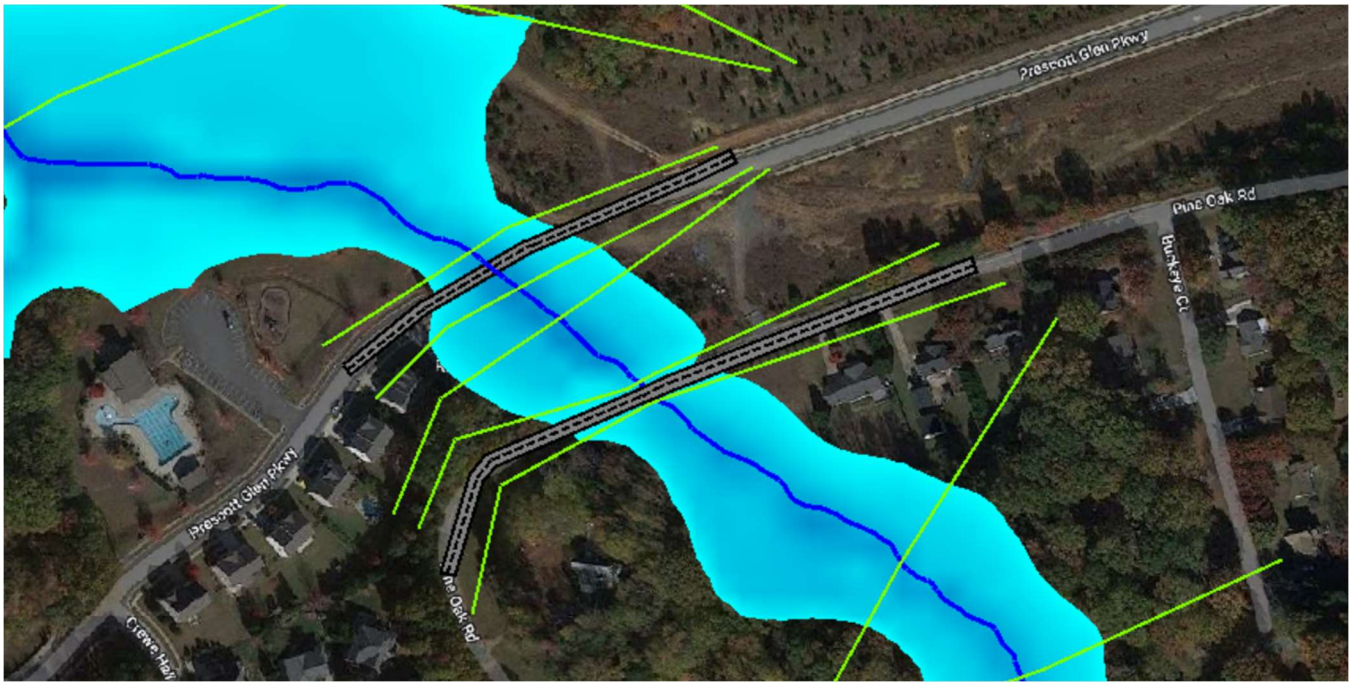

FIGURE 1 BFE FOOTPRINT OF THE BRIDGE ALTERNATIVE FOR TRIBUTARY 4

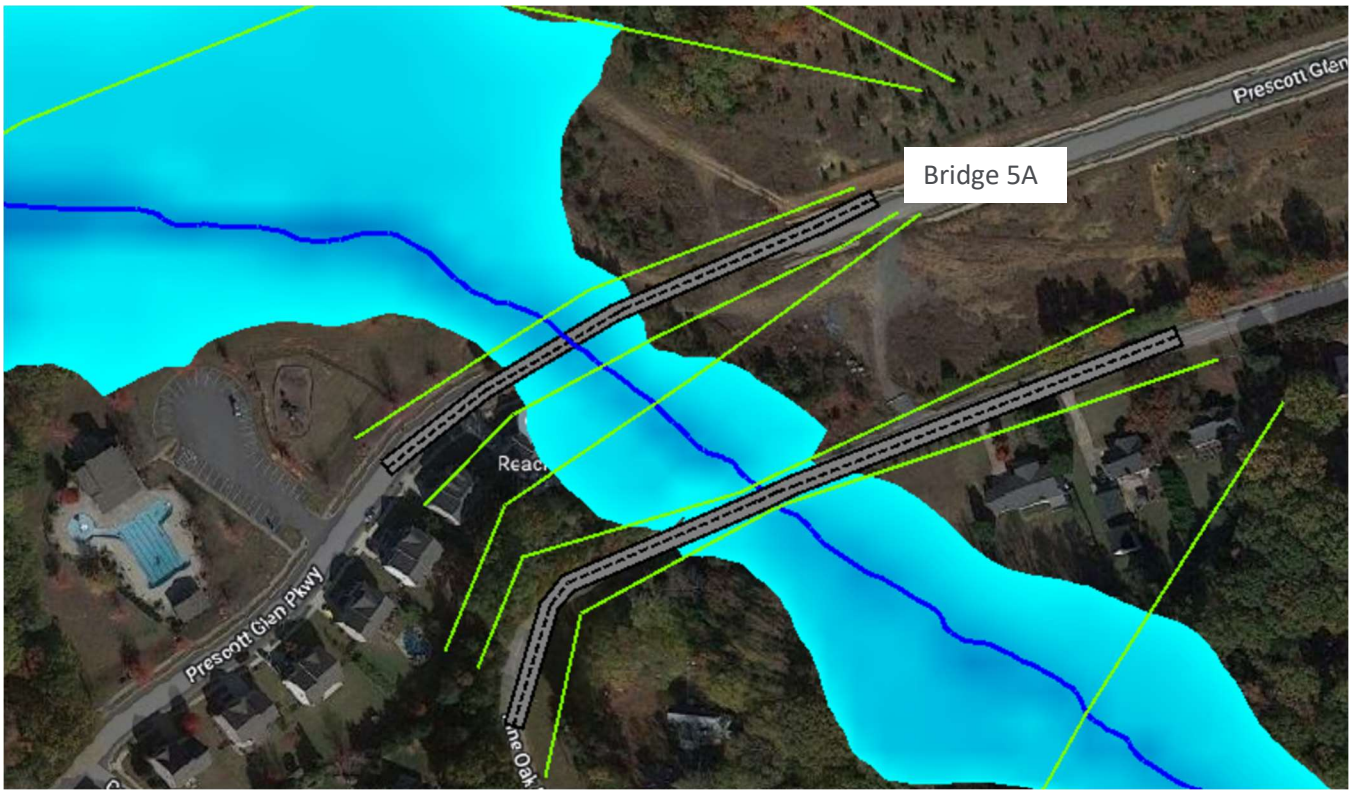

FIGURE 3 BFE FOOTPRINT OF THE BOX CULVERT ALTERNATIVE FOR TRIBUTARY 4

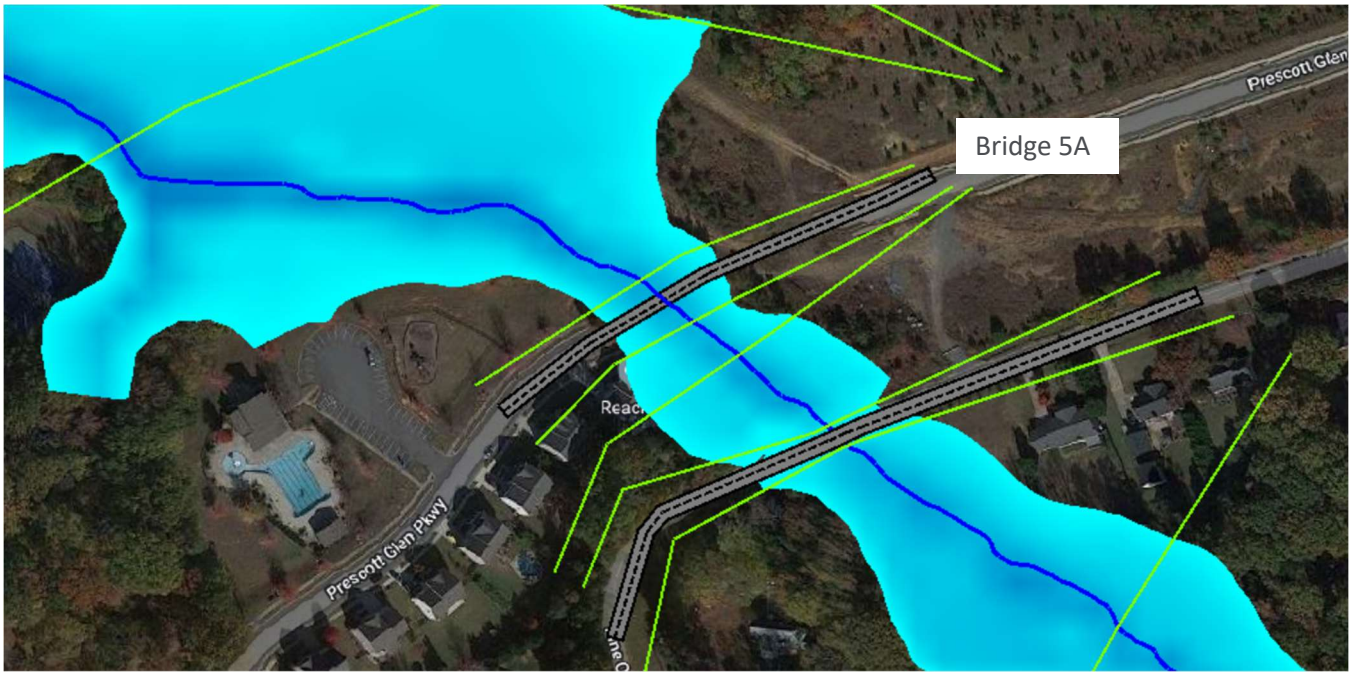

FIGURE 4 BFE FOOTPRINT OF THE PIPE ALTERNATIVE FOR TRIBUTARY 4

TWELVEMILE CREEK AND WEST FORK TWELVEMILE CREEK: BRIDGES 6A AND 6B

Due to the configuration of the data provided, a Duplicate effective model could not be created.

Preliminary Conditions model

The Geometries of East Fork Twelvemile Creek and Twelvemile Creek Tributary 3 were imported into the published LOMR of 13-04-3703P. This ensured an appropriate junction with the reach of West Fork Twelvemile Creek. The West Fork Twelvemile geometry was imported, and a junction was installed to appropriately combine the geometries into one single model.

The first and last available flow changes were added to the flow file from the original effective models. The following changes were also made to this mode:

- Cross section 10647 was deleted from Reach Twelvemile Creek
- Cross sections 10741, 10493 and 10396 were added to reach Twelvemile Creek
    - These cross sections were added by RAS Mapper and the approximate location was determined using the Google Satellite layer within RAS Mapper
- Mannings n's comparable to up and downstream cross sections and expansion and extraction coefficients were set to 0.1 and 0.3 for all added cross sections.

Preliminary Revised Model

The following changes were made to the Preliminary Effective model to create the Preliminary Revised models:

- Bridge 6A was added at cross section 10510 of reach Twelvemile Creek
    - The superstructure used is a 150-foot single span bridge with a low chord of 498.5’ and vertical abutments.
    - The Low Flow Method section was set t to include the drag coefficient to 1.2.
- Bridge 6B was added at cross section 205 of reach West Fork Twelvemile Creek
    - The superstructure used is a 110-foot single span bridge with a low chord of 500.8’ and vertical abutments.
    - the Low Flow Method section was set t to include the drag coefficient to 1.2.
    - The contraction and expansion coefficients at cross sections 371 and 132 were set to 0.3 and 0.5. Ineffective flow areas were added to these cross sections as well.
- Floodway widths and encroachments were not revised due to this feasibility study.

While comparing the Effective to Revised model, Cross sections on the West Fork Twelvemile Creek reach saw a maximum increase of 0.02 ft upstream of bridge 6B and cross sections on the Twelvemile Creek reach saw a maximum increase of 0.06 ft upstream of bridge 6A.

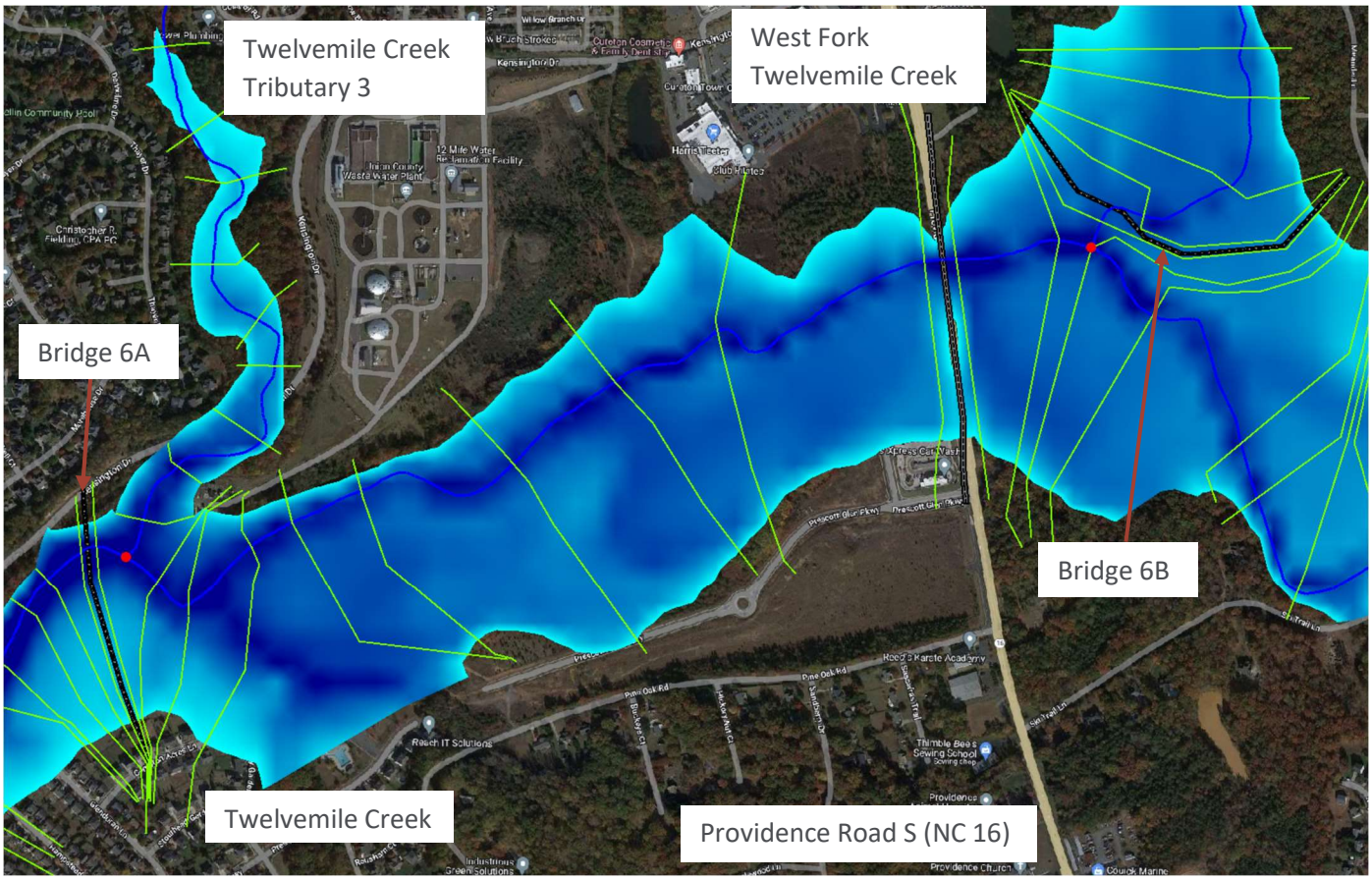

FIGURE 5 BFE FOOTPRINT OF THE PRELIMINARY EFFECTIVE MODEL

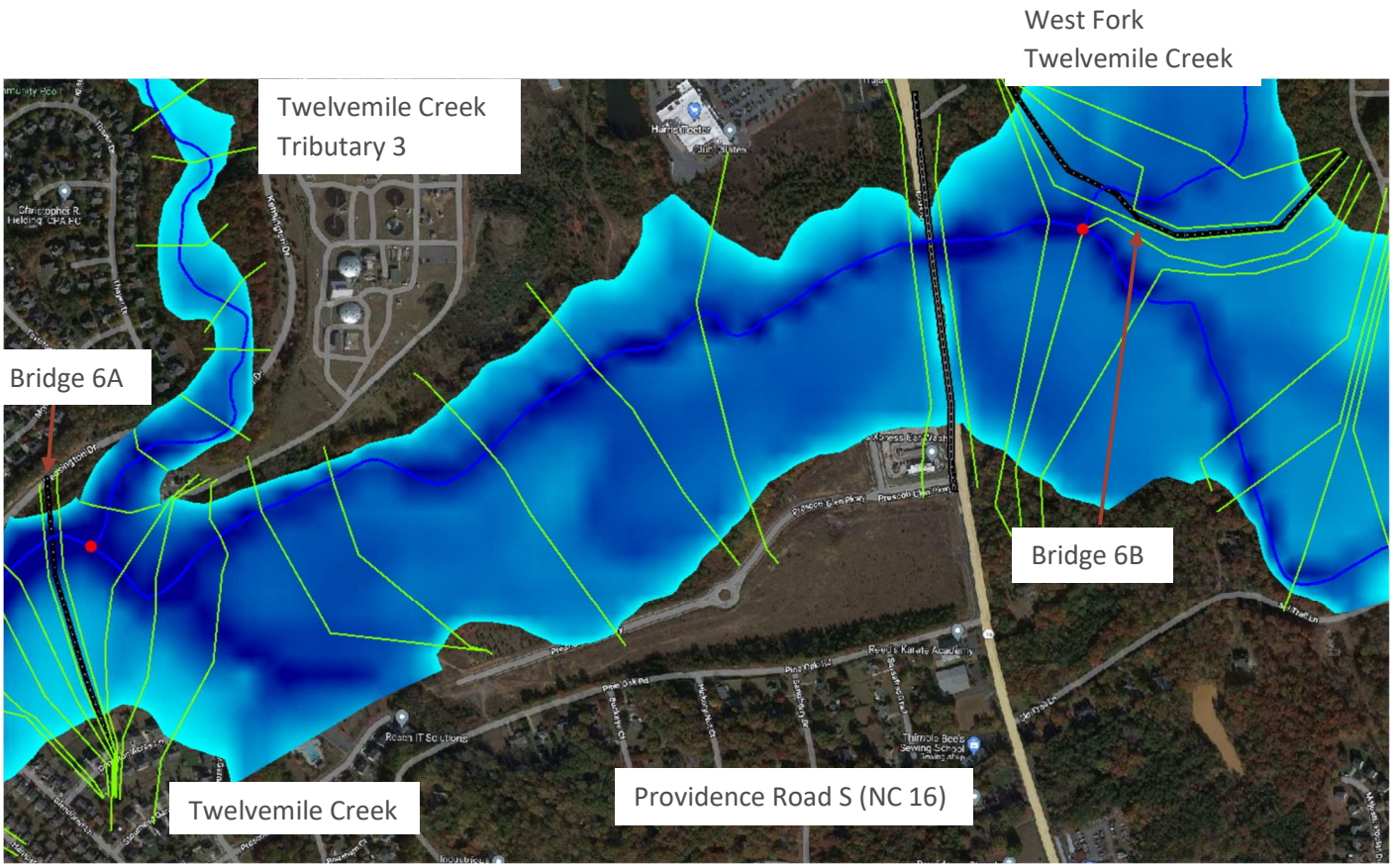

FIGURE 6 BFE FOOTPRINT OF THE PRELIMINARY REVISED MODEL

SUMMARY AND RECOMMENDATIONS

The results of the preliminary model of Twelvemile Creek tributary 4 indicate that a culvert structure may not cause an increase above 1 foot, thus a CLOMR is not expected for this reach. Benesch recommends exploring the culvert and pipe options while designing for this crossing. A CLOMR is anticipated however, for the bridges crossing Twelvemile Creek and West Fork Twelvemile Creek due to the number of cross sections experiencing an increase after the addition of these bridges. There is a possibility that a CLOMR could be avoided though further analysis during the design phase will need to determine if these structures can be modeled without causing a rise of over 0.01 feet in the BFE.

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Twelve Mile Creek Greenway Feasibility Study

Project Location: Waxhaw, NC
Project Description: Completion of Twelve Mile Creek Greenway from SC to Wesley Chapel
Client: NCDOT IMD and Town of Waxhaw
From/To: SC line to Millbridge Parkway
Segment Length: 0.25 miles
Proposed Structures: (3) total; (2) - 20-ft Long Bridge / Boardwalk; (1) - 40-ft Long Bridge / Boardwalk

ENGINEER'S OPINION OF PROBABLE COST OF CONSTRUCTION - Feasibility Study

Segment 1						
				Option 1	Option 2	Option 3
Item Description	Quantity	Unit	Unit Price	Path Repair Only	Path Repair + Replace Structures with Timber & Composite	Path Repair, Replace Small Structures with Timber and Composite, Replace Large Bridge with Prefab Steel Bridge
Replace Structure with 20' Timber & Composite Bridge	2	LS	$ 75,000.00	$ -	$ 150,000.00	$ 150,000.00
Replace Structure with 40' Prefabricated Steel Bridge	1	LS	$ 281,000.00	$ -	$ -	$ 281,000.00
Replace Structure with 40' Timber & Composite Bridge	1	LS	$ 145,000.00	$ -	$ 145,000.00	$ -
Path Repair	1320	LF	$ 20.00	$ 26,000.00	$ 26,000.00	$ 26,000.00
			Subtotal	$ 26,000.00	$ 321,000.00	$ 457,000.00
			25% Contingency	$ 6,500.00	$ 80,250.00	$ 114,250.00
			15% Engineering	$ 3,900.00	$ 48,150.00	$ 68,550.00
			Estimated Total	**$ 36,000.00**	**$ 449,000.00**	**$ 640,000.00**

Notes:
1. Cost opinion does not include costs for easement or ROW acquisition.
2. 15% Engineering includes engineering, geotech, design survey, and construction administration.
3. Cost opinion does not include cost for private utility relocations.
4. Unit costs used in this cost opinion are representative of typical market costs as best known to the Consultant as of the date of this estimate, and do not account for inflationary cost escalation.
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Twelve Mile Creek Greenway Feasibility Study

Project Location: Waxhaw, NC
Project Description: Completion of Twelve Mile Creek Greenway from SC to Wesley Chapel
Client: NCDOT IMD and Town of Waxhaw
From/To: Millbridge Parkway to Nesbit Trailhead Connection
Segment Length: 0.25 miles
Proposed Structures: (1) - 80-ft Long Bridge

ENGINEER'S OPINION OF PROBABLE COST OF CONSTRUCTION - Feasibility Study

SEGMENT 2							
					Option 1	Option 2	Option 3
NCDOT SPEC	Item Description	Quantity	Unit	Unit Price	Repair Existing Path Only	Pave Path Only	Pave Path + Replace Bridge
800	MOBILIZATION	1	LS	$ 4,500.00	$ -	$ 5,000.00	$ 5,000.00
801	CONSTRUCTION SURVEYING	1	LS	$ 10,000.00	$ -	$ 10,000.00	$ 10,000.00
200	CLEARING	1.2	AC	$ 12,000.00	$ -	$ 15,000.00	$ 15,000.00
520	AGGREGATE BASE COURSE (4" DEPTH)	456	TON	$ 55.00	$ -	$ 25,000.00	$ 25,000.00
720	BI-AXIAL GEOGRID	1813	SY	$ 5.50	$ -	$ 10,000.00	$ 10,000.00
610	ASPHALT CONC. SURFACE COURSE, TYPE S9.5b, 2"	161	TON	$ 160.00	$ -	$ 26,000.00	$ 26,000.00
310	18" RCP (CLASS III)	132	LF	$ 100.00	$ -	$ 13,000.00	$ 13,000.00
310	18" RCP FLARED END SECTION	8	EA	$ 1,400.00	$ -	$ 11,000.00	$ 11,000.00
876	CLASS B RIPRAP	40	TON	$ 80.00	$ -	$ 3,000.00	$ 3,000.00
1605	INLET PROTECTION	4	EA	$ 250.00	$ -	$ 1,000.00	$ 1,000.00
1605	SILT FENCE	1320	LF	$ 5.50	$ -	$ 7,000.00	$ 7,000.00
1060	DIVERSION DITCHES	1320	LF	$ 4.50	$ -	$ 6,000.00	$ 6,000.00
1060	EROSION MATTING	2933.3	SY	$ 3.50	$ -	$ 10,000.00	$ 10,000.00
1620	TEMPORARY SEEDING	0.6	AC	$ 2,500.00	$ -	$ 2,000.00	$ 2,000.00
1620	PERMANENT SEEDING AND LANDSCAPING	0.6	AC	$ 4,000.00	$ -	$ 2,000.00	$ 2,000.00
1607	GRAVEL CONSTRUCTION ENTRANCE	2	EA	$ 4,000.00	$ -	$ 8,000.00	$ 8,000.00
	0.25 mile existing path repair	1320	LF	$ 20.00	$ 26,400.00	$ -	$ -
	Replace Structure with 80' Prefabricated Bridge	1	LS	$ 348,000.00	$ -	$ -	$ 348,000.00
				Subtotal	$ 26,400.00	$ 154,000.00	$ 502,000.00
				25% Contingency	$ 6,600.00	$ 38,500.00	$ 125,500.00
				15% Engineering	$ 3,960.00	$ 23,100.00	$ 75,300.00
				Estimated Total (rounded)	**$ 37,000.00**	**$ 216,000.00**	**$ 703,000.00**

Notes:
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Twelve Mile Creek Greenway Feasibility Study

Project Location: Waxhaw, NC
Project Description: Completion of Twelve Mile Creek Greenway from SC to Wesley Chapel
Client: NCDOT IMD and Town of Waxhaw
From/To: Nesbit Trailhead Connection to Split Near Creekview Drive Trailhead
Segment Length: 0.35 miles
Proposed Structures: (5) - 20-ft Long Bridge / Boardwalk

ENGINEER'S OPINION OF PROBABLE COST OF CONSTRUCTION - Feasibility Study

Segment 3						
				Option 1	Option 2	Option 3
Item Description	Quantity	Unit	Unit Price	Replace Existing Structures with Timber & Composite	Replace Existing Structures with Prefabricated Bridges	Replace Pavement + Replace Existing Structures with Prefabricated Bridges
Replace Structures with 20' Prefabricated Bridge	4	LS	$ 174,000.00	$ -	$ 696,000.00	$ 696,000.00
Replace Structures with 20' Boardwalk	4	LS	$ 75,000.00	$ 300,000.00	$ -	$ -
Replace Pavement	1848	LF	$114.00	$ -	$ -	$ 210,000.00
			Subtotal	$ 300,000.00	$ 696,000.00	$ 906,000.00
			25% Contingency	$ 75,000.00	$ 174,000.00	$ 226,500.00
			15% Engineering	$ 45,000.00	$ 104,400.00	$ 135,900.00
			Estimated Total (rounded)	**$ 420,000.00**	**$ 974,000.00**	**$ 1,268,000.00**

Notes:
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Twelve Mile Creek Greenway Feasibility Study

Project Location: Waxhaw, NC
Project Description: Completion of Twelve Mile Creek Greenway from SC to Wesley Chapel
Client: NCDOT IMD and Town of Waxhaw
From/To: Split at Creekview Drive Trailhead to Waxhaw-Marvin Road
Segment Length: 0.6 miles
Proposed Structures: (2) total; (1) - 30-ft Long Bridge; (1) - 1320-ft Long Boardwalk

ENGINEER'S OPINION OF PROBABLE COST OF CONSTRUCTION - Feasibility Study

Segment 4						
					Option 1	Option 2
NCDOT SPEC	Item Description	Quantity	Unit	Unit Price	100% Geogrid Surface + Existing Bridge Replacement	50%/50% Boardwalk and Asphalt Pavement + Existing Bridge Replacement
800	MOBILIZATION	1	LS	$ 4,500.00	$ 4,500.00	$ 4,500.00
801	CONSTRUCTION SURVEYING	3	AC	$ 5,000.00	$ 15,000.00	$ 15,000.00
200	CLEARING	3	AC	$ 12,000.00	$ 36,000.00	$ 36,000.00
226	EARTHWORK COMPREHENSIVE GRADING	1	LS	$ 20,000.00	$ -	$ 20,000.00
520	AGGREGATE BASE COURSE (12" DEPTH)	853	TON	$ 55.00	$ -	$ 23,500.00
720	BI-AXIAL GEOGRID	4267	SY	$ 5.50	$ -	$ 11,500.00
610	ASPHALT CONC. SURFACE COURSE, TYPE S9.5b, 2"	469	TON	$ 160.00	$ -	$ 37,500.00
310	18" RCP (CLASS III)	320	LF	$ 100.00	$ -	$ 16,000.00
310	18" RCP FLARED END SECTION	16	EA	$ 1,400.00	$ -	$ 11,000.00
876	CLASS B RIPRAP	80	TON	$ 80.00	$ -	$ 3,000.00
1605	INLET PROTECTION	8	EA	$ 250.00	$ -	$ 1,000.00
1605	SILT FENCE	3200	LF	$ 5.50	$ -	$ 9,000.00
1060	DIVERSION DITCHES	3200	LF	$ 4.50	$ -	$ 7,000.00
1060	EROSION MATTING	2134	SY	$ 3.50	$ -	$ 3,500.00
1620	TEMPORARY SEEDING	0.6	AC	$ 2,500.00	$ -	$ 1,000.00
1620	PERMANENT SEEDING AND LANDSCAPING	0.6	AC	$ 4,000.00	$ -	$ 1,000.00
1607	GRAVEL CONSTRUCTION ENTRANCE	2	EA	$ 4,000.00	$ -	$ 4,000.00
	Boardwalk (1320-ft)	1	LS	$ 4,510,000.00	$ -	$ 4,510,000.00
1056	Geoweb grid system trail surface (4")	1	LS	$ 50,000.00	$ 50,000.00	$ -
1056	Geoweb grid system rock	3200	LF	$ 40.00	$ 128,000.00	$ -
1056	Geoweb grid system install (15% of materials)	1	LS	$ 26,700.00	$ 26,700.00	$ -
	Replace Structure with 30' Prefabricated Bridge	1	LS	$ 185,000.00	$ 185,000.00	$ 185,000.00
				Subtotal	$ 445,200.00	$ 4,899,500.00
				25% Contingency	$ 111,300.00	$ 1,224,875.00
				15% Engineering	$ 66,780.00	$ 734,925.00
				Estimated Total (rounded)	**$ 623,000.00**	**$ 6,859,000.00**

Notes:
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Twelve Mile Creek Greenway Feasibility Study

Project Location: Waxhaw, NC
Project Description: Completion of Twelve Mile Creek Greenway from SC to Wesley Chapel
Client: NCDOT IMD and Town of Waxhaw
From/To: Waxhaw-Marvin Road to the End of Prescot Glen Parkway West
Segment Length: 1 mile

ENGINEER'S OPINION OF PROBABLE COST OF CONSTRUCTION - Feasibility Study

Segment 5				
Item Description	**Quantity**	**Unit**	**Unit Price**	**Replace .3 mi. existing asphalt pavement**
MOBILIZATION	1	AC	$ 4,500.00	$ 4,500.00
CONSTRUCTION SURVEYING	1	AC	$ 4,500.00	$ 4,500.00
AGGREGATE BASE COURSE (4" DEPTH)	352	TON	$ 55.00	$ 19,360.00
BI-AXIAL GEOGRID	1907	SY	$ 6.00	$ 11,442.00
ASPHALT CONC. SURFACE COURSE, TYPE S9.5b, 2"	194	TON	$ 160.00	$ 31,040.00
18" RCP (CLASS III)	158	LF	$ 100.00	$ 15,840.00
18" RCP FLARED END SECTION	8.0	EA	$ 1,400.00	$ 11,200.00
CLASS B RIPRAP	40.0	TON	$ 80.00	$ 3,200.00
CHECK DAM	4.0	EA	$ 250.00	$ 1,000.00
SILT FENCE	1584	LF	$ 5.50	$ 8,712.00
DIVERSION DITCHES	1584	LF	$ 4.50	$ 7,128.00
EROSION MATTING	3520	SY	$ 3.50	$ 12,320.00
TEMPORARY SEEDING	0.7	AC	$ 2,500.00	$ 1,818.18
PERMANENT SEEDING AND LANDSCAPING	0.7	AC	$ 4,000.00	$ 2,909.09
GRAVEL CONSTRUCTION ENTRANCE	2.0	EA	$ 4,000.00	$ 8,000.00
			Subtotal	$ 142,969.27
			25% Contingency	$ 35,742.32
			15% Engineering	$ 21,445.39
			Estimated Total (rounded)	**$ 200,000.00**

Notes:
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Twelve Mile Creek Greenway Feasibility Study

Project Location: Waxhaw, NC
Project Description: Completion of Twelve Mile Creek Greenway from SC to Wesley Chapel
Client: NCDOT IMD and Town of Waxhaw
From/To: End of Prescot Glen Parkway East to NC 16
Segment Length: 0.8 miles
Proposed Structures: (1) - 100-ft Long Bridge or (1) Concrete Box Culvert

ENGINEER'S OPINION OF PROBABLE COST OF CONSTRUCTION - Feasibility Study

Segment 6						
					Option 1	Option 2
NCDOT SPEC	Item Description	Quantity	Unit	Unit Price	Culvert Crossing + .8 mi Geogrid Trail	Bridge Crossing + .8 mi Geogrid Trail
1056	Geoweb grid system trail surface (4")	1	LS	$ 50,000.00	$ 50,000.00	$ 50,000.00
1056	Geoweb grid system rock	4224	LF	$ 40.00	$ 168,960.00	$ 168,960.00
1056	Geoweb grid system install (15% of materials)	1	LS	$ 32,844.00	$ 32,844.00	$ 32,844.00
	NEW PREFABRICATED BRIDGE (6A; 100 ft)	1	LS	$ 381,000.00	$ -	$ 381,000.00
	CONCRETE CULVERT BRIDGE (6A)	1	LS	$ 70,000.00	$ 70,000.00	$ -
				Subtotal	$ 321,804.00	$ 632,804.00
				25% Contingency	$ 80,451.00	$ 158,201.00
				15% Engineering	$ 48,270.60	$ 94,920.60
				Estimated Total (rounded)	**$ 451,000.00**	**$ 886,000.00**

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Twelve Mile Creek Greenway Feasibility Study

Project Location: Waxhaw, NC
Project Description: Completion of Twelve Mile Creek Greenway from SC to Wesley Chapel
Client: NCDOT IMD and Town of Waxhaw
From/To: NC 16 to Encore Clubhouse Trail
Segment Length: 0.6 miles
Proposed Structures: (1) - 110-ft Long Bridge

ENGINEER'S OPINION OF PROBABLE COST OF CONSTRUCTION - Feasibility Study

Segment 7					
NCDOT SPEC	**Item Description**	**Quantity**	**Unit**	**Unit Price**	**Cost**
1056	Geoweb grid system trail surface (4")	1	LS	$ 50,000.00	$ 50,000.00
1056	Geoweb grid system rock	3168	LF	$ 40.00	$ 126,720.00
1056	Geoweb grid system install (15% of materials)	1	LS	$ 26,508.00	$ 26,508.00
	NEW PREFABRICATED BRIDGE (7A; 110ft)	1	LS	$ 457,000.00	$ 457,000.00
				Subtotal	$ 660,228.00
				25% Contingency	$ 165,057.00
				15% Engineering	$ 99,034.20
				Estimated Total (rounded)	$ 924,000.00

Notes:

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Twelve Mile Creek Greenway Feasibility Study

Project Location: Waxhaw, NC
Project Description: Completion of Twelve Mile Creek Greenway from SC to Wesley Chapel
Client: NCDOT IMD and Town of Waxhaw
From/To: Encore Clubhouse Trail to Lawson East Boundary
Segment Length: 0.4 miles
Proposed Structures: None

ENGINEER'S OPINION OF PROBABLE COST OF CONSTRUCTION - Feasibility Study

Segment 8						
					Option 1	Option 2
NCDOT SPEC	Item Description	Quantity	Unit	Unit Price	Geogrid Surface and 1 Footbridge	Asphalt Pavement and 1 Footbridge
800	MOBILIZATION	1	LS	$ 4,500.00	$ 5,000.00	$ 5,000.00
801	CONSTRUCTION SURVEYING	2	AC	$ 5,000.00	$ 10,000.00	$ 10,000.00
200	CLEARING	2	AC	$ 12,000.00	$ 24,000.00	$ 24,000.00
520	AGGREGATE BASE COURSE (12" DEPTH)	2245	TON	$ 55.00	$ -	$ 123,000.00
270	BI-AXIAL GEOGRID	2816	SY	$ 5.50	$ -	$ 15,000.00
610	ASPHALT CONC. SURFACE COURSE, TYPE S9.5b, 2"	161	TON	$ 160.00	$ -	$ 26,000.00
226	EARTHWORK COMPREHENSIVE GRADING	1	LS	$ 80,000.00	$ -	$ 80,000.00
310	18" RCP (CLASS III)	216.5	LF	$ 100.00	$ -	$ 22,000.00
310	18" RCP FLARED END SECTION	12	EA	$ 1,400.00	$ -	$ 17,000.00
876	CLASS B RIPRAP	40	TON	$ 80.00	$ -	$ 3,000.00
1605	INLET PROTECTION	6	EA	$ 250.00	$ -	$ 2,000.00
1605	SILT FENCE	2112	LF	$ 5.50	$ -	$ 12,000.00
1060	DIVERSION DITCHES	2112	LF	$ 4.50	$ -	$ 10,000.00
1060	EROSION MATTING	2816	SY	$ 3.50	$ -	$ 10,000.00
1620	TEMPORARY SEEDING	1	AC	$ 2,500.00	$ -	$ 2,000.00
1620	PERMANENT SEEDING AND LANDSCAPING	1	AC	$ 4,000.00	$ -	$ 4,000.00
SP	GRAVEL CONSTRUCTION ENTRANCE	2	EA	$ 4,000.00	$ -	$ 8,000.00
1056	Geoweb grid system trail surface (4")	1	LS	$ 50,000.00	$ 50,000.00	$ -
1056	Geoweb grid system rock	2112	LF	$ 40.00	$ 84,480.00	$ -
1056	Geoweb grid system install (15% of materials)	1	LS	$ 7,506.00	$ 7,506.00	$ -
	Replace Structure with 20' Timber and Composite Bridge	1	LS	$ 74,600.00	$ 74,600.00	$ 74,600.00
				Subtotal	$ 255,586.00	$ 447,600.00
				25% Contingency	$ 63,896.50	$ 111,900.00
				15% Engineering	$ 47,922.38	$ 83,925.00
				Estimated Total (rounded)	**$ 367,000.00**	**$ 643,000.00**

Notes:
1. Cost opinion does not include costs for easement or ROW acquisition.
2. 15% Engineering includes engineering, geotech, design survey, and construction administration.
3. Cost opinion does not include cost for private utility relocations.
4. Unit costs used in this cost opinion are representative of typical market costs as best known to the Consultant as of the date of this estimate, and do not account for inflationary cost escalation.
5. Quantities used in this cost opinion are approximations based on feasibility study alignments by Benesch dated July 2024 and are subject to revision prior to bid.
6. The Engineer has no control over the cost of labor, materials, or equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions.

benesch

Twelve Mile Creek Greenway Feasibility Study

Project Location: Waxhaw, NC
Project Description: Completion of Twelve Mile Creek Greenway from SC to Wesley Chapel
Client: NCDOT IMD and Town of Waxhaw
From/To: Lawson W Boundary to the End of Lawson Walking Path
Segment Length: 0.96 miles
Proposed Structures: (4) - 20-ft Long Bridge / Boardwalk

ENGINEER'S OPINION OF PROBABLE COST OF CONSTRUCTION - Feasibility Study

Segment 9						
					Option 1	Option 2
NCDOT SPEC	Item Description	Quantity	Unit	Unit Price	Replace Existing Structures with Boardwalk	Replace Existing Structures with Prefabricated Bridges
1072	Replace Structure with 20' Prefabricated Bridge	4	LS	$ 174,000.00	$ -	$ 696,000.00
	Replace Structure with 20' Boardwalk	4	LS	$ 77,000.00	$ 308,000.00	$ -
				Subtotal	$ 308,000.00	$ 696,000.00
				25% Contingency	$ 77,000.00	$ 174,000.00
				15% Contingency	$ 46,200.00	$ 104,400.00
				Estimated Total (rounded)	**$ 431,000.00**	**$ 974,000.00**

Notes:
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benesch

Twelve Mile Creek Greenway Feasibility Study

Project Location: Waxhaw, NC
Project Description: Completion of Twelve Mile Creek Greenway from SC to Wesley Chapel
Client: NCDOT IMD and Town of Waxhaw
From/To: End of Lawson Walking Path to Trail Terminus
Segment Length: 0.25-0.95 miles
Proposed Structures: None

ENGINEER'S OPINION OF PROBABLE COST OF CONSTRUCTION - Feasibility Study

Segment 10					
NCDOT SPEC	Item Description	Quantity	Unit	Unit Price	Asphalt Paving 0.25-Mile Continuation of Trail
800	MOBILIZATION	1	LS	$ 4,500.00	$ 5,000.00
801	CONSTRUCTION SURVEYING	1	LS	$ 10,000.00	$ 10,000.00
200	CLEARING	2.4	AC	$ 12,000.00	$ 29,000.00
520	AGGREGATE BASE COURSE (12" DEPTH)	2738	TON	$ 55.00	$ 151,000.00
270	BI-AXIAL GEOGRID	8800	SY	$ 5.50	$ 48,000.00
610	ASPHALT CONC. SURFACE COURSE, TYPE S9.5b, 2"	161	TON	$ 160.00	$ 26,000.00
226	EARTHWORK COMPREHENSIVE GRADING	1	LS	$ 80,000.00	$ 80,000.00
310	18" RCP (CLASS III)	264	LF	$ 100.00	$ 26,000.00
310	18" RCP FLARED END SECTION	14	EA	$ 1,400.00	$ 20,000.00
876	CLASS B RIPRAP	40	TON	$ 80.00	$ 3,000.00
1605	INLET PROTECTION	7	EA	$ 250.00	$ 2,000.00
1605	SILT FENCE	2640	LF	$ 5.50	$ 15,000.00
1060	DIVERSION DITCHES	2640	LF	$ 4.50	$ 12,000.00
1060	EROSION MATTING	5867	SY	$ 3.50	$ 21,000.00
1620	TEMPORARY SEEDING	1.2	AC	$ 2,500.00	$ 3,000.00
1620	PERMANENT SEEDING AND LANDSCAPING	1.2	AC	$ 4,000.00	$ 5,000.00
SP	GRAVEL CONSTRUCTION ENTRANCE	2	EA	$ 4,000.00	$ 8,000.00
				Subtotal	$ 464,000.00
				25% Contingency	$ 116,000.00
				15% Engineering	$ 69,600.00
				Estimated Total (rounded)	**$ 650,000.00**

Notes:
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2. 15% Engineering includes engineering, geotech, design survey, and construction administration.
3. Cost opinion does not include cost for private utility relocations.
4. Unit costs used in this cost opinion are representative of typical market costs as best known to the Consultant as of the date of this estimate, and do not account for inflationary cost escalation.
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Summary of Segment Costs

Segment Number	Location Description	Priority Ranking	Length (Approx)	Existing Surface	Existing Parcel Control	Proposed Typical Section	Proposed Structures	Key Connections	Estimated Cost (Low/Option 1)	Estimated Cost (Medium/Option 2)	Estimated Cost (High/Option 3)
1	South Carolina Border to Millbridge Parkway	7	0.25 mi	Natural	Millbridge Homeowners Association and Town of Waxhaw	Varied natural pathway	Replacement of 3 timber footbridges (Options 2 and 3)	Gateway to South Carolina	$36,000	$449,000	$640,000
2	Millbridge Parkway to Nesbit Park Trailhead	8	0.25 mi	Gravel and Paved	Millbridge Homeowners Association and Town of Waxhaw Parks & Recreation Department	Repair existing (Option 1); 10-foot paved asphalt path (Options 2 and 3)	Replace foot bridge (Option 3)	Millbridge neighborhood to H.C. Nesbit Park, and adjacent to Kensington Elementary School	$37,000	$216,000	$703,000
3	H.C. Nesbit Park Connection to Creekview Drive Trailhead	9	0.35 mi	Paved	Millbridge HOA	6-foot paved asphalt path (Option 3)	Replace 4 bridges: Timber/composite (Option 1); Prefab Steel (Options 2 and 3)	Millbridge neighborhood to H.C. Nesbit Park, and adjacent to Kensington Elementary School	$420,000	$974,000	$1,268,000
4	Creekview Drive Connection to Town Creek Park / Waxhaw-Marvin Road	1	0.60 mi	Natural	Millbridge HOA and Town Creek Park owned by the Town of Waxhaw	Geogrid path surface (Option 1); 50/50 10-foot paved asphalt path and boardwalk (Option 2)	Replacement of bridges and incorporation of flood resilient pathway	Connection between Harvey Clay Nesbit Park and Town Creek Park	$623,000	$6,859,000	N/A
5	Waxhaw-Marvin Road to End of Prescout Glen Parkway West	4	0.80 mi	Paved	Prescot Homeowners and Town of Waxhaw	10-foot paved asphalt path	Replace 0.30 mi of pavement	Allow Southern and Northern Greenway connection via Sonny Way and connection between Prescot Glen Parkway the Grove Manor neighborhood	$200,000	N/A	N/A
6	Prescout Glen Parkway West to Encore as Streamside	2	0.80 mi	N/A	Widewaters Prescot LLC (Prescot Village) and 30-foot Union County Water sanitary sewer easement	10-foot paved asphalt path	Culvert (Option 1); Prefabricated Steel Bridge (Option 2)	Pedestrian connection between both sides of NC 16/Providence Road and Blythe Creek Greenway	$451,000	$886,000	N/A
7	NC 16/Providence Road to Encore at Streamside	5	0.60 mi	Sidewalk	Encore at Streamside Homeowners Association and Providence Road Dev. Group LLC (South Creek)	10-foot paved asphalt path	Prefabricated bridge crossing and a 0.60 mi path	Pedestrian connection between both sides of NC 16/Providence Road	$924,000	N/A	N/A
8	Encore at Streamside - East Side	3	0.40 mi	N/A	Encore at Streamside Homeowners Association and Lawson Community Association	10-foot geogrid path (Option 1); 10-foot paved asphalt path (Option 2)	Footbridge and a paved path	Connect Encore at Streamside and Lawson Neighborhoods	$367,000	$643,000	N/A
9	Lawson Walking Path	5	1.00 mi	Paved	Lawson Community Association	Existing Path	Replace structures with boardwalk (Option 1) or prefabricated steel bridges (Option 2)	Proposed Machine Branch Greenway	$431,000	$974,000	N/A
10	End of Lawson Community Walking Path to Project End	9	0.25 mi	N/A	Lawson Community Association and Old Methodist Church Cemetery	10-foot paved asphalt path	0.25 mi continuation of trail	Future connection into Union County	$650,000	N/A	N/A

CRTPO
charlotte regional transportation planning organization

Charlotte Regional Transportation Planning Organization

Transportation Alternatives Program Criteria Scoring Guide

January 2021

CRTPO's Methodology

CRTPO's Technical Coordinating Committee (TCC) and Bicycle & Pedestrian Work Group (BPWG) are responsible for development of the TAP Methodology and *Criteria Scoring Guide*. The TAP study and development process began in Fall of 2014 and concluded in Summer of 2015.

Development of the methodology began first with recognizing the constraints of TAP as a funding source. These include the eligible project types, eligible project sponsors, and the limited amount of funding available.

The next step in the process included identifying appropriate evaluation categories. The evaluation categories address "big picture" considerations and generally support transportation goals of the MPO as identified in the Metropolitan Transportation Plan. The final evaluation categories identified include Connectivity & Place-Making, Feasibility & Cost, Safety, and Health & Environment.

The next step included developing specific, quantifiable criteria which address each of the larger evaluation categories. These criteria were selected and developed with an eye on practically quantifying physical, safety, environmental, and other benefits.

While CRTPO's Bicycle & Pedestrian Work Group was charged with developing the specifics of the TAP Methodology, all TCC staff were integral to its development. Throughout the months-long process of developing the methodology and criteria, formal updates were given to TCC, regional staff, and the MPO board. TCC staff were updated, and provided direction to the process in January, March, and April of 2015. It should be noted that the BPWG is primarily staffed by TCC members. The CRTPO Policy Board was updated in September 2014 and May 2015.

TAP Criteria Scoring Guide

CRTPO's TAP methodology has culminated in the development of this document, the *Transportation Alternatives Program Criteria Scoring Guide*. The purpose of this guide is to communicate CRTPO's preferred evaluation categories and criteria in an organized fashion, and allow potential project sponsors to evaluate and score projects, and submit applications for project ranking and selection. The final Scoring Guide is a compilation of seventeen (17) criteria allocated to the four previously identified evaluation categories.

The criteria included in the Scoring Guide are carefully worded to make applying for TAP funds as intuitive as possible for potential project sponsors. An online *TAP - Criteria Reference Map* is available here to assist applicants with scoring *Safety* and *Health & Environment* criteria. This Scoring Guide is also supplemented by on-line documents and guidance available on CRTPO's Discretionary Page, here: https://crtpo.org/projects-plans-programs/crtpo-discretionary-funds-program/discretionary-grant-funding/.

DRAFT

Charlotte Regional Transportation Planning Organization

Transportation Alternatives Program Criteria Scoring Guide

January 2021

Bicyclist & Pedestrian Project
Scoring Criteria Guide

Trip Generation & Connectivity

High, Moderate, Low Interest Destinations (6-Destination Maximum)

Does the project provide access to destinations of interest? Select a total of up to six destinations below, which are accessible via the proposed project. Please reference the *Destination Definitions* section at the end of this document, and **provide a map** of the project and maximum of 6 destinations.

High Interest **(5 Pts ea)**	Moderate Interest **(3 Pts ea)**	Low Interest **(1 Pt ea)**
Community & Regional Parks	Bus Stop (Community Scale)	Bus Stop (Neighborhood Scale)
Downtown/ Central Business District	Greenway	Designated/Known Bike Route
Healthy Food Option	Hotel	(CRTPO Bicycle Suitability Map)
Hospital	Library	Low-Density Single Family
Human Service Facilities (High-need Populat	Light Rail Stop	Privately Accessible Property
Major Employment	Medical Office Building/Health Care Facility	
Mixed Use Center	Multi-Family Development	
Park-n-Ride Facility	Neighborhood Park/Nature Preserve	
School	Religious/Civic /Conference Center	
Significant Sports & Entertainment	Retail Center	
Transit Center	Unique Destination (Please qualify "Uniqueness")	
University/ College		

Destination Network Multiplier

How far away is each destination above from the proposed project, via the bicyclist/pedestrian network? The bicyclist network typically includes low volume, low speed roads, bicycle facilities, shared use paths, and advisory shoulders/lanes. The pedestrian network typically includes shared use paths, sidewalks, and advisory shoulders/lanes.

Multiply each individual destination score (above) by its respective network multiplier, below.
CRTPO's CTP mapping is a good reference for the area's current bike-ped network: CRTPO CTP Map

Multiplier	***1***	***0.75***	***0.5***	***0***
Pedestrian Network Distance (miles)	0 - 0.25	.26 - 0.5	0.51 - 1.0	1.01+
Bicycle Network Distance (miles)	0 - 1.0	1.01 - 3.0	3.01 - 5.0	5.01+

Destination Scores _____ _____ _____ _____ _____ _____

(Score = *Destination* * *Accessibility Multiplier*)

Total Destination Score _____

Connections to Existing Facilities

Does the proposed project connect to an existing non-motorized transportation facility/facilities? If so, how many connections are made?
"Existing Facilities" include: shared-use paths, sidewalks, designated bicycle facilities, advisory shoulders/lanes, and signed bicycle routes

3+ Connections	2 Connections	1 Connection	0 Connections
15 Pts	**10 Pts**	**5 Pts**	**0 Pts**

Existing Facilities Score _____

Trip Generation & Connectivity

Adopted Plans & Policies

Has the project been identified through a previous or existing planning effort or policy?

> Transportation Plan (LRTP, MTP, Bicycle Plan, Pedestrian Plan, Other Locally adopted Transportation Plan or Prioritization)
> Land Use or Comprehensive Plan
> Recreation Plan
> Economic Development Plan; Local or county Health Needs Assessments

Please note that CRTPO's Comprehensive Transportation Plan (CTP) does not qualify, as it functions as a transportation network assessment

Regional Scope* **(10 Pts)**	County or Municipal Scope **(5 Pts)**	None **(0 Pts)**

Please select one of the above plan classifications.

* "Regional" understood to mean crossing county boundaries as shown in adopted plans (i.e. *Geographically* multi-jurisdictional/regional planning initiatives)

Adopted Plan/Policy Score _____

Place-Making Amenities

Does the project include desirable amenities? Desirable amenities include, but are not limited to:

Seating, Bicycle racks, Repair Stands, Landscaping, Unique Way Finding, Public Art, Pedestrian-Scale Lighting, "Fitness Stations", Other (please specify), Docking, Dockless Parking Spaces

1 Point per Amenity Type (5 Point Max)

Amenities Score _____

Demonstrated Need/Desire

Is there a worn path (desire lines), pre-existing facility, high volume of cyclists or pedestrians along a roadway, or documented community request? Please summarize results of any community outreach or request, or provide a picture(s) which illustrates the physical need.

Staff-observed need, high volume peds/cyclists, worn paths	**5 Pts**	Documented community correspondence (email, letters, meeting comments)	**5 Pts**	None	**0 Pts**

Demonstrated Need Score _____

Safety

Documented Safety Challenge

Are there documented safety challenges associated with this project? Examples of documented safety challenges may include (but are not limited to) recorded crash data of any severity, or a posted speed limit over 35 miles per hour, # vehicle lanes required to cross.
In lieu of the challenges above, please provide a picture(s) illustrating design flaws, hazards, concerns, etc.

Crash Data	**(5 Pts)**
Posted Speed Limit above 35mph	**(5 Pts)**
Documented Safety Hazards	**(5 Pts)**
Multi-lane Facility Crossing	**(5 Pts)**

Safety Challenge Score _____

Reduce Human Exposure

Does the proposed project reduce the exposure between motor vehicles and vulnerable humans? Reduced exposure should take the form of a physical barrier or defined space.

Examples of a "physical barrier" include, but are not limited to: an off-road greenway, pedestrian refuge island, bike boulevard separated by a vertical structure, or buffered sidewalk (buffered curb or ditch cross-section).

Examples of a "defined space" may include, but are not limited to: striped bike lanes, back-of-curb sidewalks, crosswalks.

10 Pts	**5 Pts**	**3 Pts**	**0 Pts**
Physical Separation/Barrier	Defined Space	Reduced Crossing Distance	No Reduced Exposure

Human Exposure Score _____

Traffic Calming

Does the proposed project design encourage traffic calming or vehicle lane narrowing, as advanced by the National Association of City Transportation Officials (NACTO)?
Please reference available NACTO Guidelines.

Yes **(5 Pts)** No **(0 Pts)**

Traffic Calming Score _____

Vehicle Traffic

What is the motor vehicle AADT of the specific roadway facilities *from which bicyclist or pedestrian exposure would be reduced* ?
Please cite data source.

40,001+ **20 Pts**	22,001 - 40,000 **15 Pts**

10,001 - 22,000 **10 Pts**

1,001 - 10,000 **5 Pts**	1,000 or Less **0 Pts**

Vehicle Traffic Score _____

Health & Environment

Emission & Pollutant Reduction (Vehicle Mile Reduction)

Will this project result in reducing vehicle miles traveled locally?

20 Pts	300+ Daily Veh Miles
15 Pts	200 - 299 Daily Veh Miles
10 Pts	100 - 199 Daily Veh Miles
5 Pts	0 - 99 Daily Veh Miles

*1. Assume vehicle trips equal **2%** of the AADT total from the **Vehicle Traffic** criteria.*

-OR-

Where AADT/ADT is unavailable, estimate the daily usership of the proposed facility. Assume that each user represents a vehicle trip removed from the road.

2. Measure roadway miles that bicyclists or pedestrians would otherwise travel, if not for the proposed facility.

3. Multiply vehicle trips by roadway miles to determine vehicle miles reduced.

Emissions Reduction Score _____

Social Equity

Please reference CRTPO's EJ Degree of Impact mapping which identifies geographically-based concentrations of racial, car-less, and low income populations.

EJ Degree of Impact Mapping

Does the project provide access (direct or adjacent contact) for environmental justice (EJ) populations?

High Impact	Moderate Impact	Low Impact	No Impact
10 pts	**5 pts**	**2pts**	**0pts**

Social Equity - EJ Score _____

Does the project provide access (direct or adjacent contact) for carless households?

Yes	No
5 pts	**0pts**

Social Equity - Carless Score _____

Environmental Quality

Does the project include significant benefits which address wildlife safety, water quality, or other improvements?
Examples of benefits may include, but are not limited to: pervious surfaces, rain gardens, routing to avoid wildlife habitats.
Please list any proposed benefits/improvements.

Yes **(5 Pts)** No **(0 Pts)**

Environmental Quality Score _____

Health Equity

Does this project provide access for people at greater risk of chronic disease? Please reference the most current CRTPO TAP Health Focus Areas Mapping, which uses education and income level as social determinants of populations at greater risk for chronic disease.

12% or more residents were living below the poverty level within the past 12 months AND 10% or more residents have less than a high school diploma	5% - 11.9% of residents were living below the poverty level within the past 12 months OR 5%-9.9% of residents have less than a high school diploma	Less than 5% of residents were living below the poverty line within the past 12 months AND less than 5% of residents have less than a high school diploma
Yes **(5 Pts)**	Yes **(3 Pts)**	No **(0 Pts)**

Health Equity Score _____

Feasibility & Cost

Effective Use of Federal Funds

What is the estimated amount of CRTPO funding being requested (This amount should not include the local match) ?
Please reference the ***"Funding & Match"*** example on the following page.

5 Pts *Project administration costs outweigh benefits*	**20 Pts** *Most cost-effective*	**10 Pts**	**0 Pts**
$0 - $1,000,000	$1,000,001 - $2,000,000	$2,000,001 - $4,000,000	$4,000,001 +

Effective Use Score _____

Amount of Available Funding Requested

What percentage of the available CRTPO discretionary funding is currently being requested for this project?

20 Pts	**10 Pts**	**5 Pts** *Limiting funding for additional projects*	**0 Pts** *Severely limiting funding for additional projects*
1 - 20%	21 - 35%	36 - 50%	51%+

Funding Request Score _____

Local Match Commitment

Is the applicant contributing a significant amount of their own resources towards the requested TAP funding?
Keep in mind that a minimum of 20% is required for a local match. "In kind" contributions can not be considered for the local match.

Match % = Point Total (Maximum of 50%)

For example: A local match of 35% would result in a score of 35.

Local Match Score _____

Right-of-Way Previously Acquired/ Available

Has right-of-way been acquired or dedicated through the appropriate process, specifically for use by the proposed project?

15 Pts	**10 Pts**	**5 Pts**	**0 Pts**
76 - 100%	51 - 75%	21 - 50%	0 - 20%

Right-of-Way Score _____

Cost - Benefit

What is the combined Connectivity, Safety, and Environmental benefit of this project per dollar spent?
Determining this score will first require the applicant to complete scores for the *Trip Generation & Connectivity* , *Safety* , and *Health & Environment* evaluation categories. Please use the calculation method below.

$$\text{Cost Benefit} = \frac{\text{Sum (}\textit{Trip Generation \& Connectivity}\text{ Scores + }\textit{Safety}\text{ Scores + }\textit{Health \& Environment}\text{ Scores) * 10,000}}{\text{Funding Amount Requested (Dollars)}}$$

15 Pts *High Cost Benefit*	**10 Pts** *Desirable Cost Benefit*	**5 Pts** *Moderate Cost Benefit*	**0 Pts** *Poor Cost Benefit*
2.01 or Higher	1.01 - 2.0	0.41 - 1.0	0.4 or Lower

Cost - Benefit Score _____

Total Score

Total Combined Score for all Criteria

Please sum scores for each of the above criteria and enter below. This is the final TAP Score for this project/facility.

_____

Funding & Match Example

Town of Municipalville Downtown Pedestrian Improvements

The Town of Municipalville is cobbling together funding for downtown pedestrian improvements.

The suite of improvements is estimated to cost $2,000,000.

A local Municipalville developer will contribute $500,000 to the project, leaving a balance of $1,500,000 in needed funding.

Municipalville has decided to apply for TAP funding to cover the remaining **$1,500,000**, recognizing that TAP funding requires a minimum **20%** local match.

Municipalville submits an application for **$1,200,000** in TAP funding, with plans to match **$300,000** from the town's general fund.

Here is an explanation of Municipalville's project costs and TAP request:

Total Project Cost*:	$1,500,000
TAP Funding Requested:	$1,200,000
Local Match:	$300,000
Local Match Percentage:	20% (Local Match / Total Project Cost)
Local Match Score:	20 points

*For the purposes of funding requests, CRTPO is concerned only with the amount of funding requested from the MPO and any related local match. In this case, CRTPO must assess the $1,500,000 in TAP funding requested from us.

The total estimate of $2,000,000 for the suite of improvements, and the developer's $500,000 contribution, is irrelevant.

Destination Definitions

High Interest Destinations

These are common, highly-trafficked destinations within a particular city, town, or region.

Community & Regional Parks

Publicly-owned recreational or cultural spaces of a scale intended to serve multiple neighborhoods or multiple local jurisdictions.

Downtown/Central Business District (CBD)

Downtown or central business district of a city or town.

Healthy Food Options

Large and small grocery stores, farmer's markets, or fresh foods. Other local, stationary food providers will be considered.

Hospital

A medical facility which accommodates in-patient care and typically operates 24 hours per day

Human Service Facilities

Facilities which provide services offered by the government, private, profit and non-profit organizations. Human services facilities typically include education, food subsidy and distribution, job training, housing subsidy, family services, addiction centers, and community management centers.

Major Employment

A dense collection of non-retail employment locations, where the percentage of employers is significantly higher than that of surrounding areas.

Example: An office park

Mixed Use Center

An integrated development project which combines multiple uses within individual buildings or sites.

Example: A retail development with residential units above or adjacent.

Park-n-Ride Facility

A designated parking location which allows drivers to park private automobiles, bicycles, or other vehicles, and access public transportation or transit.

School

Any K-12 school facility

Significant Sports & Entertainment

Any public or private facility which hosts large sporting and/or entertainment events on a frequent basis.

Transit Center

A station or hub which serves as the central location for more than one transit system or network.

University/College

Any public or private university, college, or community college.

Moderate Interest Destinations

These are common, moderately-trafficked destinations, typically found in many cities and towns.

Bus Stop (Community Scale)

Boarding locations located on larger properties accessible by multiple modes. Typically include large weather-protected passenger waiting areas and often provide bus route transfer service. Community scale bus stops are typically larger than a single bench or bus stop shelter located adjacent to sidewalk.

Greenway

A natural or paved path, typically located outside of vehicular rights-of-way, intended for non-motorized active transportation.

Destination Definitions

Hotel
Hotels, motels, and other commercial establishments offering lodging, meals, and other guest services

Library
A physical location which provides access to reading materials such as books, periodicals, and newspapers, and often other forms of video or audio media.

Light Rail Stop (Guideway Transit)
A designated location which allows users to board light rail or transit vehicles.

Medical Office Building/ Health Care Facility
Hospital or medical services. These can include both large facilities and offices.

Multi-family Development
Multiple residential housing units located in one building/structure, or multiple buildings within one complex. Example: Apartment complex.

Neighborhood Park/Nature Preserve
Regional, local, or neighborhood space for passive or active recreation.

Religious/Civic/Conference Center
A private or public venue which offers religious or civic services to the general public.

Retail Center
A collection of retail locations where the percentage of retailers is significantly higher than that of surrounding areas.

Unique Destination
A specific destination of civic or cultural value which attracts visitors, is unique to a particular city, town, or county, and may not satisfy other destination descriptions.

Low Interest Destinations

These are common destinations, which typically experience less human traffic.

Bus Stop (Neighborhood Scale)
Typically a bench or 5 to 15-person shelter located adjacent to a sidewalk or roadway.

Designated/Known Bicycle Route
Rural or suburban roads which typically do not include prescribed bicycle facilities, but may be signed as state, historic, scenic, or recreational bicycle

Low Density Single Family Development
Detached single family development. Can be found in rural, suburban, and urban environments.

Privately Accessible Property
Private property which is available for public use

Discretionary Grants Program Policy Guide

Adopted by CRTPO Board
February 13, 2019
Revised: August 19, 2020
Revised: September 20, 2023

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PART 1: Discretionary Grants Process

I. Introduction

The Charlotte Regional Transportation Planning Organization (CRTPO) is the federally designated Metropolitan Planning Organization (MPO) for the Charlotte urban area, which includes Iredell, Mecklenburg, and Union counties. The CRPTO receives direct attributable funds, also known as discretionary funds or grants, to be allocated to member jurisdictions for specific projects on a competitive basis. CRTPO is responsible for allocating federal transportation funds and ensuring funds are preauthorized as stipulated within Federal Highway Administration (FHWA) policy. This document summarizes the Discretionary Grants Program and the funding process, which supports transportation projects in the CRTPO planning area.

The Discretionary Grants Program Policy Guide (the "Policy") was initially adopted by the CRTPO on February 13, 2019, with the current revision was adopted by the CRTPO Board on September 20, 2023. The CRTPO uses the Policy to prioritize and program all projects within the planning area that utilize discretionary funds. This process involves an annual call for new local highway, intersection, transit, bicycle, and pedestrian projects and a biannual call for existing discretionary projects that require supplemental funds. It will result in projects added to the CRTPO's Transportation Improvement Program (TIP).

The CRTPO's Project Oversight Committee (POC), a subcommittee of the Technical Coordinating Committee (TCC), makes project selection recommendations and monitors the progress of the CRTPO's discretionary grant projects. The following six principles guide discretionary funding:

1. Projects must be federal funds or Strategic Transportation Investment (STI) eligible.
2. There is an annual schedule for proposing, scoring, and funding projects.
3. Project scoring is consistent with the requirements of the various funding sources.
4. The process addresses funding existing project shortfalls.
5. The process will be iterative, and the Policy may be amended.
6. The Policy is transparent and easily understood by stakeholders.

II. Funding Overview

The CRTPO is responsible for awarding discretionary grants comprised of five Federal funding sources:

1. Surface Transportation Block Grant Direct Attributable (STBG-DA)
2. Congestion Mitigation & Air Quality (CMAQ)
3. Carbon Reduction Program (CRP)
4. Transportation Alternatives Program Direct Attributable (TAP-DA)
5. Bonus Allocations (BA) Funds (Funds originate with NCDOT through STI law)

The Strategic Transportation Investments (STI) law allows the CRTPO to award federal or state BA funds. The purpose of these funds is to incentivize local funding and highway tolling projects, as well as to fund the construction of eligible highway projects.

The CRTPO can allocate Bonus Allocation funds based on the following conditions:

- The allocation is obtained through local government funding participation or highway tolling.
- Local officials commit non-state or non-federal funds to leverage the commitment of state or federal transportation funds.
- BA funds must be spent within the county of the toll project and are subject to the funding ceilings identified within the STI legislation.
- Funds can only fund highway projects in the same county the tolling project was developed.

A. Funding Process

The CRTPO will offer one annual call for new projects and biannual shortfall calls in which all available discretionary federal funds will be considered for programming.

A CRTPO member jurisdiction may submit one application per project, and the CRTPO staff will evaluate the project's eligibility and suitability for the most appropriate funding source. Although applicants are not required to identify which funding source they are applying for, there are optional questions specific to the project type and core questions for all projects.

Awarded projects will be amended into the CRTPO TIP and NCDOT's State Transportation Improvement Program (STIP).

B. Annual Funding Timeline & Availability

Below are the typical activities and dates for the call for projects. Please see **Appendix 1** for the current fiscal year's funding schedule. Please see **Appendix 2** for funding availability.

Date	Activity / Milestone
March, Year 1	CRTPO formally announces the Call for Projects date and other key dates
March, Year 1	CRTPO determines funding targets by mode
March, Year 1	Call for Project-Shortfall Requests opens (for existing CRTPO projects)
Spring, Year 1	Pre-Application Training
Mid-August, Year 1	Call for Projects opens
October, Year 1	CRTPO begins eligibility review/requests follow-up information
Late October, Year 1	Call for Projects closes
November, Year 1	Project scoring
November, Year 1	Selection committee meetings
December, Year 1	Scoring decisions finalized
January, Year 2	Present to TCC and CRTPO Board for information
February, Year 2	Present to TCC and CRTPO Board for approval
February, Year 2	Public Comment Period
March, Year 2	Report on comments to TCC & Board; approve the list of projects
March, Year 2	Call for Project-Shortfall Requests opens (for existing CRTPO projects)
April – May, Year 2	TIP & STIP Amendment process
May, Year 2	Announce funding list / send award letters
May, Year 2	Conduct project implementation workshop for awardees

III. Eligibility Criteria

To be eligible to apply for discretionary grants, the member jurisdiction must identify a project that satisfies the criteria outlined in this section. These project submittal criteria must meet all federal and state funding requirements, as well as the goals of the discretionary-funding policies as adopted by the CRTPO Board.

A. Federal Aid Eligibility

Projects must comply with the statutory requirements of 23 USC 133(c). All highway projects submitted for funding improvements must be part of the Federal Aid System. For example, a member jurisdiction has prepared an application for a project along a federal-aid eligible facility that has not been added to the federal aid system map. In that case, applicants must work with NCDOT and FHWA to determine if the facility can be added to the system. This process can take several months and must be completed before applying to the CRTPO for funding. A letter from FHWA confirming the project's likelihood of eligibility upon completion for new highway alignments will satisfy this requirement.

B. Adopted Plan Compliant

Proposed projects are required to be part of an adopted plan—for instance, CRTPO's 2050 Metropolitan Transportation Plan (MTP), Comprehensive Transportation Plan (CTP), or a Capital Improvement Program (CIP). Projects that are part of other locally adopted plans may also be considered.

C. Eligible Activities

The CRTPO's Discretionary Grants Program will assist member jurisdictions by funding transportation improvements that will positively impact the region's highway, bicycle/pedestrian, and transit networks. As such, capital projects may receive these funds to complete any of the following activities.

- NEPA Documentation / Design / Preliminary Engineering
- Land or Right-of-Way Acquisition
- Utility Relocation
- Construction
- Transit Capital
- Transportation air quality projects that reduce emissions

Planning projects, such as feasibility or corridor study projects, may be submitted and will be evaluated for funding through a qualitative process involving the POC.

D. Problem & Solution

Projects should address a member jurisdiction's identified need and provide a highly effective solution to a transportation problem. A significant portion of the scoring is related to the cost-effectiveness of the project.

E. Locally Funded with Minimum Match Committed

All funds are programmed through the Discretionary Grants Program and require a minimum 20% local match. Priority will be given to projects that leverage additional local funds by contributing a higher match than 20%, thus freeing up funds for use on additional projects. A greater local match contribution will result in a higher quantitative project score. Previous match commitment on a project may not be used twice if a member jurisdiction requests supplemental funding.

BA funds through NCDOT's State Highway Trust Funds do not require a match. However, if the project using State BA funds does not have funding authorization before the STI's five-year deadline, the project will need to be locally funded, have funds swapped, or be cancelled. New discretionary funds may be applied but require a minimum 20% match. If BA funds are unavailable for shortfalls, the applicant must pay a minimum 20% match on supplemental funds.

BA project applications will be scored with other highway projects, but the final score will be determined by the proximity to the project that resulted in creating the funds.

IV. Modal Investment Targets

A. Discretionary Grant Funding Targets by Funding Source

The CRTPO's Discretionary Grants Program consists of STBG-DA, TAP, CMAQ, CRP, and BA funds. Unobligated balances will be given the highest priority and will be allocated before future year funds.

B. Discretionary Funding Targets by Mode

The annual modal mix recommendation is based on the assumptions made within the CRTPO's Metropolitan Transportation Plan and the funding structure of the STI legislation regarding the percentage of total funding for the non-highway modes. In 2017, the CRTPO Board approved an 80% highway and 20% bicycle/pedestrian and transit modal funding target recommendation.

C Funding Request Amounts

Member jurisdictions may request a minimum project discretionary grant amount of $250,000 and a maximum of not more than 25% of all available funds identified per mode (80% highway and 20% non-highway).

EXAMPLE
TOTAL FALL CALL FUNDING AVAILABLE = $10 MILLION

FUNDING STEPS	HIGHWAY PROJECTS	NON-HIGHWAY PROJECTS
MODAL SPLIT	80% = $8 MILLION	20% = $2 MILLION
MAXIMUM FUNDING REQUEST PER PROJECT (25%)	$2 MILLION	$500,000

Generally, applications requesting less than $500,000 of discretionary funds should be limited to active projects that need supplemental funds to address a shortfall.

D. Diversion from the Annual Modal Investment Target

If the CRTPO receives requests for funding that exceed any mode's investment target, the CRTPO may transfer current fiscal year funds from other modes that have not reached their targets to compensate for the difference. The actual amount of recommended discretionary funds may fall below or exceed the target of 20%, depending on the type of projects received during the future call.

An **example** of the diversion of funds between modes is shown below:

Total cost estimates of non-highway projects received in the current call	$2,000,000
Non-highway modal funding target	$5,000,000
Non-highway funding eligible to be transferred to the highway mode	$3,000,000

PART 2: Applying for Grants

I. Project Applications

There are five applications for new projects and a shortfall application to use in spring and fall. The applicant selects the project application that best fits the funding request:

- Highway projects
- Bicycle and pedestrian
- Transit
- Planning (i.e., feasibility studies)
- Air quality projects (projects specifically targeting CMAQ and CRP funds)
- Shortfalls (existing CRTPO projects that need supplemental funds)

All applicants must attend a pre-submittal meeting before the pre-submittal deadline of each call for projects. An agenda for the meeting is in the application packet.

Applications submitted in one call for projects that do not receive funding are not automatically considered for funding in subsequent years.

II. Funding Types

The following funding types will be allocated to projects:

Funding Type	Funding Flexibility
BA funding	Projects must comply with STI law, and the funds must be allocated to highway projects within the county(ies) where the toll project is located.
CMAQ funding	Reasonably flexible to all modes but must meet CMAQ criteria.
CRP funding	Reasonably flexible to all modes but must meet CRP criteria.
STBG-DA funding	The greatest amount of funds and the most flexible.
BA funding	Projects must comply with STI law, and the funds must be allocated to highway projects within the county(ies) where the toll project is located.
TAP funds	Primarily for bike/pedestrian projects.

III Cost Estimation Requirements

Each project application must contain the following to satisfy the CRTPO's cost estimation requirements:

- A qualified professional, such as a Professional Engineer or Registered Landscape Architect, shall prepare the cost estimate.
- Cost estimates shall be prepared within six months from the date of the application.
- Cost estimates shall be prepared for full project implementation—including all activities, such as preliminary engineering, environmental documentation, right-of-way acquisition, utility relocation, and construction.

1. **Preliminary Engineering Cost**
   Preliminary engineering (PE) may be estimated as 25% of the construction cost or the amount quoted by an NCDOT-prequalified engineering firm.

2. Project Phase Contingencies

Project-phase contingencies are necessary to improve the accuracy of cost estimates and lessen the need for additional funding.

Depending on the amount of work completed for the project request, the following contingency rates must be applied to new projects and shortfalls:

Project Phase Complete	Contingency and Inflation Percent Required
Planning (0-10% of the plans are complete)	40%
Design (15-65% of the plans are complete)	30%
Right-of-way (75-95% of the plans are complete)	25%
Construction (100% of the plans are complete)	10%
NCDOT administrative charges for the total project cost	Up to 10%
Inflation – (subject to annual updating)	See rates below

Note: Project scopes that entail the purchase of buses and other vehicles under existing contracts are not subject to the requirement to add a contingency percentage.

3. Inflation

The applicant must add inflation to each project's estimate (new project or shortfall request). Form 1 should be used to ensure the correct inflation rate has been calculated. The amount of inflation should be calculated as follows:

Federal Fiscal Year the project is programmed	Inflation Percent
FFY 2024	10%
FFY 2025	5%
FFY 2026	3%
FFY 2027	3%
FFY 2028	3%
FFY 2029	3%
FFY 2030	3%
FFY 2031	3%
FFY 2032	3%
FFY 2033	3%

The inflation rate shall be revisited each year. The inflation rate source is the Producer Price Index for Demand Construction is https://fred.stlouisfed.org/series/PPIDCS.

4. **Construction Engineering Inspections Estimated Costs**
   Project cost estimates should include 20% of construction costs for Construction Engineering Inspections (CEI).

5. **NCDOT Administrative Charges**
   Project estimates may include up to 10% for NCDOT administrative fees, which cover plan reviews and general project oversight. These fees are reimbursable by the grant, excluding the match. Large projects may include less than 10%. The applicant can discuss a lower fee amount with NCDOT and CRTPO staff during pre-submittal meetings if necessary.

6. **Local Match**
   A minimum of 20% matching funds is required, except on BA-funded projects. The match percentage should be based on the total project cost, including the applicable contingencies and fees referenced above. Typically, a larger match will result in a higher score. A municipal resolution or official letter on the jurisdiction's letterhead should commit to funding the local match and identify the matching funds' source.

7. **Shortfall Funding**
   The CRTPO staff works with NCDOT's STIP Unit to identify discretionary funds to be made available for active projects that have experienced an increase in their estimated project cost, resulting in a request from the project sponsor for additional discretionary funds to deliver the project successfully. The shortfall process does not allow scope changes.

   Project sponsors may request additional discretionary grants for an active project experiencing a shortfall twice yearly, and the following conditions must be met:
   - Shortfall requests are not allowed if a project has not started design.
   - Shortfall requests are limited to 100% of the original CRTPO funding award, up to and not-to-exceed $3 million in total additional funding per individual project. (This revision starts with 2023 fall call projects.)
   - Projects experiencing shortfalls must have been previously scored through the Discretionary Grants Program Policy Guide. Projects awarded through STI, for example, must be submitted as a new project to receive additional funds.

   Additional criteria are used to help guide project selection if the requests are greater than the funding available during the biannual shortfall call. The fewer the points, the more favorable of a supplemental funds award.

   The Shortfall application requires the following information:
   - Percent increase in CRTPO requests over the project's original budget.
   - Most recent project phase completed (construction phase projects receive the highest priority).
   - Percent of local funds committed for the shortfall request.
   - The number of previous shortfall awards received for the project.

	Points			
Criteria	1	2	3	4
Percent Increase in CRTPO Request over Original Budget	Up to 50%	51-99%	100-149%	150+%
Highest Phase Complete	ROW	Design	Planning or less	
Local Funds Committed	More than 25% or more than $250K	Less than 25% or less than $250K		
Previously Received Shortfall Funds	1 time	2 times	3 or more times	

Scoring

Low Priority Project	9+ points
Evaluate for Funding	8 or fewer points

The applicant must provide documentation to substantiate the shortfall request. The local match shall be the same as the original municipal agreement and/or CRTPO's award of the original project.

8. **Programming of Funding By Project Phase**
Funds programmed in the CRTPO's TIP and NCDOT's STIP may be moved from phase to phase. For example, if the right-of-way phase costs less than anticipated, surplus funds may be moved to the construction phase and vice versa. There is a risk of moving funds from a phase. For example, moving funds from the construction phase to the right-of-way phase could create a shortfall and supplemental funds through CRTPO are not guaranteed.

IV. Application Requirements

The following descriptions summarize the content of the project submittals. Applications will be released each year when the Call for Projects begins.

A. Problem & Solution Statement

Identify the problem and explain how the project will solve it. Explain how the project will address the goals & objectives of the MTP.

B. Local Priority / Adopted Plans

Identify whether the project is included in the MTP, CTP, CIP, small area plan, or another local plan.

C. Critical Opportunity

Describe any special circumstances related to the project's need for funding, including but not limited to issues of time sensitivity, construction continuity, and a critical funding gap. For example, a roadway widening project is programmed for construction in the current TIP, and the member jurisdiction wants to build a pedestrian tunnel underneath; therefore, these projects should be built together.

D. Project Readiness

Points will be allocated to project applications based on the funding requests per phase, as shown in the Highway Scoring Appendix.

E. Map Attachments

Applicants must submit a GIS layer depicting the project (extent, location, length, etc.). CRTPO will assist applicants in providing shapefiles if this poses a challenge.

F. Additional Data

Applicants are encouraged to attach copies of all pertinent project documentation related to the application's responses, including road safety audits, local crash reports, and local crash data.

G. Highway & Intersection Projects

The following descriptions summarize the application content for highway and intersection project submittals. Projects will be scaled against the highest-scoring project within each modal criteria.

1. **Safety**
   This measure uses the total crashes for a five-year period along each intersection or segment divided by the average annual daily traffic volumes.

2. **Congestion**
   Congestion is measured by using the vehicular Volume to Capacity (V/C) data obtained from NCDOT. If this data is unavailable, the local jurisdiction must be prepared to provide the data during the 60-day call for projects window. The score is based on the bi-directional V/C ratio for segments or intersection V/C ratio for an intersection.

3. **Crash Reduction and Equity**
   - A Crash Reduction Factor (CRF) is the percentage crash reduction that might be expected after implementing a given countermeasure.
     - Based on peer-reviewed articles and literature.
     - Foundation based on FHWA's *Toolbox of Countermeasures and Their Potential Effectiveness for Pedestrian Crashes*

     There are many crash modifications that have been studied and analyzed to determine their CRFs; a list of applicable crash modifications is available at the end of this appendix. Applicants can select up to one modification from the Roadway Improvement list and up to five modifications from the Bike / Ped Improvement list. A toolbox of countermeasures can be found at: https://safety.fhwa.dot.gov/ped_bike/tools_solve/ped_tctpepc/

   - *Transportation Disadvantaged Index (TDI)*
     - TDI was developed by NCDOT to measure the relative level of potential transportation disadvantage in a census block group.
     - Data sourced from the American Community Survey Block Group level.
     - Rewards projects that provide solutions in communities lacking transportation investments.

The TDI score is based on the population-weighted average of TDI scores for the tracts affected by the applicant project. A TDI map may be viewed at: https://ncdot.maps.arcgis.com/apps/instant/sidebar/index.html?appid=4175345664ac4e10b14466223758406f

4. **Cost Effectiveness**
This is the measure of the cumulative recommended points divided by the requested funds. The purpose of this criterion is to calculate a basic benefit-cost measure. For example, if a jurisdiction requested $1 million in funding and the project scored 65 points, the cost per point would be $15,385.

5. **Bonus Allocation Funds and Project Ranking**
Projects considered for BA funds are ranked by using one, two, and three-mile buffers of the tolled highway project as follows:
   - Projects within the one-mile buffer will be scored and given the highest priority.
   - Secondary priority will be given to projects within two miles of the express lanes project.
   - Third priority will be given to projects within three miles of the tolled highway project.
   - If any BA funds remain, they will be prioritized and scored for eligible highway projects throughout the remainder of the county where the tolled highway project originated.

NCDOT determines the amount of BA funds for each tolled highway project and sets the timeline to authorize the funds. Not all highway projects with a tolling component receive BA funds. Its determined by the STI criteria. Projects considered for BA funding may be programmed before other projects.

See Appendix 3 for **Scoring Criteria for Highway/Intersection Projects**

H. Bicycle/Pedestrian and Transportation Alternatives Projects

The Transportation Alternatives Program (TAP) Criteria Scoring Guide scores all bicycle and pedestrian projects. The TAP Criteria Scoring Guide includes definitions and available points for the following sections:

a. Connectivity & Placemaking
b. Safety
c. Health & Environment
d. Feasibility & Cost

The TAP guide can be accessed here:

https://crtpo.org/PDFs/TransportationAlternativeProgram/TAP_Active_Transportation_Criteria_Guide.pdf

See Appendix 4 for **Scoring Criteria for Bicycle Pedestrian Projects**

I. Air Quality Projects

Projects will be ranked separately for CMAQ and CRP funding based on the cost-effectiveness of pollution reduction. Member jurisdictions with a project that qualifies for CMAQ, and/or CRP funding must submit a Federal Highway Administration CMAQ Emission Calculator with their application.

The calculator can be accessed here:
https://www.fhwa.dot.gov/environment/air_quality/cmaq/toolkit/

CRTPO staff will review all projects for eligibility in consultation with FHWA staff. Additional projects may be considered if the funding available exceeds the funding requested. Applicants may be contacted to provide additional data to support the project and emission calculations.

1. **CMAQ Funding Eligibility and Ranking**
   CMAQ is a federal program that began in 1991 under the Intermodal Surface Transportation Efficiency Act and continues under the current transportation funding legislation. The program's purpose is to fund projects that help achieve compliance with the national air quality standards established under the Clean Air Act. An inventory of eligible project types can be accessed here:
   https://www.fhwa.dot.gov/environment/air_quality/cmaq/toolkit/data_dictionary/

   Some of the CRTPO's planning area is designated as "maintenance" for ozone by the Environmental Protection Agency in August 2015. Additional information may be accessed here: https://crtpo.org/PDFs/Resources/Maps/Metrolina%20NonAttainment%20Area.pdf.

   Any project proposed for CMAQ funding must be able to demonstrate that its implementation will contribute to a reduction in harmful emissions. Applications for CMAQ funds will be ranked by the cost-effectiveness of nitrogen oxide (NOx) emission reduction and per gram of annual NOx emission reduction.

2. **CRP Funding Eligibility and Ranking**
   In 2021, the Infrastructure Investment and Jobs Act (IIJA) was signed into law. The IIJA authorizes CRP funds to reduce transportation emissions.

   The CRP funds are available for obligation for three years after the last day of the fiscal year for which the funds are authorized. Thus, CRP funds are available for obligation for up to four years.

   Applications for CRP funds will be ranked by the cost-effectiveness of carbon dioxide equivalent (CO2e) emission reduction and per gram annual CO2e emission reduction.

See Appendix 5 to view the **Scoring Criteria for CMAQ and CRP Eligible Projects**

J. Transit Projects

The following descriptions summarize the application content that applies to transit project submittals. The application will be released each year when the Call for Projects begins. This section addresses how the project would enhance the transportation/transit network. Projects will be scaled against the highest-scoring project within each field.

1. **Enhanced Mobility**
   The ratio of both zero and one-car households to total households within ¼ mile of a proposed transit project.

2. **Ridership**
   This measure is defined as the annual ridership on an existing route or facility or the projected ridership of a proposed facility. If the ridership is estimated, the results of a quantitative study must be provided. The transit agency submitting the project must provide this data.

3. **Cost Effectiveness**
   Cost effectiveness measures the cumulative recommended points divided by the requested funds. For example, if a jurisdiction requested $1 million in funding and the project received a score of 65 points, the cost per point would be $15,385. The purpose of this criterion is to calculate a basic benefit-cost measure.

See Appendix 6 for **Scoring Criteria for Transit Projects**

K. Planning Projects

FHWA and NCDOT allocate planning (PL) funds to MPOs in North Carolina each year based on a formula approved by NCDOT and FHWA and dependent upon the MPO population.

It should be noted that CRTPO chooses to sub-allocate PL funds to member jurisdictions to allow opportunities for transportation planning activities. However, CRTPO's primary duty is to ensure sufficient funds are available to carry out mandated tasks. The CRTPO is not obligated to provide PL funds for local projects.

There are ongoing reporting responsibilities for using PL funds. The Awardee will be required to comply with various state and federal requirements and certifications.

V. Project Selection and Approval

Following approval by the CRTPO Board, the approved project is submitted to the NCDOT to amend the STIP upon approval by the North Carolina Board of Transportation (BOT). If amendments to the MTP are necessary, they will also be made through this process.

PART 3: Administering Local Projects

I. Project Administration and Oversight

NCDOT's Local Programs Management Handbook and Updates will guide the project through the project steps and can be accessed here:
https://connect.ncdot.gov/municipalities/Funding/Pages/LPM%20Handbook.aspx

The project sponsor will be asked to provide CRTPO updates on the project status and identify revisions to the project schedule.

If an application requests funding for construction, for instance, and earlier stages of the project, such as preliminary engineering and right-of-way have already been completed, then those activities must have followed Federal guidelines.

II. Municipal Agreement Execution

The project sponsor and NCDOT will execute a municipal agreement that includes the project schedule and addresses the relevant federal and state regulations governing the implementation of the project. The applicant must pay 100% of the project costs and then request reimbursement from NCDOT. Federal funds awarded to projects that cannot be completed are subject to recission.

Federal fiscal year changes to the schedule will require TIP and STIP amendments and potentially a supplement agreement with NCDOT. The CRTPO staff coordinates the amendment process.

Additional information can be accessed here:
https://connect.ncdot.gov/municipalities/Funding/Documents/REIMBURSEMENT.pdf

III. Funding Authorization Overview

Funding authorization is how federal and state funds are obligated for use on the project. Any costs incurred for work performed before the authorization of funds will not be eligible for reimbursement. NCDOT will notify the project sponsor in writing when funding is authorized, and expenses can be incurred.
Three phases receive authorization:

- Preliminary engineering
- Right-of-way
- Construction

IV. Environmental Documentation

All federally funded projects must comply with the National Environmental Policy Act (NEPA) before permitting right-of-way or construction funds. An environmental document ensures that the project has been reviewed for potential impacts on the natural, cultural, and human environment. Project sponsors are responsible for undertaking the environmental review, obtaining appropriate clearances or approvals, and submitting documentation to NCDOT for final review and signatures.

Additional information can be accessed here:
https://connect.ncdot.gov/resources/Environmental/Pages/default.aspx

V. Preliminary Engineering & Design

Preliminary Engineering (PE) authorization allows the project sponsor or municipality to be reimbursed for costs related to preconstruction activities, including planning, environmental documentation, design, and surveys. PE funding may be adjusted after the review and approval of a consultant contract. PE expenses should be monitored to stay within this range; additional funds may not be available.

VI. Right-of-Way Acquisition & Certification

The project sponsor is responsible for ensuring sufficient right-of-way (ROW) for the project.

If it is necessary to acquire the right of way, the project sponsor must comply with the Uniform Act (49 CFR 24 – Uniform Relocation Assistance & Real Property Acquisition for Federal & Federally Assisted Programs.). NCDOT's ROW Agent issues ROW Certification for the county where the project is located after receiving a request from the project sponsor accompanied by required documentation.

Forms and additional information can be accessed here:
https://connect.ncdot.gov/business/ROW/Pages/ROW-Support.aspx

VII. Construction

Construction (CON) contracts are typically awarded to the lowest responsible, responsive bidder after advertisement and solicitation of competitive bids. NCDOT must concur in the award of a construction contract by the LGA.

Additional information can be accessed here:
https://connect.ncdot.gov/projects/construction/Pages/default.aspx

VIII. Closeout

Closeout refers to obtaining a final inspection of the project from NCDOT. After the final inspection, the project sponsor may request final reimbursement. The approval of the final inspection is the start of the records retention period. The FHWA and the State of North Carolina require that records relevant to the project be maintained for at least three years.

Additional information can be accessed here:
https://connect.ncdot.gov/projects/construction/Pages/default.aspx

IX. Contact Information

A. Project Development and Project Management Assistance

Topics	Contact Name and Email Address	Title and Agency
Overview of CRTPO's Call for Projects	Jennifer Stafford jennifer.stafford@charlottenc.gov	Development Planner, CRTPO
Federal Funds and Air Quality Projects	Loretta Barren Loretta.barren@dot.gov	FHWA – NC Division Office
NCDOT Division Local Administration Coordinators	Jeff Burleson (Division 10) jaburleson@ncdot.gov Jackie McSwain (Division 12) jackie.mcswain@volkert.com	Locally Admin. Projects Engineer, NCDOT
Agreements and On-boarding Consultants	Marta Matthews mtmatthews@ncdot.gov	Local Programs Manager, NCDOT
Environmental Documentation	Joel Howard jmhoward@ncdot.gov	PDEA Engineer, NCDOT
Right of Way	Jason Callicutt Jacallicutt@ncdot.gov	ROW Agent, NCDOT
Utilities/Railroads	Lynn Basinger TLBasinger@ncdot.gov	Utilities Engineer, NCDOT
Specifications/Contract Proposal/Bidding & Award of Contract Process	Jared Mathis jsmathis@ncdot.gov	Contracts Engineer, NCDOT
Construction Contract Administration and Project Closeout	Kellie Crump ext-kkcrump@ncdot.gov	Transportation Engineer, NCDOT/KCA
NCDOT's Enterprise Business Services (EBS) Portal (agreement request, document review, reimbursement process, etc.)	Marta Matthews mtmatthews@ncdot.gov Madeline Rawley mrawley@ncdot.gov	Local Programs, NCDOT

B. CRTPO Staff for the Discretionary Grants Program

Phone: 704-336-2205

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APPENDIX

Appendix 1

FY-2023-2024 Funding Timeline

The next call for projects is scheduled to open in August 2023. Additional important dates related to the application process and the awarding of funds are listed below.

Date	Activity
Fall Call for Projects	
August 14, 2023	CRTPO formally announces Fall Call for Projects dates and other key dates
August 2023	CRTPO determines funding targets
August 2023	Pre-Application Training Webinar
August – October 2023	CRTPO conducts pre-submittal meetings with applicants
October 31, 2023	Call for Projects closes
November 2023	Project scoring
November 2023	(Optional) Applicant presentations to POC
December 2023	Scoring finalized and POC recommends projects
January 2024	Present to TCC and CRTPO Board for information
February 2024	Present to TCC and CRTPO Board for approval (including TIP amend)
February – March 2024	Announce funding list
March – April 2024	TIP Amendments sent to NCDOT to update STIP
Spring Shortfall Call for Existing CRTPO Projects	
March 2024	CRTPO determines Shortfall funding targets
March 2024	Call for Project-Shortfall Requests opens (for existing CRTPO projects)
April 2024	Shortfall call closes
June 2024	Present to TCC and CRTPO Board for information
July 2024	Present to TCC and CRTPO Board for approval
July – Aug. 2024	TIP & STIP Amendment process
July – Aug 2024	Announce funding list

Appendix 2

CRTPO Discretionary Funding Availability for 2023 Fall Call

Federal Funding Source	Eligible Modes	Next Available Allocation Year (in thousands)					CRTPO Annual Allocation Amount by Source
		FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	
Surface Transportation Block Grant – Direct Attributable (STBG-DA)	Highway and Non-highway	-	$1,747	$18,393	$17,199	$18,781	$56,120
Transportation Alternatives Program (TAP)	Non-highway	-	-	-	-	-	-
Carbon Reduction Program Funds (CRP)	Highway, non-high, transit and other	$864	$2,697	$2,697	-	-	$6,258
Congestion Mitigation Air Quality (CMAQ)	Highway, non-high, transit and other	-	-	-	-	-	
Bonus Allocation Funds (BA)	Highway	-	-	-	-	-	
Estimated Annual Total of CRTPO's Discretionary Funds for 2023 Fall Call							**$62,378**

Appendix 3. Highway/Intersection Projects Criteria Scoring Guide

Highway/Intersection Criteria	Max Points
Problem & Solution Statement	**N/A**
Local Priority / Adopted Plans	**N/A**
Local Match Points are awarded based on the amount of local match provided by the applicant. • 20% match – 0 points • 25% match – 5 points • 30% match – 10 points • 35% match – 15 points • 40% match – 20 points • 50% match – 25 points	**25**
Critical Opportunity Points are awarded based on whether or not the opportunity is stated and documented in an adopted plan.	**5**
Project Funding Request Points are awarded based on the project's phase of completion. • Funding all phases – 0 points • Funding Engineering Only – 5 points • Funding Right-of-Way and Construction Phase – 10 points • Funding Construction Phase – 15 points	**15**
Safety Points are based on the following equation: *5-year crash total divided by the average annual daily traffic volume*[1] The applicant project with the highest safety score based on the above equation is awarded a maximum of **15 points**. All other applicant projects are scaled based on the highest-scoring project.	**15**
Congestion Points are based on the following equation: *Volume to Capacity (V/C) ratio*[1] The applicant project with the highest congestion score based on the above equation is awarded a maximum of **15 points**. All other applicant projects are scaled based on the highest-scoring project.	**15**
Crash Reduction & Equity There are two subcategories for this criterion: *Crash Reduction Factors (CRF)* There are a large number of crash modifications that have been studied and analyzed to determine their CRFs; a list of applicable crash modifications is available at the end of this appendix. Applicants can select up to 1 modification from the Roadway Improvement list and up to 5 modifications from the Bike / Ped Improvement list. The applicant project with the highest total CRFs is awarded a maximum of **6 points**. All other applicant projects are scaled based on the highest-scoring project. *Transportation Disadvantaged Index (TDI) Score* – maximum of **4 points** The TDI score is based on the population-weighted average of TDI scores for the tracts affected by the applicant project. There are four discreet categories that determine points: • TDI <= 4.5 – 1 point • TDI <= 9 – 2 points • TDI <= 13.5 – 3 points • TDI > 13.5 – 4 points	**10**
Cost Effectiveness After all other scoring has been completed, the applicant project's total points are divided by the requested funding amount.	**15**

[1] Data provided by NCDOT

CRTPO's Methodology

Staff from the CRTPO and Mecklenburg County Public Health as well as the CRTPO's Project Oversight Committee (POC), are responsible for the development and updating of this *Criteria Scoring Guide*. The update began in the Winter of 2022 and concluded in the Summer of 2023.

The 2023 update includes two changes to the criteria:

1. The Safety category has been increased from a maximum of 10 points to a maximum of 15 points.
2. The Equity & Crash Reduction category has been added for Highway/Intersection projects. This category is worth a maximum of 10 points. It integrates the North Carolina Department of Transportation's (NCDOT) Transportation Disadvantaged Index (TDI) as well as Crash Reduction Factors (CRF) studied by the Federal Highway Administration (FHWA) and other authorities. More information on the TDI and on CRFs is available in Appendix 5.

Additionally, Transit Projects have been split into their own appendix (Appendix 6) for clarity purposes.

Crash Reduction Factors (CRF)

The FHWA's Toolbox of Countermeasures and Their Potential Effectiveness for Pedestrian Crashes provides a summary overview of CRFs, which the FHWA describes as estimates of crash reduction that might be expected if a specific countermeasure or group of countermeasures is implemented with respect to bicycle and pedestrian crashes. For example, a CRF of .27 would mean that the countermeasure would be expected to result in a 27% reduction in pedestrian crashes. A CRF is the percentage crash reduction that might be expected after implementing a given countermeasure; these percentages are derived from peer-reviewed literature sourced by the FHWA.

Staff will be evaluating two types of crash modifications: roadway-focused countermeasures as well as bicycle and pedestrian-focused countermeasures.

The Crash Reduction Factors Table on the following page identifies these countermeasures and their CRF values.

NCDOT's Transportation Disadvantaged Index (TDI)

The TDI tool is a customized approach to support a high-level assessment of equity impacts. The TDI tool focuses on race (Black, Indigenous, and persons of color), income, personal vehicle access, people with mobility impairments, the elderly, and youth. The TDI allows users to see where transportation-disadvantaged communities potentially exist and compare neighboring communities' needs. This map identifies areas with higher proportions of disadvantaged populations by symbolizing the TDI score for each block group in the state. The TDI is a composite score based on the six indicators of potential transportation identified above.

Table. Crash Reduction Factors

Roadway-Focused Countermeasures	
Facility Improvement	**CRF**
Add intersection lighting	0.21
Add segment lighting	0.2
Convert permissive or permissive/protected to protected only left-turn phasing	0.99
Convert unsignalized intersection to roundabout	0.27
Install dynamic speed feedback sign	0.95
Install raised median	0.25
Install refuge islands	0.36
Narrow roadway cross-section from four lanes to three lanes (two through lanes with center turn lane)	0.29
Prohibit left-turns	0.1
Prohibit right-turn-on-red	0.03
Provide paved shoulder (of at least 4 ft)	0.71
Replace two-way left-turn lane with a raised median	0.79

Bicycle & Pedestrian-Focused Countermeasures	
Facility Improvement	**CRF**
Add exclusive pedestrian phasing	0.34
Install a pedestrian hybrid beacon (PHB or HAWK)	0.83
Install bicycle boulevard	0.37
Install cycle tracks	0.9
Install enhanced rectangular rapid flashing beacon (RRFB) pedestrian crossing at mid-block crossing location	0.64
Install pedestrian hybrid beacon (PHB or HAWK) with advanced yield or stop markings and signs	0.82
Install pedestrian overpass/underpass (unsignalized intersection)	0.13
Install raised median with marked crosswalk (uncontrolled)	0.54
Install raised median with or without marked crosswalk (uncontrolled)	0.74
Install raised median with unmarked crosswalk (uncontrolled)	0.61
Install raised pedestrian crosswalk	0.7
Install rectangular rapid flashing beacon (RRFB)	0.53
Install separated bicycle lane	0.92
Install sidewalk (to avoid walking along roadway)	0.88
Installation of a cycle track 0 - 6 ft from the side of the main road with cyclist priority at intersections	1.03
Installation of a cycle track 6 - 15 ft from the side of the main road with cyclist priority at intersections	0.55
Installation of a cycle track over 15 ft from the side of the main road with cyclist priority at intersections	0.93
Installation of a two-way cycle path with cyclist priority at intersections	1.75
Modify signal phasing (implement a leading pedestrian interval)	0.05
Moving a separate bicycle crossing to a four-legged intersection	1.28
Moving a separate bicycle crossing to a three-legged intersection	0.83
Provide paved shoulder of at least 4 ft	0.71
Replace existing WALK / DON'T WALK signals with pedestrian countdown signal heads	0.25
Replacement of traditional intersection with roundabout with a grade separated separated cycle path	0.56
Replacement of traditional intersection with roundabout with separated cycle path	0.83

Source Summaries

Below is a selection of sources that CRTPO and Mecklenburg County Health staff relied upon in developing the Crash Reduction & Equity scoring criteria.

The US Department of Transportation (USDOT) & FHWA – Health in Transportation

The FHWA recognizes that transportation has a significant impact on the health of the community and emphasizes that engaging with health stakeholders is vital to both the planning and project implementation processes. The comprehensive Health in Transportation Decision Guide was created in partnership with leading health organizers to develop a robust toolkit specifically for transportation practitioners.

The Centers for Disease Control and Prevention (CDC) - Transportation Recommendations Brief & Toolkit

The Transportation Recommendations Brief & Toolkit introduces and outlines the Transportation Health Impact Assessment Toolkit that was jointly created with leading transportation organizations (including the FHWA) to allow transportation practitioners to complete a High Injury Network Assessment (HIA) without relying on staff support from health officials. The toolkit provides information on what health metrics are relevant to transportation planning and how different variables can impact each other in specific models and frameworks.

The USDOT Volpe Center – Transportation Equity for All (TransportSE)

TransportSE is a geospatial tool that introduces equity in transportation concepts, providing an interactive GIS tool that allows the user to examine residential demographics in correlation to transportation data. This tool is an important proof of concept that provides links to key materials used to inform staff's decision to integrate NCDOT's TDI.

The World Health Organization (WHO) – Transportation Toolkit

The WHO's Transportation Toolkit is another key resource staff referenced when integrating health equity into transportation efforts, one that examines a wide variety of challenges faced by cities in numerous countries. This toolkit provides a robust resource selection that offers many approaches to addressing safety and equity issues in transportation planning.

Smart Growth America (SGA) – Complete Streets Policy Toolbox

The SGA Complete Streets Policy Toolbox is widely referenced as a robust resource for policies that have been adopted and tested for success. It recognizes challenges introduced from both the health and the transportation angles in implementing systems that benefit the well-being of the community while also achieving transportation goals.

Appendix 4

Bicycle/Pedestrian Projects

Application Scoring Criteria

(Colors coordinated with the Transportation Alternatives Program Criteria Scoring Guide: https://crtpo.org/PDFs/TransportationAlternativeProgram/TAP_Active_Transportation_Criteria_Guide.pdf)

Criteria	Y/N	0 points	5 points	10 points	15 points	20 points	25 points	30 points
Problem & Solution Statement								
Local Priority / Adopted Plans								
Critical Opportunity		N/A	Critical opportunity					
Project Readiness		All other projects	Design / Survey Complete	Right-of-Way Acquired	Bid Phase			
Destinations of Interest		Scaled up to 30 points						
Connections to Existing Facilities		0 connections	1 connection	2 connections	3+ connections			
Adopted Plans and Policies		None	County	Regional				
Placemaking Amenities		Up to 5 points						
Demonstrated Need/Desire		Documented or observed	Documented and observed					
Documented Safety Challenge		None	1	2	3	4		
Reduce Human Exposure		No Reduced Exposure – to reduced (3pts)	Defined Space	Physical Separation / Barrier				
Traffic Calming		No	Yes					
Vehicle Traffic – AADT		<1,000	1001 to 10,000	10,001 to 22,000	22,001 to 40,000	>40,000		

Continued

Emission & Pollutant Reduction			Up to 99 Daily Vehicle Miles	100-199 Daily Vehicle Miles	200-299 Daily Vehicle Miles	300+ Daily Vehicle Miles		
Social Equity		None to Low (2 pts)	Moderate	High				
Carless Household		No	Yes					
Environmental Quality		No	Yes					
Health Equity		<5% to 11.9 (3 pts)	>12%					
Cost Benefit		.4 or Lower	.41 to 1.0	1.01 to 2.0	2.01 or Higher			
Effectiveness of Federal Funds		$4,000,000 plus	$0 to $1,000,000	$2,000,000 to $4,000,000		$1,000,000 to $2,000,000		
Funds Requested		>51%	36 to 50%	21 to 35%		1 to 20%		
Local Match		Match % = Point Total (Maximum of 50%)						
Right-of-way Previously Required/Available		0 to 20%	21 to 50%	51 to 75%	76 to 100%			

Please consider using the Bicycle and Pedestrian Scoring Workbook to estimate your score:
https://crtpo.org/PDFs/Resources/DiscretionaryProjects/ActiveTransportationWorksheet.xlsx

Continued

Bike & Ped Criteria - Total Possible Points

1	Critical Opportunity	5	
2	Project Readiness	15	
3	Destinations of Interest	30	Trip Generation & Connectivity
4	Connection to Existing Facilities	15	
5	Adopted Plans & Policies	10	
6	Place-making Amenities	5	
7	Demonstrated Need/Desire	5	
8	Documented Safety Challenge	20	Safety
9	Reduce Human Exposure	10	
10	Traffic Calming	5	
11	Vehicle Traffic	20	
12	Emissions & Pollutant Reduction	20	Health & Environment
13	Social Equity	10	
14	Carless Household	5	
15	Environmental Quality	5	
16	Health Equity	5	
17	Effective Use of Federal Funds	20	Feasibility & Cost
18	Amount Available Funding Requested	20	
19	Local Match Commitment	50	
20	Right-of-Way Previously Acquired/Available	15	
21	Cost Benefit	15	
	Total	**305**	

Continued

Appendix 5

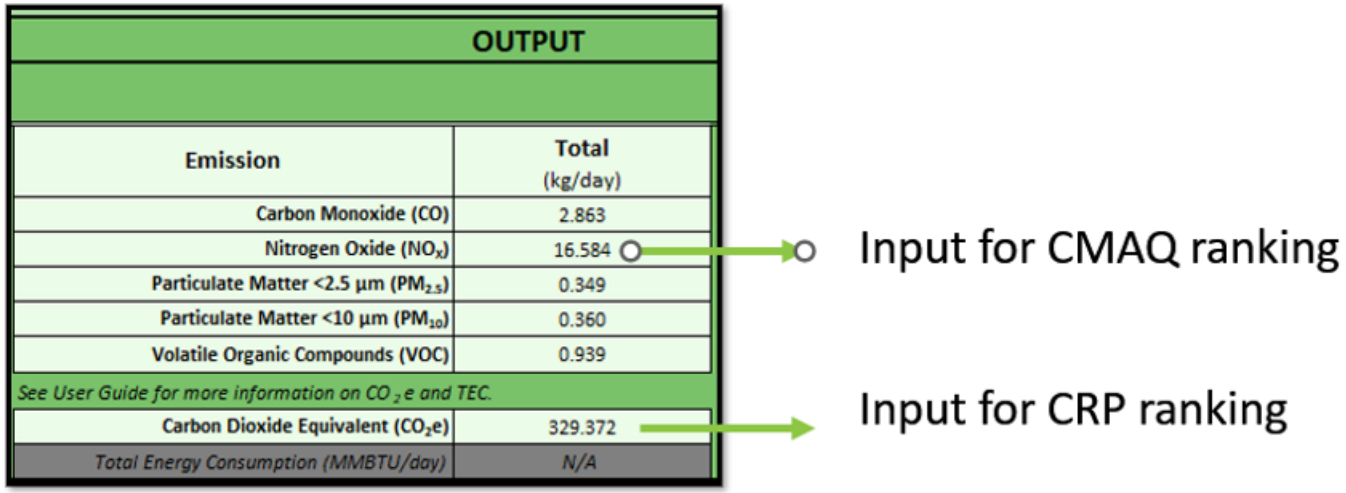
Air Quality

Application Ranking Criteria

Projects will be ranked separately for Congestion Mitigation and Air Quality (CMAQ) or Carbon Reduction Program (CRP) funding based on cost-effectiveness of pollution reduction. Projects that want to be considered specifically for CMAQ, or CRP funding, or both must submit a Federal Highway Administration CMAQ Emission Calculator with their application. The calculator may be accessed here: https://www.fhwa.dot.gov/environment/air_quality/cmaq/toolkit/

Applications for CMAQ funds will be ranked by the cost-effectiveness of nitrogen oxide (NOx) emission reduction.

Applications for CRP funds will be ranked by the cost-effectiveness of carbon dioxide equivalent (CO2e) emission reduction.



Appendix 6

Transit Projects

Application Scoring Criteria

Criteria	Y/N	0 points	5 points	10 points	15 points	20 points	25 points
Problem & Solution Statement							
Local Priority / Adopted Plans							
Local Match		20% match	25% match	30% match	35% match	40% match	50% match or greater
Critical Opportunity		N/A	States & documents opportunity				
Project Funding		All Phases	Engineering Only	Right-of-Way & Construction	Construction Phase only		
Enhanced Mobility		Ratio of 0 and 1 car households to total households in ¼ mile of proposed transit project					
Ridership		Scaled based on highest value submitted					
Cost Effectiveness		$ Amount requested divided by total points					

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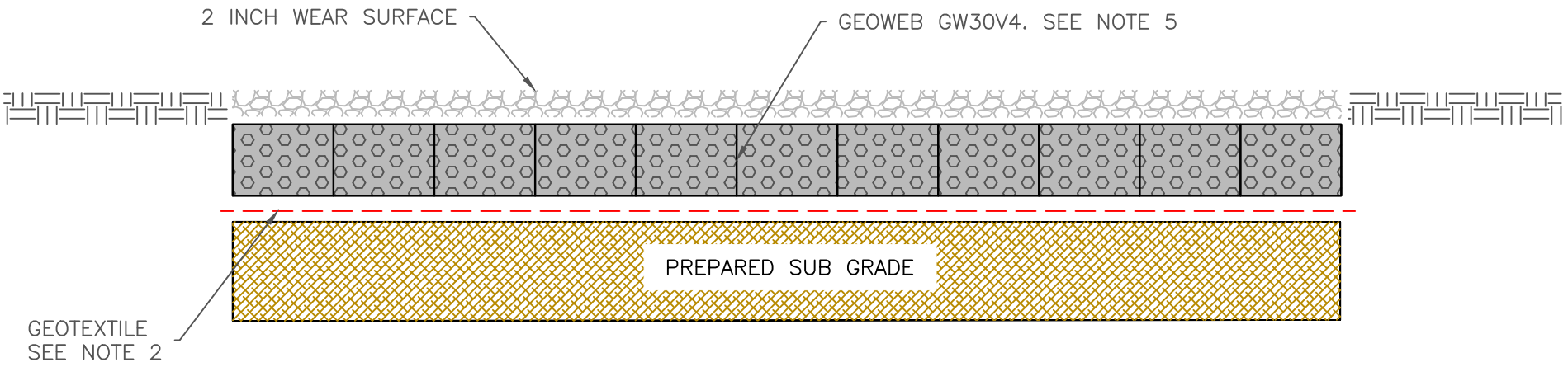

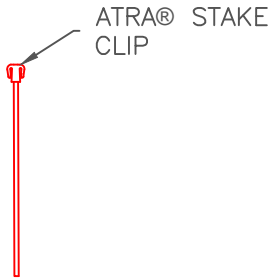

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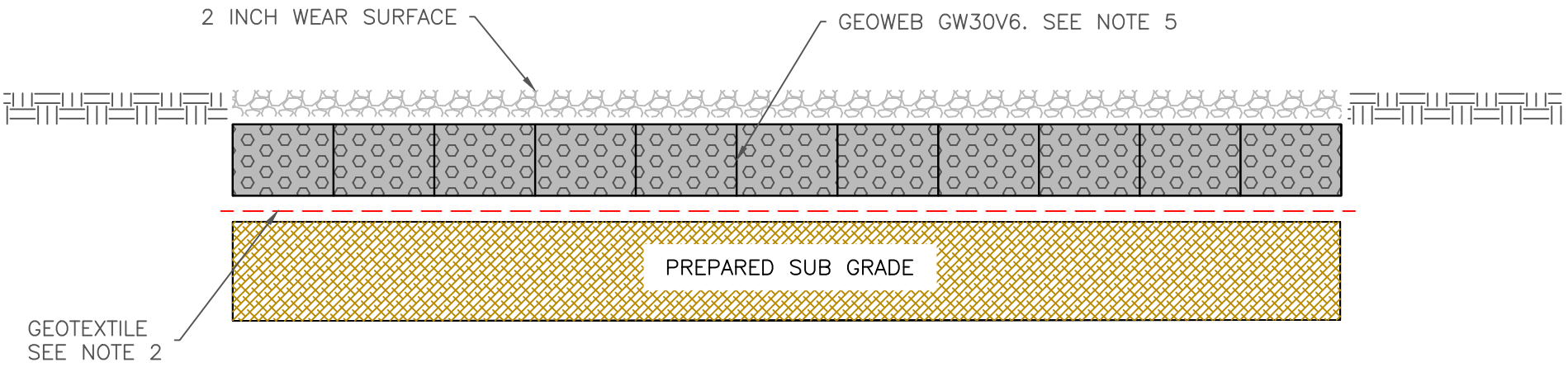

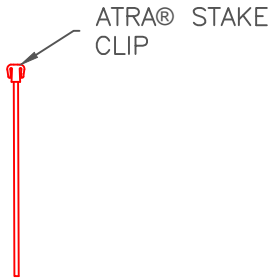

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