

# 2019 CWMTF Stream Restoration Application

## SECTION 1. APPLICANT INFORMATION

1.1	Organization Name	Piedmont Conservation Council, Inc.		
1.2	Applicant Type	Non Profit		
1.3 Person from the applicant's organization that will administer the grant contract, if awarded:				
Name		Grace Messenger		
Title		Project Director		
Address 1		201 E. Main Street., 5th Floor, Room 257, Durham, NC 27701		
Phone		484-554-4076	E-mail	grace@piedmontconservation.org
1.4 Person that CWMTF Field Representative should contact for application review:				
Name		Jennifer Murphy, P.E.		
Title		Project Engineer		
Phone(s)		919-677-2072		
E-mail		jennifer.murphy@kimley-horn.com		

## SECTION 2. PROJECT INFORMATION

2.1	Project Name	College Branch Stream Enhancement- Downtown Greenway Phase 4		
2.2	Project Duration ( <i>months</i> )	24		
2.3	Primary County	Guilford		
2.4	Other County	N/A		
2.5 Project Coordinates				
<b>Note: Please use Decimal Degrees from <a href="http://www.latlong.net">www.latlong.net</a> or similar site. Please test the coordinates before submitting.</b>				
Latitude:		36.071396	Longitude:	-79.798617

### 2.6 Narrative

*CWMTF recognizes that every project is unique. Under each heading listed below, address the topics and add additional information as necessary to explain your project. Be thorough and concise. Narratives are expected to be 1-2 pages in length.*

#### SCOPE OF WORK

*The scope of work should outline all project tasks that you are responsible for completing. List measurable tasks that will be completed as part of this project, and any tasks that will continue afterwards (such as monitoring). Include tasks to be completed with both CWMTF funds and matching funds. Be clear, concise and complete as CWMTF will use this information to develop any grant contract that may result from this application.*

This stream enhancement project was initiated by the Downtown Greenway Phase 4 and Atlantic & Yadkin (A&Y) Greenway project, which is a collaborative effort between the City of Greensboro and Action Greensboro. A portion of the proposed greenway is adjacent to a stream that has the potential for habitat improvement, bank stabilization, and buffer enhancement. Stream enhancement construction drawings have been completed for 3,700 linear feet of an unnamed tributary (locally known as College Branch). The enhancement includes in-stream grade control structures, bank stabilization, existing stormwater outfall stabilization, debris and invasive removal, and plantings. We propose 2,040 linear feet of the stream improvements for this grant application.

In 2018, Greensboro Parks & Recreation updated its 20-year comprehensive master plan, Plan2Play. The master plan identified trails and greenways as well as environmental education as top priorities for the Department. These priorities were determined through robust public outreach efforts and statistically valid survey results. In line with the Department's priorities, the Downtown Greenway Phase 4 project not only will complete the Downtown Greenway, but also will connect to the A&Y

Greenway—one of the City’s most popular greenways. The A&Y is currently 8 miles (starting at Markland Drive and ending just north of downtown Greensboro) and provides multimodal access to Greensboro’s Battleground Parks District—including Country Park, Jaycee Park, the Natural Science Center, and the Guilford Courthouse National Military Park. Further north, the A&Y connects to almost 50 miles of natural surface hiking and mountain biking trail around the City’s three lakes: Lake Higgins, Lake Brandt, and Lake Townsend, and provides access to the North Carolina Mountains to Sea Trail. This portion of the greenway provides a critical link between Downtown, surrounding downtown areas, and Battleground Parks District. Additionally, the greenways provide educational and recreational opportunities both on the greenway itself and through connectivity. The stream enhancement and stabilization proposed in this application provide additional educational opportunities. A Guilford County School, Weaver Academy, and Greensboro College being directly adjacent to the project provides a notable opportunity for students to access the stream. In addition, the University of North Carolina at Greensboro (UNCG) campus is located less than a mile from the project site.

The City photographed the existing stream conditions and completed construction drawings for the stream enhancement project from McGee Street to West Market Street and West Market Street to Guilford Avenue. Photos of the existing condition are provided in the attachments and see Figure 6 for photo locations.

If funded, the City will complete stream enhancement and stabilization for approximately 2,040 linear feet of the stream. The City will also increase the in-stream structures in the enhancement sections that have already been designed to increase stream profile variability. Additionally, if funded, the City will add educational features, such as educational signage, and implement community engagement efforts with the surrounding schools (Weaver Academy and Greensboro College) during design and maintenance. Community engagement could include having students collaborate on graphic designs for educational signage, installing plantings, conducting monitoring, or installing and maintaining free library or seed share stations. The 404/401 and erosion control permits have already been obtained for the greenway project; however, if this project was constructed separately from the greenway, a separate erosion control permit would be required, and a 404/401 permit modification may be required for the project to proceed. The proposed in-stream structures will return profile variability to provide habitat for aquatic fauna and direct flow away from unstable banks. Vertical banks will be stabilized where possible and debris and invasive plants will be removed from the channel.

In Fall 2019, Dr. Sarah Praskievicz (Assistant Professor in the Department of Geography, Environment, and Sustainability at UNCG) led a group of 26 undergraduate students in her class GES328 (The Water Planet) in conducting physical habitat assessments and water quality monitoring on several tributaries of North Buffalo Creek, including on College Branch downstream of the proposed project site. The data gathered as part of this class project contributes to the baseline assessment of the stream, while future classes can collect additional data that can contribute to post-project monitoring. Dr. Praskievicz plans to teach the course at least every two years and to continue incorporating field-based research by students.

Following the stream restoration project, the City will complete monitoring and maintenance. After a five-year monitoring period, the project area would be included in the City’s riparian buffer monitoring program. This program includes managing invasive species and monitoring the buffer condition. The City will maintain major repairs (such as damaged outfalls, debris jams, or proper vegetation maintenance), if required. In 2018, the City of Greensboro spent \$34,650 per mile of greenway on maintenance. This amount does not include volunteer effort which has an estimated value of approximately \$10,000 for 2018. Action Greensboro also has access to the Downtown Greenway Maintenance Endowment valued at over \$1 million (held with Community Foundation of Greater Greensboro), which can be used to supplement activities or projects that are not covered by the City.

#### PROJECT DESCRIPTION AND NEED

*Project description should include the location, setting and size of the proposed (watershed, landmarks, project length, etc.); observations and/or monitoring data that identify a problem; connections to other restoration projects or protection efforts; why this project is needed; and how the proposed project will solve the problem. Also, discuss the ecological significance of the project area, with an emphasis on aquatic resources.*

The project stream is an unnamed tributary to North Buffalo Creek (HUC 03030002), locally known as College Branch. The drainage area to College Branch for the section proposed in this application is 0.45 square miles. North Buffalo Creek is listed on the 303(d) list for poor benthos and fish community. North Buffalo Creek is classified as C, NSW. In addition, North Buffalo Creek is part of the nutrient sensitive Jordan Lake watershed. Opportunities for water quality improvement throughout the watershed typically include restoration of smaller tributaries, wetland restoration, or stormwater best management practices (BMPs). A TMDL for fecal coliform was established for the North Buffalo Creek watershed in 2004. This project will have

positive impacts on the overall watershed. The City has made incremental progress since that time through various projects including other stream restorations, stormwater BMPs, and buffer enhancement.

The watershed of North Buffalo Creek is highly developed with an estimated 30-40% impervious cover. The channel bed and banks are primarily made of rip rap, boulders, and structural sandbag walls, because it is directly adjacent to the rail bed—which appears to have undergone many stabilization projects over the years. All sections of the proposed project stream fall between moderate and very high BEHI index; however, the presence of non-native materials in much of the bed and bank means a majority of the stream is stable in its current condition. Grade control structures and channel shaping will return a more natural channel cross section and provide profile variability. The lack of profile variability (pools and riffles) and overly wide channel provide poor habitat. Improved profile and bed material provided by constructed riffles and other in-stream structures provide improved habitat for benthic species. The channel work, combined with native vegetation planting, will produce channel stability, habitat improvement, and educational and community engagement as an aesthetic feature of the greenway.

Previous phases of Downtown Greenway involved the City's first roadside innovative stormwater treatment devices. The remaining portion of the Downtown Greenway is the final mile and missing link between the Downtown Greenway and the southern terminus of the A&Y Greenway. Because of the limited construction access and limitations due to existing infrastructure, if the stream enhancement work is not done before or during construction of this section of greenway, it will likely not be completed in the future. Implementing the stabilization activities before the greenway construction begins is the most efficient way to complete the enhancement work, educational features, and community connections.

This project will be included in the City's riparian buffer management initiative after the monitoring period, which includes monitoring and invasive species management. The City has successfully planted and maintained the Lake Daniel Reforestation Project, which included planting 18,000 trees along 11 linear miles between 2001 and 2004. This project is only approximately 0.5 miles from our proposed stream restoration area.

The need and opportunity for public engagement is great—especially with the adjacent schools. Because of its proximity to schools, the stabilized and enhanced stream will provide opportunities for outdoor education, including a living laboratory and outdoor classrooms, community service requirements for high schoolers, and access to the Guilford Community Garden space. Environmental education is particularly important in urbanized downtown areas where opportunities to engage with nature are scarce.

In Fall 2019, Dr. Praskievicz's UNCG course (GES328) The Water Planet conducted a physical habitat assessment of College Branch for a 200-m reach downstream of the project site, starting at Smith Street bridge and extending upstream. The protocol used was the Environmental Protection Agency (EPA) Wadeable Streams Field Operations Manual under the National Rivers and Streams Assessment 2013-2014. The specific components included in the assessment were the thalweg profile, woody debris tally, and channel/riparian cross-sections. Students found low diversity of channel habitat units, with 9% of the surveyed length consisting of riffles and 7% of pools, with the remainder being runs. Substrate diversity was very low, being mostly small boulders (resulting from riprap that had fallen into the channel) and sand. Density of large woody debris was also very low, with only two pieces found in the study reach. The channel was highly incised, with bankfull width-to-depth ratios for cross-sections ranging from 4.2 to 10.3.

Students also took near-weekly water-quality measurements with a YSI Professional Plus ion-selective electrode between August 24<sup>th</sup> and November 16<sup>th</sup>, 2019, just upstream of the Smith Street bridge (downstream of the proposed project site). The measured parameters were temperature, conductivity, dissolved oxygen, pH, and ORP. The highest temperature recorded was 25.8°C. Dissolved oxygen saturation ranged from 94.7 to 99.6%. Conductivity ranged between 7.58 to 533 mS/cm, pH from 6.47 to 8.49, and ORP from -44.9 to 192.8 mV. Students also took water samples from the Smith Creek Bridge on a near weekly-basis over the same timespan and analyzed them for suspended-sediment concentrations in the lab using the gravimetric method. Suspended-sediment concentrations ranged between 10 to 70 mg/L.

Beyond the 2019 data collected in the UNCG course, there has not been any other formal or consistent documentation or monitoring of in-stream macros in the College Branch; however, North Buffalo Creek (the downstream system) has a monitoring station established as part of the Ambient Monitoring System Quality Assurance Project Plan. Improvements to the stream function in College Branch contribute to the ecological uplift of the larger North Buffalo Creek system.

The students in Dr. Praskievicz's GES328 class conducted a physical habitat assessment of College Branch for a 200-m reach downstream of the project site (starting at the Smith Street bridge and extending upstream).

## **WATER QUALITY OBJECTIVES AND HOW THEY WOULD BE ACHIEVED**

*Describe the objectives of the project in terms of protecting or improving water quality. Detail efforts to improve hydrology, hydraulics, water quality, and/or habitat based on restoring the maximum natural functional potential to the project area. Include the square foot area of degraded land to be restored and/or the number of linear feet of stream to be restored, enhanced and/or stabilized.*

The goal of the Downtown Greenway College Branch Stream Enhancement is to stabilize stream banks, improve bed substrate, create habitat with in-stream structures, and improve the community engagement and educational aspects of the stream feature. The existing streambed lacks habitat along much of its length. Stabilizing the banks and constructing in-stream habitat and grade control structures will lead to readily observable substrate improvements, such as boulder and log features, scour pools, and better sorting of bed materials, resulting in localized areas with less fines. The construction drawings and concept plan for additional improvements includes adding habitat and grade control features, such as constructed riffles and step pools. The structures will provide grade control and habitat as well as establish a more diverse profile in the stream reach. These structures will create scour pools and redirect flow across the structures into the thalweg of the stream, simultaneously improving fish habitat and bank stability. Stabilizing and revegetating the actively eroding banks will reduce the current sedimentation. In total, the project will enhance 2,040 linear feet of stream.

The proposed bank treatments will reduce the slope of the near vertical existing banks where possible and, combined with invasive species removal, these banks will allow native vegetation to be established.

The North Buffalo Creek watershed presents a multitude of water quality challenges typical in urbanized areas. Through the proposed project and future projects in the North Buffalo Creek watershed, Greensboro hopes to incrementally improve water quality, aquatic habitat, and riparian functions. This project is considered part of a larger effort that will include future improvements yet to be identified.

## **OTHER PUBLIC BENEFITS**

*Describe any public benefits of the project related to public access, facilities for recreation, specific scientific opportunities and/or directed educational opportunities.*

With the stream enhancement and greenway completed, the public access, recreational, and educational opportunities will be robust. The enhanced greenway connection will strengthen the education, outreach, and community engagement efforts that have already been implemented. More specifically, the stream stabilization process will solidify the implementation of the greenway path, which provides safer, more controlled, and enhanced public access; allows an urban community access to a natural environment boosts environmental education; showcases conservation; encourages better citizen awareness, and makes watershed connections that encourage ownership. Additionally, the proposed project will increase public visibility of this area that traditionally has been unknown due to commercial train presence. With these sections of College Branch stabilized, the City will be able to complete what it started in 2001. It was noted in the 2018 Greensboro Parks & Recreation updated 20-year comprehensive master plan, "Plan2Play", that trails/greenways and environmental education were both identified as top priorities through a robust public outreach effort and was statistically validated through survey results.

As mentioned previously, there are five colleges and universities within a half-mile of the project area. Thus, streambank stabilization and greenway completion will provide stronger academic connections through encouraging citizen science monitoring and observations coupled with hands-on learning. Historically, the College of Greensboro ecology classes conduct citizen science along the College Branch stream, yet there currently is concern for safe access. With the stream stabilization and corresponding Downtown Greenway projects completed, citizens will have more predictable access and additional opportunities for enhanced citizen science and real-world data collection.

If the proposed project is funded, Dr. Praskievicz, from UNCG, has committed to returning to College Branch to do additional fieldwork with her GES328 students, she will continue to teach the class either yearly or every other year. Under her supervision, the students will repeat the physical habitat assessments and water quality measurements conducted in Fall 2019. The results will allow for monitoring of any improvements in physical habitat and water quality for at least a five-year period following completion of the stream stabilization and enhancement project. Additionally, the continued involvement of UNCG in the post-project monitoring will provide students with a valuable experiential education opportunity to conduct research with real-world impacts.

Increasing community engagement in this area through the greenway and other park features ultimately creates a safer public

amenity, as the area will have additional lighting as well as increased monitoring by greenway users, maintenance, and adjacent businesses.

### SECTION 3. RESOURCE SIGNIFICANCE

#### 3.1 Receiving Waters

*CWMTF staff will review the stream classification, biological stream rating and 303(d) status using the most recent data from the Division of Water Resources (DWR).*

Name of Receiving Water(s)	DWR Stream Classification	DWR Biological stream rating	303(d) Y/N
North Buffalo Creek	C	NSW	Y

If additional receiving waters and their classifications/status are necessary to describe, please do so below.

#### 3.2 Aquatic Habitat - *Mark any of the following that apply directly to the receiving waters, or within one mile downstream of the proposed project. **NONE***

	Streams supporting species listed as Federally Threatened or Endangered
<input type="checkbox"/>	Division of Coastal Management exceptional wetland
	Division of Water Resources unique wetland
<input type="checkbox"/>	Division of Marine Fisheries Primary Nursery Areas
<input type="checkbox"/>	Inland Primary Nursery Areas identified by the Wildlife Resources Commission
	Wildlife Resources Commission Wild Trout
<input type="checkbox"/>	Division of Marine Fisheries Shellfish Area

#### 3.3 Source Water Assessment Program - *Mark if the following apply to the project area.*

none

#### 3.4 Protection or Improvement of Water with Special Uses - *Mark any of the following that apply directly to the receiving waters, or within 1 mile downstream of the proposed project.*

X	Not Applicable
	National Scenic Waters

	National Heritage River
<input type="checkbox"/>	National Seashore, National or State Park, National Wildlife Refuge, Coastal Preserve
3.5 Location Relative to Existing and Future Public Drinking Water Supply - <i>Check all that apply.</i>	
	Existing surface drinking water supply (reservoir or intake) within 1 mile downstream
<input type="checkbox"/>	Future surface drinking water supply that has received Record of Decision (reservoir or intake) within 1 mile downstream
<input type="checkbox"/>	Future surface drinking water supply (reservoir or intake) within mile downstream, which has Division of Water Resources concurrence
	X None of the Above
If the project location is near a water supply, please provide a brief description (e.g. river intake, reservoir, etc.) and location of the existing or future water supply.	
N/A	

## SECTION 4. PROJECT INFORMATION

4A	Project Need and Vision
4A.1	Need for the project, considering existing stream conditions and/or conditions in the project catchment areas:
a)	Describe the source, extent and probable causes of instabilities or impairments.
<p>This tributary to North Buffalo Creek is located in a highly impervious and developed area of downtown Greensboro. Much of the watershed was developed before stormwater BMPs were required for peak flow reduction, sediment removal, or nutrient reduction. These factors all contribute to intense flows during storm events. The development (buildings, parking lots, and the railbed) has encroached on the stream and buffer area in many places, creating steep banks and an incised channel. Much of the vegetation is invasive. The railroad maintenance over the years has led to concrete, brick, structural sandbag, and other debris in the channel, disturbing the channel geometry and habitat.</p> <p>The location of the stream between adjacent highly developed areas and within the railroad right-of-way has made the stream vulnerable to instability and impairment. Because the stream is located within a railroad right-of-way, it has previously been inaccessible in most proposed areas in this application—that is, until the Downtown Greenway project began acquiring the existing railbed and adjacent easement to convert it to a greenway.</p>	
b)	Describe observations and any monitoring conducted to identify any actual or potential cause(s) of impairment.
<p>All the project stream sections fall between moderate and very high BEHI index; however, the presence of non-native materials in much of the bed and bank means the stream is relatively stable in its current condition. While the non-native material may make the bank relatively stable, it has not provided riparian habitat, because it has left debris in the channel and an overly wide and shallow channel. The remaining banks are steep (majority steeper than 2:1) with invasive vegetation, which does not allow the significant root system of native plants to retain bank material.</p> <p>During the design phase for the proposed greenway, a damaged flared end section for a 48-inch RCP from the right side of the channel was repaired and boulder toe installed on the opposite bank, which had experienced erosion from the fallen FES. There are several other stormwater outfalls into this channel that will eventually require similar stabilization or repair in the future.</p> <p>The most serious water-quality issues identified by Dr. Praskievicz's students were excessively high-water temperatures (&gt;25°C) in summer and relatively high suspended-sediment concentrations (70 mg/L) during stormflow. Both these impairments are likely to be improved by the proposed stabilization and enhancement project (by providing native vegetation to shade the channel and by stabilizing the banks to prevent excessive erosion). By repeating the measurements at the same location after the project is implemented, future students will be able to compare their data to the baseline 2019 data and determine the extent to which the project resulted in improved water quality.</p>	
4A.2	Assuming the proposed project's outcomes would be highly successful, describe conditions that would reveal success.
<p>Success in this project would be defined by a stable channel with profile variability to support riparian habitat. Mature, native vegetation and reduced or removed invasive species are also a condition of success. Overall increased bank stability, the presence of in-stream habitat, and more varied riffle-pool sequence are indicators of success.</p>	

Additional indicators of success include community engagement with greenway users and the nearby schools for study, stream monitoring, and general enjoyment of the stream; students using the stream area as part of their community service requirements; and classrooms and groups using the area as a living classroom.

It is anticipated that enhancing and stabilizing the project stream will improve water quality functions. These improvements could be measured by making use of data from the QAPP monitoring station located on North Buffalo Creek (downstream of the project).

4A.3 Describe alternatives to the proposed project that were considered. Explain why you chose the proposed project.

One alternative to the proposed project would be to leave the stream in its current condition. This option is not desirable for several reasons. The proposed greenway is directly adjacent to the project stream for most of its length, and the current condition of the stream is not appealing to greenway users. The stormwater outfalls along the project are also unstable because of continued bank erosion. The proposed greenway could be in danger of reduced shoulder or becoming undermined by continued bank erosion. Also, if no stream enhancement or stabilization is done before or during the greenway construction, it will likely not be completed because access will be highly constrained by the greenway and other features constructed as part of the greenway.

A second alternative would be to leave the stream as is but stabilize outfalls and remove debris. This option would improve the aesthetic quality of the channel; however, leaving the overly wide channel and steep banks subjects the stream to erosion and instability, which also puts the greenway infrastructure at risk of failing if the stream banks continued to erode. It also does little to improve the greenway user's interaction with the stream.

Completing a restoration was not possible for the project channel because of the existing rail bed and the adjacent infrastructure (parking lots, roads, and buildings).

The final proposed enhancement was chosen because it provides improved riparian habitat; reduced erosion; protection of existing infrastructure, including stormwater outfalls and adjacent development; and enhancement of the greenway's aesthetic. Enhancing the stream also provides a place for greenway users and students in the area to engage with nature and the watershed's streams.

4A.4 Provide name(s) and qualifications of professionals whose evaluations contributed to the assessment that this project is needed.

Jennifer Murphy, P.E., Kimley-Horn, completed Rosgen Level III (6+ years stream restoration experience)

Will Wilhelm, P.E., Kimley-Horn, completed Rosgen Level IV (20+ years stream restoration experience)

Jason Hartshorn, PWS, Kimley-Horn (8+ years stream permitting experience)

David Phlegar, Stormwater Division Manager for Water Resources Department, City of Greensboro (20+ years water quality and stormwater management experience)

4A.5 Identify and describe any aspects of the proposed project that are for complying with regulatory mandates or permit conditions.

None of the stream enhancement aspects are required for permitting or regulatory mandates.

4B In the table below, please provide the name and a brief description of each water quality or conservation projects in the watershed and within 1 mile of the proposed project. Indicate whether the project is upstream or downstream and the approximate distance to the proposed project area.

[illegible]


4C Local Measures to Protect Water Quality - Check any of the following items that apply to local water quality protection currently in effect in the project's watershed:

- ☒ Local protection includes stormwater management program, ordinances, and/or planning; and local buffer, wetland and/or floodplain ordinances
- ☐ Local protection includes either stormwater management program, ordinances, and/or planning; and local buffer, wetland and/or floodplain ordinances
- ☐ No protection ordinances are in place

Identify and describe local ordinances the community has implemented or will implement to control and treat stormwater or protect wetland or riparian areas. Include a description of the effects these ordinances might have on the proposed project, or vice versa.

Although not an ordinance, the City's Riparian Buffer Program was implemented in 2001-2003. The project area is located upstream of Jordan Lake; it is subject to the Jordan Lake buffer rules. The City is currently an NPDES Phase 1 Community, but it was required to adopt the minimum stormwater requirements for the NPDES Phase 2 regulations. The City is an active member of the National Flood Insurance Program (NFIP) and is rated an 8 in the Community Rating System. The City fully enforces all provisions of state mandated laws.

#### 4D Watershed Stability

4D.1 Current Land Use - complete the following table:	% land cover in catchment area	Number of acres in catchment area
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Forest		
Agriculture		
High Density Residential	12.3	37
Low Density Residential		
Development		
Commercial or Industrial	87.7	265
Other		
Total	100	302

If **OTHER** was completed in Table 4D.1 above, please explain:

4D.2 Select the choice that most accurately describes the expected change in land use over the next 20 years:

High Density Residential anticipated to increase although majority will likely remain commercial/industrial

4E Consistency with DWR Basinwide Plan, Division of Mitigation Services Planning, other surface water state agency plans. If you are aware of any plans that mention the project area, please reference below.

Plan Title No. 1:

[Stream Corridor Reforestation project](#). No specific plan mentions this exact area; however, the reforestation goals proposed are consistent with the goals of NCDEQ for mitigation services and basinwide planning.



Mark any of the following that apply to the proposed project and the related state agency plan	
X	Project site work is explicitly mentioned as needed
	Project type is mentioned as beneficial to pristine or nutrient sensitive waters
	Generally, supports goals of the Basinwide Plan or other surface water state agency plan
	<input type="checkbox"/> No connection to surface water state agency plan

For the plan referenced above, provide the plan date; specific page reference to the proposed project; and explanation, quotation, or excerpt from the plan; and explain how the proposed project is strategically related to the referenced long-term or regional management plan.

From 2001-2003, the City of Greensboro implemented a Stream Corridor Reforestation project to reestablish riparian buffers along streams throughout Greensboro that were historically being mowed right down to the water's edge. More than 18,000 native trees were planted along 11 linear miles of urban streams in 34 different park or open space areas. The riparian buffers were established and qualify for enhancement level credit in accordance with the USACE & NCDEQ stream and wetland mitigation guidelines. Since 2003, the City of Greensboro has maintained the stream buffers using invasive species contractors, pruning limbs, and managing the buffers in accordance with the regulatory guidelines and to enhance community acceptance of the stream buffers.

Plan Title No. 2:	
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Mark any of the following that apply to the proposed project and the related state agency plan	
	Project site work is explicitly mentioned as needed
	Project type is mentioned as beneficial to pristine or nutrient sensitive waters
	Generally, supports goals of the Basinwide Plan or other surface water state agency plan
	<input type="checkbox"/> No connection to surface water state agency plan

For the plan referenced above, provide the plan date; specific page reference to the proposed project; and explanation, quotation, or excerpt from the plan; and explain how the proposed project is strategically related to the referenced long-term or regional management plan.

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Plan Title No. 3:	
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Mark any of the following that apply to the proposed project and the related state agency plan	
	Project site work is explicitly mentioned as needed
	<input type="checkbox"/> Project type is mentioned as beneficial to pristine or nutrient sensitive waters
	Generally, supports goals of the Basinwide Plan or other surface water state agency plan
	<input type="checkbox"/> No connection to surface water state agency plan

For the plan referenced above, provide the plan date; specific page reference to the proposed project; and explanation, quotation, or excerpt from the plan; and explain how the proposed project is strategically related to the referenced long-term or regional management plan.

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#### 4F Project Details and Objectives

4F.1 What type of project are you proposing? Mark all that apply

X	Stream Restoration	X	Stream Stabilization		Wetland Creation
	Stream Enhancement		Agriculture BMP		Other

<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

<input type="checkbox"/>
<input type="checkbox"/>

[illegible]

PROJECT TOTAL		2040

If needed, additional reaches and type of work may be listed below:

If "Stabilization" was completed in 4F.5 above, please provide a brief description of the proposed technique

Stream banks will be stabilized with native plantings, rock toe where necessary, invasive species removal, and debris removal. Because of the existing structures and proposed greenway location, stream channel dimension cannot be changed significantly, but stabilization of the existing banks and native vegetation will assist in maintaining the existing slope.

If "Other" was completed in 4F.5 above, please provide a brief description of the proposed technique

4F.6 Provide information concerning Rosgen Classification of Natural Rivers Stream Types as it applies to the stream(s) proposed to be restored

4F.6a. Rosgen Classification Stream Type(s) before restoration project (by stream reach, as appropriate)

Stream type C4

4F.6b. Rosgen Classification Stream Type(s) after restoration project (by stream reach, as appropriate)

Stream type C4 (no change)

4F.7 Describe how the following stream features will be modified (by stream reach, as appropriate)

#### 4F.7a. Dimension

The existing channel is over-wide. A low flow channel will be created and the banks will be laid back at a flatter slope where possible. In areas with lateral space, a bankfull bench can be added to provide floodplain access and varied vegetation.

#### 4F.7b. Pattern

The pattern of the stream will remain largely unchanged in all reaches, as it is constrained on both sides for the majority of the stream length by existing infrastructure and the proposed greenway. The stream will be enhanced and stabilized in its current location.

#### 4F.7c. Profile

Stream profile will be returned to a more natural profile with run, pool, glide, and riffle variability throughout the enhancement reaches (Reach 1 and Reach 3). This will be achieved by shaping the existing material; adding stream structures, such as step pools, vanes, and constructed riffles; and creating pools.

4F.8 Ecological lift – Complete fields after selecting Option 1 **OR** Option 2. Only one option will be scored.

**4F.8. OPTION A** - Predict Ecological Uplift through Sediment Load Transport Reduction - For projects with more than one project site, provide information for each project site.

4F.8A.1 Estimated annual sediment reduction (tons/year)

4F.8A.2 Calculations showing how the annual sediment reduction was determined. *It is also possible to upload the calculations as an attachment in the Grants Management System.*

4F.8A.3 Other pollutant reduction: Describe and provide calculations or other basis for determining other pollutant reductions. *It is also possible to upload the calculations as an attachment in the Grants Management System.*

**4F.8 OPTION B:** Predict Ecological Uplift through approved models. Estimate habitat uplift by determining the percentage of project length or area that is predicted to receive significant habitat improvement. Use a CWMTF approved assessment to determine existing habitat conditions as described in the Restoration Guidelines Document to determine the percent of the existing project that does not contain functioning habitat and the percentage that contains habitat of limited function. - For projects with more than one project site, provide information for each project site.

**4F.8B.1** Which ecological uplift model did you use? Were there any aspects of the model that you feel did not address predicted uplift?

NCSAM (stream assessment method) (KH). NCSAM was completed for the entire tributary to the confluence with North Buffalo Creek. NCSAM Reaches 3, 4 and 5 are proposed for enhancement or stabilization in this grant application. This model accurately represents the condition of the project stream, because it takes into account bank condition, access to floodplain, riparian habitat, and other stream feature conditions. See Figure 5 for the NCSAM reaches.

**4F.8B.2** Uplift data:

Reach name or number	Reach Length (ft)	Present Habitat Condition	Predicted post-project habitat condition
NCSAM Reach 3	690	Low	Medium or High
NCSAM Reach 4	995	Low	Medium or High
NCSAM Reach 5	360	Low	Medium or High

**NOTE:** Assessment model data and results must also be uploaded to the GMS system.

If needed, describe additional reaches and habitat condition below:

**4F.9** List deliverables/outputs to be completed for each task named below

**4F.9a. Design/construction documents/construction bids**

Construction drawings, specifications, and bid documents are completed and will be updated to include additional features.

**4F.9b. Permit preparation**

Wetlands and streams have been delineated, and a jurisdictional determination has been received. The USACE has permitted the project under a Nationwide 3 and 27 (maintenance and stream enhancement), and the DWQ Water Quality Certification has been received. Both permits would be modified for the additional stream enhancement and stabilization features and any educational or recreational features.

**4F.9c. Easement acquisition/preparation/recordation**

Temporary construction access and conservation easement acquisition are in process with the Railroad and property owners. As of November 2019, the City of Greensboro and Norfolk Southern Railway reached an agreement for working in this area.

**4F.9d. Construction**

Stream enhancement and stabilization, plantings, invasive species removal, and construction observation will be completed.

**4F.9e. Other**

Educational/community engagement tasks—such as coordination with students to create educational stream stations, free libraries, and living classrooms will be implemented.

## SECTION 5. OTHER PUBLIC ACCESS

☐

<b>5A</b> Provides Recreational Uses and Public Access
<input checked="" type="checkbox"/> Plan includes improvements to recreational uses related to water (e.g. fishing, boating) and the recreational uses would have public access
<input type="checkbox"/> No recreational component

<b>5B</b> Provides Public or Scientific Education
<input checked="" type="checkbox"/> Part of an organized educational effort open to public educational institutions. This effort would include active promotion by outreach, which could include a presence on the internet (e.g. website) and also signage, etc. at the project site
<input type="checkbox"/> No educational component

<b>5B.1</b> Briefly explain the educational efforts, if applicable.
<p>The City of Greensboro Parks &amp; Recreation has an established relationship with Guilford County Schools and encourages students to engage in passive recreation, environmental education and conservation efforts.</p> <p>The rich environmental education opportunities will include installing educational signage, showing watershed connections, providing information about the historic and geographic context of the region, identifying animal and plant communities of the greenway, and installing permanent, interactive environmental stations and living outdoor classroom laboratories.</p>

<b>5C</b> Provides Development of Riparian Greenway
<input checked="" type="checkbox"/> Will establish a greenway system or add to an existing greenway as part of this project
<input type="checkbox"/> No greenway to be developed

<b>5C.1</b> Briefly explain the development of the riparian greenway, if applicable.
<p>The stream stabilization portion of the project will allow the 1.5-mile Downtown Greenway construction to continue. In 2001, the Center City Master Plan identified the initial four-mile paved greenway loop as proposed by Action Greensboro. The completed greenway system will further enhance Greensboro's already nationally recognized Parks &amp; Recreation system and offer connectivity between an urban core and established suburbs trail network. Important connections and users of the trails include a dozen neighborhoods directly adjacent to the downtown area, five colleges and universities within 0.5 miles of the greenway, and more than 35,000 office workers downtown.</p> <p>The western side of the loop provided a special opportunity. The railroad line owned by Norfolk Southern operated for one commercial user and ran a train about once every three weeks. The College Branch stream ran along the tracks, weaving across and under it in several locations. The stream is degraded, filled with trash, and relatively unknown except to the homeless populations that frequented the area.</p> <p>The City of Greensboro 2006 BiPed Plan identified the Downtown Greenway as the central hub of the entire trails system, providing connections to in-town neighborhoods as well as surrounding neighborhoods and communities. The Downtown Greenway was unanimously adopted as a City 200th birthday signature project, followed by the Greensboro City Council</p>

adopting a resolution of support for the project in February 2007.

Action Greensboro has worked to raise seed funding, leverage public support, and obtain bond support all dedicated to the creation of the Downtown Greenway. The initial groundbreaking occurred in 2009, and the first section opened in 2010. Design and construction have continued over the subsequent years. Currently, 1.5 miles are open and another 1.5 miles are slated for construction. All greenway design work is completed.

The design of the railroad corridor section has been a collaborative effort through many broad-based community meetings, stakeholder meetings along the corridor, and input from skilled designers with a focus on the stream restoration and enhancement aspects of the project. As of November 2019, the agreement with the City of Greensboro and Norfolk Southern Railway was completed thus allowing the greenway construction to commence. Completion of the four-mile loop is anticipated to be by the end of 2021.

5E Project Maintenance: Please provide the name of the organization that will inspect the project site and conduct maintenance and repair features as needed.

City of Greensboro

5F Water Quality Monitoring: If water quality monitoring is proposed as a matching contribution, please describe who would conduct the monitoring, what parameters would be monitored, what methods would be used, and a timetable for the monitoring.

Dr. Sarah Praskievicz will conduct the monitoring with her students in GES328: The Water Planet, to be taught in the fall semester at least every other year. The parameters monitored will be temperature, conductivity, dissolved oxygen, pH, and ORP (using Dr. Praskievicz's YSI Professional Plus ion-selective electrode meter) and suspended-sediment concentrations (using the gravimetric method in Dr. Praskievicz's lab).

#### Monitoring Timetable

August-November 2019: Baseline assessment (complete)

January 2021: Stream stabilization/enhancement project begins

December 2022: Stream stabilization/enhancement project completed

August-November 2023: Post-project data collection period 1 (Fall 2023)

August-November 2025: Post-project data collection period 2 (Fall 2025)

August-November 2027: Post-project data collection period 4 (Fall 2027)

## SECTION 6. LONG TERM AGREEMENTS

6A Provide the name of the proposed holder of the conservation easement.

City of Greensboro

6B Schedule of Property Interest

The Schedule of Property Interest table is part of the project budget, which must be completed using the online Grants Management System.

7A Plan and Design Status *Attach documents if applicable*

## SECTION 7. READINESS AT THE DATE OF THE PROJECT APPLICATION

7B Grant Withdrawal *Pursuant to N.C.G.S. 143B-135.238(f), if the project includes construction, this grant award shall be withdrawn if the grant recipient fails to enter into a construction contract for the project within one year after the award date.*

- ☒ YES, applicant commits to entering into a construction contract within one year of the award date  
☐ NO, applicant cannot commit to entering into a construction contract within one year of award date

## SECTION 8. BUDGET

The Project Budget shall be completed using the online Grants Management System (GMS). Please log on at [www.ebs.nc.gov](http://www.ebs.nc.gov) and select New Application from the Home Page. Detailed guidance for completing the project budget can be found in the [CWMTF Stream Restoration Application Questions and Guidelines](#)

8A Identify any costs to be incurred before CWMTF grant award decisions for which you would request approval of matching funds.

Kimley-Horn is under contract with the City of Greensboro to complete the stream enhancement study and design for approximately \$96,840. The stream work proposed in this grant application accounts for 55% of the stream length, therefore \$53,770 is requested to be approved as matching funds.

Kimley-Horn, under the same contract with the City of Greensboro, hired a subcontractor to complete the 404/401 and erosion control permit applications for the entire greenway project for \$48,000. Approximately 30% of the permitted length accounts for the stream work proposed in this grant application; therefore \$14,680 is requested to be approved as matching funds.

## SECTION 9. ATTACHMENTS

You are required to upload application attachments using the on-line Grants Management System. Once you have completed this application form and assembled all other required documents, use the on-line GMS to complete the project budget and upload application attachments. Attachments should be uploaded as individual documents with a description using the following naming convention: Project Name\_type of document (e.g. Smith Creek\_Application Form). Project name on the description should match the project name in Section 1 of this application.

Application Form

Location Map

Property Map

Letter of Intent (if applicable)

Survey Map (if applicable)

☐ By checking this box, I affirm that the information in this application and the statements and attached exhibits are true, correct, and complete to the best of my knowledge and belief. I further confirm that I am authorized by my governing board to submit an application and enter into any grant contract that may result from the application.