North Carolina Clean Water Management Trust Fund

Grant Contract Final Report Form (innovative stormwater project)

This report must be submitted by the date given under Schedule in Exhibit A in order for CWMTF to release final payment.

CWMTF project no.: **2014-1001**
Contract expiration date: **August 31st, 2019** Date prepared: August 30, 2019
Project name/description: **In-Stream Wetlands Project, Little River Watershed**

Grant Recipient: **Albemarle Resource Conservation & Development Council**
Primary contact: **Mark Powell, Project Management Consultant**
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Submit progress report to:
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CWMTF
1651 Mail Service Center
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Status of project deliverables and outputs:

Deliverable or output item	Status at project's completion	Date completed
Design plans, specs, and permits*	The Stormwater BMP Operation and Maintenance Plan and the Declaration of Conditions for Stormwater Purposes for Harris Sites LLC were fully executed on 1/18/16 by all parties. These documents were submitted with the 2nd Quarterly Report. USACE representative confirmed that the landowner agreement with Pasquotank Soil and Water Conservation District to maintain the wetland for 10 years was sufficient documentation for the project. No permits were required. Design plans were finalized in February 2016, and two contractors were selected in March, 2016. The bid packet with wetland designs was included with the 2nd Quarterly Report. Design plans for Phase II wetland extension were included in the 4th Quarterly Report. Design plans for Phase III wetland extension were included in the 5th Quarterly Report.	1/26/16 5/30/16 8/30/16
Constructed project	Phase I wetland construction (2,000 ft) started on March 14, 2016 and was completed on 3/31/16. Water management improvements were initiated on 3/21/16 and completed on 4/1/16. Phase II wetland extension (800 ft) was completed 5/30/16. Maps of Phases I and II with geographic coordinates were included in the 3rd Quarterly Report. The Declaration of Conditions for Stormwater Purposes Amendment One was signed 5/19/16 and included in the 3rd Quarterly Report.	4/1/16 Phase I 5/30/16 Phase II 8/30/16 Phase III

	Phase III wetland extension (2,100 ft) was completed 8/13/16. Maps of Phases I, II and III with geographic coordinates were included in the 5th Quarterly Report. The Declaration of Conditions for Stormwater Purposes Amendment Two was signed 8/2/16 and included in the 5th Quarterly Report. Nine acres of in-stream wetlands and buffers were constructed during the three phases. A map of the project areas is included with this final report.	
Project final report*	Presented in this final report form with attachments.	August 30, 2019
Outreach and workshop materials*	Consultant Powell presented a case study (copy in 4th Quarterly Report) at a watershed planning workshop in Kinston, NC on June 16th. The Tools of Watershed Management Workshop was sponsored by UNC-Chapel Hill's Institute for the Environment in partnership with the NC Watershed Stewardship Network. Watershed signage created and installed. Photos were included in the 7th Quarterly Report. A field day was held April 26th for 26 conservation professionals and farmers. Dwane Hinson gave an overview of the Little River watershed and the EPA 319 and CWMTF-USFWS in-stream wetland projects before heading to the field. Mike Burchell of NCSU provided information on water quality monitoring. The participant list, handouts, wetland signage, and photos were included in the 8th Quarterly Report. NCSU provided a monitoring report covering Fall 2016 to Spring 2017, which was included with the 9th Quarterly Report. NCSU provided a Total P report, which was included in the 10th Quarterly Report. The ARC&D developed a two page fact sheet for the Little River Watershed including the in-stream wetland projects for its website and public distribution. The fact sheet was include in the 10th Quarterly Report and has been recently updated. Dr. Mike Burchell, Associate Professor and Brock Kamrath, MS student in the NCSU Department of Biological and Agricultural Engineering presented preliminary water quality monitoring results from the EPA 319 and CWMTF in-stream wetland projects at the WRRI conference in March 2018. The ARC&D organized a field day at the in-stream wetland during a Green Expo event in March 2018. Consultant Powell and Dwane Hinson spoke to 78 participants from around the	6/16/16 12/5/16 4/30/17 10/20/17 March 2018 July 2018 8/25/18 January 2019 May-August 2019

	state about the importance of the in-stream wetlands to restoration activities in the Little River watershed. Consultant Powell gave a presentation on 8/25/18 on the regional partnership to protect water quality including the CWMTF in-stream wetland in the Little River watershed. Sixty people attended the Saturday event in Edenton. The PowerPoint presentation was included with the 13th Quarterly Report. In July 2018, residents of the Little River watershed collected the first set of water samples from 7 locations on the Little River and sent the samples to the NCDA lab for analysis. They collected samples once per month through November 2018. The sampling strategy is helping determine where P and organic N are entering the river. The monitoring plan and first sample results were included in the 13th Quarterly Report. In January 2019, Dr. Michael Burchell, Associate Professor and Extension Specialist, NCSU Department of Biological and Agricultural Engineering gave a presentation *Drainage Canal Strategies to Protect Water Resources in Agricultural Watersheds* to the N.C. Association of Soil and Water Conservation Districts, Research and Technology Committee Meeting in Raleigh, N.C. His presentation highlighted work on the EPA 319 and CWMTF funded in-stream wetland projects in the Little River Watershed. In 2019, residents of the Little River watershed have collected two sets of water samples from 6 locations on the Little River and sent the samples to the NCDA lab for analysis. The sampling strategy may help determine where P and N are entering the river. New locations include tributaries Halls Creek, Deep Creek and Symonds Creek. Samples collected at all locations are showing high P levels, but in particular in Symonds Creek, which flows into Dances Bay. The group will collect monthly water samples through October.	

* Indicates items to be submitted to CWMTF, per the grant contract.

a. Project summary and evaluation:

Project's original objectives, any changes, and explanation for changes:

This innovative stormwater management project was in the headwaters of the Little River watershed, which encompasses eastern Perquimans County and western Pasquotank County, and extends from remnants of the Great Dismal Swamp in the north to the Albemarle Sound in the south. The in-stream wetlands were constructed along a major canal that drains approximately 6,000 acres of agricultural land.

The purpose of the project was to help restore the health and integrity of the Little River watershed.

The goals of the project were:

- Develop and demonstrate a practical and effective stormwater system for improving water quality.
- Develop an effective water quality monitoring program to measure project impacts.
- Develop practical and useful communication tools for public outreach and education.
- Create a practical framework for restoring similar watersheds in eastern North Carolina.

The original objectives and goals of the project were mostly met. Monitoring water quality was challenging due to the quantity of water that flows through in-stream wetland. Hurricane Matthew and other strong storms delayed the establishment of wetland plants. NCSU's water quality monitoring report is attached to this final report.

Project's original scope of work, any changes, and explanation for changes:

The Scope of Work of the project was:

1. *Construction*: Construct approximately six acres of in-stream wetlands on a main drainage canal in agricultural lands.
2. *Easement agreements*: Easement agreements signed with farmers at the beginning of the project, which will stipulate that farmers will be responsible for the Operation and Maintenance of the in-stream wetlands, and that access will be allowed for monitoring, evaluation and demonstration activities. The Pasquotank Soil and Water Conservation District will hold and monitor the easement agreements.
3. *Monitoring*: Pre and post construction monitoring provided to evaluate the effectiveness of the project.
4. *Dissemination of Information about the Results*:
    a. Monitoring data summarized and presented in practical formats for the public on the Albemarle RC&D Council's web site, and through local, regional, state and national Soil and Water Conservation offices and university networks including NCSU.
    b. Field days will be held in the second year for farmers and conservation professionals to demonstrate the function and benefits of in-stream wetlands for effectively managing stormwater and protecting water quality at the watershed level.
    c. Extension materials and research results shared through local, regional and state Soil and Water Conservation offices and university networks including NCSU.

The items in the Scope of Work were met or exceeded. Money saved by working with local and known contractors on the original 2,000 ft in-stream wetland allowed the project to extend the wetland to the north and south, and ultimately construct 9 acres of in-stream wetland with buffers.

Any changes to the project budget and explanation for changes:

There were no changes to the project budget.

Work accomplished on the project:

Most of the canals that flow into the Little River are on private lands, and constructing in-stream wetlands along these canals is critical for effectively managing stormwater in the watershed. In 2016, the ARCD, Pasquotank County, and Pasquotank SWCD used this grant from the CWMTF and a

matching grant from the USFWS to construct 4,800 ft. of instream wetland on the Steve Harris farm in the upper part of the watershed. At the same time, the ARCD, Perquimans County, and Perquimans SWCD used this EPA 319 grant to construct 2,000 ft. of in-stream wetland on the Wade Boyce farm, which is just above the impaired section of the Little River. A second EPA 319-funded in-stream wetland was constructed in 2018 along 2,000 ft. of privately-owned canal that drains approximately 3,200 acres of agricultural land and solar farm on the Pasquotank County side of the watershed.

The 4,800 ft. in-stream wetland on the Harris farm filters nutrients and sediment from a 6,000-acre watershed with a direct outlet to the Little River. Design and construction included the following components:

- Reconfigured and improved the canal channel
- Stabilized the side banks
- Stabilized lateral ditches draining to the in-stream wetland
- Installed water control structures on lateral ditches to allow better water management
- Installed two new pipes at the head of the wetland to improve water flow
- Planted native wetland plants to filter nutrients and sediment
- Established a 50 ft. grass buffer on the cropland side of the in-stream wetland.
- Enrichment planted cypress in 4 acres of wetland adjacent to the in-stream wetland

The construction designs and specifications were included in the 2nd Quarterly Report. The in-stream wetland has helped stabilize the watershed drainage system and make it more resilient to major storm events, such as Hurricane Matthew in late 2016.

These in-stream wetland projects are creating a critical mass of Best Management Practices (BMPs), which are needed to effectively manage stormwater above and along the impaired section of the Little River. The projects also demonstrate how the same stormwater system may be used on privately-owned canals throughout the watershed that flow into the Little River. The impact of agriculture on water quality of the Little River watershed is typical to watersheds in eastern NC, and the in-stream wetland system could be replicated throughout the region.

In-stream wetlands are one component of improving farm water management.
The project developed a model for working with private landowners to construct in-stream wetlands on main agricultural drainage canals in the Little River watershed. The landowner on this project, Steve Harris, was concerned about how much cropland he was going to have to set aside for the project including the in-stream wetland and buffer. The project design included improvements to drainage and water management on his adjacent cropland, which helped show him that he was going to get better crop production even though he had to give up some cropland for the project. The instream wetland became an integral component of his overall effort to improve drainage and water management on his cropland.

Straightforward conservation agreement. The project helped develop a model conservation agreement that does not overburden landowners with technical and legal language, but that does provide enough structure to ensure the terms of agreement are legally binding. The agreement, between Steve Harris and the Pasquotank SWCD, includes a 10-year conservation period for the wetland and buffer. The SWCD manages the conservation agreement and the project is included it in its Spot Check program. The same conservation agreement was used on two other in-stream wetland projects in the Little River watershed. The signed conservation agreement and two amendments between Pasquotank SWCD and Steve Harris were included in the 2nd, 3rd and 5th Quarterly Reports.

Increased public awareness for conservation professionals and the general public. The project held a field day April 26th, 2017 for 26 conservation professionals and farmers. Dwane Hinson gave an overview of the Little River watershed and the EPA 319 and CWMTF in-stream wetland projects before heading to the field. Stops included the instream wetland on the Wade Boyce farm, and the CWMTF in-stream wetland on the Steve Harris farm. Mike Burchell of NCSU provided information on water quality monitoring. Information on the field day was included in the 7th project report.

Dr. Mike Burchell and Brock Kamrath, MS student in the NCSU Department of Biological and Agricultural Engineering presented preliminary water quality monitoring results from the Boyce and Harris in-stream wetlands at the WRRI conference in March 2018.

The ARC&D worked with volunteers in the Green $aves Green group to organize the first Green $aves Green Expo at the Museum of the Albemarle in Elizabeth City in March, 2018. Approximately 1,600 people attended the event with 60 sponsors and vendors. Mark Powell had a table with information about the EPA 319 and CWMTF in-stream wetland projects, and the partnership to protect and improve water quality in the Little River watershed. Three van tours carried 80 people to see the Amazon Wind Farm, and the in-stream wetland projects in the watershed. Mark Powell gave each tour group a summary of how the in-stream wetlands are helping protect and improve water quality in the watershed. Participants had many questions about how poor water quality is related to the algal blooms that have returned to Albemarle waters after an absence of 30-35 years. The extensive and persistent algal blooms in the Little River and Dance's Bay in 2017 were the first blooms that long-time residents had ever experienced.

Increased public awareness of water quality issues in the Little River watershed, including the link to algal blooms, helped stimulate a group of local residents to begin a citizen scientist initiative to monitor water quality. In the summer of 2018, the citizen scientists collected monthly water samples from seven locations on the Little River from the top of the watershed to Dance's Bay in the lower part of the watershed. The group sent the samples to the NCDA lab for analysis of Organic N and Total P, which per DEQ data collected at its river monitoring station on old US17, have been increasing over the past 20 and 35 years, respectively. The objective of this work is to help identify where these nutrients are coming into the river, and then work back to help identify and address the sources. This work was funded through the CWMTF/USFWS in-stream wetland project. A detailed description of the Little River monitoring plan was included in the 13th project report.

Developed strong local partnerships and support for watershed projects. The project developed strong partnerships with Pasquotank and Perquimans county managers and commissioners, and SWCD supervisors. Dwane Hinson and Mark Powell provided regular updates on the in-stream wetland project in particular, and water quality issues in the Little River watershed, in general. As a result, the counties have increased money each year for water quality activities in the watershed.

Strong partnerships also were developed with progressive farmers Steve Harris on this project, and Wade Boyce on the EPA 319 funded in-stream wetland project. As a result of these projects, Nina Needham, a landowner on the Pasquotank side of the Little River, contacted Dwane Hinson about constructing an in-stream wetland on a main drainage canal on a property that was previously used to graze cattle. A 2,000 ft. in-stream wetland was constructed in 2018 with funding from EPA 319 and matching funds from the Pasquotank SWCD.

This project also helped re-established the ARC&D, SWCD and NCSU partnership that collaborated for many years on stormwater wetland projects in northeast N.C., including the Town of Edenton's

EPA-funded wetland on Filbert's Creek, and the CWMTF-funded wetlands at Edenton airport, Chowan Golf Club, and Guinea Mill in Currituck County.

On August 25th, 2018 Mark Powell gave a presentation to sixty people in Edenton on the regional partnership to protect and improve water quality including the effort to identify the causes of the algal blooms that have returned to Albemarle waters after an absence of 30-35 years. The presentation also included a description of regional stormwater management projects including the CWMTF and EPA funded in-stream wetland projects in the Little River watershed. The PowerPoint presentation was included in the 12th project report.

Lessons learned during the project/would do differently next time:

Substantial planning is required from project concept to construction. In-stream wetland projects on private lands require substantial planning and meetings with landowners. The **first step** is to identify a drainage canal with potential to construct an in-stream wetland. The **second step** is to talk with the landowner about developing such a project. If the landowner is receptive, then the **third step** is to conduct field work to determine the scale and cost of the project. This includes determining the project's construction footprint, activities, and buffer areas. This information is then presented to the landowner for review and comments. Changes may be made to the design based on feedback from the landowner. If the landowner wishes to proceed with the project, the **fourth step** is to look for grant opportunities and matching funds. Substantial ARC&D and SWCD staff time is required to move a project from concept to design and construction.

In-stream wetland projects are a component of whole-farm water management. Landowners are naturally concerned about how much cropland they will have to give up to construct an in-stream wetland. This was the case with Steve Harris. Dwane Hinson designed his in-stream wetland to improve water quality, and at the same time, to improve drainage and water management on the adjacent cropland. Harris was more receptive to the project, and less concerned about giving up cropland, when he saw that he would be able to help increase crop production by improving drainage and water management, and decreasing soil erosion. This same process was used with Wade Boyce and Nina Needham on their EPA 319-funded in-stream wetland projects.

Water quality improvement should be implemented at a watershed scale.
Most of the canals that flow into the Little River are on private lands, and constructing in-stream wetlands along these privately owned canals is critical for effectively managing stormwater in the watershed. The Steve Harris, Wade Boyce, and Nina Needham in-stream wetlands are creating a critical mass of BMPs, which are needed to effectively manage stormwater above and along the impaired section of the Little River. The projects also demonstrate how the same stormwater system may be used on privately-owned canals that flow into the Little River throughout the watershed. The impact of agriculture on water quality of the Little River watershed is typical to watersheds in eastern NC, and the in-stream wetland system could be replicated throughout the region.

The nine-element restoration plan for the Little River watershed also identified the conservation of swamp forest buffers as a key activity for improving and protecting water quality. Swamp forests in the watershed are critical for storing and filtering stormwater, and providing key habitat for fish and wildlife. These forests are slow growing and there is a lack of information on how recent, large clearcuts of swamp forests with little or no buffers are impacting water temperature and nutrient release into the Little River. In 2016, the ARC&D, Perquimans and Pasquotank SWCD, and Perquimans and Pasquotank county managers and commissioners worked together to develop a program whereby landowners may enroll a minimum 300 ft. buffer of swamp forest in a voluntary

conservation agreement. In exchange, landowners receive a grant incentive based on the tax value of the enrolled acreage. Wade Boyce was able to enroll 20 acres of swamp forest in the conservation program. Steve Harris did not own swamp forest buffers in the watershed.

Water quality monitoring should be longer than two years to effectively measure the impact of in-stream wetlands. Brock Kamrath monitored wetland performance for approximately 18 months for his MS thesis, and a summary of his research is attached to this report.

Many wetland plants planted in May 2016 were washed away by Hurricane Matthew. The wetland was enrichment planted in the spring of 2017, 2018 and 2019. Under normal circumstances, the wetland plants should have been well established by the summer of 2017. However, good stocking of wetland plants was not achieved until the spring of 2019. The delay in establishment of wetland plants limited NCSU's time frame for measuring water quality improvements during a period when the wetland had optimal stocking of wetland plants. As a result, caution should be used when interpreting the water quality performance of the wetland based on Brock's study. A longer period of monitoring is needed--four to five years--to effectively measure the water quality performance of this instream wetland under natural conditions.

Comparison of the EPA 319 In-stream Wetland with the CWMTF In-Stream Wetland
The EPA 319 project area has more change in elevation than the CWMTF project area, and drains a much smaller watershed -- 600 acres vs 6,000 acres. This allowed the incorporation of small rock structures in the design to hold water at different elevations to support wetland plants. This design did not back up water and cause drainage issues on the farms above the project area. The bottom elevation of the canal on the CWMTF project was above some bottom elevations of the canal above the project area and installing rock structures would have backed up water and caused drainage issues with upstream farmers. Thus the design with wetland benches at stormwater elevation to filter nutrients and sediment coming from upstream, and from lateral ditches coming from adjacent farmland. Improving drainage is a key requirement for getting these types of projects on the ground.

The EPA 319 in-stream wetland was able to include 50 ft buffers on both sides of the in-stream wetland, whereas the CWMTF in-stream wetland was able to include a 50 ft buffer only on the cropland side of the canal due to the existing road on the other side of the canal.

The CWMTF project incorporated new methods for integrating field drainage with the main drainage system. Vegetated benches move stormwater from field ditches to the main drainage canal, thus providing additional treatment areas. These methods can be utilized anywhere field drainage systems enter a main drainage canal in the Albemarle - Pamlico area.

b. Describe and discuss water quality benefits achieved or to be achieved because of the project:

The NCSU monitoring report details the setup and results of a pilot study conducted to determine the treatment efficiencies of a one-sided two-stage ditch built into an existing canal network. The overall goal of the study was to evaluate the ability of ditch modifications to remediate the negative effects of surface and subsurface drainage systems with respect to nutrient and sediment pollution.

Objectives of this study included:

- Monitor the initial performance of the linear wetland with respect to nutrient and sediment removal
- Analysis of water quality data to determine the influent, midpoint, and effluent nitrate (NO3-N), ammonium (NH4-N), organic nitrogen (ON), total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS) concentrations.
- Evaluate the water quality benefit of the linear wetland systems in initial stages of development.

Study Conclusions

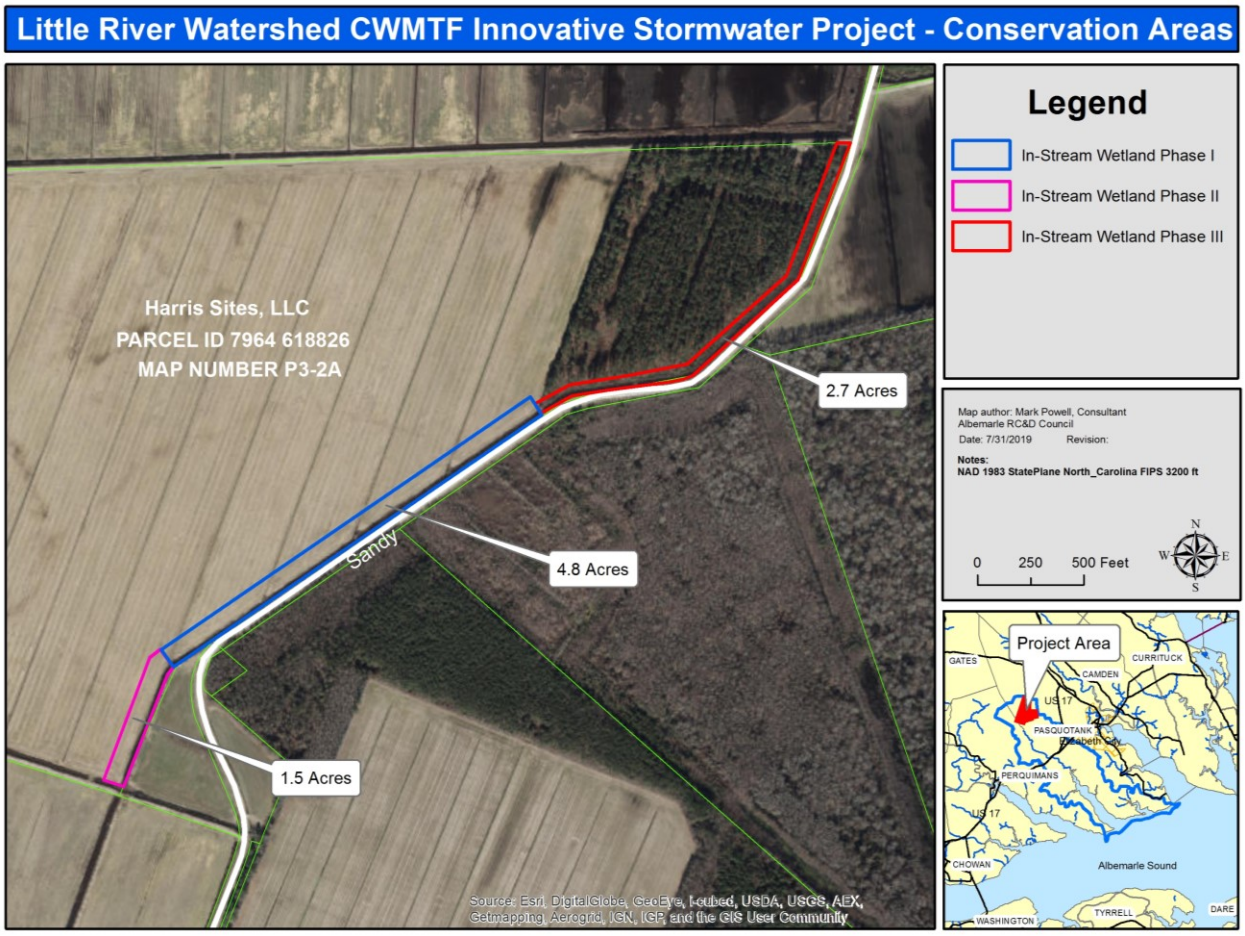
- The results indicate only minor concentration changes occurred within the treatment section of the canal for each pollutant parameter. TSS reduction appeared to be the highest among pollutants evaluated.
- The two-stage ditch/vegetated shelf design implemented was limited by small retention time, small treatment surface area relative to the watershed, and elevation within the ditch that allowed frequent flooding and scour of the vegetation.
- This study should not discourage the use of vegetated ditches, shelves, or two-stage ditches. However, more time needs to be spent to determine proper sizing relative to the influent flows and determining strategic locations in the watershed.
- Future sites could be designed and funded to allow for more intense and effective experimental monitoring, ideally after the practices become established, to better determine treatment potential of these practices.

NCSU's final report is attached.

While the study's results indicate only minor concentration changes occurred within the treatment section of the canal for each pollutant parameter, TSS reduction appeared to be the highest among pollutants evaluated. The reduction in TSS could be important considering that the impairment for the Little River is chlorophyll *a*.

As noted in the previous report section, caution should be used when interpreting the water quality performance of the wetland based on NCSU's study. A longer period of monitoring is needed--four to five years--to effectively measure the water quality performance of this instream wetland under natural conditions.

c. Provide a map showing the Project Site and no larger than 11”x17”.



A PDF version of the project site map is attached to this final report.

d. Provide a geo-referenced shapefile (includes a .prj file) of the easement area boundary. Where multiple deeds of easement are recorded, include a separate polygon for each easement area. For accuracy, the shapefile should be derived from a survey of the easement area. If the easement area is not surveyed, the easement area boundary may be derived from mapping software (e.g., digitized in ArcMap).

Shapefiles are attached to this final report.

e. Provide project reports, plans, photographs, or other documents that verify the project's completion (attach or reference items already provided to CWMTF):

Project reports were submitted for quarters 1-16. Project photos were included in reports 3,5,6,7,8,9,10,11,12, and 16. Following is a list of key documents included with quarterly reports.

- The Stormwater BMP Operation and Maintenance Plan and the Declaration of Conditions for Stormwater Purposes for Harris Sites LLC were submitted with the 2nd Quarterly Report.
- Design plans were included with the 2nd Quarterly Report.
- Harris Sites LLC P3-2A – $2,313 / Acre Cropland Market Value included in the 3rd Quarterly Report.
- Design plans for Phase II wetland extension were included in the 4th Quarterly Report.
- Watershed workshop case study presentation included in the 4th Quarterly Report.
- The Declaration of Conditions for Stormwater Purposes Amendment One was included in the 4th Quarterly Report.
- Design plans for Phase III wetland extension were included in the 5th Quarterly Report.
- The Declaration of Conditions for Stormwater Purposes Amendment Two was included in the 5th Quarterly Report.
- Harris Sites LLC P3-2A – $2,283 / Acre Forestland Market Value included in the 5th Quarterly Report.
- Field day participant list, handouts, wetland signage, and photos were included in the 8th Quarterly Report.
- NCSU monitoring report covering Fall 2016 to Spring 2017 was included in the 9th Quarterly Report.
- NCSU provided a Total P report, which was included in the 10th Quarterly Report.
- ARC&D two page fact sheet for the Little River Watershed including the in-stream wetland projects was include in the 10th Quarterly Report.
- Presentation on regional partnership to protect water quality including the CWMTF in-stream wetland in the Little River watershed was included with the 13th Quarterly Report.
- Little River citizen water quality monitoring plan and first sample results were included in the 13th Quarterly Report.
- NCSU's final water quality monitoring report is included with this final project report.

f. Describe participation in the project by local partners or stakeholders (funding, in-kind contributions, and/or other):

A nine-element watershed restoration plan, completed in 2014 through a 205j grant to the Albemarle Commission, identified in-stream wetlands and conservation of swamp forest buffers as key activities for restoring water quality of the Little River. Most of the canals that flow into the Little River are on private lands, and constructing in-stream wetlands along these privately-owned canals is critical for effectively managing stormwater in the watershed. In 2016, the ARCD, Pasquotank County, and Pasquotank SWCD used this grant from the CWMTF and a matching $25,000 grant from the US Fish and Wildlife Service (USFWS) to construct the 4,800 ft. of instream wetland on the Steve Harris farm in the upper part of the watershed that drains 6,000 acres of farmland and the Amazon wind farm. At the same time, the ARCD, Perquimans County, and Perquimans SWCD used an EPA 319 grant to construct 2,000 ft. of in-stream wetland in a privately-owned farm canal that drains 600 acres of farmland just above the impaired section of the Little River. In 2018, a second EPA 319 grant was used to construct 2,000 ft. of in-stream wetland in a privately-owned farm canal that drains approximately 3,200 acres of farmland and solar farms on the Pasquotank County side of the watershed.

Grants received to date for restoration of the Little River Watershed include:
2013, 205j Nine Element Watershed Restoration Plan - $25,300
2015, CWMTF - $141,878; Match - $100,000
2015, USFWS Partners for Fish and Wildlife - $25,000
2015, EPA 319 - $85,598; Match - $222,967
2018, EPA 319 - $116,736; Match - $79,600
TOTAL Grants and Match - $ 797,079

As mentioned in the accomplishments report section, the project developed strong partnerships with Pasquotank and Perquimans county managers and commissioners, and SWCD supervisors. Dwane Hinson and Mark Powell provided regular updates on the in-stream wetland project in particular, and water quality issues in the Little River watershed, in general. As a result, the counties have increased money each year for water quality activities in the watershed.

Pasquotank County Soil and Water contributed the time of Technician Dwane Hinson to design the in-stream wetland, and to supervise construction activities. Pasquotank County provided in-kind match to spray alligator weed in the project area, and to clean woody debris from the Little River and its tributaries after Hurricane Matthew.

Strong partnerships also were developed with progressive farmers Steve Harris on this project, and Wade Boyce on the EPA 319 funded in-stream wetland project. As a result of these projects, Nina Needham, a landowner on the Pasquotank side of the Little River, contacted Dwane Hinson about constructing an in-stream wetland on a main drainage canal on a property that was previously used to graze cattle. A 2,000 ft. in-stream wetland was constructed in 2018 with funding from EPA 319 and matching funds from the Pasquotank SWCD.

This project also helped re-established the ARC&D, SWCD and NCSU partnership that collaborated for many years on stormwater wetland projects in northeast N.C., including the Town of Edenton's EPA-funded wetland on Filbert's Creek, and the CWMTF-funded wetlands at Edenton airport, Chowan Golf Club, and Guinea Mill in Currituck County.

Increased public awareness of water quality issues in the Little River watershed, including the link to algal blooms, helped stimulate a group of local residents to begin a citizen scientist initiative to monitor water quality. With seed money from the CWMTF and USFWS, citizen scientists with the Green $aves Green group collected monthly water samples in the summer of 2018 from seven locations on the Little River from the top of the watershed to Dance's Bay in the lower part of the watershed. The group sent the samples to the NCDA lab for analysis of Organic N and Total P, which per DEQ data collected at its river monitoring station on old US17, have been increasing over the past 20 and 35 years, respectively. The objective of this work is to help identify where these nutrients are coming into the river, and then work back to help identify and address the sources. The same group is monitoring water quality in 2019 at nine locations on the Little River and other creeks with financial support from Pasquotank County and Pasquotank Soil and Water.

g. Provide an Engineer's Certification of Completion (attach if applicable):
Not applicable.

_____ August 30, 2019

Signature Date