



DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

July 12, 2019

Regulatory Division

Re: NCIRT Review and USACE Approval of the Catfish Pond Mitigation Plan; SAW-2018-00424;
NCDMS Project # 100039

Mr. Tim Baumgartner
North Carolina Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

Dear Mr. Baumgartner:

The purpose of this letter is to provide the North Carolina Division of Mitigation Services (NCDMS) with all comments generated by the North Carolina Interagency Review Team (NCIRT) during the 30-day comment period for the Catfish Pond Mitigation Plan, which closed on June 12, 2019. These comments are attached for your review.

Based on our review of these comments, we have determined that no major concerns have been identified with the Draft Mitigation Plan, which is considered approved with this correspondence. However, several minor issues were identified, as described in the attached comment memo, which must be addressed in the Final Mitigation Plan.

The Final Mitigation Plan is to be submitted with the Preconstruction Notification (PCN) Application for Nationwide permit approval of the project along with a copy of this letter. Issues identified above must be addressed in the Final Mitigation Plan. All changes made to the Final Mitigation Plan should be summarized in an errata sheet included at the beginning of the document. If it is determined that the project does not require a Department of the Army permit, you must still provide a copy of the Final Mitigation Plan, along with a copy of this letter, to the appropriate USACE field office at least 30 days in advance of beginning construction of the project. Please note that this approval does not preclude the inclusion of permit conditions in the permit authorization for the project, particularly if issues mentioned above are not satisfactorily addressed. Additionally, this letter provides initial approval for the Mitigation Plan, but this does not guarantee that the project will generate the requested amount of mitigation credit. As you are aware, unforeseen issues may arise during construction or monitoring of the project that may require maintenance or reconstruction that may lead to reduced credit.

Thank you for your prompt attention to this matter, and if you have any questions regarding this letter, the mitigation plan review process, or the requirements of the Mitigation Rule, please call me at 919-554-4884, ext 60.

Sincerely,

Kim Browning
Mitigation Project Manager
for Henry Wicker

Enclosures

Electronic Copies Furnished:

NCIRT Distribution List
Jeff Schaffer – NCDMS
Shawn Wilkerson—WEI



July 25, 2019

Ms. Kimberly Browning
Mitigation Project Manager
U.S. Army Corps of Engineers
11405 Falls of the Neuse Road
Wake Forest, NC 27857

RE: Response to IRT comments on Draft Final Mitigation Plan Submittal
Catfish Pond Mitigation Site, Durham County, NC
Neuse River Basin - 03020201
DMS Project ID No. 100039 / DEQ Contract #007424

Dear Ms. Browning,

Wildlands received comments from you dated June 26, 2019 on the Catfish Pond draft final mitigation plan submitted on May 13, 2019. The comments were constructive and will improve the mitigation plan. This letter provides our responses to those comments. Edits have been made to the final mitigation plan.

Catfish Pond Mitigation Plan Comments

Mac Haupt, NCWR:

1. *DWR would prefer the PJD/JD be complete by the draft Mitigation Plan review stage, however, we realize sometimes the PJD does not get finalized until the permit review stage. If this is the case, the applicant must realize further changes may be recommended to the Mitigation Plan at this late stage, and until said changes are documented, the permit review cannot proceed.*

DMS is following the guidance provided by the USACE, and agreed to by DWR, that an email from the USACE PM stating that they concur with a delineation is an acceptable alternative to getting an official PJD/JD. Per Todd Tugwell's 3/21/2019 email, the IRT will, for the purposes of banks and ILF sites, treat an email from the PM stating that they concur with a JD map just the same as an officially issued JD. Please see Appendix 2 for the listed correspondence.

2. *Section 6.3 – the text refers to “small wetland features along most of Catfish Pond stream”, DWR believes that the wetland on site make up a rather significant portion of the total easement (16%).*

Changed this sentence to: “Small wetland features are present along most of the Catfish Pond project streams, except for UT1 which has more extensive wetlands along it (see Section 3.4 – Project Resources).”

3. *Section 8.4.5 – While a lower design discharge may have been utilized for the channels adjacent to the wetlands on Reach UT1, DWR will still require the installation of several gages along this reach to document maintenance of wetland hydrology and increased overbank flooding.*

OK.

4. *Table 16 – please revise the table to incorporate wetland monitoring gauges. In addition, DWR recommends these gages be downloaded at least quarterly.*

Groundwater gages were added to Table 16 and will be downloaded quarterly.

5. *Table 18 – Project Asset Table – During the site visit there were discussions of appropriate enhancement ratio of several tributaries, namely; Catfish R1-R3, UT2 and the Mountain Tributary. The discussion was mainly based on less evidence of cattle usage in these areas. Table 13 lists cattle access as the primary source of stressor/impairment. As the wrap up discussion, DWR pointed out the desire to include some wetland areas adjacent to UT1 Reach 1. DWR was willing to accept the E2 ratios for the above reaches if the Provider agreed to protect the wetland areas and drainages that were currently not included in the proposed easement. While Wildlands did include a portion of the wetlands that were not initially in the easement, DWR believes that there should have been more wetland areas included in this area.*

We included the larger wetland you referred to, just not the thin channel above it, within the conservation easement. We also extended the CE on the eastern side of UT1 to capture most of the wetlands running along it. The proposal had a CE of 18.3 acres and our current CE is 20.73 acres, a 13.3% increase.

6. *Wildland April 23, 2019 letter to Jeff Schaffer – A Terracell was mentioned in comment #27. During review of Design Sheet 0.2 DWR did not see mention of Terracell, please confirm that a Terracell will not be used on this project.*

The Terracell was inadvertently included in the IRT submittal. The reference was removed in subsequent iterations related to the DEQ SEC submittals. Terracell will not be used on the Catfish project.

7. *Design Sheet 2.10 – DWR would like to see a design sheet that shows all the newly capture wetland area adjacent to UT1.*

A PDF of the requested area is included at the end of this comment-response letter.

8. *DWR requires that three wetland monitoring gauges be placed at the following locations on UT1; station 212+00 stream right, station 213+25 stream right, and station 215+00 stream right.*

Groundwater gages will be installed at these locations.

9. *DWR recommends the addition of a vegetation plot (fixed or random) in the planted areas along the following reaches: Catfish Creek Reach 3, Catfish Reach 7, and the Mountain Tributary.*

Planting zones were updated on the plan sheets to show more accurate planting zones. Catfish Creek Reach 3 is a short section of Enhancement II stream that is currently wooded. One vegetation plot is proposed near the lower section of the reach. This should be sufficient to monitor the small area along Catfish Creek Reach 3 that will be planted. Vegetation plots were added to Catfish Creek Reach 7 and Mountain Tributary.

10. Design Sheet 6.3 – DWR recommends that the log sills extend at least through the bankfull elevation in the streambank (Section A-A'), and preferably 2-3 feet beyond the bankfull point.

The log sills will be extended a minimum of 5' from the toe of slope. Based on stream channel geometries for this project, this will embed the sills beyond the bankfull elevation. The Charleston office provided a revised detail to Daniel Taylor for review and will update the specifications to align with the detail.

Katie Merritt, NCWR:
General comments:

1. *A concept plan is provided on Figure 8. Please revise this plan to show where buffer mitigation and/or nutrient offset are also being generated.*

Wildlands has added Figure 8a to show the overlap of all the mitigation types on the project.

2. *IRT field note 2/23/18 stated that the field ditch along UT1 near Reach 2 would be buffered and would eliminate the need for a BMP to control runoff. This plan doesn't show the Ditch being buffered all the way up and there is no proposal for a BMP. Please explain how diffused flow of runoff through the newly restored riparian area is to be maintained by the inclusion of this ditch.*

Wildlands will use guidelines in the Diffuse Flow for Buffer Mitigation memo (***DWR Buffer Interpretation/Clarification Memo #2008-019***) and receive no credit for 0.1 acres where the ditch comes into the easement.

It appears this was a miscommunication on the field minutes. We didn't intend to extend the buffer upstream along Ditch D from the UT1 CE, as shown on the map that accompanied the minutes.

The stream design accounts for drainage added by the ditch. Some nutrients will enter the project streams via this ditch but that is true of any drainage that enters a project area. Many smaller streams and ditches enter the CEs in various mitigation projects.

3. *Section 4.1 –*
 - a. *USFWS had concerns about sediment impacts from this site on aquatic species. Please indicate how sediment impacts to the stream will be prevented during construction.*

The dam will be breached and dewatered, with the turbidity curtain in place, as an initial sequence of construction. This area will be allowed to dry before working with the material. Once the site is suitably dry for earthwork operations, as determined by the engineer, the dam will be removed as a first step. This material, if deemed suitable, will be stockpiled on-site for reuse in grading operations. Residual sediments shall be excavated to native ground, spread

and stabilized with appropriate seed mixture within the limits of CE. If saturated, residual sediments shall be stockpiled in loose lifts and allowed to dry prior to respreading within the CE. This will reduce the potential for sediment runoff and sloughing of the spread residual sediments. Residual sediments shall not be reused as structural fill on-site. Earthwork and grading for the new channel will only occur in native material or select fill material.

Additionally, erosion control plan sheets have been added to the mitigation plan. DEMLR has reviewed these and the remaining comment left to address is to provide the 404/401 permits.

- b. WRC letter dated 3/21/18 requested biodegradable erosion control measures that are wildland friendly. Explain how this request is being acknowledged.*

Erosion control measures other than silt fence that are being incorporated within the limits of construction include biodegradable coir matting along the channel side slopes. Additionally, the side slopes within the dam removal area will be graded at 3:1. This, along with the perimeter control along the haul roads, eliminates the need for application of permanent or temporary matting along these side slopes. The construction specifications and planting plan have been developed to specifically address this area with a heavy stabilization and permanent seed mixture.

Kim Browning, USACE:

1. Plan Sheet 2.12: Is inserted upside down, and it states that the reach-wide treatments include fencing, treating invasives, supplemental buffer planting, and spot repair on eroded banks, but it appears that P1 restoration is planned on this reach (UT1 Reaches 2 and 3). Please justify why this is restoration at 1:1 if restoration is not actually planned, or correct the treatments statement.

This section is restoration. The note on this sheet has been revised.

2. *Plan Sheet 5.0: The list of planned species to be planted is not legible.*

PDF looks OK, must have been the printed version.

3. *Section 5.1, Hydrology: This section states that hydrology function is expected to remain functioning, though restoration on UT1 reach 2 and on Catfish Creek reach 4 will impact existing wetlands. Though wetland credits are not being sought on this project, and it's anticipated that raising the streambed will improve adjacent hydrology, please provide assurance that wetland function in these areas will not be lost by installing monitoring gauges.*

We will install wetland monitoring gages along UT1 Reach 2 per Mac Haupt's comment and add one along Catfish Creek Reach 4.

4. *Section 5.2: The narrative states that UT1 R4 and Catfish Creek R7 are fully functioning. If this is the case, what is the functional uplift?*

The narrative stated that *some sections* of those reaches have fully functioning hydraulics. We dropped the word 'fully' because that suggests more than hydraulic function. Catfish Creek R7 has a number of treatments along it, including head cut stabilization, boulder toe protection, two constructed riffles, and bank grading along the lower reach. UT1 R4 has more general

treatment including cattle exclusion, buffer planting, and invasives treatment, but the restoration grading from R3 also extends into R4 and will stabilize steep banks.

5. *Section 8.3.1: Please explain how the dam removal will be treated, and how the pond bottom sediment will be handled.*

The dam will be breached and dewatered, with the turbidity curtain in place, as an initial sequence of construction. This area will be allowed to dry before working with the material. Once the site is suitably dry for earthwork operations, as determined by the engineer, the dam will be removed as a first step. This material, if deemed suitable, will be stockpiled on-site for reuse in grading operations. Residual sediments shall be excavated to native ground, spread and stabilized with appropriate seed mixture within the limits of CE. If saturated, residual sediments shall be stockpiled in loose lifts and allowed to dry prior to res-spreading within the CE. This will reduce the potential for sediment runoff and sloughing of the spread residual sediments. Residual sediments shall not be reused as structural fill on-site. Earthwork and grading for the new channel will only occur in native material or select fill material.

There is also a pond removal detail on plan sheet 6.10. Additionally, Wildlands will follow the Sediment and Erosion Control Plan as approved by DEMLR.

6. *Section 9.2: Please add a vigor standard of 7 feet for year 5.*

A vigor standard of 7 feet for monitoring year 5 was added to Section 9.2.

7. *The letter from the NCWRC mentions the possible presence of rare aquatic species. Please coordinate with Dr. Tyler Black prior to project commencement.*

We followed up with Travis Wilson about this and included that information in Section 5.5. It seems the species of concern (*Elliptio* mussels) is not rare, but indicates good habitat and water quality downstream in Mountain Creek. Additionally, Travis said that Tyler Black has moved on from NCWRC and that it is not a good use of their biologists limited time to work on this. Instead, he recommended focusing on preventing sediment release into Mountain Creek. Wildlands will not be working in Mountain Creek but has included the sediment and erosion control plan sheets in the final mitigation plan. Additionally, Wildlands will follow the Sediment and Erosion Control Plan as approved by DEMLR.

8. *The letter from USFWS requested an approved erosion and sediment control plan. Please provide in the final mitigation plan.*

The erosion and sediment control plan approval is dependent on receipt of the 404/401 permits. We are waiting for the 404/401 permits before we make the final submittal. The erosion control plan sheets, however, have been included in the final mitigation plan. The remaining comment to address to receive the SEC permit is to provide the 404/401 permits.

We hope that these responses adequately address the IRT's comments and we look forward to working with the IRT during the next phases of this important project.

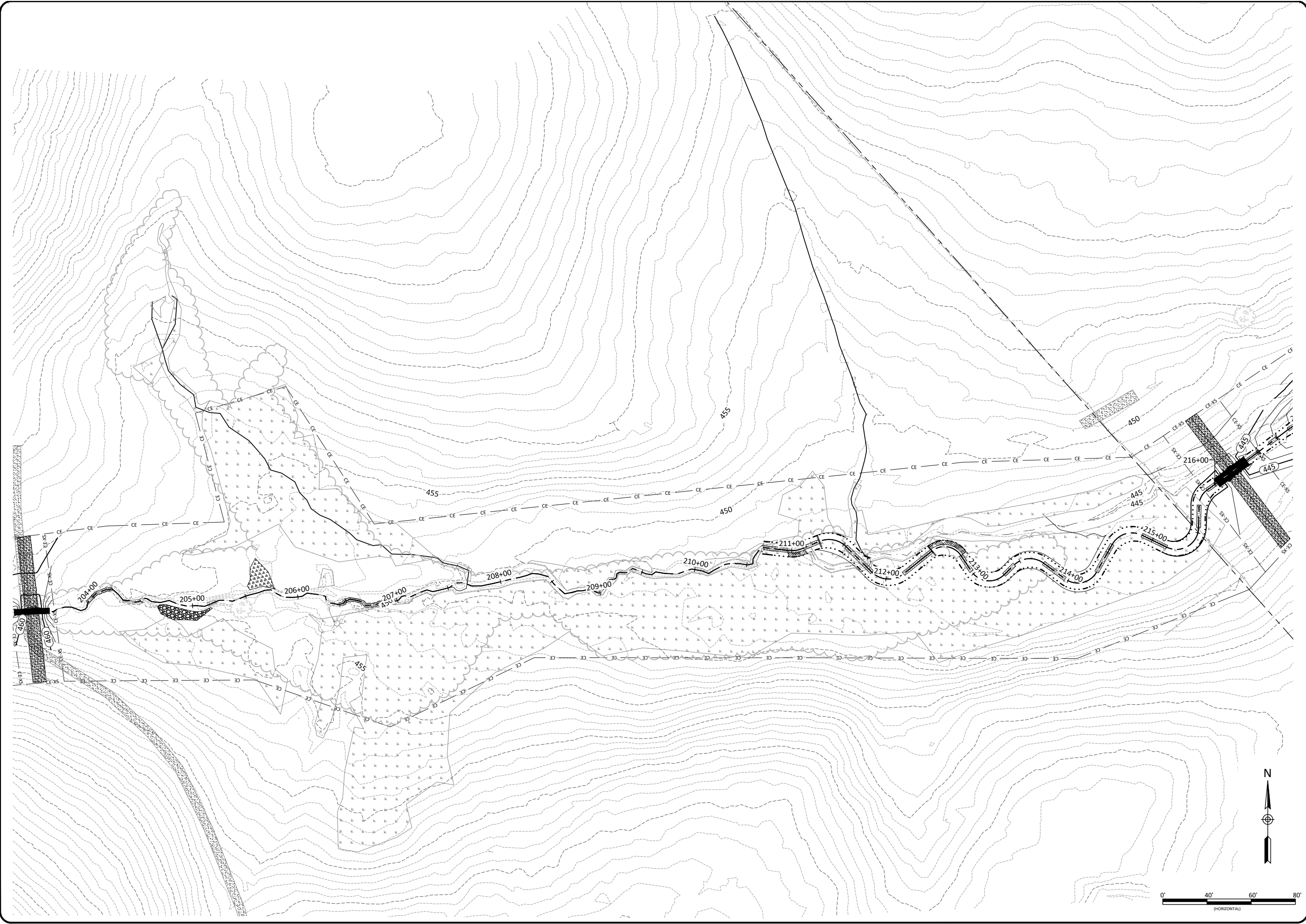
Sincerely,



Chris Roessler

Project Manager

croessler@wildlandseng.com



Revisions

Date: 06-25-2019
 Job Number: 005-02168
 Project Engineer: DJ
 Drawn By: ABP
 Checked By: CR

1

Sheet

Catfish Pond Mitigation Site
 Durham County, North Carolina
 UTI Wetlands
 Stand-Alone Sheet

PRELIMINARY
 DO NOT
 USE FOR
 CONSTRUCTION

WILDLANDS
 ENGINEERING
 312 W. Millbrook Rd. Suite 225
 Raleigh, NC 27609
 Tel: 704.332.3306
 Fax: 704.332.3306
 Firm License No. F-0831



July 25, 2019

Ms. Katie Merritt

RE: Response to DWR comments on Draft Final Buffer Mitigation Plan Submittal
Catfish Pond Mitigation Site, Durham County, NC
Neuse River Basin - 03020201
DMS Project ID No. 100039 / DEQ Contract # 007424

Dear Ms. Merritt,

Wildlands received comments from you dated June 12, 2019 on the Catfish Pond draft final buffer mitigation plan submitted on May 13, 2019. The comments were constructive and will improve the mitigation plan. This letter provides our responses to those comments. Edits have been made to the final mitigation plan.

Catfish Pond Buffer Mitigation Plan Comments

1. *General Mitigation Plan & Buffer Plan comments:*

- a. *The use of the term "buffer" and "riparian buffer" is used too loosely throughout the plan. These terms should only be used to describe an area that is within the Neuse Riparian Buffer. For this site, only the first 50' adjacent to streams subject to the rule are Neuse Riparian Buffers. Therefore, please correct applicable references to "buffer" or "riparian buffer" and replace incorrect references with "riparian areas" or "riparian restoration".*

We've made those changes.

- b. *The DWR Stream Determination letter for this site dated 3/12/18 was not included in the mitigation plan or in Appendix 12. Please include.*

We don't have a stream determination letter for this project. In an email dated 6/13/19, you said you couldn't find it either and it probably was not issued.

- c. *Where plan sheets, figures and appendices of the Stream Mitigation Plan have relevant information for the buffer plan, those items should be referenced in the buffer plan to assist DWR with review. Otherwise, things can be mistakenly overlooked. Example: pond design sheet, Ditch D shown on plan sheets, Planting Plan details, Invasive Species plan, etc.*

References have been added to the buffer plan. Nutrient offset credits were only derived from buffer restoration areas with widths of at least 50 feet and not more than 100 feet.

- d. *Table 8a & 8b Project Area & Assets – changes and corrections are needed.*
1. *Based on comments made under Table 8b, it appears there are areas less than 50', less than 29' and less than 20' widths, but none of those areas are depicted on Table 8a as receiving buffer credit at reduced amounts. Are those areas included in the buffer credits shown in Table 8a? Explain and correct assets where necessary.*

The notes below Table 8b refer to longitudinal stream lengths (i.e., linear feet) where the buffer is between 30 and 50 feet. They do not refer to buffer widths.

2. *Figures 6 and 9 do not provide reach information, therefore it is difficult to compare those two figures to see the areas referenced under Table 8b.*

We will add reach information to Figures 6 and 9.

3. *Text under Table 8b states there is a difference of 5,597 ft² due to the widths being less than the required 50'. However, I don't see that detailed out or shown in the figures referenced. If the area is small and you can zoom in to the area, that may be helpful.*

These areas are now shown in Figure 9a and the locations are described below Table 8b.

4. *The creditable acreage is shown out to 4 decimal places on Table 8b. Explain why they aren't rounded to the nearest hundredth as is normally requested by DWR.*

The acreage is a calculated value based on square feet, and four decimal places were used to more accurately reflect the actual square footage. I.e., the creditable area is 255,790 (sqft), but $5.87 \text{ (ac)} \times 43,560 \text{ (sqft)} = 255,697 \text{ (sqft)}$.

2. *Section 4.1 –*

- a. *USFWS had concerns about sediment impacts from this site on aquatic species. Please indicate how sediment impacts to the stream will be prevented during construction.*

The dam will be breached and dewatered, with the turbidity curtain in place, as an initial sequence of construction. This area will be allowed to dry before working with the material. Once the site is suitably dry for earthwork operations, as determined by the engineer, the dam will be removed as a first step. This material, if deemed suitable, will be stockpiled on-site for reuse in grading operations. Residual sediments shall be excavated to native ground, spread and stabilized with appropriate seed mixture within the limits of CE. If saturated, residual sediments shall be stockpiled in loose lifts and allowed to dry prior to re-spreading within the CE. This will reduce the potential for sediment runoff and sloughing of the spread residual sediments. Residual sediments shall not be reused as structural fill on-site. Earthwork and grading for the new channel will only occur in native material or select fill material.

Additionally, Wildlands will follow the Sediment and Erosion Control Plan as approved by DEMLR. Erosion control plan sheets have been added to plan set in the stream mitigation plan.

- b. *WRC letter dated 3/21/18 requested biodegradable erosion control measures that are wildlife friendly. Explain how this request is being acknowledged.*

Erosion control measures other than silt fence that are being incorporated within the limits of construction include biodegradable coir matting along the channel side slopes. Additionally, the side slopes within the dam removal area will be graded at 3:1. This, along with the perimeter control along the haul roads, eliminates the need for application of permanent or temporary matting along these side slopes. The construction specifications and planting plan have been developed to specifically address this area with a heavy stabilization and permanent seed mixture.

3. Section 6.0 –

- a. *Diffuse flow needs to be maintained in all riparian areas generating buffer mitigation and nutrient offsets. The DWR stream determination letter called the ditch entering UT1 near reach 2 a Ditch. Plan sheets (Sheet 5.4) show this ditch going through the proposed buffer restoration area. The ditch also extends beyond the conservation easement boundary. Please explain how diffused will be maintained by the inclusion of Ditch D.*

Wildlands will use guidelines in the Diffuse Flow for Buffer Mitigation memo (***DWR Buffer Interpretation/Clarification Memo #2008-019***) and receive no credit for 0.1 acres where the ditch comes into the easement.

- b. *Plan sheet 2.6 shows the stream restoration through the Pond and should therefore be referenced in this section to assist in DWR review.*

This reference has been added.

- c. *Details on how the pond will be breached, efforts made to reduce sediment loss, stabilization measures, drawdown, etc. aren't provided but are needed so that DWR can make informed decision that the pond restoration will be done with the least impact to streams as possible. If these details are in the stream plan, then reference the applicable section here to assist DWR review.*

Reference is also made within the buffer mitigation plan to the pond removal detail on plan sheet 6.10. Additionally, Wildlands will follow the Sediment and Erosion Control Plan as approved by DEMLR.

- d. *It is recommended that a statement be added to this section that reads similar to "Riparian restoration and enhancement will occur adjacent to mitigated stream onsite".*

Added this to second sentence of first paragraph in section.

- e. *No detailed planting plan is referenced in this section, however plan sheets were provided in Appendix 7 detailing where trees would be planted. Include reference.*

Referenced that a planting plan is provided on plan sheets 5.0 – 5.7 in Appendix 7.

- f. *The invasive species plan is pertinent to this plan and should be referenced in this section.*

Referenced that an invasive species plan is provided in Appendix 8.

- g. *Correct buffer mitigation rule citation in Section 6.3. It should be .0295 (o) instead of .0295 (o)(6).*

Corrected.

4. *Section 8.0 -*

- a. *Add that planted stems in the monitoring plots will all be flagged.*

Added to Section 8.2.

- b. *Include applicable terms from Table 15 of the Stream plan and add to this section.*

Survival rates were added to Section.

- c. *Vigor needs to be added to 8.2 as a measurement during monitoring. Add height measurements.*

A vigor standard was added to Section 8.2.

- 5. *Section 9.0, second paragraph states that “no livestock, fencing, or internal crossing changes are currently present or planned by the landowner”. Can you explain the meaning of this sentence considering there are livestock and fencing currently present.*

Removed this sentence. This makes it consistent with Section 11.0 in the stream mitigation plan.

- 6. *Overall, if the riparian restoration and enhancement is done according to the plan and addresses all comments and corrections provided by DWR, the site should provide a good buffer mitigation and nutrient offset project.*

Sounds good.

We hope that these responses adequately address the IRT’s comments and we look forward to working with the IRT during the next phases of this important project.

Sincerely,

A handwritten signature in black ink, appearing to be 'Chris', written in a cursive style.

Chris Roessler

Project Manager

croessler@wildlandseng.com



MITIGATION PLAN

Final

July 18, 2019

CATFISH POND MITIGATION SITE

Durham County, NC
NCDEQ Contract No. 7424
DMS ID No. 100039

River Basin
HUC 03020201

USACE Action ID No. 2018-00424
RFP #: 16-007279

PREPARED FOR:



NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

PREPARED BY:



Wildlands Engineering, Inc.
312 W Millbrook Road, Suite 225
Raleigh, NC 27609
Phone: (919) 851-9986

FINAL MITIGATION PLAN

Catfish Pond Mitigation Site

Durham County, NC

NCDEQ Contract No. 7424

DMS ID No. 100039

Neuse River Basin

HUC 03020201

USACE Action ID No. 2018-00424

PREPARED FOR:



NC Department of Environmental Quality

Division of Mitigation Services

1652 Mail Service Center

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PREPARED BY:



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Wildlands Engineering, Inc.

312 W Millbrook Road, Suite 225

Raleigh, NC 27609

Phone: (919) 851-9986

This mitigation Plan has been written in conformance with the requirements of the following:

- Federal rule for compensatory mitigation project sites as described in the Federal Register Title 33 Navigation and Navigable Waters Volume 3 Chapter 2 Section § 332.8 paragraphs (c)(2) through (c)(14).
- NCDEQ Division of Mitigation Services In-Lieu Fee Instrument signed and dated July 28, 2010.

These documents govern DMS operations and procedures for the delivery of compensatory mitigation.

Contributing Staff:

Chris Roessler, *Project Manager*

John Hutton, *Principal in Charge*

Daniel Johnson, PE, *Design Lead*

Michael Clark, EI, *Designer*

Win Taylor, PWS, *Wetland Delineations*

Emily Reinicker, PE, *Lead Quality Assurance*

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1.0 Introduction

1.1 Site Overview

The Catfish Pond Mitigation Site (Site) is located in Durham County approximately 12 miles north of the City of Durham and approximately 3 miles east of the Orange County/Durham County border (Figure 1). The project is located within the DMS targeted watershed for the Neuse River Basin Hydrologic Unit Code (HUC) 03020201020040 and NC Division of Water Resources (DWR) Subbasin 03-04-01. The site was selected by DMS to provide stream credits and buffer credits in the Neuse River Basin 03020201 (Neuse 01). The project involves the restoration and enhancement of 7,134 existing linear feet of impacted streams from the mainstem of Catfish Creek and three unnamed tributaries. Restoration and enhancement of these reaches will provide 3,748.800 stream credits. The project will also restore or enhance 18.1 acres of riparian buffer on-site, which will provide 522,327.570 buffer credits. The site will be protected by a 20.73-acre conservation easement. The Site Protection Instrument detailing the easement is in Appendix 1.

Table 1: Project Attribute Table Part 1 – Catfish Pond Mitigation Site

Project Information	
Project Name	Catfish Pond Mitigation Site
County	Durham
Project Area (acres)	20.73
Project Coordinates (latitude and longitude)	36° 9' 48.03" N, 78° 54' 37.66" W
Planted Acreage (acres of woody stems planted)	8.0

2.0 Watershed Approach and Site Selection

The 2009 Neuse River Basinwide Water Quality Plan lists major stressors in Subbasin 03-04-01 to be total suspended solids (TSS), nutrients, and chlorophyll α . The 2010 Neuse River Basin Restoration Priorities (RBRP) highlights the importance of riparian buffers for stream restoration projects. Riparian buffers retain and remove nutrients and suspended solids. Of the 123 miles of streams in the Neuse 01 HUC, 23% do not have adequate riparian buffers. The RBRP states that “priority [restoration] projects should increase or improve buffers.” Another goal of the RBRP for the Neuse 01 HUC is to support the Falls Lake watershed plan. Falls Lake is the receiving water supply water body downstream of the Site and is classified as water supply waters (WS-IV) and nutrient sensitive waters (NSW). The RBRP also states that a goal for the Neuse 01 HUC is to “...promote nutrient and sediment reduction in agricultural areas by restoring and preserving wetlands, streams, and riparian buffers.” The Catfish Pond Mitigation Site was selected because of its location within the targeted watershed and its potential to address the goals of the RBRP through stream restoration and buffer restoration.

Restoration and enhancement of streams on the Site will directly and indirectly address stressors identified in the RBRP by building stable stream banks and restoring a forested buffer. The restoration work will also involve restoring meandering pattern. The project will slow surface runoff, increase retention times, provide shade to streams, and reconnect the streams to their historic floodplains and riparian wetlands, which should reduce sediment and nutrient loads. The latter contribute to the downstream production of chlorophyll α . In addition, restoration will provide and improve instream and terrestrial (riparian) habitats while improving stream stability and overall hydrology.



3.0 Baseline and Existing Conditions

The Site watershed (Table 2 and Figure3) is in a northern 14-digit HUC of the Neuse 01. It is situated in the rural countryside in Durham County approximately 12 miles north of Durham, NC, upstream of the intense growth and development pressure associated with the Raleigh-Durham metropolitan area (Figure 2). The following sections describe the existing conditions of the watershed and watershed processes, including disturbance and response.

Table 2: Project Attribute Table Part 2 – Catfish Pond Mitigation Site

Project Watershed Summary Information	
Physiographic Province	Piedmont
Ecoregion	Carolina Slate Belt (45c)
River Basin	Neuse River
USGS HUC (8 digit, 14 digit)	03020201, 03020201020040
NCDWR Sub-basin	03-04-01
Project Drainage Area (acres)	227 (197 + 30)
Project Drainage Area Percentage of Impervious Area	0%
CGIA Land Use Classification	45.6% forested, 54.2% cultivated, 0.2% wetland

3.1 Landscape Characteristics

3.1.1 Physiography and Topography

The site is located in the Piedmont Physiographic Province of North Carolina. The Piedmont is characterized by gently rolling, well rounded hills with long low ridges, with elevations ranging from 300 to 1,500 feet above sea level. Site topography, as indicated on the Rougemont, NC USGS 7.5 minute topographic quadrangles, includes mostly steeply sloped areas with some moderate slopes along the main tributary (UT1) (Figure 4).

Figure 2 shows the existing site conditions. Catfish Creek has a confined colluvial valley that ranges in width from 80 feet at the upstream end to 100 feet at the downstream end. For valley slopes, Catfish Creek begins with 5.5 to 6.0 percent slopes in its upper reaches (Reach 1, UT2, respectively), continues to above Catfish pond with a 2.5 percent slope, through the pond to the UT1 confluence with a 4.6 percent slope, and finishes with a 2.5 percent slope to the confluence with Mountain Creek.

UT1 has a flatter, more alluvial valley than Catfish Creek. The valley width ranges from 100 feet wide in the upstream end to 150 feet wide in the lower restoration reach. As it approaches Catfish Pond, it enters a tighter, 50-foot wide valley. Valley slopes for UT1 are 1.5 percent through Reach 3, and 4.8 percent in Reach 4.

Mountain Tributary's valley is steep and colluvial before it makes a 90-degree turn to the northeast with a 4.9 percent slope and 30-foot width. The lower section's valley slope reduces to 2.7 percent and the width ranges from 60 to 100 feet.

The colluvial valley of UT2 is 7.0 percent and moderately confined to confined.

Along many of the project streams, wetlands are present. They have formed at the toe of valley slopes and extend longitudinally along the stream channels. The largest wetlands areas may be found along UT1 Reaches 1 and 2 and Catfish Creek Reach 7. Smaller wetland pockets may be found along the remaining reaches.

3.1.2 *Geology and Soils*

The project is located in the Ecoregion 45c - Carolina Slate Belt of the Piedmont physiographic province. The Carolina Slate Belt extends from southern Virginia, across the Carolinas, and into Georgia. The Carolina Slate Belt consists of metamorphosed igneous and sedimentary rock including gneiss and schist that has been intruded by younger granitic rocks (NCGS, 2013). The underlying geology of the proposed Site is mapped as late Proterozoic to Cambrian (1 billion to 500 million years in age) intermediate meta-volcanic rock (CZiv) and felsic meta-volcanic rock (CZfv) (NCGS, 1985). The intermediate meta-volcanic rock is described as metamorphosed andesitic tuffs and flows that are medium to dark grayish green in color with minor felsic and mafic meta-volcanics. The felsic meta-volcanic rock is described as metamorphosed dacitic to rhyolitic flows and tuffs that is light gray to greenish gray in color that interbedded with intermediate meta-volcanic rock. Instances of exposed bedrock along project channels.

The geology of this area has important effects on Site hydrology, hydraulics, geomorphology, and sediment transport. Streams in the Carolina Slate Belt tend to go dry during late summer and early fall as a result of geologic, topographic, and climatic factors. A study by Giese and Mason (1993) states that the "Carolina slate belt has among the lowest potential for sustaining baseflow in streams" throughout the year as compared to other regions of North Carolina. Median low flows in the Carolina Slate Belt, defined by the study as the 7Q10 (7-day consecutive low flow with a 10-year return frequency, or the lowest stream flow for seven consecutive days that would be expected to occur once in ten years), can be as low as 0.005 ft³/s/mi² of drainage area (Giese and Mason, 1993).

The proposed project is mapped by the Durham County Soil Survey. Project area soils are described below in Table 3. Figure 5 is a soil map of the Site. Wehadkee soils underly upper UT1 and upper Catfish Creek. Tatum underlies Catfish Creek Reaches 4, 5, and 6. Georgeville soils are prevalent on Mountain Tributary. Chewacla and Wehadkee soils are present as Catfish Creek approaches the Mountain Creek floodplain.

Site investigations revealed sporadic visible bedrock in pastures or within the channel. With most floodplain soils having depths greater than 80 inches to bedrock, grade control structures will be used in the stream design to prevent incision. There is potential to excavate native materials on site to use in constructed riffles and other grade control structures. Weathered bedrock is present between 42 and 80 inches in the Tatum gravelly silt loam series, which provide a well-mixed substrate with varying size classes.

It is Wildlands' experience that small streams in the Slate Belt are low bedload sediment supply systems. These streams commonly have coarse gravel to cobble bed material that is derived from weathered parent material. Watersheds with low rolling topography that are largely covered by vegetation will often result in low sediment supply. Without a naturally high bedload supply to drive morphological change, these streams are relatively slow to adjust without watershed disturbance or manipulation.

Table 3: Project Soil Types and Descriptions – Catfish Pond Mitigation Site

Soil Name	Description
Wehadkee silt loam	This soil is found on narrow floodplains with a slope of 0 to 2 percent. This soil is typically poorly drained and frequently floods. The surface layer of the series is loam with a thickness of about 8 inches. The subsoil of sandy clay loam has a depth of 43 inches. This soil is fairly well suited for pasture.
Tatum gravelly silt loam	This well-drained soil is found on uplands with a slope of 15 to 25 percent. The surface layer has a gravelly silt loam of about 7 inches. The subsoil of silty clay loam extends to a depth of 42 inches and weathered bedrock is present from 42 to 80 inches. This soil is well suited to pine and hardwood forest and to pasture. Slope and the erosion resulting from runoff are the major concerns in management.
Georgeville silt loam	This well-drained soil is found on narrow side slopes on uplands with a slope of 6 to 10 percent. It has a surface layer of reddish-brown or brown silt loam to about 7 inches. Its subsoil is red, firm silty clay or silty clay loam to about 10 inches. Slope and the erosion resulting from runoff are the major concerns for management.
Chewacla and Wehadkee soils	These soils are about 60 percent Chewacla soil and 35 percent Wehadkee soil. These are somewhat poorly drained soils on floodplains with slopes of 0 to 2 percent that flood frequently. They occur as long, level areas parallel to the major streams and rivers. These soils have a surface layer of loam to about 4 inches and a subsurface layer of silty clay loam to about 26 inches. These soils are well suited to hardwood forest and pasture.

Source: Soil Survey of Durham County, North Carolina, USDA-NRCS, <http://www.nrcs.usda.gov>

3.2 Land Use/Land Cover

Land use and land cover were investigated throughout the watershed using historical aerials of the Site and adjacent parcels from 1940-2012 and a watershed reconnaissance survey. The most common historical and current land uses in the watershed are silviculture and agriculture. The Site area has been used for livestock grazing or maintained as managed herbaceous cover since at least 1940. The limits of riparian buffers and agricultural land on the Site have remained consistent since about 1972. Prior to then, there was an increase in agricultural activity between 1955 and 1972. Today, the Site is primarily used for cattle grazing and hay production. Cattle have access to the pastures, wooded areas, and the streams.

There are no signs of impending land use changes or development pressure that would impact the project in the Catfish Creek watershed. The entire watershed is zoned as Rural Residential (RR). This classification requires a minimum lot size of 0.5 dwelling units per acre or less.

The consistency in land use within the project watershed over the past 78 years indicates that watershed processes affecting hydrology, sediment supply, and nutrient and pollutant delivery have not varied widely over time. With a lack of developmental pressure, watershed processes and stressors from outside the project limits are likely to remain consistent for the foreseeable future. These stressors and processes are discussed further in Section 4, below. First, a review of land use through examination of aerial photography is discussed.

Historical aerials were also obtained from EDR reports for 1940, 1955, 1972, 1983, 1993, 2005, 2006, 2008, 2009, 2010, and 2012.

Catfish Pond was constructed sometime between 1940 and 1955. This period also saw extensive logging and farm road construction on the Site streams. By 1983, the trees on Catfish Creek were allowed to grow.

Aerial photographs from 1972 show the area around UT1 in a cleared condition. This imagery and the lack of sinuosity on UT1 suggest that the channel was straightened for agricultural purposes prior to 1972. There were essentially no riparian buffers on UT1 until the 2005 photo when a narrow corridor of trees are visible. Catfish Creek, UT2, and Mountain Tributary do not show signs of channel manipulation.

3.3 Existing Vegetation

Upland portions of the Site maintained for cattle grazing are dominated by pasture grasses including tall fescue (*Schedonorus arundinaceus*), bermudagrass (*Cynodon dactylon*), and red fescue (*Festuca rubra*). Herbaceous vegetation in wetland and riparian areas includes tearthumb (*Polygonum sagittatum*), common rush (*Juncus effuses*), spotted ladythumb (*Polygonum persicaria*), yellow jewelweed (*Impatiens pallida*), *Carex* species (*Carex spp.*), and Japanese stilt grass (*Microstegium vimineum*). Forested riparian buffers are generally narrow or discontinuous, but common tree species present in the canopy are American sycamore (*Platanus occidentalis*), green ash (*Fraxinus pennsylvanica*), sweetgum (*Liquidambar styraciflua*), yellow poplar (*Liriodendron tulipifera*), and red maple (*Acer rubrum*). Additional woody plants present in smaller proportions or lower strata include eastern red cedar (*Juniperus virginiana*), white oak (*Quercus alba*), hazel alder (*Alnus serrulata*), black willow (*Salix nigra*), paw paw (*Asimina triloba*), greenbriar (*Smilax rotundifolia*), Chinese privet (*Ligustrum sinense*), and Japanese honeysuckle (*Lonicera japonica*).

The watershed has likely been periodically logged since humans settled this area around 1800, and many tree species located in surrounding riparian areas are now mid successional. The species in these areas are not necessarily indicative of what would have been on-site before human disturbance.

3.4 Project Stream and Wetland Resources

On March 8, August 1, and August 3, 2018 Wildlands investigated on-site jurisdictional waters of the U.S. within the proposed project area. Jurisdictional areas were delineated using the US Army Corps of Engineers (USACE) Routine On-Site Determination Method. This method is defined by the 1987 Corps of Engineers Wetlands Delineation Manual and the subsequent Eastern Mountain and Piedmont Regional Supplement. Streams were classified using North Carolina Division of Water Resources (DWR) Classification Forms. All jurisdictional waters of the U.S. were located by either controlled survey or sub-meter GPS. Wetland determination forms representative of on-site jurisdictional areas as well as non-jurisdictional upland areas are included in Appendix 4.

The presence and extent of jurisdictional resources was reviewed and approved by USACE staff via email on September 26, 2018, but no preliminary jurisdictional determination has been issued at this time. There are one open water feature and 30 wetland features on site. These wetland features were classified as headwater forest, seep, or non-tidal freshwater marsh using the North Carolina Wetland Assessment Method (NCWAM) and the evaluators' best professional judgement. The wetlands occur on the side slopes and floodplains that drain to the on-site stream channels. These features exhibited evidence of saturation within 12 inches of the soil surface, hydrophytic vegetation, and a low chroma matrix. The majority of these areas are significantly impacted by livestock. The submitted preliminary jurisdictional determination package and email correspondence regarding approval is included Appendix 2.

The Site contains two perennial streams: Catfish Creek (Reaches 2, 3, 4, 5, 6, and 7) and UT1 and contains three intermittent streams: Catfish Creek Reach 1, UT2, and Mountain Tributary. The DWR stream identification forms are included in Appendix 3. A summary of the US Army Corps of Engineers

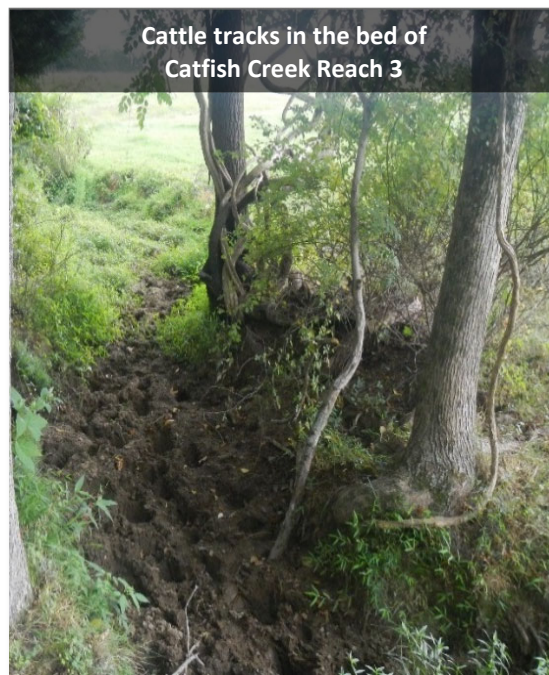
(USACE) forms are located in Appendix 4. Stream features are described in more detail below and in Section 5. Table 4 provides a summary of water resources within the project limits. Existing conditions are also illustrated in Figure 2.

Catfish Creek

The headwater of Catfish Creek is on the west side of the project parcel and the stream flows east toward Mountain Creek. Catfish Creek was subdivided into seven reaches for analysis. Streambanks are primarily wooded but pasture exists beyond a narrow riparian corridor along most of Catfish Creek. Herbaceous vegetation is limited from grazing and cattle access. Ground cover is dominated by Japanese stiltgrass and grasses such as fescue. Overall the project reaches of Catfish Creek are Rosgen B-, C-, or E-type streams depending on valley position and current condition.

Catfish Creek Reach 1 begins at a small groundwater seep on the west end of the Site and flows east as an intermittent channel. Reach 2 is a perennial channel that continues to the confluence with UT2. A headcut is present on Reach 2. Catfish Creek Reach 3 begins at the confluence of UT2. Catfish Creek Reaches 1, 2, and 3 are very similar in their current condition. These reaches are moderately to steeply sloped and flow through confined valleys. Riparian vegetation is primarily comprised of a mature overstory with limited understory and herbaceous vegetation due to cattle grazing. Cattle access and riparian buffer grazing are the major limiting factors in the overall health and stability of Catfish Creek Reaches 1, 2, and 3. Isolated areas of over widening and instability exist along these project reaches, which can be directly correlated to cattle access. Bedform within these reaches is more stable and diverse compared to other project reaches.

Catfish Creek Reach 4 flows east to an existing farm crossing. Catfish Creek Reach 4 has been extensively altered in the past. The channel has been re-aligned, straightened, and pushed against the right valley wall. Additionally, cattle access within this reach has resulted in extensive adverse impacts to the stream substrate, bedform, and stability. Based on observations, the cattle have begun using the channel as a wallow area and cattle trail. A remnant channel can be seen in the left floodplain which may have been the historic location of Reach 4 prior to alteration. The combination of relocating the channel, straightening, and livestock access has caused the channel to incise and become disconnected from the floodplain with a bank height ratio greater than 2.0. Understory vegetation along the reach is limited and extensively grazed. Some overstory hardwood species are present but the understory ground cover is sparse and dominated by pasture grasses.



Catfish Creek Reach 5 begins below an existing farm crossing and continues east to Catfish Pond. Catfish Creek Reach 5 has bedrock influenced bedform and very little incision. Instability along the reach is from cattle access, wallowing, and grazing. The stream flows through a somewhat confined, moderately sloped valley with a mature hardwood dominated overstory and a sparse understory due to cattle grazing.

Catfish Creek Reach 6 flows through Catfish Pond. Currently, all of Reach 6 is contained within Catfish Pond or the pond embankment, which was installed sometime between 1940 and 1955. Cattle have unlimited access and were seen wallowing within the farm pond on multiple occasions during Wildlands' site visits. Vegetation around the pond is limited to pasture grasses and some trees.



Catfish Creek Reach 7 begins at the confluence with UT1 and continues to the confluence of Mountain Creek and Catfish Creek. Catfish Creek Reach 7 has a bedform dominated by bedrock features (35% of reach) which have limited vertical instability. However, livestock access throughout the site has caused areas of lateral instability and widening. At multiple locations along the reach there is evidence of cattle wallows and trampled banks. Cattle impacts have caused instability including mass wasting and scour in isolated areas along the reach.



UT1 to Catfish Creek

UT1 flows onto the site from a wooded parcel south of project and flows northeast. The entire stream is accessed by livestock and, based on historical aeriels, the channel and floodplain were heavily altered sometime between 1955 and 1972. In the 1972 historic aerial photo, a large area of deforestation along the stream corridor is evident. It also appears that the surrounding floodplain was manipulated from a forested system to agricultural fields for production. UT1 was divided into four separate reaches for analysis. Reach 1 and 2 are most similar to a Rosgen C stream type, while Reach 4 is most similar to a Rosgen B stream type. Reach 3 is unnatural in that it contains a culvert and vertical stacked rock retaining wall.

UT1 Reach 1 begins at the southern project boundary and flows northeast to the confluence with an ephemeral tributary. Along UT1 Reach 1 there is a narrow buffer with some woody and herbaceous vegetation. Throughout the reach there are cattle entry and exit points which have resulted in unstable banks leading to scour and incision. Multiple headcuts are present along the reach. In addition, cattle impacts have caused the degradation of channel bedform diversity and instream habitat.



UT1 Reach 2 begins at the confluence of UT1 and the ephemeral tributary and flows northeast until an existing farm crossing. A fence line associated with the parcel boundary bisects UT1 Reach 2. Downstream of the fence line, there is no woody or herbaceous vegetation within the floodplain and vegetation is dominated by pasture grasses. The channel is incised in this section. Upstream of the fence line, the woody vegetation is limited with some areas of hazel alder and green ash. The stream banks are cattle trampled, resulting in an overwide dimension; it is difficult to identify the main stem of the channel because cattle trampling has resulted in poorly-defined stream channel. The channel exhibits very little to no bedform throughout the reach and fecal material is present along the entire reach.



UT1 Reach 3 begins just upstream of the existing farm crossing and continues through it. The downstream end of the existing farm crossing drops approximately 10 vertical feet at a stacked rock retaining wall. The valley is narrow with steep walls downstream of the crossing.

UT1 Reach 4 begins at the existing farm crossing and continues until the confluence with Catfish Creek. UT1 Reach 4 is vertically stable due to widespread bedrock in the channel. Just downstream of the farm crossing there is a small area of incision. Similar to other project reaches the major limiting ecological factor for UT1 Reach 4 is livestock access. Grazing areas in the floodplain have limited understory vegetation and cattle fecal material is prevalent.

UT2 to Catfish Creek and Mountain Tributary

UT2 to Catfish Creek and Mountain Tributary are both intermittent headwater tributaries within the project area. UT2 begins at the farthest western edge of the project and flows southeast towards Catfish Creek. Mountain Tributary begins in the northwest corner of the project area and flows southeast before turning and flowing northeast into Mountain Creek. Mountain Tributary has multiple shallow head cuts but displays stable stream pattern. The lower extent of the reach is overly wide with poorly-defined channel geometry as it flows through a wetland on both sides. The reach ends at an existing culvert crossing. These headwater tributaries are in a similar existing condition with an established riparian woody canopy and a grazed understory. Overall, ecological degradation of these streams is directly attributed to cattle impacts.

Table 4: Project Attribute Table Part 3 – Catfish Pond Mitigation Site

Parameter	Catfish Reach 1	Catfish Reach 2	Catfish Reach 3	Catfish Reach 4	Catfish Reach 5
Length of Reach (LF)	115	323	474	434	473
Valley Confinement (confined, moderately confined, unconfined)	Confined	Confined	Confined	Unconfined	Moderately Confined
Drainage Area (acres)	17	17	53	56	61
Perennial, Intermittent, Ephemeral	I	P	P	P	P
NCDWR Water Quality Classification	WS-II/HQW/NSW				
Stream Classification ¹ (Existing)	E5b/E4b	E5b/E4b	E4	Incised E6	C4b
Evolutionary Trend (Simon)	IV- Degradation and Widening	IV- Degradation and Widening	IV- Degradation and Widening	IV- Degradation and Widening	IV- Degradation and Widening
FEMA Classification	N/A	N/A	N/A	N/A	N/A

Parameter	Catfish Reach 6	Catfish Reach 7	UT1 Reach 1	UT1 Reach 2	UT1 Reach 3
Length of Reach (LF)	466	1087	1066	490	154
Valley Confinement (confined, moderately confined, unconfined)	Moderately Confined	Moderately Confined	Unconfined	Moderately Confined	Moderately Confined
Drainage Area (acres)	70	197	75	105	107
Perennial, Intermittent, Ephemeral	P	P	P	P	P
NCDWR Water Quality Classification	WS-II/HQW/NSW				
Stream Classification ¹ (Existing)	N/A ²	C4b	E4	C6	E4b
Evolutionary Trend (Simon)	N/A	V – Aggradation and Widening	IV - Degradation and Widening	V – Aggradation and Widening	IV- Degradation and Widening
FEMA Classification	N/A	Zone AE (bottom end)	N/A	N/A	N/A

Parameter	UT1 Reach 4	UT2	Mountain Trib
Length of Reach (lf)	447	412	1362
Valley Confinement (confined, moderately confined, unconfined)	Confined	Confined	Moderately Confined
Drainage Area (acres)	108	32	30
Perennial, Intermittent, Ephemeral	P	I	I
NCDWR Water Quality Classification	WS-II/HQW/NSW		
Stream Classification ¹ (Existing)	E4b	C3b/C4b	E4b
Evolutionary Trend (Simon)	IV - Degradation and Widening	IV - Degradation and Widening	IV - Degradation and Widening
FEMA Classification	N/A	N/A	N/A

1. The Rosgen classification system (Rosgen, 1994) is for natural streams, while Simon Channel Evolution Model (Simon, 1989) describes a stream's evolutionary process after any disturbance. These channels have been heavily manipulated by livestock and humans and therefore may not fit one Rosgen classification category.
2. Catfish Creek Reach 6 contains an in-line embankment pond and therefore Rosgen classification does not apply.

4.0 Watershed and Channel Disturbance and Response

As discussed above in Section 3.2, tree clearing, stream channelization, and pond and road construction occurred between 1940 and 1955. Trees were permitted to grow along Catfish Creek and Mountain Tributary by 1983 and along UT1 by 1993.

These activities likely resulted in initiation of channel incision. Incision is present in a number of reaches, but due to small drainage areas, bedrock grade control, and riparian protection, erosion is often spotty and limited. Nevertheless, in some locations, the channels have begun to widen through streambank

scour and livestock trampling. Existing headcuts are generally not active because tree roots are resisting erosion.

In general, the Site is generally stable and will benefit from livestock exclusion measures, tree planting, and targeted stream restoration and enhancement efforts.

5.0 Functional Uplift Potential

The potential for functional uplift is described in this section according to the Stream Functions Pyramid (Harman, 2012). The Stream Functions Pyramid describes a hierarchy of five stream functions, each of which supports the functions above it on the pyramid. Sometimes, functions reinforce those below it, particularly on the bottom end. The five functions in order from bottom to top are hydrology, hydraulics, geomorphology, physicochemical, and biology.

5.1 Hydrology

The major watershed disturbances, prior to 1940 and between 1955 and 1972 (see Section 3.2), have been deforestation, stream channelization, and conversion of approximately half of the watershed to agricultural land uses. This historic land clearing and conversion to agriculture probably resulted in moderate increases in water yield.

Population growth in this rural area is limited by land use zoning and reliance on septic systems. Therefore, future alteration to the land cover and associated effects on hydrology are not expected in the foreseeable future. Considering this, the Site hydrology is functioning.

A stream restoration project performed at a specific Site does not often result in uplift to hydrology (Harman, 2012). However, some of the Catfish reaches will noticeably increase forested land cover because the conservation easement area comprises perhaps more than a nominal portion of the watersheds. Examples include Catfish Creek R4 (8.1% of the catchment area will be within the conservation easement), Catfish R6 (10.1%), Catfish R7 (5.1%), UT1 R2 (4.8%), UT1 R4 (8.8%), and Mountain Tributary (11.9%). Though this may not significantly improve the rainfall-runoff relationship, it may offer a degree of protection from future land development, particularly if sheet flow is maintained through the riparian buffer.

Therefore, in general, there is not an opportunity to further improve the hydrology function, but it is expected to remain functioning.

5.2 Hydraulics

Some of the streams on the Site are channelized and incised and not well connected to their floodplains. This has resulted in reduced hydraulic function by the channels. Bank height ratios greater than 1.5 are considered to be highly incised and thus not functioning (Rosgen, 2006; Harman, 2012). Fully functioning is indicated by bank height ratios of less than 1.2.

The bank height ratio on Catfish Creek Reach 4 is 1.9 to 2.2 (not functioning). Catfish Creek Reach 6 is impounded and thus it is not functioning hydraulically. The bank height ratios on UT1 are 1.4-1.8 (Reach 1) and 2.2 (Reach 2), which are mostly not functioning.

According to bank height ratio, most of the other project reaches are functioning-at-risk, though Catfish Creek R7 and UT1 R4 have some sections that are functioning. Existing conditions geomorphic parameters are provided in Appendix 5.

Entrenchment ratios show better function. Considering fully functional ratings apply to streams with entrenchment ratios greater than 2.2 for C and E stream types and 1.4 for B stream types, most reaches of the Site are functioning. There are exceptions, however, including sections of Catfish Creek (isolated



areas on R2, R4, R5 and R7) and upper UT1 (R1-R2), where entrenchment ratios indicate a lack of hydraulic function.

The reaches slated for restoration (Catfish Creek R4 and UT1 R2/R3) are incised and the channels will be reconstructed and connected to its floodplain so that streamflows above bankfull stage will reach the floodplain. The bank height ratios for all three restored reaches, after implementing Priority 1 restoration, will be 1.0 to 1.1 (functioning).

Bankfull flow velocities and shear stress will be maintained at functioning levels and groundwater exchange and adjacent wetland hydrology will be improved because of the increased frequency of floodplain inundation. After project implementation, hydraulics will transition to functioning.

5.3 Channel Geomorphology

Past channelization and downcutting, and current widening described in Sections 3.4 and 4 assigns many of the Site streams to Stages IV and V of the Simon Channel Evolution Model. Table 4 at the end of Section 3.4 lists the stage for each reach. It is true that these stages are physical processes acting to achieve a more stable condition and, in that sense, might be considered functioning; however, they indicate an unstable condition which comes with active erosion and thus are considered Not Functioning by Harman (2012). The goal of restoration is to achieve a stable condition, either by returning to Stage I through Priority 1 restoration or advancing to Stage VI through Priority 2 restoration. Both Stages I and VI have limited erosion. Late Stage V can be considered functioning-at-risk if the stream has begun to construct a floodplain at a lower elevation, but this is not the case for the stream channels on the Site. A number of Site streams are in Stage IV and thus are considered not functioning but the rate of change appears to be slow.

Wildlands conducted rapid assessments using the NC SAM methodology for five Catfish Creek reaches and six tributary reaches (UT1 R1-R4, UT2, Mountain Tributary). The NC SAM forms are provided in Appendix V. These evaluations show the habitat conditions on the Site are rated either Low or High, which largely follows where the stream has been manipulated or heavily impacted by cattle. Many locations have well-mixed sand, gravel, and cobble but there are also locations on each reach where embeddedness or scour are evident. For example, UT1 alternates between sections with well-mixed rock substrate and those that are embedded by fine sediment.

Most reaches contain sticks, leaf packs, woody debris, and coarse substrate necessary to support diverse macroinvertebrate communities. The riparian buffers are similar in that most have abundant mature trees with good bank coverage and width greater than 30 feet. However, due to livestock grazing understory species are largely absent. Also, UT1 Reaches 1 and 2, and Catfish Creek Reaches 4, 6, and 7 have locations with no trees on the streambanks or just a single row.

Reaches including most of UT1 and R4 and R6 on Catfish Creek have compromised habitat and thus Low ratings for NC SAM. Otherwise, the other channels have High NC SAM ratings.

While fish passage potential is good there are two major impediments: the dam at Catfish Pond and the culvert that is part of the stacked stone wall on UT1 Reach 3.

There is opportunity to improve the geomorphologic function on the Site and move the most unstable streams to a stable condition. All restoration reaches will remove incision and active bank erosion, or develop a functioning stream channel (UT1 Reach 2). The degree of bank erosion is not severe on Enhancement Level II reaches. Large woody debris will be added to the Site streams through construction of instream structures and bank revetments, and a riparian buffer will be planted. The geomorphology function will be restored to functioning on most project streams (Table 4). Those that are incised but targeted for enhancement are considered functioning-at-risk.

5.4 Physicochemical

There are no water quality monitoring stations within the watershed. The 2009 Neuse River Basinwide Water Quality Plan lists the major stressors in subbasin 03-04-01 as TSS, nutrients, and chlorophyll α . However, since the watershed land use is like the greater subbasin, the Site likely has similar physicochemical concerns as those stated in the Basinwide Water Quality Plan. Potential sediment sources in the watershed include streambank erosion, bed scour, and, to a lesser extent, runoff from agricultural fields. Potential sources of nutrients within the watershed are the livestock operations within the project area. The suspected high nutrient load and lack of shade in some reaches may contribute to elevated levels of chlorophyll α .

Wildlands estimated nutrient removal from livestock exclusion and riparian buffer establishment. The annual rate of nutrient removal from buffer establishment is calculated by using the NC Division of Water Quality “Methodology and Calculations for determining nutrient reductions associated with riparian buffer establishment” (1998). This spreadsheet model estimates total nitrogen (TN) and total phosphorus (TP) removed from land use change, from nonpoint source runoff filtration, and from periodic overbank flooding. For this calculation, Wildlands considered only restored riparian buffer adjacent to agricultural fields; 20.65 acres of buffer will exclude cattle. This buffer conversion is estimated to result in TN reduction of 1,054 pounds and a TP reduction of 87 pounds.

Estimated total nitrogen reduction from project implementation	1,054 pounds
Estimated total phosphorus reduction from project implementation	87 pounds

Although it is not mentioned in the Water Quality Plan, fecal coliform is another likely source of pollution within the watershed due to livestock operations. DMS has provided a method for quantifying benefits to water quality from livestock exclusion and riparian buffer establishment for stream restoration (NCDMS, 2016). A literature review found that an 85 percent reduction in bacteria loading may be achieved by establishing a riparian buffer and an additional 8.5 percent reduction may be achieved by excluding livestock from the stream channels. Wildlands applied this methodology and found that an estimated reduction of 6.55×10^{11} colonies per day are achieved from livestock exclusion, considering that there are 35 animal units in the project area. Also, an annual load reduction of 2.25×10^{14} fecal coliform colonies is estimated from nearly 130.9 acres of existing pasture area due to riparian buffer filtering. This estimate is based on pastures under continual grazing and a reduction in pasture runoff area to about 110.25 acres (i.e., the difference is in part due to reduced pasture area). The total annual fecal coliform reduction from the project is thus estimated to be 4.65×10^{14} colonies.

Using the information provided above, the current level of physicochemical functioning is estimated to be Not Functioning because of the high nutrient and fecal coliform bacteria loading. Annual reductions of 4.64×10^{14} fecal coliform colonies, 1,054 pounds of TN, and 87 pounds of TP are estimated and this would raise the Site to functioning.

Estimated pre-mitigation annual fecal coliform loading	4.96×10^{14} fecal coliform colonies
Estimated post-mitigation annual fecal coliform loading	3.21×10^{13} fecal coliform colonies
Estimated annual load reduction from mitigation project	4.65×10^{14} fecal coliform colonies

There is additional potential to improve the physicochemical functioning of the project streams. Streamflow will cascade over instream structures which will provide aeration; trees will be planted in the riparian zone to eventually shade and cool streamflow and help filter runoff; and, streambank erosion will be greatly reduced to nearly eliminate large sources of sediment. However, the potential

improvements to physicochemical functioning will not happen immediately and some aspects will not occur until a mature canopy is established.

5.5 Biology

The NC Wildlife Resource Commission noted there are multiple records of *Elliptio* species in Mountain Creek, which is immediately downstream from the Site (Travis Wilson, personal communication). Though this is a more common native mussel species, it indicates good habitat and water quality can be found in Mountain Creek. The Site will help to improve and protect this habitat in Mountain Creek. It also demonstrates a need to prevent downstream sedimentation impacts during project construction.

Because no data on the existing communities are available to evaluate the current level of biologic functioning, this function is Not Rated.

There is opportunity to improve the instream and riparian habitat, particularly in the restoration reaches. Habitat will be improved by adding instream structures with a variety of rock and woody materials, adding woody bank revetments, providing a riparian buffer to shade the stream and improve terrestrial habitat, creating pools of variable depths, and reducing loading of fine sediments. Two fish passage impediments will be addressed to improve aquatic organism passage. The biological response of the system will be tied to the habitat improvement. Even if these functions improve, the ultimate level of improvement in biology may not occur until after the completion of the seven-year monitoring period.

5.6 Overall Functional Uplift Potential

Overall, the Catfish Pond Mitigation Site can be considered, on average, as functioning-at-risk but the functional uplift potential is for it to be reclassified as functioning. This change in overall classification is mainly related to improvements in water quality between the existing and proposed conditions. The hydrology function will not be significantly improved by the project because it is already functioning and watershed-scale reforestation would be required to further improve it. Physicochemical and biological improvements are a likely result of the project.

5.7 Site Constraints to Functional Uplift

One of the trademarks of the Catfish Pond Mitigation Site is that, because so much of it is Enhancement II, it is low risk. Two of the restoration reaches, Catfish Creek Reach 6 and UT1 Reach 3, include constructing step pool sequences that involve significant amounts of rock. There is some risk posed by this approach which can be mitigated by installing stable footers and filter fabric to prevent piping.

Crossings are limited to three locations and these will be culverted and enable passage of fish and macroinvertebrates. All crossings will be within the conservation easement with livestock exclusion fencing to protect the stream from livestock access.

The stream restoration and enhancement approaches on the Site will allow for the development of stable, functioning streams and there are no other known constraints to the functional uplift described above in this section. The degree to which the physicochemical and biology functions can improve on the Site is somewhat limited by the presence of source communities downstream of the Site (i.e., benthic macroinvertebrates and fish).

6.0 Regulatory Considerations

Table 5, below, is a summary of regulatory considerations for the Site. These considerations are expanded upon in Sections 6.1-6.3.



Table 5: Project Attribute Table Part 4 – Catfish Pond Mitigation Site

Regulatory Considerations			
Parameters	Applicable?	Resolved?	Supporting Docs?
Water of the United States - Section 401	Yes	In Process	Appendix 4
Water of the United States - Section 404	Yes	In Process	Appendix 4
Endangered Species Act	Yes	Yes	Appendix 6
Historic Preservation Act	Yes	Yes	Appendix 6
Coastal Zone Management Act	No	N/A	N/A
FEMA Floodplain Compliance	Yes	In Process	N/A
Essential Fisheries Habitat	No	N/A	N/A

6.1 Biological and Cultural Resources

A Categorical Exclusion for the Catfish Pond Mitigation Site was submitted to DMS and FHWA on April 17, 2018 and approved on April 19, 2018. This document included investigation into the presence of threatened and endangered species on Site protected under The Endangered Species Act of 1973, as well as any historical resources protected under The National Historic Preservation Act of 1966. The biological conclusion for the Site, per the Categorical Exclusion research and response by US Fish and Wildlife Service, is that the, “proposed action [in this project] is not likely to adversely affect any federally listed endangered or threatened species, their formally designated critical habitat, or species currently proposed for listing under the Act.” All correspondence with USFWS and a list of Threatened and Endangered Species in Durham County, NC is included in Appendix 6. The conclusion for cultural resources per the Categorical Exclusion research and response by the State Historic Preservation Office is that there are no historic resources that would be affected by this project. For additional information and regulatory communications please refer to the Categorical Exclusion document in Appendix 6.

6.2 FEMA Floodplain Compliance and Hydrologic Trespass

The project is within the FEMA FIRM panel 3720082700J, effective October 19, 2018. The streams within the project limits are outside the Special Flood Hazard Area with the exception of the lower extent of Catfish Creek. Approximately 400 feet of Catfish Creek experiences backwater from Mountain Creek floodplain and lies within Zone AE. The project design has been developed to avoid hydrologic trespass to adjacent property. The E2 approach minimizes change to the profile and cross section, thus reducing the risk of changes to flooding.

Wildlands will coordinate with Durham County to obtain a floodplain development permit, if necessary.

6.3 401/404

Small wetland features are present along most of the Catfish Pond project streams, except for UT1, which has more extensive wetlands along it (see Section 3.4 – Project Resources). The proposed stream channels are routed away from these features when possible. However, the proposed stream channels often will go through the wetlands when there is no alternative on the existing floodplains. Any wetlands within the conservation easement and outside of the limits of disturbance will be flagged with safety fence during construction to prevent unintended impacts. This will be denoted in the final construction plans on the Erosion and Sediment Control plan and Detail plan sheets, as well as in the project specifications. Most floodplain grading will be considered a temporary impact to wetlands. Wildlands expects a net gain of wetland area, as construction of the new channels will fill most of the

old channels to the elevation of the existing wetlands and remove dredge spoil along the banks, creating a wider overall floodplain and riparian wetland area.

Table 6 estimates the anticipated impacts to wetland areas on this project. Final impacts will be provided in the Pre-Construction Notification, after proposed floodplain grading has been completed, and will more accurately quantify these data. The numbers below reflect a conservative estimate of potential impacts. Of the 30 individually mapped wetlands, nine have some type of impact, and three have permanent impacts.

Table 6: Estimated Impacts to Project Wetlands – Catfish Pond Mitigation Site

Jurisdictional Feature	Classification	Total Acreage	Permanent (P) Impact		Temporary (T) Impact	
			Type of Activity	Impact Area (acres)	Type of Activity	Impact Area (acres)
Wetlands A-DD	Riparian Riverine	3.29	Conversion of Wetland to Stream Resource	0.145	Floodplain Grading	0.4

7.0 Mitigation Site Goals and Objectives

The project will improve stream functions as described in Section 5 through stream restoration and enhancement, and riparian buffer re-vegetation. Project goals are desired project outcomes and are verifiable through measurement and/or visual assessment. Objectives are activities that will result in the accomplishment of goals. The project will be monitored after construction to evaluate performance as described in Section 11 of this report. The project goals and related objectives are described in Table 7.

Table 7: Mitigation Goals and Objectives – Catfish Pond Mitigation Site

Goal	Objective	Expected Outcomes	Function(s) Supported
Exclude cattle from project streams.	Install fencing around conservation easements adjacent to cattle pastures or remove livestock.	Reduce and control sediment inputs; reduce and manage nutrient inputs; reduce and manage fecal coliform inputs. Contribute to protection of or improvement to a Water Supply Waterbody.	Geomorphology, Physicochemical
Reconnect channels with floodplains and riparian wetlands to allow a natural flooding regime.	Reconstruct stream channels for bankfull dimensions and depth relative to the existing floodplain. Remove existing berms to re-connect channel with adjacent wetlands.	Raise water table and hydrate riparian wetlands. Allow more frequent flood flows to disperse on the floodplain. Support geomorphology and higher level functions.	Hydraulic
Improve the stability of stream channels.	Construct stream channels that will maintain stable cross sections, patterns, and profiles over time.	Significantly reduce sediment inputs from bank erosion. Reduce shear stress on channel boundary. Support all stream functions above hydrology.	Geomorphology
Improve instream habitat.	Install habitat features such as constructed riffles, cover/lunker logs, and brush toes into restored/enhanced streams. Add woody materials to channel beds. Construct pools of varying depth.	Increase and diversify available habitats for macroinvertebrates, fish, and amphibians leading to colonization and increase in biodiversity over time. Add complexity including LWD to streams.	Geomorphology (supporting Biology)



Goal	Objective	Expected Outcomes	Function(s) Supported
Restore and enhance native floodplain and streambank vegetation.	Plant native tree and understory species in riparian zone and plant appropriate species on streambank.	Reduce sediment inputs from bank erosion and runoff. Increase nutrient cycling and storage in floodplain. Provide riparian habitat. Add a source of LWD and organic material to stream. Support all stream functions.	Hydrology (local), Hydraulic, Geomorphology, Physicochemical, Biology
Permanently protect the project site from harmful uses.	Establish conservation easements on the Site.	Protect Site from encroachment on the riparian corridor and direct impact to streams and wetlands. Support all stream functions.	Hydrology (local), Hydraulic, Geomorphology, Physicochemical, Biology

8.0 Design Approach and Mitigation Work Plan

8.1 Design Approach Overview

The design approach for this Site was developed to meet the goals and objectives described in Section 7 which were formulated based on the potential for uplift described in Section 5. The design is also intended to provide the expected outcomes in Section 7, though these are not tied to performance criteria. The project streams planned for restoration will be reconnected with an active floodplain and the channels will be reconstructed with stable dimension, pattern, and profile that will transport the water and sediment delivered to the system. Enhancement Level II stream sections will include cattle exclusion and bank stabilization. Where buffer restoration or enhancement is needed, the adjacent floodplains and riparian wetlands will be planted with native tree species. Instream structures will be built in the channels to help maintain stable channel morphology and improve aquatic habitat. The entire project area will be protected in perpetuity by a conservation easement.

The design approach for this Site employed a combination of analog and analytical approaches for stream restoration. Reference reaches were identified to serve as an acceptable range for design parameters. Channels were sized based on design discharge hydrologic analysis. Designs were then verified and/or modified based on a sediment transport analysis. This approach has been used on many successful Piedmont and Slate Belt restoration projects (e.g., Underwood, Foust, Holman Mill, Maney Farm, and Agony Acres Mitigation Sites) and is appropriate for the goals and objectives for this Site.

8.2 Reference Streams

Reference streams provide geomorphic parameters of a stable system, which can be used to inform design of stable channels of similar stream types in similar landscapes and watersheds. Five reference reaches were identified for this Site and used to support the design of Catfish Creek and its tributaries (Figure 8). These reference reaches were chosen because of their similarities to the Site streams including drainage area, valley slope, morphology, and bed material. Geomorphic parameters for these reference reaches are summarized located in Appendix 5. The references to be used for the specific streams are shown in Table 8. A description of each reference reach is included below.

Table 8: Stream Reference Data Used in Development of Design Parameters – Catfish Pond Mitigation Site

	UT4 (UT to Cedar Creek)	UT to Wells Creek	UT to Henry Fork	UT to Varnals Creek	Agony Acres UT1
Stream Type:	C4	C4	B4a	B4/E4b	B3
Catfish Creek Reach 4	X	X		X	
Catfish Creek Reach 6			X		X
UT1 Reach 2	X	X		X	

8.2.1 *UT4 (UT to Cedar Creek)*

UT4 (UT to Cedar Creek) is located in eastern Stanly County, NC just upstream of Lake Tillery on the Pee Dee River. The site was identified by Environmental Banc & Exchange (EBX) and used as a reference reach for the Rockwell Pastures Stream and Wetland Restoration Site in 2008. The site has a drainage area of 0.11 square miles that is mostly wooded and includes a series of three small ponds. Extensive pattern, profile, and cross-sectional data were gathered by EBX and Kimley-Horn and Associates, Inc. UT4 was classified as a Rosgen C4 stream type, with a width to depth ratio of 12.6 and an entrenchment ratio of 2.7. It has a channel slope of 1.6% and a valley slope of 1.7%.

8.2.2 *UT to Wells Creek*

The UT to Wells Creek reference reach is located in south central Alamance County, NC near the Cane Creek Mountains and just southwest of UT to Varnals Creek. The site was identified by Arcadis and used as a reference reach for the Wells Creek Stream Restoration Site (Arcadis, 2002). Wildlands visited UT to Wells Creek in September 2014 and April 2019, and visually confirmed that the land use is unchanged from reported conditions and that the stream is laterally and vertically stable. UT to Wells Creek has a drainage area of 0.13 square miles and is classified as a Rosgen C4 stream type for the majority of the reach. UT to Wells Creek has a similar channel (2.0%) and valley slope (2.8%) to the Catfish Creek Reach 3 and UT1 Reach 2.

8.2.3 *UT to Henry Fork*

This reference reach is located immediately upstream of UT1 Reach 1 on the Henry Fork mitigation site in the western Piedmont and has a drainage area of about 0.1 square miles. This stream flows through a steep, confined valley with small intermittent flood benches. The channel slope of the surveyed reach is 4.2% and the width to depth ratio varies from 5.0 to 16.0. The entrenchment ratio is 1.7 to 2.0, typical of a B type stream. Rosgen classification is a B4a. Boulder/cobble and bedrock steps, pools, rock riffles, and other stable physical and habitat structure exist.

8.2.4 *UT to Varnals Creek*

The UT to Varnals Creek reference reach is in south central Alamance County, NC near the Cane Creek Mountains. The site was identified by Arcadis and used as a reference reach for the Wells Creek Stream Restoration Site (Arcadis, 2002). Wildlands visited UT to Varnals Creek in September 2014 and visually confirmed that the land use is unchanged from reported conditions and that the stream is laterally and vertically stable. In October 2014, Wildlands conducted a detailed morphological survey. Wildlands revisited the site in April 2019 and visually confirmed the stream remains laterally and vertically stable. UT to Varnals Creek near the Wildlands survey has a drainage area of 0.41 square miles and is classified as a Rosgen B4/E4b stream type for most of the reach. UT to Varnals Creek has a similar channel (1.7%) and valley slope (2.0%) to Catfish Creek Reach 3 and UT1 Reach 2.

8.2.5 *Agony Acres*

The Agony Acres reference reach (UT1 – Reach 3) is in northeast Guilford County, NC. It was identified as a high quality preservation component of the nearby Agony Acres Mitigation Site in the mitigation plan submitted in March 2014 and was used as a reference reach for that project. It was selected as a reference reach due to its similarity in slope and drainage area to the tributaries on the project. A detailed survey was conducted in March of 2013. The site is regularly visited as an active mitigation project, and as of March 2019 the reach is still reference quality. Agony Acres UT1 – Reach 3 has a drainage area of 0.17 square miles and is classified as a B3 stream type.

8.3 Design Channel Morphological Parameters

Reference reaches were a primary source of information to develop the pattern and profile design parameters for the streams. Ranges of pattern parameters were developed within the reference reach parameter ranges with some exceptions based on best professional judgement and knowledge from

previous projects. For example, radius of curvature ratio is kept above 1.6 on all reaches and meander width ratio is kept above a 2.5 in the moderately confined to unconfined valleys of the Site. Wildlands has found these minimum ratios to support stable geometry. Reference reaches were also used to inform the design of the cross-sections on the streams. The streams were designed with pool widths to be approximately 1.35 times the width of riffles to provide adequate point bars and riffle pool transition zones. Designer experience was used for pool design as well. Pool depths were designed to be a minimum of 2.0 times deeper than riffles to provide habitat variation. Cross-section parameters such as area, depth, and width were designed based on the design discharge and stable bank slopes. The width to depth ratio was increased beyond some of the reference parameters to provide stable bank slopes prior to the development of a fully vegetated streambank. Key morphological parameters for the Site are listed in Tables 9 and 10 for Catfish Creek Reach 3, Reach 5 and UT1 Reach 2. Complete morphological tables for existing, reference, and proposed conditions are in Appendix 5.

Table 9: Summary of Morphological Parameters for Restored C Channels – Catfish Pond Mitigation Site

Parameter	Existing Parameters		Reference Parameters			Proposed Parameters	
	Catfish Reach 4	UT1 Reach 2	UT4 (UT to Cedar Creek)	UT to Wells Creek	UT to Varnals Creek	Catfish Reach 4	UT1 Reach 2
Contributing Drainage Area (acres)	56	105	70	83	262	56	105
Channel/Reach Classification	E6	C6	C4	C4	C4/E4	C4	C4
Discharge Width (ft)	7.0	16.7	7.3	6.2-8.6	9.3-10.5	8.5	11.5
Discharge Depth (ft)	0.9	0.4	0.6	0.6-1.0	1.5-1.7	0.7	0.9
Discharge Area (ft ²)	6.4	7.1	4.2	3.9-6.3	10.3-12.3	5.8	9.9
Discharge Velocity (ft/s)	2.8	3.0	5.2-6.1	3.8	4.39-5.24	3.0	2.1
Design Discharge (cfs)	18	21	21.7-25.8	15	54	17.0	20.6
Water Surface Slope (ft/ft)	0.016	0.02	0.016	0.02	0.02	0.014	0.005
Sinuosity	1.07	1.06	1.05	1.41	1.2	1.18	1.23
Width/Depth Ratio	7.7	39.5	12.6	6.1-12.6	8.1-9.3	12.6	13.4
Bank Height Ratio	2.2	2.4	1.0	1.0-1.8	1.0	1.0	1.0 – 1.1
Entrenchment Ratio	1.7	1.3	2.7	1.9-4.1	5.7-10	2.2<	2.2-5.0

Table 10: Summary of Morphological Parameters for Restored B Channels – Catfish Pond Mitigation Site

Parameter	Existing Parameters		Reference Parameters		Proposed Parameters	
	Catfish Reach 6*	UT1 Reach 3 (Reach 4 XS)	UT to Henry Fork	Agony Acres	Reach 6	UT1 Reach 3
Contributing Drainage Area (acres)	70	108	32	96	70	108
Channel/Reach Classification	N/A	E4b	B4/A	B3	B4a	B4a
Discharge Width (ft)	--	6.2	3.2 – 7.7	11.1	8.5	8.0
Discharge Depth (ft)	--	0.7	0.5 – 0.6	1	0.6	0.6
Discharge Area (ft ²)	--	4.2	1.3 – 3.6	7.4	5.3	4.9

Parameter	Existing Parameters		Reference Parameters		Proposed Parameters	
	Catfish Reach 6*	UT1 Reach 3 (Reach 4 XS)	UT to Henry Fork	Agony Acres	Reach 6	UT1 Reach 3
Discharge Velocity (ft/s)	--	5.1	3.8 – 5.4	4.9	4.0	4.4
Design Discharge (cfs)	--	21	12	37	20.9	21.8
Water Surface Slope (ft/ft)	--	0.038	0.042	0.05	0.043	0.054
Sinuosity	--	1.1	1.1	1.04	1.04	1.02
Width/Depth Ratio	--	9.2	5.2 – 16.4	16.6	13.8	13.0
Bank Height Ratio	--	1.1	1.0 – 1.3	1.0	1.0	1.0
Entrenchment Ratio	--	3.6	1.7 – 2.0	2.3	1.4-2.5	1.4-2.5

*Reach 6 is an embankment pond and thus has no existing channel characteristics

8.3.1 Restoration Reaches

The following section includes brief descriptions of the design approach for the Site reaches. Invasive species treatment and riparian buffer planting with native hardwood vegetation will be conducted in each restoration reach. Supplemental planting will be conducted, as necessary, in the enhancement reaches.

Catfish Reach 4 is an incised channel with a bank height ratio of 2.2. It has been channelized along the right side of the valley. A C4 channel with a width to depth ratio of 12.6 is targeted for Reach 4.

Catfish Reach 6 is a pond with eroded banks from cattle access. The pond will be de-watered and a restored stream will be constructed. A B4a channel is proposed in this area with a slope of 0.043 feet/foot.

UT1 Reach 2 is incised, with a bank height ratio of 2.2 and little pattern, in some sections and braided in others. It will be designed to have a slope of 0.005 feet/foot. The existing crossing will be replaced and installed further upstream to accommodate a lower slope downstream of the culvert.

UT1 Reach 3 has a stone retaining wall on the downstream end of the existing crossing. The crossing will be removed and relocated upstream and the retaining wall removed to distribute the drop across the reach. It will be designed to have a slope 0.054 feet/foot. A B4a channel is proposed.

8.3.2 Enhancement II Reaches

Catfish Creek R1, R2, R3, R5, R7, and UT1 R1, UT1 R4, UT2, and Mountain Tributary are also incised but are generally stable except for more isolated instances of bank erosion. Similarly, there are relatively few headcuts on these and those that are present are slowed by hardpan bottom or tree roots.

Catfish Creek R1 and R2 are small, upper reaches of Catfish Creek with a narrow valley through mature forest. Isolated head cuts will be repaired with rock to create riffle sections. These reaches are steeper and sediment transport prevents aggradation.

Catfish Creek R3 begins at the confluence with UT2. The channel remains narrow and is largely stable but is incised in certain places. There is active erosion of the outside of some meander bends. These banks are proposed to be stabilized using channel realignment, bank grading, or brush toe installation.

Catfish Creek R5 begins downstream of an existing culvert crossing and is much larger than the upper reaches of Catfish Creek. As the valley width increases, Reach 5 is surrounded by a riparian buffer but cattle have access. There are multiple instances of rock debris piles (i.e., where rock from agricultural fields has been dumped), bank erosion, and exposed bedrock. The downstream extent of R5 has been

trampled by cattle as the stream reaches the backwater of the embankment pond. A step pool sequence is proposed to stabilize the profile at the upper end and livestock exclusion fencing will be installed.

Catfish Creek R7 is below the pond embankment and includes the confluence with UT1. Above and at the confluence, there are several areas of bank erosion. Below the confluence the valley becomes much wider and there is a large wetland on the right bank. Wildlands will stabilize the banks around the confluence with UT1 and other locations further downstream.

UT1 R1 is a long, flat reach with a thin buffer of trees separating the channel from adjacent farm pastures. Two wetland channels flow into the reach from the left side. There are two instances of head cuts, accumulation of rock debris from adjacent agricultural fields, and bank erosion. Wildlands will repair the bank erosion, stabilize the head cuts, exclude livestock, and plant a riparian buffer.

UT1 R4 is confined in a narrow valley with moderate slope. There is a lot of exposed bedrock throughout the reach. UT1 R4 is in largely stable condition but Wildlands will install fencing to prevent livestock access.

UT2 is a small headwater reach and is largely stable. UT2 exists within a mature forest. Cattle have access and will be excluded from the conservation easement.

Finally, Mountain Tributary has multiple shallow head cuts but displays stable stream pattern. The reach ends at an existing culvert crossing. The crossing will be removed, and the head cuts will be repaired by adding rock to create riffle sections.

8.4 Design Discharge Analysis

Multiple methods were used to develop bankfull discharge estimates for each of the project restoration reaches: the NC Rural Piedmont Regional Curve (Harman et al., 1999), NC Piedmont/Mountain Regional Curve (Walker, unpublished), a Wildlands regional USGS flood frequency analysis, a site specific reference reach curve, existing bankfull indicators, and data from previous successful design projects. The resulting values were compared, and best professional judgment was used to determine the specific design discharge for each restoration reach.

8.4.1 Published Regional Curve Data

Discharge was estimated using the published NC Rural Piedmont Curve (Harman et al., 1999), also known as the Piedmont Rural Curve. Discharge estimates were also obtained from the NRCS curve for rural Piedmont and mountain streams, also known as the Walker Curve (Walker, unpublished).

8.4.2 Wildlands Regional USGS Flood Frequency Analysis

Wildlands developed a regional flood frequency analysis tool that tailored the USGS 2009 publication *Magnitude and Frequency of Rural Floods in the Southeastern United States, through 2006* to the Piedmont of North Carolina. Of the 103 stations referenced in the publication, 23 were used in the development of the tool. To fill gaps in data, six additional stations were added by Wildlands to represent streams with drainage areas less than one square mile. The Hosking and Walls homogeneity test was performed in R[®] to identify the most appropriate gages based on homogeneity (Hosking and Walls, 1993). The six additional gages used were:

- USGS 02068610 – Hog Rock Creek near Moores Springs, NC (DA=0.31 mi²)
- USGS 02077210 – Kilgore Creek Tributary near Leasburg, NC (DA=0.25 mi²)
- USGS 02082540 – Wildcat Branch near Mapleville, NC (DA=0.32 mi²)
- USGS 02087240 – Stirrup Iron Creek Trib near Nelson, NC (DA=0.25 mi²)
- USGS 0209736050 – Battle Branch near Chapel Hill, NC (DA = 0.42 mi²)
- USGS 0213228795 – Jordan Creek near Silver Hill, NC (DA = 0.36 mi²)



The data from these 29 gage stations were used to develop flood frequency curves for the 1.2-year and 1.5-year recurrence interval discharges. These relationships can be used to estimate discharge of those recurrence intervals for ungaged streams in the same hydrologic region, and were solved for each designated restoration reach based on their corresponding drainage area.

8.4.3 *Existing Bankfull Indicators (Manning's Equation)*

Stable riffle cross sections on the Site were surveyed to estimate discharge using Manning's equation. The highest quality bankfull indicators, such as top of bank, were identified in the field during this survey. Manning's equation was used to calculate a corresponding discharge using surveyed channel slope. Two discharge estimates using this method were added to the site-specific regional curve.

8.4.4 *Site Specific Reference Reach Curve*

Wildlands developed a site-specific reference reach curve (site specific curve) using nine points: the five reference reaches identified in Section 8.2, as well as two additional reference reach discharge points (Franklin Creek Trib XS4 and UT to Cane Creek) and two points from existing bankfull indicators to balance the distribution across drainage areas. The drainage areas for these nine points range from 0.05 to 0.41 square miles. This compares well with the drainage area of the Site restoration reaches, which range from 0.09 to 0.17 square miles.

Each reference reach was surveyed to develop information for analyzing drainage area-discharge relationships. Stable cross-sectional dimensions and channel slopes were used to compute a bankfull discharge with the Manning's equation for each of these seven reaches. The resulting discharge values were plotted with drainage area and a site-specific regression equation was developed. The R^2 value for this equation is 0.7729.

8.4.5 *Design Discharge Analysis Summary*

The overarching design goal is to build stable channels that transport sediment without aggrading or degrading and to reconnect streams with their natural valleys, to the extent practicable. A design discharge analysis was employed to determine a range of discharge values to guide the discharge selection for each design reach. In summary, the NC Piedmont Rural Curve results are higher than the Walker Curve results by approximately 50%. The USGS gage analysis produced discharge estimates such that the 1.5-year (recurrence interval) results were typically 30% greater than the Piedmont Rural Curve results and the 1.2-year event was 60% greater than the Walker Curve results. The site specific curve yielded results that were typically 20% higher than the Piedmont Rural Curve and generally were slightly below the 1.5-year (recurrence interval) results for the USGS analysis.

Selecting a design discharge based on the Walker Curve results promotes frequent floodplain inundation, but the observed frequency, based on documented observations related to constructed projects, appears to be lower (more frequent) than the 1.2-year interval. Due to the desire to achieve somewhat regular floodplain interaction, design discharges were selected to be equal to or less than the site specific curve and close to the designated USGS 1.2-year recurrence interval.

UT1 has abundant jurisdictional wetlands along it and Wildlands favored a lower design discharge in these reaches to avoid a drainage effect by the restored channel. UT1 Reach 3 is steeper than UT1 Reach 2, but there is no significant change in drainage area. As such, the discharge estimate was maintained for Reach 3 and the designed channel (i.e., typical section) accommodates the change in slope. Catfish Creek Reaches 4 and 6 have relatively higher design discharges in order to design a minimum one-foot design channel depth. The design discharge for Catfish Creek Reach 4 is slightly higher than the site specific curve results due to the one-foot design channel depth. The design discharge for Catfish Creek Reach 6 is slightly lower than the results of the site specific curve due to weighting of the Piedmont

Curve. The restoration reaches were designed to tie into existing floodplain elevations to the extent practicable, while regarding existing natural features (i.e., wetlands, trees) and restoration objectives.

Table 11 gives a summary of the discharge analysis. Figure 9 illustrates the design discharge data.

Table 11: Summary of Design Discharge Analysis – Catfish Pond Mitigation Site

		Reach 4	Reach 6	UT1 Reach 2	UT1 Reach3 ¹
DA (acres)		56	70	107	108
DA (sq. mi.)		0.09	0.11	0.16	0.16
NC Rural Piedmont Regional Curve (cfs)		15	18	24	24
Alan Walker Curve (cfs)		8	10	13	13
Wildlands Regional USGS Flood Frequency Analysis (cfs) ²	1.2-year event	17	18	20	20
	1.5-year event	24	26	28	28
Site Specific Reference Reach Curve		17	20	27	27
Manning's Equation from Surveyed XS (cfs)	XS6	20			
	XS10			23	
Selected Design Discharge (cfs)		18	19	21	21

¹The increase in drainage area for UT1 Reach 3 is considered to be negligible compared to UT1 Reach 2

²USGS Peak Discharge Estimation for NC Rural Piedmont grayed for catchments smaller than those on which the regression equation was developed. Wildlands Rural Piedmont Discharge Calculator for DAs>0.25 sq. mi. and <10% impervious cover.

8.5 Sediment Transport Analysis

A current and historical analysis of the streams and land use within and adjacent to the project was conducted to facilitate the sediment transport analysis. The existing watershed conditions have been static in this rural area over an extended period with minor exceptions, and the potential for future land use change is likely to be inconsequential to project stream hydrology (see Section 5.1). Sediment contributions from the watershed are deemed to be constant and are not expected to vary significantly in the future. The watershed and site assessment suggest that local factors contribute sediment within the project corridor and that the sediment load contributed by the upstream watershed (beyond the project limits) is stable. Sediment deposition observed in the existing channels is attributed to local bank erosion within the project streams and input of fine sediment from adjacent pastures. Thus, the design approach will address the major sediment source (i.e., bank erosion) within the project area by protecting stream banks and increasing shear resistance via the construction of in-stream structures. The constructed streams will not be capacity limited; therefore, the focus of sediment transport analysis was to verify that the designed channels will be stable over time and provide the competence to pass the sediment delivered by the stream network.

8.5.1 Capacity Analysis

For watersheds with rapidly changing land uses and for streams with visual signs of high bedload supply, a detailed capacity analysis, along with field data collection, may be necessary. Based on the analysis described above, the project streams currently appear to be supply limited (i.e., have capacity to move a sediment load greater than the supplied load).

8.5.2 Competence Analysis

In natural streams, the shear stress in a channel increases corresponding to an increase in discharge until the point at which the stream is flowing full and gains access to the floodplain. The floodplain access disperses the flow and prevents further increases in shear stress within the channel. This relationship of shear stress, channel dimension, and discharge influences erosion potential within the channel and the channel's ability to entrain certain sizes of sediment (competence). To support the

competence analysis, the calculated shear stresses for both existing and proposed conditions along restoration reaches were compared to determine if the proposed stream will be able to move the bed material within the channel and to support material sizing within the constructed riffles. The proposed channels were modeled using their design bankfull flow. The analysis utilized standard equations based on a methodology using the Shields (1936) curve and Andrews (1980) equation described by Rosgen (2001). Channel slope and design dimensions were varied until the resulting design verified that the stream reach could move the bed load supplied to the stream. The competence analysis for each project reach is summarized in the tables below.

The initial competence analysis was based on the size material naturally found in the stream to mimic potential bed load. The results were used to inform further design of the reach. Wood and rock structures, including various riffle types (e.g., chunky riffles, etc.), were located based on the shear stress results and integrated into the design as grade control. Also, the proposed D50 and D100 for the constructed riffles were sized to ensure a stable pavement layer while allowing for bed load material to be active within the system. Riffles will be supplemented with Class A stone or similarly sized natural substrate where the proposed condition shear stress exceeds the shear stress necessary to move the maximum particle size supplied by the watershed. Class B stone or similarly sized natural substrate will be utilized along Catfish Creek Reach 6 and UT1 R3.

Table 12: Results of Competence and Capacity Analysis, Restoration Reaches – Catfish Pond Mitigation Site

	Catfish Creek		UT1	
	Reach 4	Reach 6	Reach 2	Reach 3
Dbkf (ft)	0.7	0.6	0.9	0.6
Schan (ft/ft)	0.0142	0.0428	0.0051	0.0536
Bankfull Shear Stress, τ (lb/sq ft)	0.56	1.52	0.26	1.89
Existing Dmax Subpavement (mm)	68.9	68.9	31.9	31.9
Dcrit (ft)	1.00	0.33	1.33	0.13
Scrit (ft/ft)	0.0203	0.0237	0.0076	0.0113
Movable particle size (mm)	43	120	20	152
Predicted Shear Stress to move Dmax	0.57	1.52	0.26	1.89

1. Reported numbers are based on the Shield’s curve.
2. The maximum and D₅₀ for Class A stone are 152.4mm and 101.6mm, respectively (NCDOT standard specification).
3. The maximum and D₅₀ for Class B are 304.8mm and 203.2mm, respectively (NCDOT standard specification).

The predicted largest movable particle is less than the existing maximum diameter of a subpavement particle for Catfish Reach 4 and UT1 R2. Existing native subpavement material will be utilized to the extent practicable along this reach because the largest measured particle is not expected to be transported as bedload in the proposed stream. As previously noted, local factors (i.e., bank erosion by cattle or stream) contribute sediment to UT1 R2. The risk of aggradation along UT1 R2 is mitigated through proposed enhancement activities upstream of UT1 R2 and through cattle exclusion. Class B stone or similarly sized natural substrate will be utilized along Reach 6 and UT1 R3 to reinforce constructed riffles. Grade control structures will also be used on UT1 R3 to manage the increase in shear stress. The D50 of the pavement material is expected to coarsen over time with the reduction and elimination of bank erosion, promoting further stabilization of the riffle substrate.

8.6 Project Implementation

This section provides narrative detail on the restoration or enhancement approaches for each of the project reaches. All project reaches will include the establishment of the following:

1. A conservation easement protecting the project from uses that would damage it.
2. A riparian buffer that consists of native hardwood species.
3. Livestock exclusion where applicable.
4. Invasive species treatment.

Table 13 lists the primary stressors for each project reach and the approach Wildlands will use to restore or enhance it. Priority 1 restoration is a frequently employed approach. It will raise the water table, improve hydrologic connection to the riparian wetlands, and allow for frequent inundation of the floodplain and a reduction of shear stress on the channel.

Table 13: Functional Impairments and Restoration Approach – Catfish Pond Mitigation Site

Resource	Primary Stressors/Impairments	Restoration Approach
Catfish Creek R1	Livestock access	Enhancement II
Catfish Creek R2	Livestock access, headcut, lack of riparian vegetation	Enhancement II
Catfish Creek R3	Livestock access, bank erosion	Enhancement II
Catfish Creek R4	Stream channelization, livestock access	Restoration – Priority 1
Catfish Creek R5	Livestock access, incision near culvert at upper end	Enhancement II
Catfish Creek R6	Farm pond, lack of riparian vegetation	Restoration – Priority 1
Catfish Creek R7	Lack of riparian vegetation, livestock access, bank erosion	Enhancement II
UT1 R1	Bank erosion, livestock access, lack of riparian vegetation	Enhancement II
UT1 R2	Livestock access, aggradation	Restoration – Priority 1
UT1 R3	Livestock access, culvert, and online retaining wall.	Restoration – Priority 2
UT1 R4	Livestock access	Enhancement II
UT2	Livestock access, incision	Enhancement II
Mountain Trib	Bank erosion, livestock access, lack of habitat	Enhancement II

8.7 Reach Specific Implementation

Catfish Creek has been separated into seven reaches for the restoration design, separated by confluences with other channels or changes in mitigation approach. Reaches 1-3 are slated for Enhancement Level II practices to stabilize eroding streambanks. Access will be carefully planned to avoid impacts to the existing mature riparian forest.

Priority 1 restoration will commence at Reach 4. The proposed stream will be realigned to the low point in the existing valley and will avoid jurisdictional wetlands to the extent practicable. The existing farm crossing at the end of Reach 4 will be removed and replaced with an appropriately sized culvert.

Reach 5 begins just downstream of the farm crossing. Due to the Priority 1 restoration of Reach 4, a step pool sequence will transition the stream bed from the culvert down to the existing channel elevation.

Reach 6 begins approximately 100 feet above the extent of the existing pond. The pond will be de-watered and the embankment will be removed to allow a channel to be routed through this area. The elevation drop necessitates a channel with an average slope of 4.3%, transitioning between flatter riffle sections and steeper step pool sequences.

Once at grade, Enhancement Level II practices are proposed for Catfish Creek Reach 7. Here, the vertical eroding outside bends will be stabilized using a variety of measures, including constructed riffle installation, bank grading, and toe protection, particularly at the confluence with UT1.

UT1 is divided into four reaches. UT1 Reaches 1 and 4 will be Enhancement II while Reach 2 will be Priority 1 restoration and Reach 3 will be Priority 2 restoration to allow more gradual slope across the elevation change present at the existing retaining wall. UT1 R1 on the upstream end is targeted for Level II Enhancement practices whereby the streambed will be raised with constructed riffles and eroding streambanks will be stabilized. An existing farm crossing will be removed and replaced.

UT1 Reach 2 features Priority 1 restoration to maintain channel and floodplain connectivity and preserve flood access to the adjacent wetlands. The alignment uses the available floodplain, which is in pasture. Efforts will be made during construction to minimize the impact to existing wetlands on this floodplain. An existing farm crossing on UT1 Reach 3 will be relocated upstream to Reach 2.

UT1 Reach 3 begins at the downstream end of the proposed, relocated farm crossing and will be Priority 2 restoration to allow a more gradual slope down to the existing channel at the beginning of Reach 4. Topsoil will be stockpiled for incorporation with the Priority 2 restoration final grade. Currently, there is a stone retaining wall at the existing farm crossing which will be removed. The retaining wall is approximately 10 feet high. A channel with average slope of 5.4%, little sinuosity, and largely step pool structures will achieve this drop in elevation.

UT2 will feature Enhancement Level II. Though is in relatively stable condition, livestock will be excluded and a constructed riffle will be installed using minimally invasive procedures to decrease incision and establish grade control.

Mountain Trib is proposed to be Enhancement Level II, with the streambed being raised to create riffle sections to stabilize head cuts. An existing farm crossing at the downstream end will be decommissioned.

8.8 Additional Project Implementation Benefits

The restoration of Site streams is likely to increase the wetland footprint on-site to include old channel beds and newly created floodplains. This, along with the development of a riparian forest, should increase the Site's ability to cycle and store nutrients. The efficacy of nutrient cycling is likely to increase as the forest matures and develops a seasonal input of organic material into the system.

Wildlands estimated nutrient removal from livestock exclusion and riparian buffer establishment (see Section 5.4) using the NC Division of Water Quality "Methodology and Calculations for determining nutrient reductions associated with riparian buffer establishment" (1998). The project is estimated to annually reduce TN by 1,046 pounds and TP by 87 pounds. These numbers do not include the probable reductions associated with riparian wetlands.

The Site is connected to a wooded parcel at the upstream and downstream ends of Catfish Creek. Once a riparian buffer is established on-site, wildlife will likely migrate to the newly forested area.

The Site streams will be comprised of riffle-pool sequences with log and rock drop structures. In-stream structures will include various types of constructed riffles, log sills, rock sills, and J-hooks. The structures will reinforce channel stability and serve as habitat features. Some riffles will incorporate woody brush material and large woody debris. The diverse range of constructed riffle types will provide grade control, diversity of habitat, and will create varied flow vectors. Log J-hooks will deflect flow vectors away from banks while adding to habitat diversity. Log sills will be used to allow for small grade drops across pools and provide extra grade control. At select outer meander bends, the channel banks will be constructed with brush toe revetments to reduce erosion potential, encourage pool maintenance, and provide varied pool habitat. Sod mats will also be used to provide immediate bank protection. Due to the limited availability of sod containing native herbaceous vegetation on site, it will be used minimally, where most beneficial. The concept plan is illustrated in Figure 8.



Wildlands has completed several projects within the Slate Belt and has found that riffle grade control material can be harvested from weathered parent material on valley side slopes to mitigate for the natural lack of grade control. Per soil descriptions, the Tatum gravelly silt loam (TaE), located along Catfish Creek, contains weathered bedrock beginning at a depth of 42 inches. This area will be used to source rock for habitat and grade control structures during construction. This method, along with the introduction of woody debris, has been successful at providing a heterogeneous mixture of riffle material that increases channel roughness and improves channel hydraulics and geomorphology. The gradation of material provides varied pore spaces within the riffles and structures, which benefits hyporheic exchange processes and niche habitat formation.

8.9 Vegetation and Planting Plan

The long-term objective of the planting plan is to establish a thriving native riparian buffer. Only the areas without established forested buffer vegetation will be planted with trees. This restored buffer will improve riparian habitat, help maintain the stability of restored streams, and provide temperature-reducing shade, as well as a source for LWD and organic material to the streams. Beyond creating stream credits, the Site will also generate riparian buffer credits for the Neuse 01 in accordance with 15A NCAC 02B .0295. The development of buffer credits is further detailed in Appendix 12. The Site will be planted to the extents of the conservation easement. Riparian buffers will be seeded and planted with early successional native vegetation. The specific species composition to be planted was selected based on the community type, observation of occurrence of species in riparian buffers adjacent to the Site, and best professional judgement on species establishment and anticipated Site conditions in the early years following project implementation. Species chosen for the planting plan are listed on Sheet 5.0 of the draft preliminary plans located in Appendix 7. The draft plans also contain additional guidance on planting zones.

While not specifically proposed, NCDMS reserves the right to convert available Buffer credits to Nutrient Offset credits for all riparian areas proposed for buffer credit except those generating credits from enhancement as indicated in the site viability letter provided by DWR (see Appendix 3) and as shown in Appendix 12.

The riparian buffer areas will be planted with bare root seedlings. In addition, the top of banks will be planted with live stakes and the channel toe will be planted with multiple herbaceous species. Live stakes will not be planted within channels with bankfull widths of less than eight feet due to the small size of the channel. Live stakes will be planted one to two feet beyond the top of bank on small channels. Permanent herbaceous seed will be spread on streambanks, floodplain areas, and all disturbed areas within the project easement.

To help ensure tree growth and survival, soil amendments may be added to areas of the floodplain where overburden material is removed. Soil tests will be performed in areas of cut, and fertilizer and lime will be applied based on the results. Additionally, topsoil will be stockpiled, reapplied, and disked before permanent seeding and planting activities take place.

Species planted as bare roots will be planted at 12-foot by 6-foot spacing for an initial density of 605 stems per acre. The targeted density after monitoring year 3 is 320 stems per acre.

Invasive species within the riparian buffers will be treated and/or removed at the time of construction. The extent of invasive species coverage will be monitored, mapped, and controlled as necessary throughout the required monitoring period. Please refer to Appendix 8 for the invasive species plan. Additional monitoring and maintenance issues regarding vegetation are in Sections 9 and 10 and Appendix 9.



8.10 Project Risk and Uncertainties

The land use surrounding much of the project has cattle operations so there is potential for accidental livestock access. Livestock exclusion measures, as long as cattle are present, will be maintained on site. Due to the proximity to downtown Durham, NC, there is some risk that the project parcels may be developed outside of the proposed conservation easement limits. This could potentially alter the hydrology or sediment supply to the degree that the project is put at risk. The Rural Residential zoning requirement of 0.5 dwelling units per acre, as well as applicable stormwater regulations, should make any development that occurs unlikely to impact the mitigation project.

Aggradation of UT1 R2, a low shear stress reach, and on Enhancement Level II reaches, where the cross section is not significantly changed, is an additional uncertainty. By excluding livestock and addressing the worst instances of streambank erosion, the sediment supply should be reduced which will lessen aggradation risk. This is a common risk of the light-touch, Enhancement Level II approach.

8.11 Stream Crossings

Table 14 summarizes the proposed crossings on the Site. All three crossings are included in the conservation easement. Crossing will be fenced with 5-strand barbed wire or charged high-tensile wire and gated. Because the crossings will be culverted, cross-fenced, and gated, cattle will not have access to the live streams when moving through the crossings.

The crossings will be designed to allow for fish passage and aquatic habitat continuity. Culvert pipes will be buried 6 to 12 inches to allow for a natural stream bed through the crossing. Some of the existing culverts on site have vertical profile steps at the outfalls, posing a challenge to fish passage. This project will help to improve aquatic passage and stream habitat by replacing perched culverts and allowing for a continuous stream bed habitat.

Table 14: Crossing Summary - Catfish Pond Mitigation Site

Reach	Crossing Location (STA)	Crossing Type	Width (feet)	Within Conservation Easement?
Catfish Creek R4/R5	113+20	culvert	60	Yes
UT1 R1	203+30	culvert	40	Yes
UT1 R2	216+00	culvert	60	Yes

9.0 Performance Standards

The stream performance standards for the project will follow approved performance standards presented in the DMS Mitigation Plan Template (June 2017), the Annual Monitoring Template (June 2017), and the Stream Mitigation Guidelines issued October 2016 by the USACE and NCIRT. Annual monitoring and semi-annual site visits will be conducted to assess the condition of the finished project. Specific performance standard components are proposed for stream morphology, hydrology, and vegetation. Performance standards will be evaluated throughout the seven-year post-construction monitoring.

9.1 Streams

9.1.1 Dimension

Riffle cross-sections on the restoration reaches should be stable and should show little change in bankfull area, maximum depth ratio, and width-to-depth ratio. Per DMS guidance, bank height ratios on restoration reaches shall not exceed 1.2 and entrenchment ratios shall be at least 2.2 for restored C and E channels and no less than 1.4 for B channels to be considered stable. All riffle cross-sections should fall

within the parameters defined for channels of the appropriate stream type. If any changes do occur, these changes will be evaluated to assess whether the stream channel is showing signs of instability. Indicators of instability include a vertically incising thalweg or eroding channel banks. Changes in the channel that indicate a movement toward stability or enhanced habitat include a decrease in the width-to-depth ratio in meandering channels or an increase in pool depth. Remedial action would not be taken if channel changes indicate a movement toward stability.

9.1.2 Pattern and Profile

Visual assessments and photo documentation should indicate that streams are remaining stable and do not indicate a trend toward vertical or lateral instability.

9.1.3 Substrate

Channel substrate materials will be sampled with the pebble count method along Catfish Creek and UT1. Restoration reaches should show maintenance of coarser materials in the riffle features and smaller particles in the pool features. A reach-wide pebble count will be performed in each restoration reach each monitoring year for classification purposes. A pebble count will be performed at each surveyed riffle cross-section, only during the as-built survey to characterize the pavement.

9.1.4 Photo Documentation

Photographs should illustrate the Site's vegetation and morphological stability on an annual basis. Cross-section photos should demonstrate no excessive erosion or degradation of the banks. Longitudinal photos should indicate the absence of persistent mid-channel bars or vertical incision. Grade control structures should remain stable. Deposition of sediment on the bank side of vane arms is preferable. Maintenance of scour pools on the channel side of vane arms is expected.

9.1.5 Bankfull Events and Stream Hydrology

The occurrence of bankfull events will be documented throughout the monitoring period. Four bankfull flow events must be documented on restoration streams during the seven-year monitoring period. The four bankfull events must occur in separate years. Stream monitoring will continue until performance standards in the form of four bankfull events in separate years have been documented.

9.2 Vegetation

Vegetative performance for riparian buffers associated with the stream restoration component of the project (buffer widths up to 50ft) will be in accordance with the Stream Mitigation Guidelines issued October 2016 by the USACE and NCIRT. Only planted areas will be monitored and subject to success criteria. The success criteria are an interim survival rate of 320 planted stems per acre at the end of monitoring year three (MY3), 260 stems per acre at the end of monitoring year 5 (MY5), and a final vegetation survival rate of 210 stems per acre at the end of monitoring year 7 (MY7). Planted vegetation must average 10 feet in height in each plot at the end of the seventh year of monitoring, with an interim average of 7 feet in height at the end of MY5. Vegetation monitoring will be conducted between July 1st and the end of the growing season. Individual plot data will be provided and will include height, density, vigor, damage (if any), and survival. In fixed vegetation plots planted woody stems will be marked annually as needed and given a coordinate, based off a known origin, so they can be found in succeeding monitoring years. Mortality will be determined from the difference between the previous year's living planted stems and the current year's living planted stems.

A separate buffer monitoring report will be submitted to NCDWR as discussed in Appendix 12.

The extent of invasive species coverage will be monitored and controlled as necessary throughout the required monitoring period (MY7). Additional information is provided in Appendix 8.

9.3 Visual Assessments

Visual assessments will be conducted a minimum of twice per year by qualified individuals. These visual assessments will include vegetation density, vigor, invasive species, stream channel and structure inspection, and easement encroachments.

10.0 Monitoring Plan

The Site monitoring plan has been developed to ensure that the required performance standards are met and project goals and objectives are achieved. Annual monitoring data will be reported using the DMS Annual Monitoring Reporting Template (June 2017). The monitoring report shall provide project data chronology that will facilitate an understanding of project status and trends, ease population of DMS databases for analysis and research purposes, and assist in close-out decision making.

Using the DMS As-Built Baseline Monitoring Report Template (June 2017), a baseline monitoring document and as-built record drawings of the project will be developed within 60 days of the planting completion and monitoring installation on the restored site. Monitoring reports will be prepared in the fall of each monitoring year and submitted to DMS by November 30. These reports will be based on the DMS Annual Monitoring Template (June 2017) and Closeout Report Template (January 2016). Full monitoring reports will be submitted to DMS in monitoring years 1, 2, 3, 5, and 7. Abbreviated monitoring reports will be submitted in monitoring years 4 and 6. Closeout monitoring period will be seven years beyond completion of construction or until performance standards have been met.

Table 15, below, describes how the monitoring plan is set up to verify project goals and objectives have been achieved.

Table 15: Monitoring Plan – Catfish Pond Mitigation Site

Goal	Treatment	Performance Standards	Monitoring Metric	Outcome	Likely Functional Uplift
Exclude cattle from project streams.	Install fencing around conservation easements adjacent to cattle pastures.	There is no required performance standard for this metric.	Visual inspections of fencing and buffer vegetation.	Fencing and buffer vegetation undisturbed by livestock.	Reduce and control sediment inputs; Reduce and manage nutrient inputs; contribute to protection of or improvement to a Water Supply Waterbody.
Reconnect channels with floodplains and riparian wetlands to allow a natural flooding regime.	Reconstruct stream channels with appropriate bankfull dimensions and depth relative to the existing floodplain. Remove overburden to reconnect with adjacent wetlands.	Four bankfull events within monitoring period.	Crest gauges on Catfish Creek and UT1 recording peak flow elevations.	Multiple bankfull events within the monitoring period.	Dispersion of high flows on the floodplain, increase in biogeochemical cycling within the system, and recharging of riparian wetlands.

Goal	Treatment	Performance Standards	Monitoring Metric	Outcome	Likely Functional Uplift
Improve stability of stream channels.	Construct stream channels that will maintain stable cross-sections, patterns, and profiles over time.	Entrenchment ratio stays over 2.2 and bank height ratio below 1.2 with visual assessments showing progression towards stability.	Cross-section monitoring and visual inspections.	Stable stream channels with entrenchment ratios over 2.2 and bank height ratios below 1.2.	Reduction in sediment inputs from bank erosion, reduction of shear stress, and improved overall hydraulic function.
Improve instream habitat.	Install habitat features such as constructed riffles, lunger logs, and brush toes into restored streams. Add woody materials to channel beds. Construct pools of varying depth.	There is no required performance standard for this metric.	Complete a Rapid Stream Assessment Technique (RSAT) score for aquatic instream habitat	The RSAT score for instream aquatic habitat would progress from a poor condition to a good or excellent condition over time.	Increase in available habitat niches for macroinvertebrates and fish leading to an increase in biodiversity over time.
Restore and enhance native floodplain and streambank vegetation.	Plant native tree and understory species in riparian zones and plant appropriate species on streambanks.	For planted areas only. 210 planted stems per acre at MY7. Interim survival rate of 320 planted stems per acre at MY3 and 260 at MY5. For buffer credit areas, survival rate of 260 stems per acre at MY5.	One hundred square meter vegetation plots will be placed on 2% of the planted area of the project and monitored annually.	For planted areas only. Planted stem densities will be at or above 210 planted stems per acre at MY7, with volunteer trees growing on Site as well.	Reduction in floodplain sediment inputs from runoff, increased bank stability, increased LWD and organic material in streams, increased biogeochemical cycling in floodplain, and improved riparian habitat.
Permanently protect the Site from harmful uses.	Establish conservation easements on the Site.	Prevent easement encroachment.	Visually inspect the perimeter of the Site to ensure no easement encroachment is occurring.	No harmful encroachment into the conservation easement.	Protection of the Site from encroachment into the conservation easement.

10.1 Monitoring Components

Project monitoring components are listed in more detail in Table 16. Approximate locations of the proposed vegetation plots, cross sections, and crest gage monitoring components are illustrated in Figure 9.

Table 16: Monitoring Components – Catfish Pond Mitigation Site

Parameter	Monitoring Feature	Quantity/ Length by Reach		Frequency	Notes
		Restoration	Enhancement 2		
Dimension	Riffle Cross Sections	4	N/A	Year 1, 2, 3, 5, and 7	1
	Pool Cross Section	3	N/A		
Pattern	Pattern	N/A	N/A	N/A	2
Profile	Longitudinal Profile	N/A	N/A	N/A	
Substrate	Reach wide (RW), Riffle (RF) 100 pebble count	4 RW, 4 RF	N/A	Reach Wide Year 1, 2, 3, 5, and 7	3
Hydrology	Crest Gage	2	N/A	Quarterly	4
Wetlands	Groundwater Wells	4		Quarterly	5
Vegetation	CVS Level 2	7 Fixed, 2 Random		Year 1, 2, 3, 5, and 7	6
Visual Assessment		Y	Y	Semi-Annual	
Exotic and nuisance vegetation				Semi-Annual	7
Project Boundary				Semi-Annual	8
Reference Photos	Photographs	5	15	Annual	

1. Cross sections will be permanently marked with rebar to establish location. Surveys will include points measured at all breaks in slope, including top of bank, bankfull, edge of water, and thalweg.
2. Pattern and profile will be assessed visually during semi-annual site visits. Longitudinal profile will be collected during as-built baseline monitoring survey only, unless observations indicate lack of stability and profile survey is warranted in additional years.
3. Reach wide pebble counts will be conducted each year a monitoring report is submitted. Riffle cross-section pebble counts will be conducted during as-built baseline monitoring only, unless observations indicate otherwise.
4. Crest gages and/or transducers will be inspected quarterly or semi-annually, evidence of bankfull events will be documented with a photo when possible. Transducers, if used, will be set to record stage once every 2 hours. The transducer will be inspected and downloaded semi-annually.
5. Groundwater wells are for informationally purposes only, there is no success criteria for these wetland areas.
6. Vegetation monitoring will follow CVS protocols.
7. Locations of exotic and nuisance vegetation will be mapped.
8. Locations of vegetation damage, boundary encroachments, etc. will be mapped.

11.0 Long-Term Management Plan

Upon approval for close-out by the NC IRT the site will be transferred to the North Carolina Department of Environmental Quality (NCDEQ) Stewardship Program. This party shall serve as conservation easement holder and long-term steward for the property and will conduct periodic inspection of the site to ensure that restrictions required in the conservation easement are upheld. The NCDEQ Stewardship Program is developing an endowment system within the non-reverting, interest-bearing Conservation Lands Conservation Fund Account. The use of funds from the Endowment Account will be governed by

North Carolina General Statute GS 113A-232(d)(3). Interest gained by the endowment fund may be used for stewardship, monitoring, stewardship administration, and land transaction costs, if applicable.

The Stewardship Program will periodically install signage as needed to identify boundary markings as needed. Any livestock or associated fencing or permanent crossings will be the responsibility the owner of the underlying fee to maintain.

Table 17: Long-Term Management Plan – Catfish Pond Mitigation Site

Long-Term Management Activity	Long-Term Manager Responsibility	Landowner Responsibility
Signage will be installed and maintained along the Site boundary to denote the area protected by the recorded conservation easement.	The long-term steward will be responsible for inspecting the Site boundary and for maintaining or replacing signage to ensure that the conservation easement area is clearly marked.	The landowner shall report damaged or missing signs to the long-term manager, as well as contact the long-term manager if a boundary needs to be marked, or clarification is needed regarding a boundary location. If land use changes in future and fencing is required to protect the easement, the landowner is responsible for installing appropriate approved fencing.
The Site will be protected in its entirety and managed under the terms outlined in the recorded conservation easement.	The long-term manager will be responsible for conducting annual inspections and for undertaking actions that are reasonably calculated to swiftly correct the conditions constituting a breach. The USACE, and their authorized agents, shall have the right to enter and inspect the Site and to take actions necessary to verify compliance with the conservation easement.	The landowner shall contact the long-term manager if clarification is needed regarding the restrictions associated with the recorded conservation easement.

12.0 Adaptive Management Plan

Upon completion of Site construction, Wildlands will implement the post-construction monitoring defined in Sections 9 and 10. Project maintenance will be performed during the monitoring years to address minor issues as necessary (Appendix 9). If, during annual monitoring it is determined the Site’s ability to achieve Site performance standards are jeopardized, Wildlands will notify the DMS of the need to develop a Plan of Corrective Action. Once the Plan of Corrective Action is prepared and finalized Wildlands will:

- Notify the USACE as required by the Nationwide 27 permit general conditions;
- Revise performance standards, maintenance requirements, and monitoring requirements as necessary and/or required by the USACE;
- Obtain other permits as necessary;
- Implement the Corrective Action Plan; and
- Provide the USACE a Record Drawing of Corrective Actions. This document shall depict the extent and nature of the work performed.

13.0 Determination of Credits

The final stream credits associated with the Site are listed in Table 18. Stream restoration is at a ratio of 1:1 and Enhancement Level II activities are credited at a ratio of 2.5:1. In addition to excluding livestock, treating invasive species, stabilizing headcuts, and fixing spot erosion, Wildlands is placing the wetland along T1 within the conservation easement and protecting mussel species in Mountain Creek. The mussel species protection is discussed in Section 5.5, and the IRT field meeting minutes are in Appendix 5 and include a discussion of the Enhancement Level II credit ratio. The credit release schedule is in Appendix 11. Buffer credits are discussed in Appendix 12.

The project stream length with less than 50-foot riparian buffers is 4.37%. These primarily occur near crossings or at the beginning of stream reaches. Since this is less than 5.0%, per the Wilmington District Stream and Wetland Compensatory Mitigation Update dated October 24, 2016, credit adjustments for buffer widths will not be required. Most of the buffers on the site far exceed the 50-foot standard.

Table 18: Project Asset Table – Catfish Pond Mitigation Site

Type	Stream		Riparian Wetland		Riparian Buffer	
	R	RE	R	RE	R	RE
Totals	3,748.800	N/A	N/A	N/A	522,327.570	N/A

Project Component or Reach ID	Existing Length	Proposed Stationing Location	Restoration Level	Restoration Length (LF)	Mitigation Ratio	Proposed Stream Credits
Catfish R1	115	100+00 to 101+15	EII	115	2.5	46.000
Catfish R2	323	101+15 to 104+38	EII	323	2.5	129.200
Catfish R3	474	104+38 to 109+11	EII	473	2.5	189.200
Catfish R4	369	109+11 to 112+85	R	374	1.0	374.000
	65	112+85 to 113+57	-	72	0	0
Catfish R5	459	113+57 to 118+17	EII	460	2.5	184.000
Catfish R6	466	118+17 to 122+71	R	454	1.0	454.000
Catfish R7	1,087	122+71 to 133+42	EII	1,071	2.5	428.400
UT1 R1	307	200+52 to 203+15	EII	263	2.5	105.200
	42	203+15 to 203+57	-	42	0	0
	717	203+57 to 210+74	EII	717	2.5	286.800
UT1 R2	430	210+74 to 215+89	R	515	1.0	515.000
	60	215+89 to 216+49	-	60	0	0
UT1 R3	154	216+49 to 217+98	R	149	1.0	149.000
UT1 R4	447	217+98 to 222+44	EII	446	2.5	178.400
UT2	412	302+35 to 306+47	EII	412	2.5	164.800
Mountain Trib	1,362	400+89 to 414+51	EII	1,362	2.5	544.800

Component Summation				
Restoration Level	Stream (LF)	Riparian Wetland (Acres)	Buffer (sq. ft.)	Upland (AC)
Restoration	7,134	N/A	788,934	N/A

14.0 References

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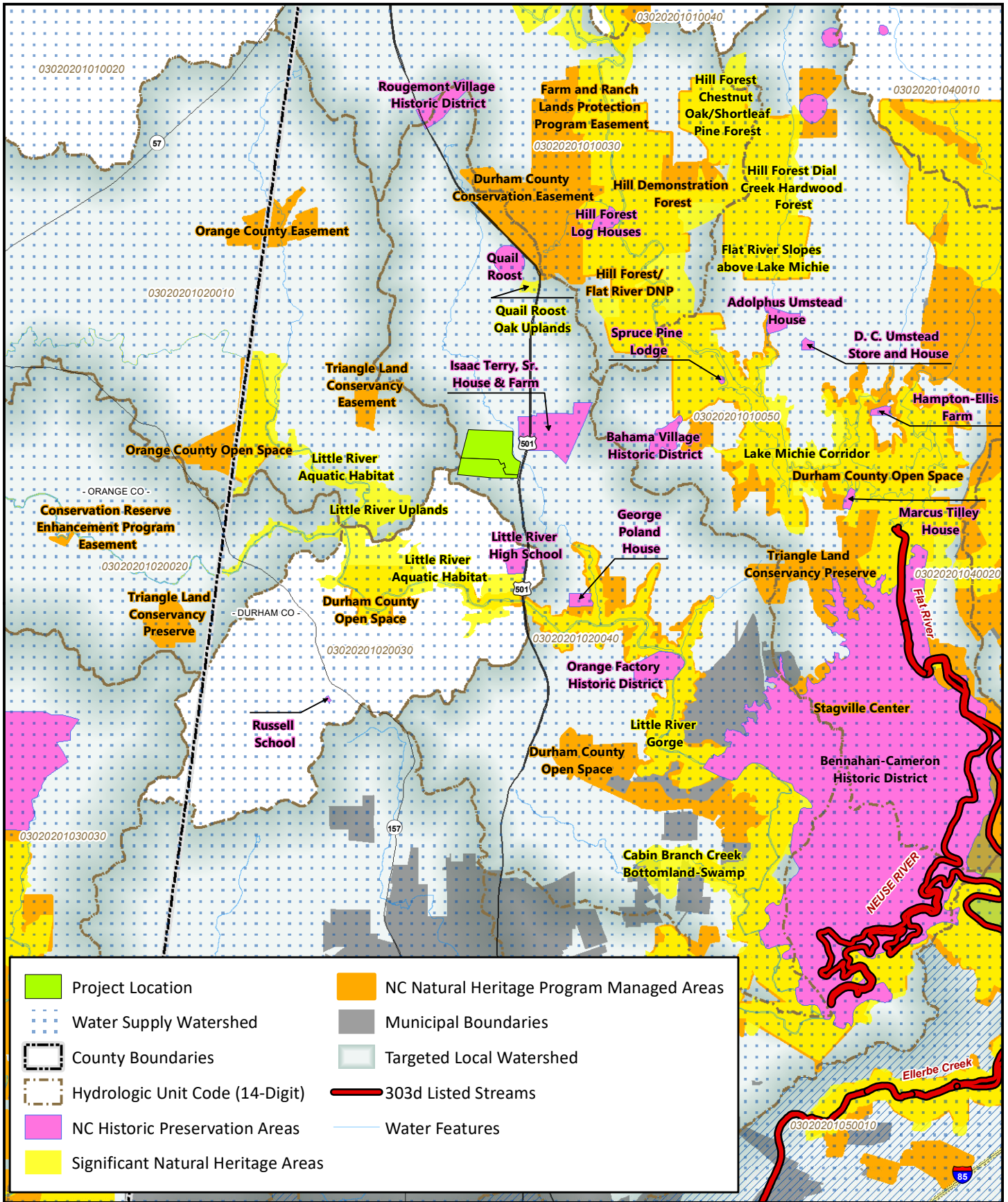
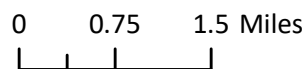
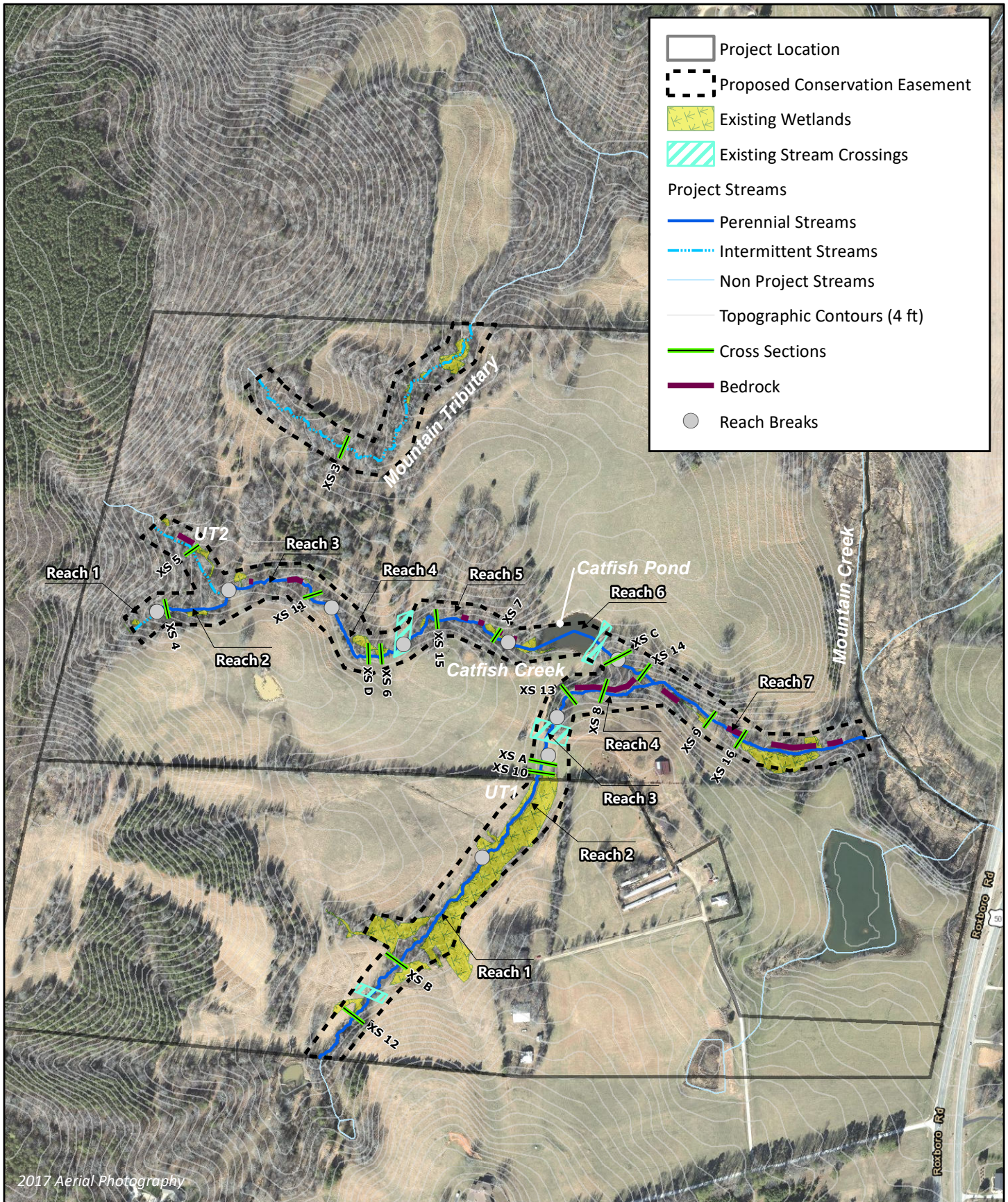


Figure 1 Vicinity Map
 Catfish Pond Mitigation Site
 Neuse River Basin 03020201
 Durham County, NC





	Project Location
	Proposed Conservation Easement
	Existing Wetlands
	Existing Stream Crossings
Project Streams	
	Perennial Streams
	Intermittent Streams
	Non Project Streams
	Topographic Contours (4 ft)
	Cross Sections
	Bedrock
	Reach Breaks

2017 Aerial Photography

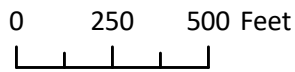


Figure 2 Site Map
 Catfish Pond Mitigation Site
 Neuse River Basin 03020201

Durham County, NC

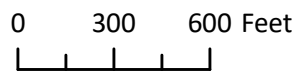
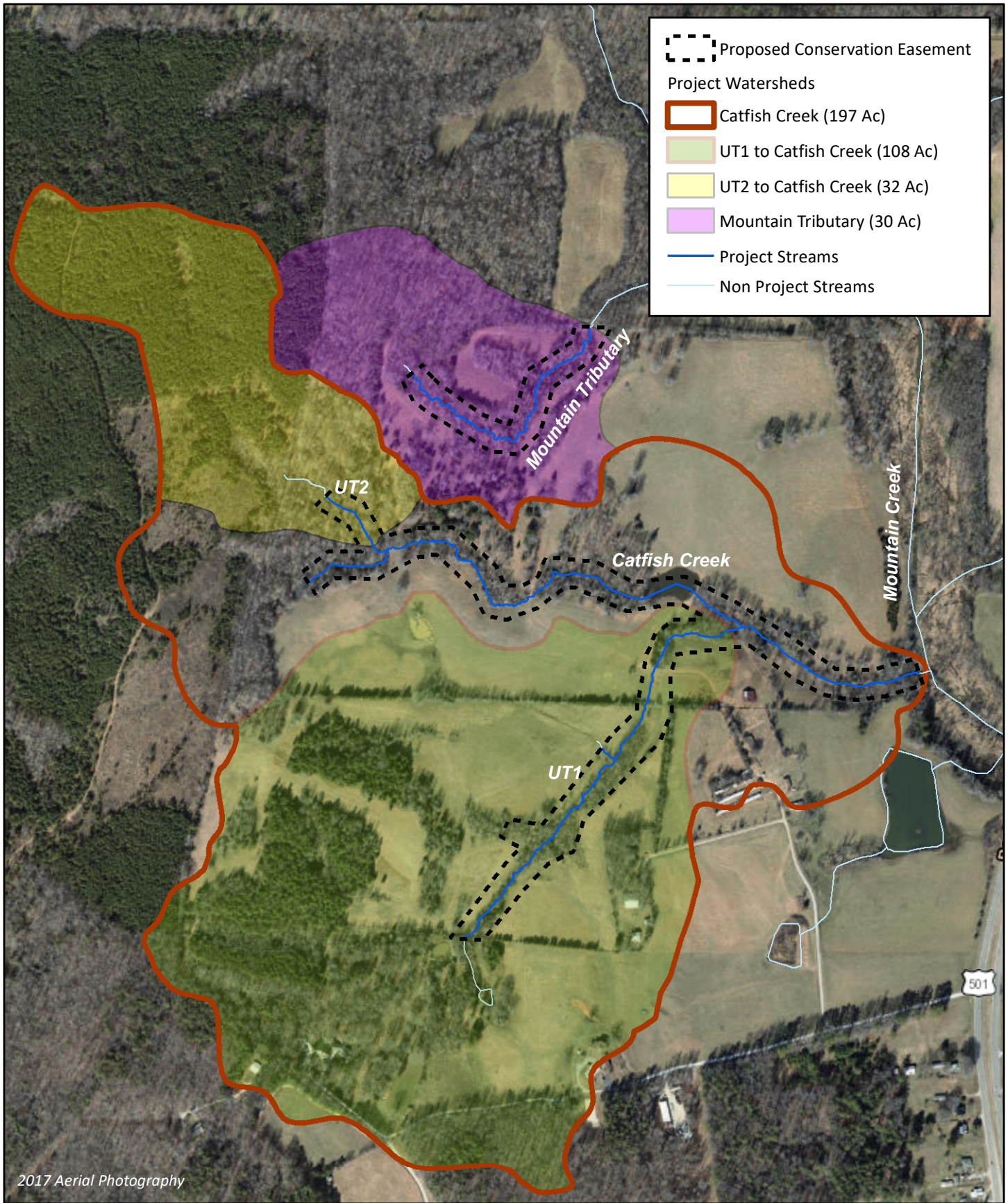


Figure 3 Watershed Map
 Catfish Pond Mitigation Site
 Neuse River Basin 03020201

Durham County, NC

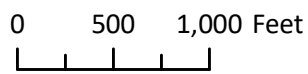
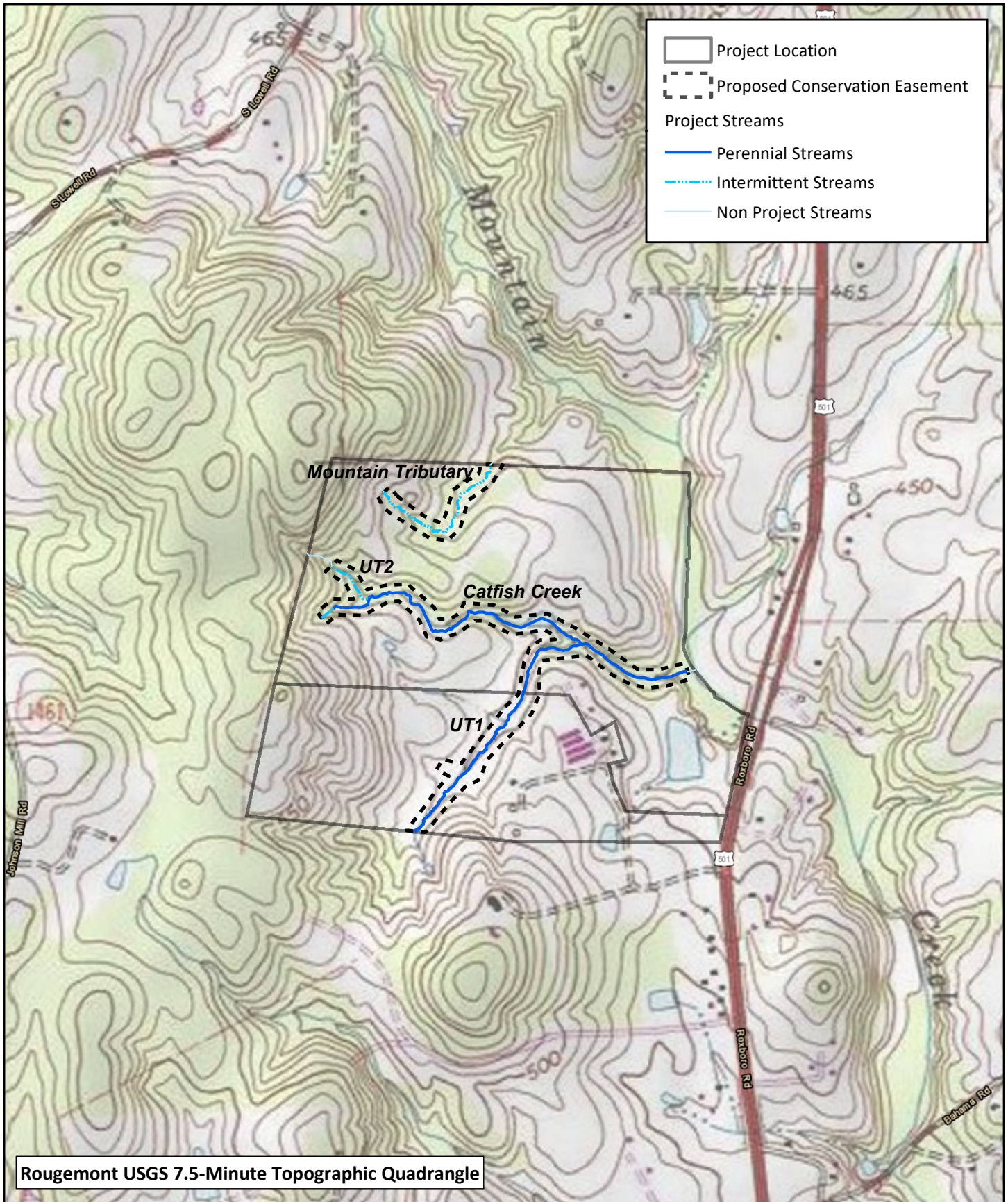


Figure 4 USGS Topographic Map
 Catfish Pond Mitigation Site
 Neuse River Basin 03020201

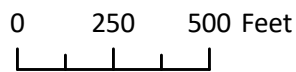
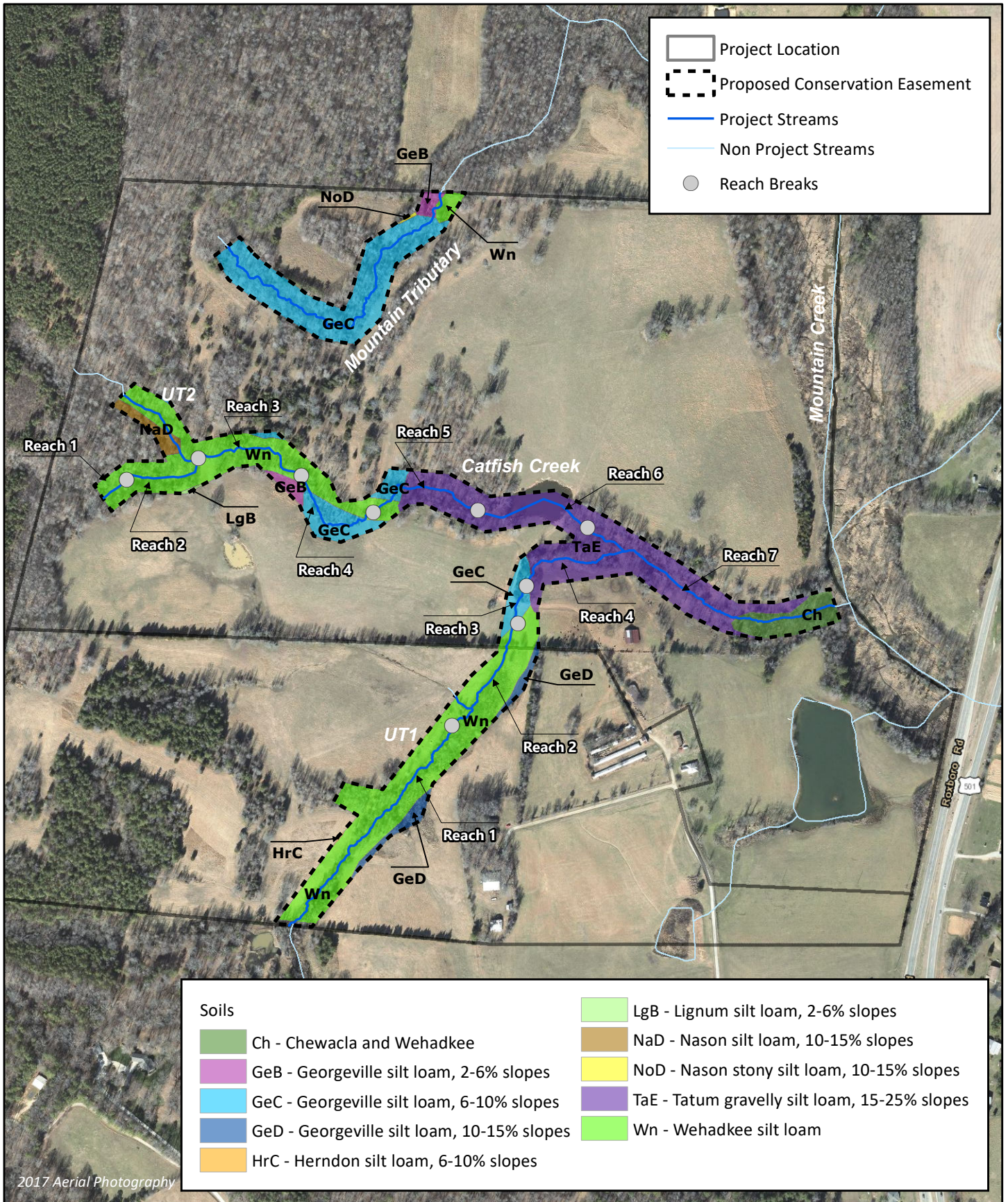


Figure 5 Soils Map
 Catfish Pond Mitigation Site
 Neuse River Basin 03020201

Durham County, NC

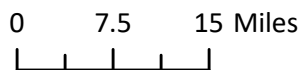
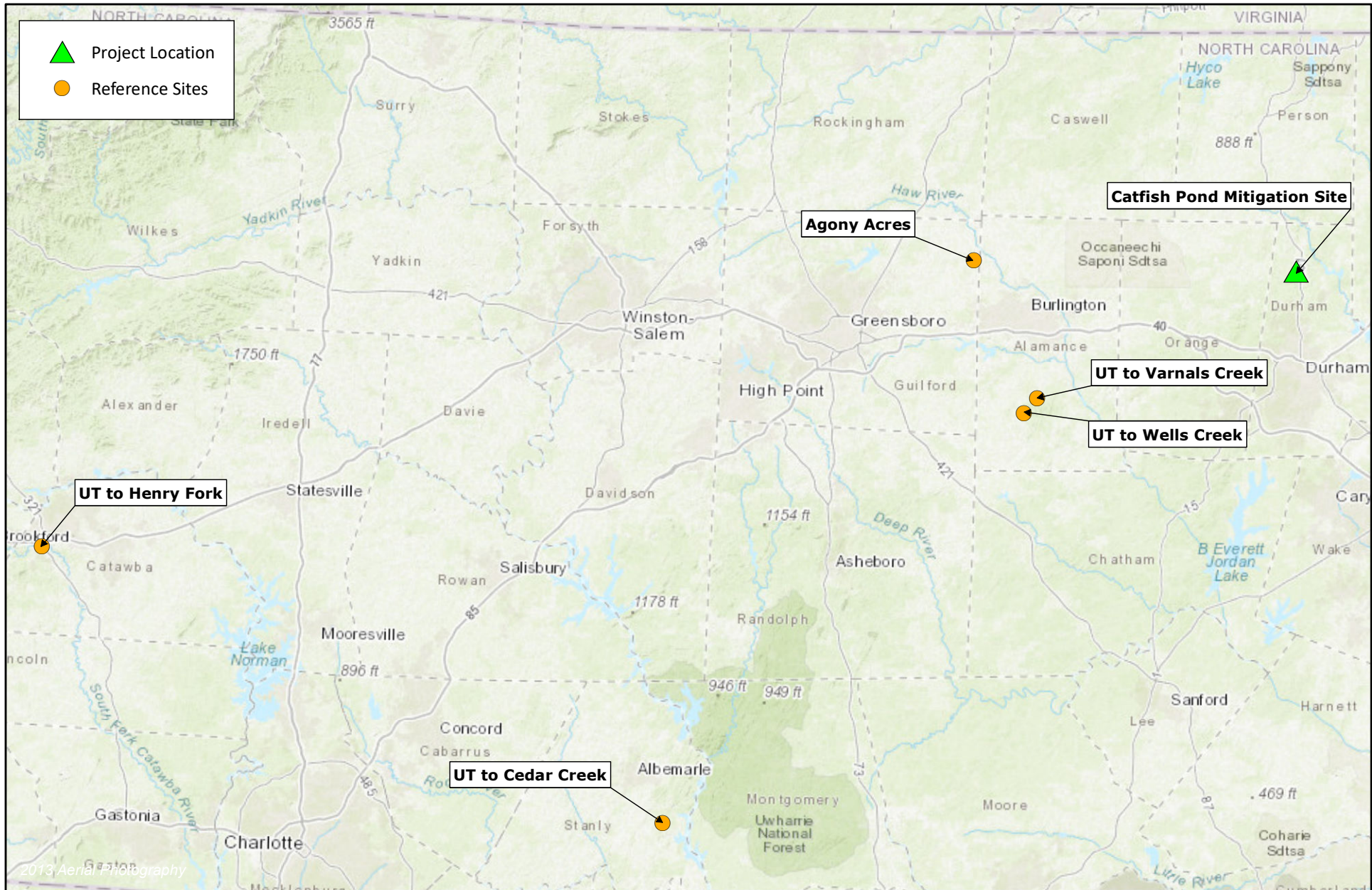
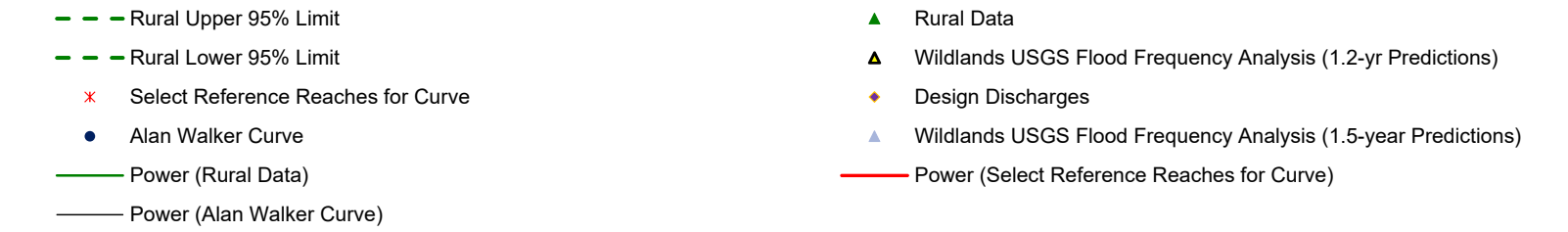
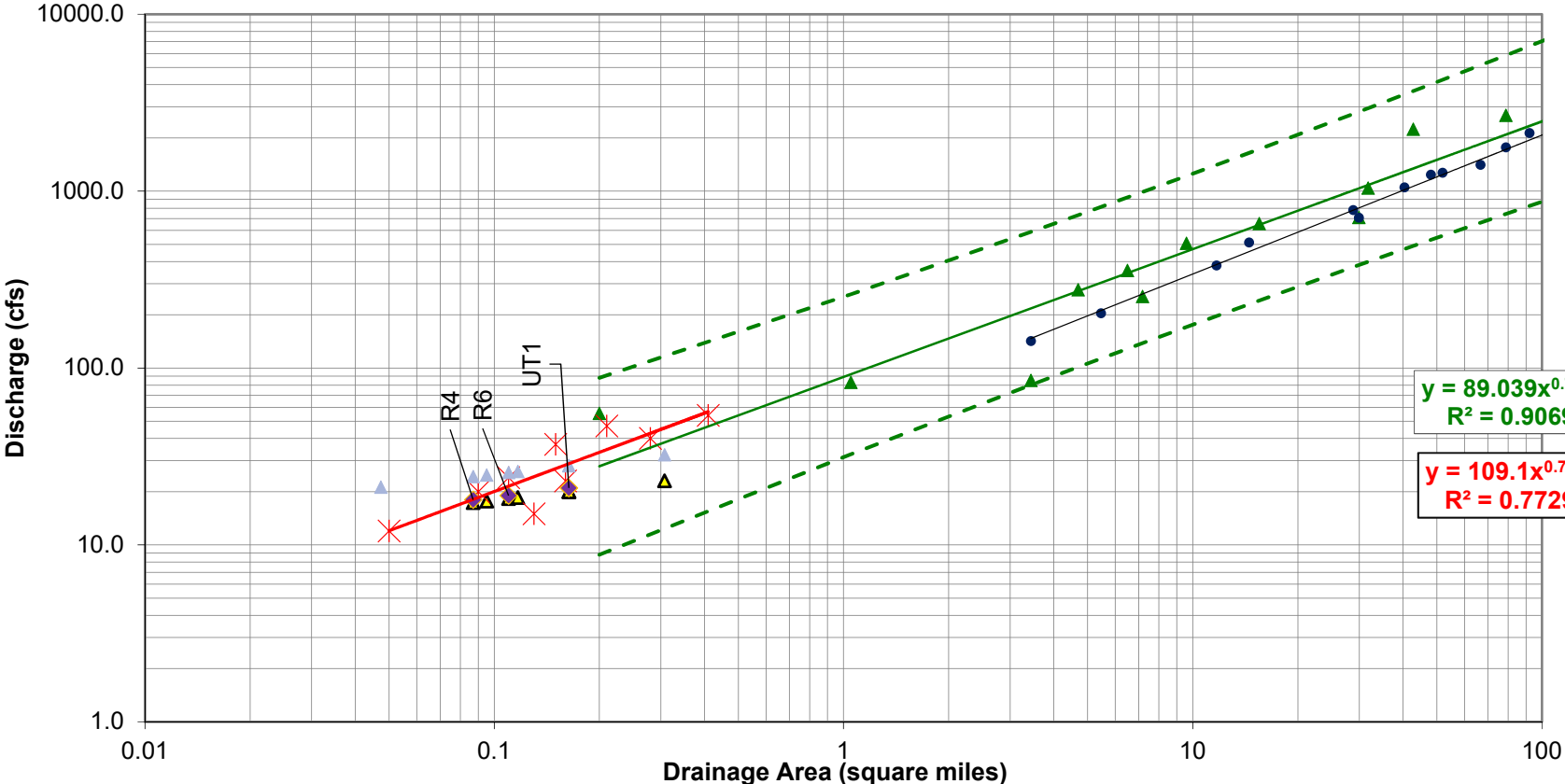


Figure 6 Reference Reach Vicinity Map
Catfish Pond Mitigation Site
Neuse River Basin 03020201

Durham County, NC

Figure 7. Project Discharge Date Overlaid on North Carolina Regional Curves



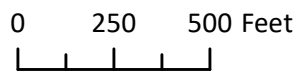
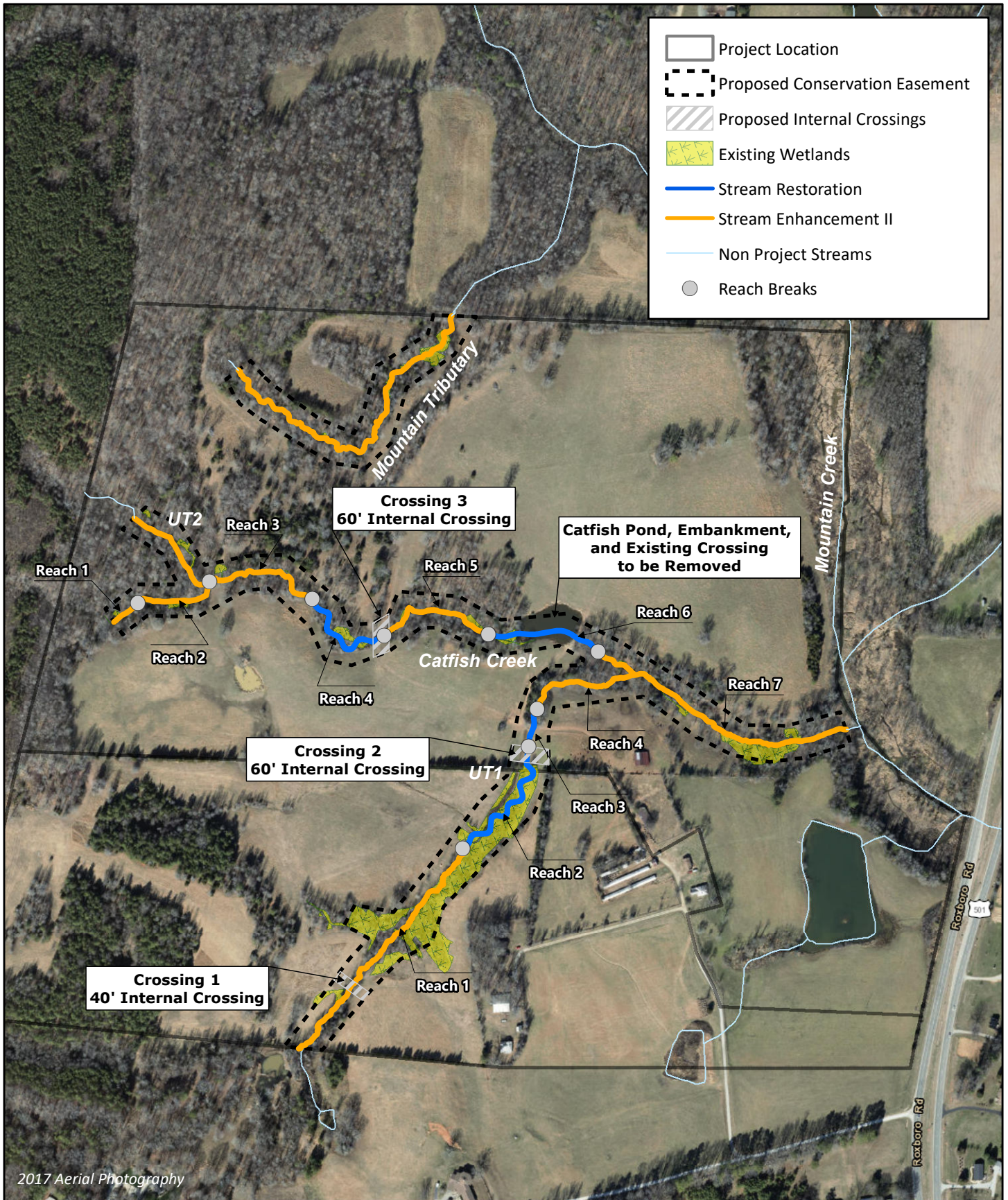


Figure 8 Concept Design Map
 Catfish Pond Mitigation Site
 Neuse River Basin 03020201

Durham County, NC

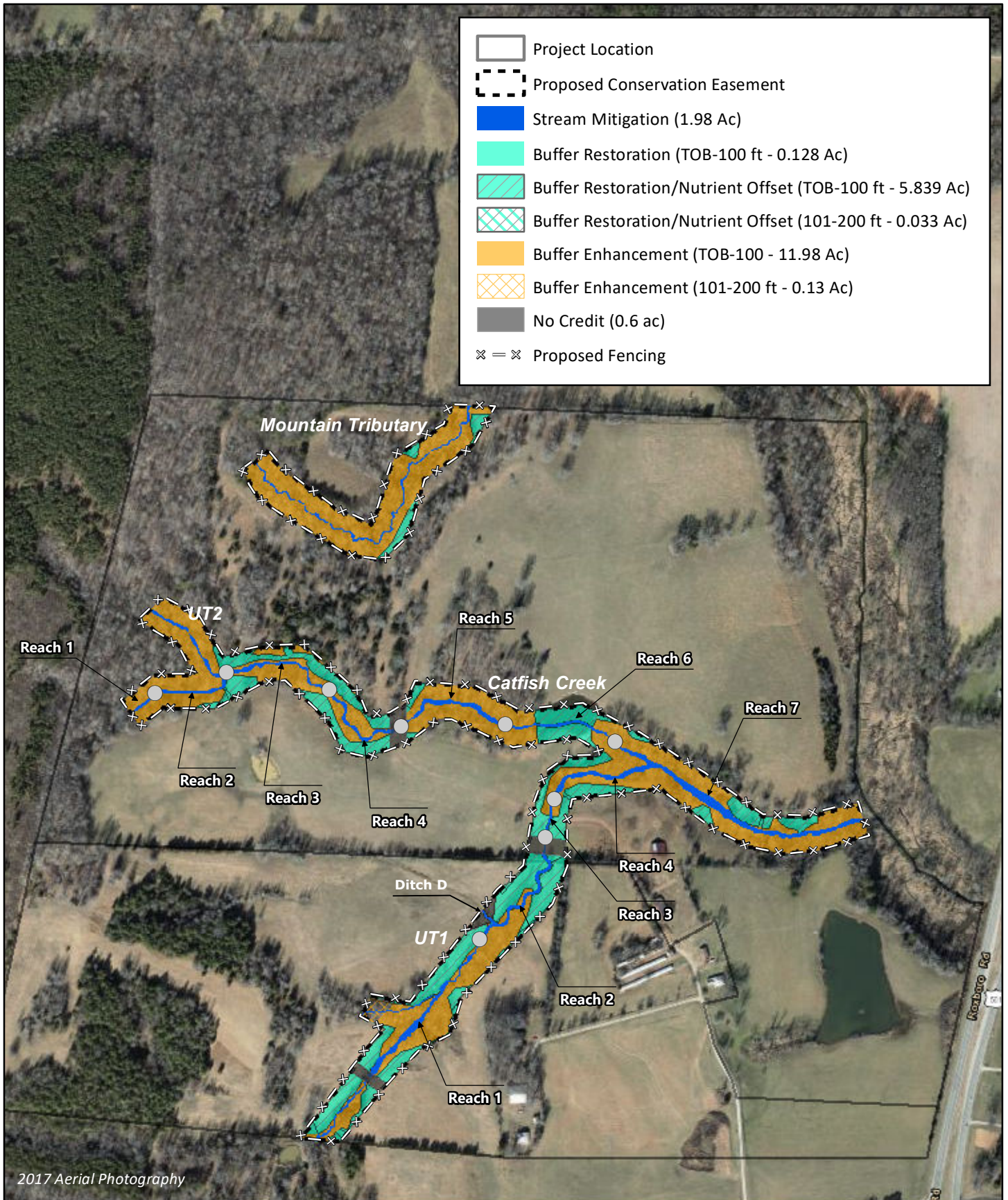
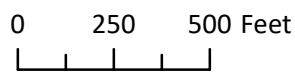


Figure 8a Buffer and Nutrient Offset Map
 Catfish Pond Mitigation Site
 Neuse River Basin 03020201



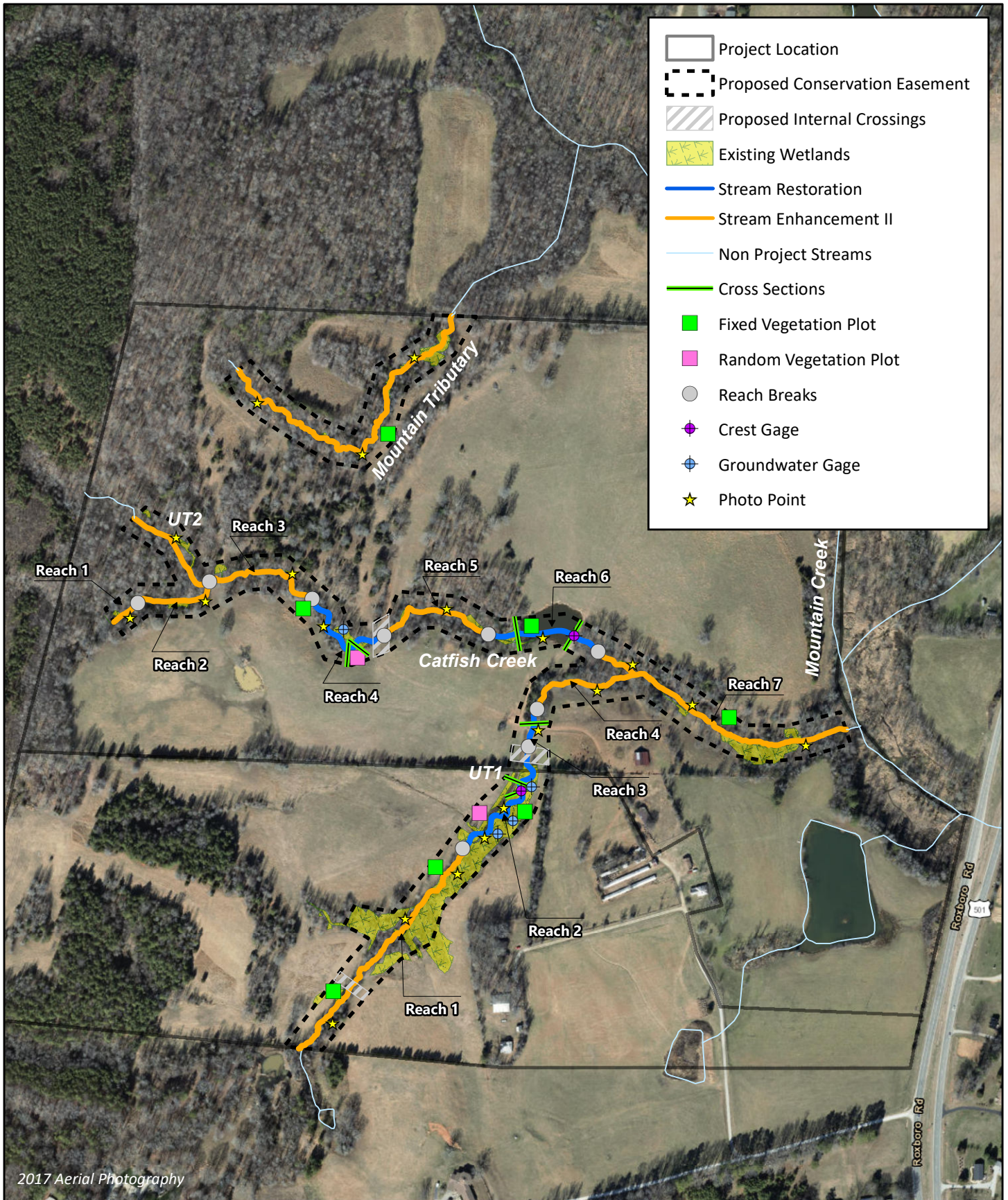


Figure 9 Monitoring Components Map
 Catfish Pond Mitigation Site
 Neuse River Basin 03020201

Durham County, NC

APPENDIX 1

Site Protection

1.0 Site Protection Instrument

The land required for construction, management, and stewardship of this mitigation project includes portions of the parcels listed in Table 1. This area totals 20.65 acres. The deed book and page number listed are for the agreements on an option to purchase a conservation easement. A conservation easement will be recorded on the parcels and includes streams and wetlands being restored along with their corresponding riparian buffers.

Table 1: Site Protection Instrument – Catfish Pond Mitigation Site

Landowner	PIN	County	Site Protection Instrument	Memo of Option Deed Book and Page Number	Acreage to be Protected
Gary Penny Jack B. Penny, Jr Richard Penny	0827-02-67-0407 0827-02-68-0515	Durham	CE	DB: 8235 PG: 776-780	20.65

All site protection instruments require 60-day advance notification to the USACE and or DMS prior to any action to void, amend, or modify the document. No such action shall take place unless approved by the State.

Appendix 2
Approved Preliminary JD and
Wetland JD Forms

Chris Roessler

From: Sullivan, Roscoe L III CIV (US) <Roscoe.L.Sullivan@usace.army.mil>
Sent: Wednesday, September 26, 2018 8:41 AM
To: Charlie Neaves
Subject: RE: SAW-2018-00424 Catfish Pond Mitigation Site PJD Request

Hey Charlie,

I have reviewed the information provided by you and have determined that the delineation map (Figure 3: Site Map), provided by you on 9/20/2018, accurately depicts the limits of potentially jurisdictional waters within the project area. This determination is based on available online resources and my observations during the IRT site visit conducted on 2/23/2018. Therefore, I do not need to conduct an additional site visit to verify the delineation.

I will issue the Preliminary Jurisdictional Determination for this project in the order that it was received, but please note that I have a substantial backlog of permits and JDs to work through at this time and it may take several months.

Please feel free to contact me with any questions.

Best,

Ross

Ross Sullivan, PWS, ISA Certified Arborist
Regulatory Specialist
Raleigh Regulatory Field Office
U.S. Army Corps of Engineers - Wilmington District
3331 Heritage Trade Drive, Suite 105
Wake Forest, North Carolina 27587
Office #: 919-554-4884. Ext. 25
Email: roscoe.l.sullivan@usace.army.mil

We would appreciate your feedback on how we are performing our duties. Our automated Customer Service Survey is located at: http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0
Thank you for taking the time to visit this site and complete the survey.

From: Charlie Neaves [mailto:cneaves@wildlandseng.com]
Sent: Thursday, September 20, 2018 10:06 AM
To: Sullivan, Roscoe L III CIV (US) <Roscoe.L.Sullivan@usace.army.mil>
Subject: [Non-DoD Source] RE: Catfish Pond Mitigation Site PJD Request

Ross,

The aquatic resource spreadsheet and revised site map are attached. Let me know if there is anything else I can do to streamline future submittals.

Thanks, Charlie

From: Sullivan, Roscoe L III CIV (US) <Roscoe.L.Sullivan@usace.army.mil>
Sent: Tuesday, September 18, 2018 1:47 PM

To: Charlie Neaves <cneaves@wildlandseng.com>
Subject: RE: Catfish Pond Mitigation Site PJD Request

Hey Charlie,

As we discussed over the phone, please revise Figure 3 so that all aquatic resources are included within the delineation study area. Additionally, I have attached an Aquatic Resources upload sheet to this email. Could you please fill out the "AqResources" tab with all of the potentially jurisdictional features from the site and send it back to me? The sheet is somewhat self-explanatory and it even has a button to validate the information to ensure accuracy (red-orange shield at the top of worksheet). This form would save me time in processing your information, and I would suggest filling it out for future projects with 20+ features.

Please let me know if you have any questions.

Best,

Ross Sullivan, PWS, ISA Certified Arborist
Regulatory Specialist
Raleigh Regulatory Field Office
U.S. Army Corps of Engineers - Wilmington District
3331 Heritage Trade Drive, Suite 105
Wake Forest, North Carolina 27587
Office #: 919-554-4884. Ext. 25
Email: roscoe.l.sullivan@usace.army.mil

We would appreciate your feedback on how we are performing our duties. Our automated Customer Service Survey is located at: [Blockedhttp://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0](http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0)
Thank you for taking the time to visit this site and complete the survey.

From: Charlie Neaves [<mailto:cneaves@wildlandseng.com>]
Sent: Monday, September 10, 2018 8:58 AM
To: Sullivan, Roscoe L III CIV (US) <Roscoe.L.Sullivan@usace.army.mil>
Subject: [Non-DoD Source] Catfish Pond Mitigation Site PJD Request

Mr. Sullivan,

Please see the attached PJD request package for the Catfish Pond Mitigation Site. If you wish to conduct a site walk, I can schedule one almost any time.

Thank you,

Charlie Neaves

Charlie Neaves | *Environmental Scientist*
O: 919.851.9986 x114 **M:** 336.413.5317

Wildlands Engineering, Inc.
312 West Millbrook Road, Suite 225
Raleigh, NC 27609

Corps Submittal Cover Sheet

Please provide the following info:

1. Project Name Catfish Pond Mitigation Site
2. Name of Property Owner/Applicant: Wildlands Engineering, Inc.
3. Name of Consultant/Agent: Charlie Neaves, Wildlands Engineering, Inc.

*Agent authorization needs to be attached.

4. Related/Previous Action ID number(s): _____
5. Site Address: 9005 North Roxboro Street, Bahama, NC 27503
6. Subdivision Name: _____
7. City: Bahama
8. County: Durham
9. Lat: 36.163565 Long: -78.911348 (Decimal Degrees *Please*)
10. Quadrangle Name: Rougemont
11. Waterway: Catfish Creek and Unnamed Tributaries and Mountain Tributary
12. Watershed: Mountain Creek
13. Requested Action:

- Nationwide Permit # _____
- General Permit # _____
- Jurisdictional Determination Request
- Pre-Application Request

The following information will be completed by Corps office:

AID: _____

_____ Prepare File Folder _____ Assign number in ORM _____ Begin Date

Authorization: _____ Section 10 _____ Section 404

Project Description/ Nature of Activity/ Project Purpose:

Site/Waters Name: _____

Keywords: _____



September 10, 2018

Mr. Ross Sullivan
US Army Corps of Engineers
Raleigh Regulatory Field Office
3331 Heritage Trade Drive, Suite 105
Wake Forest, North Carolina 27587

Subject: **Preliminary Jurisdictional Delineation and Request for Verification
Catfish Pond Mitigation Site
Durham County, North Carolina**

Dear Mr. Sullivan:

Wildlands Engineering, Inc. (Wildlands) is requesting written verification from the U.S. Army Corps of Engineers (USACE) regarding the extent of potential waters of the United States within the subject project area. The Catfish Pond Mitigation Site is located north of the city of Durham in northern Durham County, NC (Figures 1 and 2). The Site has been accepted as full delivery stream mitigation project for the North Carolina Department of Environmental Quality Division of Mitigation Services. To date, a draft mitigation plan is being developed and Wildlands is currently in the process of finalizing easement boundaries.

Methodology

On March 8, August 1, and August 3, 2018 Wildlands delineated potential waters of the United States within the proposed project easement area. These areas were delineated using the USACE Routine On-Site Determination Method. This method is defined by the 1987 Corps of Engineers Wetlands Delineation Manual and subsequent Eastern Mountain and Piedmont Regional Supplement. Wetland Determination Data Forms representative of on-site wetland areas as well as upland areas have been enclosed.

Stream channels were classified according to USACE and NCDWR guidance. NCDWR Stream Classification Forms representative of on-site stream channels are enclosed.

Potential Waters of the United States

The results of the on-site field investigation indicate that there are four non-wetland waters within the proposed project area which include Mountain Tributary, Catfish Creek, and unnamed tributaries to Catfish Creek; hereafter referred to as UT1 and UT2. Thirty wetland areas and one open water feature was identified within the proposed project area (Figure 3).

On-site stream channels are located within NCDWR Subbasin 03-04-01 of the Neuse River Basin (HUC 03020201). Approximate linear footage and acreage of on-site waters are summarized in Table 1.

Table 1. Summary of On-Site Potential Waters of the United States

Feature	Classification	Length (LF)	Acreage	Watershed (ac)	NCDWR Stream Scores
Catfish Creek	Intermittent Non-Wetland Water	142	-	17	22
Catfish Creek	Perennial Non-Wetland Water	3043	-	200	45.25
UT1	Perennial Non-Wetland Water	2120	-	109	31.5
UT2	Intermittent Non-Wetland Water	424	-	32	23.5
Mountain Tributary	Intermittent Non-Wetland Water	1382	-	30	26
Wetland A	Headwater Forest	-	1.836	-	-
Wetland B	Headwater Forest	-	0.005	-	-
Wetland C	Headwater Forest	-	0.358	-	-
Wetland D	Headwater Forest	-	0.027	-	-
Wetland E	Headwater Forest	-	0.075	-	-
Wetland F	Headwater Forest	-	0.002	-	-
Wetland G	Headwater Forest	-	0.114	-	-
Wetland H	Headwater Forest	-	0.072	-	-
Wetland I	Seep	-	0.001	-	-
Wetland J	Non-Tidal Freshwater Marsh	-	0.056	-	-
Wetland K	Headwater Forest	-	0.034	-	-
Wetland L	Headwater Forest	-	0.010	-	-
Wetland M	Headwater Forest	-	0.078	-	-
Wetland N	Headwater Forest	-	0.002	-	-
Wetland O	Headwater Forest	-	0.002	-	-
Wetland P	Headwater Forest	-	0.027	-	-
Wetland Q	Headwater Forest	-	0.027	-	-
Wetland R	Headwater Forest	-	0.012	-	-
Wetland S	Headwater Forest	-	0.001	-	-
Wetland T	Headwater Forest	-	0.038	-	-
Wetland U	Headwater Forest	-	0.013	-	-
Wetland V	Headwater Forest	-	0.318	-	-
Wetland W	Headwater Forest	-	0.041	-	-
Wetland X	Headwater Forest	-	0.024	-	-
Wetland Y	Headwater Forest	-	0.003	-	-
Wetland Z	Headwater Forest	-	0.005	-	-
Wetland AA	Headwater Forest	-	0.008	-	-
Wetland BB	Headwater Forest	-	0.007	-	-
Wetland CC	Headwater Forest	-	0.008	-	-
Wetland DD	Headwater Forest	-	0.155	-	-

Feature	Classification	Length (LF)	Acreage	Watershed (ac)	NCDWR Stream Scores
Pond A	Open Water	-	0.597	-	-

Streams

Catfish Creek originates as an intermittent non-wetland water downslope of the convergence of multiple ephemeral drainages. Catfish Creek becomes a perennial non-wetland water approximately 142 feet downstream of its origin. UT1 originates off the project property and enters the site as a perennial non-wetland water. UT2 originates on site as an intermittent non-wetland water where an ephemeral drainage becomes characteristic of a jurisdictional non-wetland water. Mountain Tributary also originates on site as an intermittent non-wetland water. NCDWR stream Identification Form scores range from 22 to 45.25. Throughout the majority of the project area, the stream channels and riparian corridors have been affected by livestock grazing and hoof shear.

Wetlands

There are thirty wetlands located within the project area. These wetland features were classified as headwater forest, seep, or non-tidal freshwater marsh using the North Carolina Wetland Assessment Method (NCWAM) classification key and the evaluator’s best professional judgment. The wetlands occur on the side slopes and floodplains that drain to the on-site stream channels. These features exhibited indicators of saturation within the upper 12 inches of the soil profile, wetland plant communities, and a low chroma matrix. Wetland Determination Data Forms representative of the wetlands and the associated upland points are enclosed.

Table 1 shows the acreage of on-site potential Waters of the United States.

Soils

Soil series within the study area predominantly include Wehadkee silt loam, Tatum gravelly silt loam, and Georgeville silt loam. Wehadkee soils range from poorly drained to very poorly drained and are mapped along UT1 and the upper portion of Catfish Creek. Tatum soils are well drained and are mapped along the lower portion of Catfish Creek. The Georgeville series is also well drained and mapped around the project reach of Mountain Tributary. NRCS soil mapping the in project area is presented in Figure 4.

Please do not hesitate to contact me at 919-851-9986 or at cneaves@wildlandseng.com should you have any questions regarding this request for preliminary jurisdictional verification.

Sincerely, _____



Charlie Neaves

Jurisdictional Determination Request



**US Army Corps
of Engineers**
Wilmington District

This form is intended for use by anyone requesting a jurisdictional determination (JD) from the U.S. Army Corps of Engineers, Wilmington District (Corps). Please include all supporting information, as described within each category, with your request. You may submit your request via mail, electronic mail, or facsimile. Requests should be sent to the appropriate project manager of the county in which the property is located. A current list of project managers by assigned counties can be found on-line at:

<http://www.saw.usace.army.mil/Missions/RegulatoryPermitProgram/Contact/CountyLocator.aspx>, by calling 910-251-4633, or by contacting any of the field offices listed below. Once your request is received you will be contacted by a Corps project manager.

ASHEVILLE & CHARLOTTE REGULATORY FIELD OFFICES

US Army Corps of Engineers
151 Patton Avenue, Room 208
Asheville, North Carolina 28801-5006
General Number: (828) 271-7980
Fax Number: (828) 281-8120

WASHINGTON REGULATORY FIELD OFFICE

US Army Corps of Engineers
2407 West Fifth Street
Washington, North Carolina 27889
General Number: (910) 251-4610
Fax Number: (252) 975-1399

RALEIGH REGULATORY FIELD OFFICE

US Army Corps of Engineers
3331 Heritage Trade Drive, Suite 105
Wake Forest, North Carolina 27587
General Number: (919) 554-4884
Fax Number: (919) 562-0421

WILMINGTON REGULATORY FIELD OFFICE

US Army Corps of Engineers
69 Darlington Avenue
Wilmington, North Carolina 28403
General Number: 910-251-4633
Fax Number: (910) 251-4025

INSTRUCTIONS:

All requestors must complete Parts A, B, C, D, E, F and G.

NOTE TO CONSULTANTS AND AGENCIES: If you are requesting a JD on behalf of a paying client or your agency, please note the specific submittal requirements in **Part H**.

NOTE ON PART D – PROPERTY OWNER AUTHORIZATION: Please be aware that all JD requests must include the current property owner authorization for the Corps to proceed with the determination, which may include inspection of the property when necessary. This form must be signed by the current property owner(s) or the owner(s) authorized agent to be considered a complete request.

NOTE ON PART D - NCDOT REQUESTS: Property owner authorization/notification for JD requests associated with North Carolina Department of Transportation (NCDOT) projects will be conducted according to the current NCDOT/USACE protocols.

NOTE TO USDA PROGRAM PARTICIPANTS: A Corps approved or preliminary JD may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA Program participants, or anticipate participation in USDA programs, you should also request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

Jurisdictional Determination Request

A. PARCEL INFORMATION

Street Address: 9021 N. Roxboro Road

City, State: Bahama, NC

County: Durham

Parcel Index Number(s) (PIN): Multiple (Information Attached)

B. REQUESTOR INFORMATION

Name: Charlie Neaves

Mailing Address: 312 West Millbrook Road, Suite 225
Raleigh, NC 27609

Telephone Number: 919-851-9986

Electronic Mail Address: cneaves@wildlandseng.com

Select one:

- I am the current property owner.
- I am an Authorized Agent or Environmental Consultant¹
- Interested Buyer or Under Contract to Purchase
- Other, please explain. _____
- _____

C. PROPERTY OWNER INFORMATION²

Name: Gary Penny, Richard Penny, Jack B. P

Mailing Address: 2917 Tavistock Drive
Durham, NC 27712

Telephone Number: 919-306-2902

Electronic Mail Address: _____

¹ Must provide completed Agent Authorization Form/Letter.

² Documentation of ownership also needs to be provided with request (copy of Deed, County GIS/Parcel/Tax Record).

Jurisdictional Determination Request

D. PROPERTY ACCESS CERTIFICATION^{3,4}

By signing below, I authorize representatives of the Wilmington District, U.S. Army Corps of Engineers (Corps) to enter upon the property herein described for the purpose of conducting on-site investigations, if necessary, and issuing a jurisdictional determination pursuant to Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act of 1899. I, the undersigned, am either a duly authorized owner of record of the property identified herein, or acting as the duly authorized agent of the owner of record of the property.

Charlie Neaves

Print Name

Capacity: Owner Authorized Agent⁵

Date

Signature

E. REASON FOR JD REQUEST: (Check as many as applicable)

- I intend to construct/develop a project or perform activities on this parcel which would be designed to avoid all aquatic resources.
- I intend to construct/develop a project or perform activities on this parcel which would be designed to avoid all jurisdictional aquatic resources under Corps authority.
- I intend to construct/develop a project or perform activities on this parcel which may require authorization from the Corps, and the JD would be used to avoid and minimize impacts to jurisdictional aquatic resources and as an initial step in a future permitting process.
- I intend to construct/develop a project or perform activities on this parcel which may require authorization from the Corps; this request is accompanied by my permit application and the JD is to be used in the permitting process.
- I intend to construct/develop a project or perform activities in a navigable water of the U.S. which is included on the district Section 10 list and/or is subject to the ebb and flow of the tide.
- A Corps JD is required in order obtain my local/state authorization.
- I intend to contest jurisdiction over a particular aquatic resource and request the Corps confirm that jurisdiction does/does not exist over the aquatic resource on the parcel.
- I believe that the site may be comprised entirely of dry land.
- Other: Stream Restoration Site
-

³ For NCDOT requests following the current NCDOT/USACE protocols, skip to Part E.

⁴ If there are multiple parcels owned by different parties, please provide the following for each additional parcel on a continuation sheet.

⁵ Must provide agent authorization form/letter signed by owner(s).

Jurisdictional Determination Request

F. JURISDICTIONAL DETERMINATION (JD) TYPE (Select One)

I am requesting that the Corps provide a preliminary JD for the property identified herein.

A Preliminary Jurisdictional Determination (PJD) provides an indication that there may be “waters of the United States” or “navigable waters of the United States” on a property. PJDs are sufficient as the basis for permit decisions. For the purposes of permitting, all waters and wetlands on the property will be treated as if they are jurisdictional “waters of the United States”. PJDs cannot be appealed (33 C.F.R. 331.2); however, a PJD is “preliminary” in the sense that an approved JD can be requested at any time. PJDs do not expire.

I am requesting that the Corps provide an approved JD for the property identified herein.

An Approved Jurisdictional Determination (AJD) is a determination that jurisdictional “waters of the United States” or “navigable waters of the United States” are either present or absent on a site. An approved JD identifies the limits of waters on a site determined to be jurisdictional under the Clean Water Act and/or Rivers and Harbors Act. Approved JDs are sufficient as the basis for permit decisions. AJDs are appealable (33 C.F.R. 331.2). The results of the AJD will be posted on the Corps website. A landowner, permit applicant, or other “affected party” (33 C.F.R. 331.2) who receives an AJD may rely upon the AJD for five years (subject to certain limited exceptions explained in Regulatory Guidance Letter 05-02).

I am unclear as to which JD I would like to request and require additional information to inform my decision.

G. ALL REQUESTS

Map of Property or Project Area. This Map must clearly depict the boundaries of the review area.

Size of Property or Review Area ~18.7 acres.

The property boundary (or review area boundary) is clearly physically marked on the site.

Jurisdictional Determination Request

H. REQUESTS FROM CONSULTANTS



Project Coordinates (Decimal Degrees): Latitude: 36.163574
Longitude: -78.911360



A legible delineation map depicting the aquatic resources and the property/review area. Delineation maps must be no larger than 11x17 and should contain the following: (Corps signature of submitted survey plats will occur after the submitted delineation map has been reviewed and approved).⁶

- North Arrow
- Graphical Scale
- Boundary of Review Area
- Date
- Location of data points for each Wetland Determination Data Form or tributary assessment reach.

For Approved Jurisdictional Determinations:

- Jurisdictional wetland features should be labeled as Wetland Waters of the US, 404 wetlands, etc. Please include the acreage of these features.
- Jurisdictional non-wetland features (i.e. tidal/navigable waters, tributaries, impoundments) should be labeled as Non-Wetland Waters of the US, stream, tributary, open water, relatively permanent water, pond, etc. Please include the acreage or linear length of each of these features as appropriate.
- Isolated waters, waters that lack a significant nexus to navigable waters, or non-jurisdictional upland features should be identified as Non-Jurisdictional. Please include a justification in the label regarding why the feature is non-jurisdictional (i.e. “Isolated”, “No Significant Nexus”, or “Upland Feature”). Please include the acreage or linear length of these features as appropriate.

For Preliminary Jurisdictional Determinations:

- Wetland and non-wetland features should not be identified as Jurisdictional, 404, Waters of the United States, or anything that implies jurisdiction. These features can be identified as Potential Waters of the United States, Potential Non-wetland Waters of the United States, wetland, stream, open water, etc. Please include the acreage and linear length of these features as appropriate.



Completed Wetland Determination Data Forms for appropriate region
(at least one wetland and one upland form needs to be completed for each wetland type)

⁶ Please refer to the guidance document titled “Survey Standards for Jurisdictional Determinations” to ensure that the supplied map meets the necessary mapping standards. <http://www.saw.usace.army.mil/Missions/Regulatory-Permit-Program/Jurisdiction/>

Jurisdictional Determination Request

- Completed appropriate Jurisdictional Determination form
 - **PJDs**, please complete a Preliminary Jurisdictional Determination Form⁷ and include the Aquatic Resource Table
 - **AJDs**, please complete an Approved Jurisdictional Determination Form⁸
- Vicinity Map
- Aerial Photograph
- USGS Topographic Map
- Soil Survey Map
- Other Maps, as appropriate (e.g. National Wetland Inventory Map, Proposed Site Plan, previous delineation maps, LIDAR maps, FEMA floodplain maps)
- Landscape Photos (if taken)
- NCSAM and/or NCWAM Assessment Forms and Rating Sheets
- NC Division of Water Resources Stream Identification Forms
- Other Assessment Forms

⁷ www.saw.usace.army.mil/Portals/59/docs/regulatory/regdocs/JD/RGL_08-02_App_A_Prelim_JD_Form_fillable.pdf

⁸ Please see <http://www.saw.usace.army.mil/Missions/Regulatory-Permit-Program/Jurisdiction/>

Principal Purpose: The information that you provide will be used in evaluating your request to determine whether there are any aquatic resources within the project area subject to federal jurisdiction under the regulatory authorities referenced above.

Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public, and may be made available as part of a public notice as required by federal law. Your name and property location where federal jurisdiction is to be determined will be included in the approved jurisdictional determination (AJD), which will be made available to the public on the District's website and on the Headquarters USAGE website.

Disclosure: Submission of requested information is voluntary; however, if information is not provided, the request for an AJD cannot be evaluated nor can an AJD be issued.

- 1) The Corps of Engineers believes that there may be jurisdictional aquatic resources in the review area, and the requestor of this PJD is hereby advised of his or her option to request and obtain an approved JD (AJD) for that review area based on an informed decision after having discussed the various types of JDs and their characteristics and circumstances when they may be appropriate.
- 2) In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre-construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an AJD for the activity, the permit applicant is hereby made aware that: (1) the permit applicant has elected to seek a permit authorization based on a PJD, which does not make an official determination of jurisdictional aquatic resources; (2) the applicant has the option to request an AJD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an AJD could possibly result in less compensatory mitigation being required or different special conditions; (3) the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) undertaking any activity in reliance upon the subject permit authorization without requesting an AJD constitutes the applicant's acceptance of the use of the PJD; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a PJD constitutes agreement that all aquatic resources in the review area affected in any way by that activity will be treated as jurisdictional, and waives any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an AJD or a PJD, the JD will be processed as soon as practicable. Further, an AJD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331. If, during an administrative appeal, it becomes appropriate to make an official determination whether geographic jurisdiction exists over aquatic resources in the review area, or to provide an official delineation of jurisdictional aquatic resources in the review area, the Corps will provide an AJD to accomplish that result, as soon as is practicable. This PJD finds that there "*may be*" waters of the U.S. and/or that there "*may be*" navigable waters of the U.S. on the subject review area, and identifies all aquatic features in the review area that could be affected by the proposed activity, based on the following information:


SUPPORTING DATA. Data reviewed for PJD (check all that apply)

Checked items should be included in subject file. Appropriately reference sources below where indicated for all checked items:

- Maps, plans, plots or plat submitted by or on behalf of the PJD requestor:
Map: _____.
- Data sheets prepared/submitted by or on behalf of the PJD requestor.
 - Office concurs with data sheets/delineation report.
 - Office does not concur with data sheets/delineation report. Rationale: _____.
- Data sheets prepared by the Corps: _____.
- Corps navigable waters' study: _____.
- U.S. Geological Survey Hydrologic Atlas: _____.
 - USGS NHD data.
 - USGS 8 and 12 digit HUC maps.
- U.S. Geological Survey map(s). Cite scale & quad name: 7.5 Minute Rougemont Quadrangle.
- Natural Resources Conservation Service Soil Survey. Citation: SSURGO.
- National wetlands inventory map(s). Cite name: _____.
- State/local wetland inventory map(s): _____.
- FEMA/FIRM maps: _____.
- 100-year Floodplain Elevation is: _____.(National Geodetic Vertical Datum of 1929)
- Photographs: Aerial (Name & Date): 2013.
or Other (Name & Date): _____.
- Previous determination(s). File no. and date of response letter: _____.
- Other information (please specify): _____.

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

Signature and date of
Regulatory staff member
completing PJD

 9/10/2018

Signature and date of
person requesting PJD
(REQUIRED, unless obtaining
the signature is impracticable)¹

¹ Districts may establish timeframes for requestor to return signed PJD forms. If the requestor does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action.

Table 1. Summary of On-Site Jurisdictional Waters

Feature	Latitude	Longitude	Cowardin Class	Estimated Amount of Aquatic Resource in Review Area	Class of Aquatic Resource
Catfish Creek	36.133520	-78.917178	Riverine-Streambed	142	Intermittent Non-Wetland Waters of the US
Catfish Creek	36.164153	-78.914796	Riverine-Unconsolidated Bottom	3043	Perennial Non-Wetland Waters of the US
UT1	36.159263	-78.914410	Riverine-Unconsolidated Bottom	2120	Perennial Non-Wetland Waters of the US
UT2	36.164550	-78.916549	Riverine-Streambed	424	Intermittent Non-Wetland Waters of the US
Mountain Tributary	36.165929	-78.915095	Riverine-Streambed	1382	Intermittent Non-Wetland Waters of the US
Wetland A	36.161099	-78.912399	Palustrine-Forested	1.836	Non-Section 10 Wetland
Wetland B	36.160702	-78.913101	Palustrine-Emergent	0.005	Non-Section 10 Wetland
Wetland C	36.160500	-78.913696	Palustrine-Forested	0.358	Non-Section 10 Wetland
Wetland D	36.160500	-78.914200	Palustrine-Emergent	0.027	Non-Section 10 Wetland
Wetland E	36.160400	-78.914200	Palustrine-Forested	0.075	Non-Section 10 Wetland
Wetland F	36.160599	-78.914299	Palustrine-Forested	0.002	Non-Section 10 Wetland
Wetland G	36.160099	-78.913498	Palustrine-Emergent	0.114	Non-Section 10 Wetland
Wetland H	36.159699	-78.914200	Palustrine-Emergent	0.072	Non-Section 10 Wetland

Feature	Latitude	Longitude	Cowardin Class	Estimated Amount of Aquatic Resource in Review Area	Class of Aquatic Resource
Wetland I	36.159199	-78.914497	Palustrine-Forested	0.001	Non-Section 10 Wetland
Wetland J	36.163399	-78.911903	Palustrine-Emergent	0.056	Non-Section 10 Wetland
Wetland K	36.163601	-78.912399	Palustrine-Forested	0.034	Non-Section 10 Wetland
Wetland L	36.163700	-78.913300	Palustrine-Forested	0.010	Non-Section 10 Wetland
Wetland M	36.163399	-78.914002	Palustrine-Forested	0.078	Non-Section 10 Wetland
Wetland N	36.163899	-78.914497	Palustrine-Forested	0.002	Non-Section 10 Wetland
Wetland O	36.164101	-78.914803	Palustrine-Forested	0.002	Non-Section 10 Wetland
Wetland P	36.164101	-78.915604	Palustrine-Emergent	0.027	Non-Section 10 Wetland
Wetland Q	36.163799	-78.916100	Palustrine-Forested	0.027	Non-Section 10 Wetland
Wetland R	36.163700	-78.916901	Palustrine-Emergent	0.012	Non-Section 10 Wetland
Wetland S	36.163601	-78.917000	Palustrine-Emergent	0.001	Non-Section 10 Wetland
Wetland T	36.164299	-78.916000	Palustrine-Emergent	0.038	Non-Section 10 Wetland
Wetland U	36.164700	-78.916496	Palustrine-Emergent	0.013	Non-Section 10 Wetland

Feature	Latitude	Longitude	Cowardin Class	Estimated Amount of Aquatic Resource in Review Area	Class of Aquatic Resource
Wetland V	36.162201	-78.908699	Palustrine-Forested	0.318	Non-Section 10 Wetland
Wetland W	36.162399	-78.908302	Palustrine-Forested	0.041	Non-Section 10 Wetland
Wetland X	36.162701	-78.909798	Palustrine-Forested	0.024	Non-Section 10 Wetland
Wetland Y	36.163200	-78.910500	Palustrine-Emergent	0.003	Non-Section 10 Wetland
Wetland Z	36.165501	-78.914299	Palustrine-Forested	0.005	Non-Section 10 Wetland
Wetland AA	36.166000	-78.913498	Palustrine-Forested	0.008	Non-Section 10 Wetland
Wetland BB	36.166100	-78.913498	Palustrine-Forested	0.007	Non-Section 10 Wetland
Wetland CC	36.166199	-78.913300	Palustrine-Forested	0.008	Non-Section 10 Wetland
Wetland DD	36.166401	-78.912804	Palustrine-Forested	0.155	Non-Section 10 Wetland
Pond A	36.163574	-78.911360	Lacustrine-Limnetic	0.597	Non-Section 10 Wetland

Appendix 3

DWR Stream Identification Forms

1.0 DWR Stream Classification

The results of the DWR Stream Classification Forms are listed in the table below. DWR forms can be found in this appendix and in the digital submission to DMS. DWR forms were completed by Wildlands for the Catfish Pond stream reaches.

Table 1: DWR Form Summary – Catfish Pond Mitigation Site

Stream	Geomorphology Score	Hydrology Score	Biology Score	Total Score
Catfish Creek Reach 1	11	5	6	22
Catfish Creek Reach 4	21.5	10.5	13.25	45.25
UT1	12	9.5	10	31.5
UT2	11	7.5	5	23.5
Mountain Tributary	9	9	8	26

NC DWQ Stream Identification Form Version 4.11

Date: 8-18-15	Project/Site: Catfish Pond site	Latitude: 36.16384 705°N
Evaluator: I. Eckardt	County: Durham	Longitude: -78.91603184°W
Total Points: Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* 35	Stream Determination (circle one) Ephemeral Intermittent Perennial	Other Catfish Creek e.g. Quad Name: Reach 15

A. Geomorphology (Subtotal = 16)

	Absent	Weak	Moderate	Strong
1 ^a . Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

^a artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 9.5)

12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 9.5)

18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macroinvertebrates (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0 none			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch: Observed several midges, 1 crane fly, 2 salamanders, 1 crayfish.

NC DWQ Stream Identification Form Version 4.11

Date: 8-18-15	Project/Site: Catfish Paw Site	Latitude: 36.164153 20°N
Evaluator: J Eckardt	County: Durham	Longitude: -78.914796 93°W
Total Points: Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* 30	Stream Determination (circle one) Ephemeral Intermittent Perennial	Other Catfish Creek e.g. Quad Name: Reach 3

A. Geomorphology (Subtotal = 17.5)

	Absent	Weak	Moderate	Strong
1 ^a . Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

^a artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 5.5)

12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 7)

18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macroinvertebrates (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0 none			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch: Channel scores out as perennial w/o baseflow on 8/18/15 site visit. Majority of channel is damp and devoid of vegetation indicating baseflow interruption only recently occurred.

NC DWQ Stream Identification Form Version 4.11

Date: 8-18-15	Project/Site: Catfish Pond Site	Latitude: 36.15926319
Evaluator: I. Eckardt	County: Durham	Longitude: -78.91441053
Total Points: Stream is at least intermittent if ≥ 19 or perennial if $\geq 30^*$ 24.5*	Stream Determination (circle one) Ephemeral Intermittent <u>Perennial</u>	Other UTI to Catfish Creek e.g. Quad Name: - Upper end of Reach 1

A. Geomorphology (Subtotal = 11)

	Absent	Weak	Moderate	Strong
1 ^a . Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

^a artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 6.5)

12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 8)

18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macroinvertebrates (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

observed pickerelweed in one spot in channel.

Notes:

Sketch: Reach assessed above upper crossing to fence line.
 1 pool w/water but remaining channel had no water.
 *Channel believed to be perennial but due to moderate drought conditions hydrology and biology score abnormally low.
 Bed was damp throughout indicating recent low of baseflow.

NC DWQ Stream Identification Form Version 4.11

Date: 8-18-15	Project/Site: Catfish Pond Site	Latitude: 36.15926319 ON
Evaluator: J. Eckardt	County: Durham	Longitude: -78.91441053
Total Points: Stream is at least intermittent if ≥ 19 or perennial if $\geq 30^*$ 33.5	Stream Determination (circle one) Ephemeral Intermittent Perennial	Other UTI to Catfish Creek e.g. Quad Name: -Reach 1 - mid reach

A. Geomorphology (Subtotal = 15)

	Absent	Weak	Moderate	Strong
1 ^a . Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

^a artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 9.5)

12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 9)

18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macroinvertebrates (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0) none			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch: - Observed aquatic worms, 20+ tubepoles in several pools.
- Wetland along right floodplain along mid-reach abby hydrology

NC DWQ Stream Identification Form Version 4.11

Date: 8-18-15	Project/Site: Catfish Pond Side	Latitude: 36.161546°N
Evaluator: J Eckardt	County: Durham	Longitude: -78.912490°W
Total Points: Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* 10.5	Stream Determination (circle one) <u>Ephemeral</u> Intermittent Perennial	Other Field Swale on e.g. Quad Name: UT1 Reach 2

A. Geomorphology (Subtotal = 7)

	Absent	Weak	Moderate	Strong
1 ^a . Continuity of channel bed and bank	0	1	(2)	3
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	(0)	1	2	3
4. Particle size of stream substrate	0	(1)	2	3
5. Active/relict floodplain	0	(1)	2	3
6. Depositional bars or benches	(0)	1	2	3
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	0	(1)	2	3
9. Grade control	(0)	0.5	1	1.5
10. Natural valley	0	0.5	(1)	1.5
11. Second or greater order channel	(No = 0)		Yes = 3	

^a artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 1.5)

12. Presence of Baseflow	(0)	1	2	3
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	(1.5)	1	0.5	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	(0)	0.5	1	1.5
17. Soil-based evidence of high water table?	(No = 0)		Yes = 3	

C. Biology (Subtotal = 2)

18. Fibrous roots in streambed	3	2	(1)	0
19. Rooted upland plants in streambed	3	2	(1)	0
20. Macroinvertebrates (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 8-18-15	Project/Site: Catfish Pond site	Latitude: 36.16454999°N
Evaluator: J. Eckardt	County: Durham	Longitude: -78.91654879°W
Total Points: Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* 26	Stream Determination (circle one) Ephemeral <u>Intermittent</u> Perennial	Other UTZ to Catfish Creek e.g. Quad Name:

A. Geomorphology (Subtotal = 15)

	Absent	Weak	Moderate	Strong
1 ^a . Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	(2)	3
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	(1)	2	3
6. Depositional bars or benches	0	(1)	2	3
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	0	(1)	2	3
9. Grade control	0	0.5	1	(1.5)
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	No = 0		Yes = 3	

^a artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 5.5)

12. Presence of Baseflow *	(0)	1	2	3
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	(1.5)	1	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 5.5)

18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macroinvertebrates (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	0	(0.5)	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0 none			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch: * Majority of reach dry w/ only bottom 100' of reach w/H₂O
 Majority of reach has cobble substrate w/ few areas of bedrock and roots holding grade.
 Although majority of channel is dry there is very little vegetation growing in channel suggesting channel flow for some period through year.
 Algae observed but no other biology.

NC DWQ Stream Identification Form Version 4.11

Date: 8-18-15	Project/Site: Catfish Pond Site	Latitude: 36.16592878
Evaluator: I. Eckardt	County: Durham	Longitude: -78.91509533
Total Points: Stream is at least intermittent if ≥ 19 or perennial if $\geq 30^*$ 26	Stream Determination (circle one) Ephemeral (Intermittent) Perennial	Other Mountain Tributary e.g. Quad Name: Upper End

A. Geomorphology (Subtotal = 12)

	Absent	Weak	Moderate	Strong
1 ^a . Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	(2)	3
4. Particle size of stream substrate	0	(1)	2	3
5. Active/relict floodplain	0	(1)	2	3
6. Depositional bars or benches *small benches sporadic	0	(1)	2	3
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	0	(1)	2	3
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	(No = 0)		Yes = 3	

^a artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 7)

12. Presence of Baseflow	0	1	(2)	3
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	(0)	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 7)

18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macroinvertebrates (note diversity and abundance)	0	(1)	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	0	0.5	(1)	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0) none			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch: Spring head / seep at top of reach.
 Weak flow in riffle sections.
 Couple root masses acting as short term grade control.
 Observed 2 frogs, 1 benthic - potential stonefly but difficult to ID b/c organism very small / transparent, fine tails.

NC DWQ Stream Identification Form Version 4.11

Date: 8-18-15	Project/Site: Catfish Pond Site	Latitude: 36.166066°N
Evaluator: J. Eckardt	County: Durham	Longitude: -78.913261°W
Total Points: Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* 20	Stream Determination (circle one) Ephemeral (Intermittent) Perennial	Other Mountain Tributary e.g. Quad Name: Lower End

A. Geomorphology (Subtotal = 11)

	Absent	Weak	Moderate	Strong
1 ^a . Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

^aartificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 5)

12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 4)

18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macroinvertebrates (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch: Majority of lower reach scores as a low intermittent during moderate drought conditions. Hydric soils less common but found w/i evaluation reach. Channel has interruptions in bed/bank due to channel trampling to low slope valley. Lower 100-200' has some braided sections that appear to be the result of cattle grazing.

Appendix 4

USACE Assessment Forms

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Catfish Pond Mitigation Site City/County: Durham/Durham Sampling Date: 8/1/2018
 Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland A-I - DP 1
 Investigator(s): Charlie Neaves Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): none Slope (%): 0
 Subregion (LRR or MLRA): MLRA 136 Lat: 36.161773 Long: -78.911796 Datum: _____
 Soil Map Unit Name: Wehadkee Silt Loam NWI classification: n/a

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation , Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____ Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____ Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Remarks: Vegetation significantly disturbed due to livestock grazing.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input checked="" type="checkbox"/> Surface Water (A1) _____ True Aquatic Plants (B14) <input checked="" type="checkbox"/> High Water Table (A2) _____ Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Saturation (A3) <input checked="" type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) _____ Water Marks (B1) _____ Presence of Reduced Iron (C4) _____ Sediment Deposits (B2) _____ Recent Iron Reduction in Tilled Soils (C6) _____ Drift Deposits (B3) _____ Thin Muck Surface (C7) _____ Algal Mat or Crust (B4) _____ Other (Explain in Remarks) _____ Iron Deposits (B5) _____ Inundation Visible on Aerial Imagery (B7) _____ Water-Stained Leaves (B9) _____ Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> _____ Surface Soil Cracks (B6) _____ Sparsely Vegetated Concave Surface (B8) _____ Drainage Patterns (B10) _____ Moss Trim Lines (B16) _____ Dry-Season Water Table (C2) _____ Crayfish Burrows (C8) _____ Saturation Visible on Aerial Imagery (C9) _____ Stunted or Stressed Plants (D1) _____ Geomorphic Position (D2) _____ Shallow Aquitard (D3) _____ Microtopographic Relief (D4) _____ FAC-Neutral Test (D5)
--	--

Field Observations: Surface Water Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0</u> Water Table Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0 - 12+</u> Saturation Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0 - 12+</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____
--	---

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Wetland A-1 - DP 1
Sampling Point: _____

	Absolute % Cover	Dominant Species?	Indicator Status	
Tree Stratum (Plot size: <u>30'</u>)				Dominance Test worksheet:
1. _____	_____	_____	_____	Number of Dominant Species That Are OBL, FACW, or FAC: <u>4</u> (A)
2. _____	_____	_____	_____	Total Number of Dominant Species Across All Strata: <u>4</u> (B)
3. _____	_____	_____	_____	Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)
4. _____	_____	_____	_____	Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
_____ = Total Cover				
Sapling/Shrub Stratum (Plot size: <u>15'</u>)				
1. <u>Alnus serrulata</u>	<u>10</u>	<u>Yes</u>	<u>OBL</u>	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
<u>10</u> = Total Cover				
Herb Stratum (Plot size: <u>5'</u>)				
1. <u>Polygonum sagittatum</u>	<u>20</u>	<u>Yes</u>	<u>OBL</u>	
2. <u>Juncus effusus</u>	<u>20</u>	<u>Yes</u>	<u>OBL</u>	
3. <u>Carex spp.</u>	<u>60</u>	<u>Yes</u>	<u>FAC</u>	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	
12. _____	_____	_____	_____	
<u>100</u> = Total Cover				
Woody Vine Stratum (Plot size: <u>30'</u>)				
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
<u>0</u> = Total Cover				
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>				

Remarks: (Include photo numbers here or on a separate sheet.)

60% coverage of Carex spp. not identifiable due to grazing, lack of flowers. FAC indicator status was applied for the dominance test.

SOIL

Sampling Point: Wetland A-I - DP 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-2	10YR 4/3	75	10YR 5/6	25	C	PL	SiL	
2-12+	10YR 6/2	80	10YR 6/6	20	C	PL	CL	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) (**LRR N**)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) (**LRR N, MLRA 147, 148**)
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) (**MLRA 147, 148**)
- Thin Dark Surface (S9) (**MLRA 147, 148**)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) (**LRR N, MLRA 136**)
- Umbric Surface (F13) (**MLRA 136, 122**)
- Piedmont Floodplain Soils (F19) (**MLRA 148**)

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) (**MLRA 147**)
- Coast Prairie Redox (A16) (**MLRA 147, 148**)
- Piedmont Floodplain Soils (F19) (**MLRA 136, 147**)
- Red Parent Material (TF2)
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____
Depth (inches): _____

Hydric Soil Present? Yes No _____

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Catfish Pond Mitigation Site City/County: Durham/Durham Sampling Date: 8/1/2018
 Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland J - DP 2
 Investigator(s): Charlie Neaves Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): None Slope (%): 0
 Subregion (LRR or MLRA): MLRA 136 Lat: 36.163461 Long: -78.911883 Datum: _____
 Soil Map Unit Name: Tatum Silt Loam NWI classification: n/a

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation , Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes _____ No
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____ Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____ Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Remarks: Wetland occurs due to backwater from a man-made impoundment. Wetland is also accessible to cattle.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ___ Surface Water (A1) ___ True Aquatic Plants (B14) <input checked="" type="checkbox"/> High Water Table (A2) ___ Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Saturation (A3) <input checked="" type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) ___ Water Marks (B1) ___ Presence of Reduced Iron (C4) ___ Sediment Deposits (B2) ___ Recent Iron Reduction in Tilled Soils (C6) ___ Drift Deposits (B3) ___ Thin Muck Surface (C7) ___ Algal Mat or Crust (B4) ___ Other (Explain in Remarks) ___ Iron Deposits (B5) ___ Inundation Visible on Aerial Imagery (B7) ___ Water-Stained Leaves (B9) ___ Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> ___ Surface Soil Cracks (B6) ___ Sparsely Vegetated Concave Surface (B8) ___ Drainage Patterns (B10) ___ Moss Trim Lines (B16) ___ Dry-Season Water Table (C2) ___ Crayfish Burrows (C8) ___ Saturation Visible on Aerial Imagery (C9) ___ Stunted or Stressed Plants (D1) ___ Geomorphic Position (D2) ___ Shallow Aquitard (D3) ___ Microtopographic Relief (D4) ___ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>3-12+</u> Saturation Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>3-12+</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:	
Remarks:	

VEGETATION (Four Strata) – Use scientific names of plants.

Wetland J - DP 2
Sampling Point: _____

	Absolute % Cover	Dominant Species?	Indicator Status		
Tree Stratum (Plot size: <u>30'</u>)					
1. _____	_____	_____	_____	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>1</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)	
2. _____	_____	_____	_____		
3. _____	_____	_____	_____		
4. _____	_____	_____	_____		
5. _____	_____	_____	_____		
6. _____	_____	_____	_____		
7. _____	_____	_____	_____		
8. _____	_____	_____	_____		
_____ = Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____	
Sapling/Shrub Stratum (Plot size: <u>15'</u>)					
1. _____	_____	_____	_____		
2. _____	_____	_____	_____		
3. _____	_____	_____	_____		
4. _____	_____	_____	_____		
5. _____	_____	_____	_____		
6. _____	_____	_____	_____		
7. _____	_____	_____	_____		
8. _____	_____	_____	_____		
_____ = Total Cover				Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)	
Herb Stratum (Plot size: <u>5'</u>)					
1. <u>Polygonum persicaria</u>	<u>100</u>	<u>Yes</u>	<u>FACW</u>		¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic. Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.
2. _____	_____	_____	_____		
3. _____	_____	_____	_____		
4. _____	_____	_____	_____		
5. _____	_____	_____	_____		
6. _____	_____	_____	_____		
7. _____	_____	_____	_____		
8. _____	_____	_____	_____		
9. _____	_____	_____	_____		
10. _____	_____	_____	_____		
11. _____	_____	_____	_____		
12. _____	_____	_____	_____		
_____ = Total Cover				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	
Woody Vine Stratum (Plot size: <u>30'</u>)					
1. _____	_____	_____	_____		
2. _____	_____	_____	_____		
3. _____	_____	_____	_____		
4. _____	_____	_____	_____		
5. _____	_____	_____	_____		
_____ = Total Cover					
Remarks: (Include photo numbers here or on a separate sheet.)					

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Catfish Pond Mitigation Site City/County: Durham/Durham Sampling Date: 8/1/2018
 Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland K-L - DP 3
 Investigator(s): Charlie Neaves Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): None Slope (%): 0
 Subregion (LRR or MLRA): MLRA 136 Lat: 36.163586 Long: -78.912404 Datum: _____
 Soil Map Unit Name: Tatum Silt Loam NWI classification: n/a

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____ Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____ Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Remarks: Wetland is a floodplain bench within a narrow, confined valley.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ___ Surface Water (A1) ___ True Aquatic Plants (B14) ___ High Water Table (A2) ___ Hydrogen Sulfide Odor (C1) ___ Saturation (A3) <input checked="" type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) ___ Water Marks (B1) ___ Presence of Reduced Iron (C4) ___ Sediment Deposits (B2) ___ Recent Iron Reduction in Tilled Soils (C6) <input checked="" type="checkbox"/> Drift Deposits (B3) ___ Thin Muck Surface (C7) ___ Algal Mat or Crust (B4) ___ Other (Explain in Remarks) ___ Iron Deposits (B5) ___ Inundation Visible on Aerial Imagery (B7) ___ Water-Stained Leaves (B9) ___ Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> ___ Surface Soil Cracks (B6) ___ Sparsely Vegetated Concave Surface (B8) ___ Drainage Patterns (B10) ___ Moss Trim Lines (B16) ___ Dry-Season Water Table (C2) ___ Crayfish Burrows (C8) ___ Saturation Visible on Aerial Imagery (C9) ___ Stunted or Stressed Plants (D1) ___ Geomorphic Position (D2) ___ Shallow Aquitard (D3) ___ Microtopographic Relief (D4) ___ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ (includes capillary fringe)	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Wetland K-L - DP 3
Sampling Point: _____

	Absolute % Cover	Dominant Species?	Indicator Status		
Tree Stratum (Plot size: <u>30'</u>)					
1. <u>Fraxinus pennsylvanica</u>	20	Yes	FACW	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>3</u> (A) Total Number of Dominant Species Across All Strata: <u>3</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)	
2. <u>Diospyros Virginiana</u>	20	Yes	FAC		
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
	40	= Total Cover		Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____	
Sapling/Shrub Stratum (Plot size: <u>15'</u>)					
1. _____					
2. _____					
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
		= Total Cover		Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)	
Herb Stratum (Plot size: <u>5'</u>)					
1. <u>Microstegium vimineum</u>	60	Yes	FAC		¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic. Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.
2. _____					
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
11. _____					
12. _____					
	60	= Total Cover		Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	
Woody Vine Stratum (Plot size: <u>30'</u>)					
1. _____					
2. _____					
3. _____					
4. _____					
5. _____					
6. _____					
		= Total Cover			
Remarks: (Include photo numbers here or on a separate sheet.)					

SOIL

Sampling Point: Wetland K-L - DP 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-12+	10YR 5/1	90	10YR 6/8	10	C	PL	CL	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:		Indicators for Problematic Hydric Soils³:	
<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Dark Surface (S7)	<input type="checkbox"/> 2 cm Muck (A10) (MLRA 147)	
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Polyvalue Below Surface (S8) (MLRA 147, 148)	<input type="checkbox"/> Coast Prairie Redox (A16)	
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Thin Dark Surface (S9) (MLRA 147, 148)	<input type="checkbox"/> (MLRA 147, 148)	
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	<input type="checkbox"/> Piedmont Floodplain Soils (F19)	
<input type="checkbox"/> Stratified Layers (A5)	<input checked="" type="checkbox"/> Depleted Matrix (F3)	<input type="checkbox"/> (MLRA 136, 147)	
<input type="checkbox"/> 2 cm Muck (A10) (LRR N)	<input type="checkbox"/> Redox Dark Surface (F6)	<input type="checkbox"/> Red Parent Material (TF2)	
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input type="checkbox"/> Depleted Dark Surface (F7)	<input type="checkbox"/> Very Shallow Dark Surface (TF12)	
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Redox Depressions (F8)	<input type="checkbox"/> Other (Explain in Remarks)	
<input type="checkbox"/> Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148)	<input type="checkbox"/> Iron-Manganese Masses (F12) (LRR N, MLRA 136)		
<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> Umbric Surface (F13) (MLRA 136, 122)		
<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 148)		
<input type="checkbox"/> Stripped Matrix (S6)			

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed): Type: _____ Depth (inches): _____	Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
---	---

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Catfish Pond Mitigation Site City/County: Durham/Durham Sampling Date: 8/1/2018
 Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland M-O - DP 4
 Investigator(s): Charlie Neaves Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): Concave Slope (%): 0
 Subregion (LRR or MLRA): MLRA 136 Lat: 36.163441 Long: -78.914076 Datum: _____
 Soil Map Unit Name: Georgeville Silt Loam NWI classification: n/a

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation , Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____ Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____ Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Remarks: Vegetation significantly disturbed due to livestock grazing.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ___ Surface Water (A1) ___ True Aquatic Plants (B14) ___ High Water Table (A2) ___ Hydrogen Sulfide Odor (C1) ___ Saturation (A3) <input checked="" type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) ___ Water Marks (B1) ___ Presence of Reduced Iron (C4) ___ Sediment Deposits (B2) ___ Recent Iron Reduction in Tilled Soils (C6) <input checked="" type="checkbox"/> Drift Deposits (B3) ___ Thin Muck Surface (C7) ___ Algal Mat or Crust (B4) ___ Other (Explain in Remarks) ___ Iron Deposits (B5) ___ Inundation Visible on Aerial Imagery (B7) ___ Water-Stained Leaves (B9) ___ Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> ___ Surface Soil Cracks (B6) ___ Sparsely Vegetated Concave Surface (B8) <input checked="" type="checkbox"/> Drainage Patterns (B10) ___ Moss Trim Lines (B16) ___ Dry-Season Water Table (C2) ___ Crayfish Burrows (C8) ___ Saturation Visible on Aerial Imagery (C9) ___ Stunted or Stressed Plants (D1) ___ Geomorphic Position (D2) ___ Shallow Aquitard (D3) ___ Microtopographic Relief (D4) ___ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ (includes capillary fringe)	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:	
Remarks:	

VEGETATION (Four Strata) – Use scientific names of plants.

Wetland M-O - DP 4
Sampling Point: _____

	Absolute % Cover	Dominant Species?	Indicator Status		
Tree Stratum (Plot size: <u>30'</u>)					
1. <u>Liquidambar styraciflua</u>	20	Yes	FAC	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>4</u> (A) Total Number of Dominant Species Across All Strata: <u>4</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)	
2. <u>Platanus occidentalis</u>	10	Yes	FACW		
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
	30	= Total Cover		Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____	
Sapling/Shrub Stratum (Plot size: <u>15'</u>)					
1. _____					
2. _____					
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
		= Total Cover		Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)	
Herb Stratum (Plot size: <u>5'</u>)					
1. <u>Microstegium vimineum</u>	30	Yes	FAC		¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
2. _____					
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
11. _____					
12. _____					
	30	= Total Cover		Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.	
Woody Vine Stratum (Plot size: <u>30'</u>)					
1. <u>Smilax rotundifolia</u>	50	Yes	FAC		Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
2. _____					
3. _____					
4. _____					
5. _____					
6. _____					
	50	= Total Cover			
Remarks: (Include photo numbers here or on a separate sheet.)					

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-12+	10YR 6/1	85	10YR 6/6	15	C	PL	L	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:		Indicators for Problematic Hydric Soils³:	
<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Dark Surface (S7)	<input type="checkbox"/> 2 cm Muck (A10) (MLRA 147)	
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Polyvalue Below Surface (S8) (MLRA 147, 148)	<input type="checkbox"/> Coast Prairie Redox (A16)	
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Thin Dark Surface (S9) (MLRA 147, 148)	(MLRA 147, 148)	
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	<input type="checkbox"/> Piedmont Floodplain Soils (F19)	
<input type="checkbox"/> Stratified Layers (A5)	<input checked="" type="checkbox"/> Depleted Matrix (F3)	(MLRA 136, 147)	
<input type="checkbox"/> 2 cm Muck (A10) (LRR N)	<input type="checkbox"/> Redox Dark Surface (F6)	<input type="checkbox"/> Red Parent Material (TF2)	
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input type="checkbox"/> Depleted Dark Surface (F7)	<input type="checkbox"/> Very Shallow Dark Surface (TF12)	
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Redox Depressions (F8)	<input type="checkbox"/> Other (Explain in Remarks)	
<input type="checkbox"/> Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148)	<input type="checkbox"/> Iron-Manganese Masses (F12) (LRR N, MLRA 136)		
<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> Umbric Surface (F13) (MLRA 136, 122)		³ Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.
<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 148)		
<input type="checkbox"/> Stripped Matrix (S6)			

Restrictive Layer (if observed): Type: _____ Depth (inches): _____	Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
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Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Catfish Pond Mitigation Site City/County: Durham/Durham Sampling Date: 8/1/2018
 Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland P-Q - DP 5
 Investigator(s): Charlie Neaves Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): Concave Slope (%): 0
 Subregion (LRR or MLRA): MLRA 136 Lat: 36.16413 Long: -78.915578 Datum: _____
 Soil Map Unit Name: Wehadkee Silt Loam NWI classification: n/a

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation , Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____ Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____ Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Remarks: Vegetation significantly disturbed due to livestock grazing.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input checked="" type="checkbox"/> Surface Water (A1) _____ True Aquatic Plants (B14) <input checked="" type="checkbox"/> High Water Table (A2) _____ Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Saturation (A3) <input checked="" type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) _____ Water Marks (B1) _____ Presence of Reduced Iron (C4) _____ Sediment Deposits (B2) _____ Recent Iron Reduction in Tilled Soils (C6) _____ Drift Deposits (B3) _____ Thin Muck Surface (C7) _____ Algal Mat or Crust (B4) _____ Other (Explain in Remarks) _____ Iron Deposits (B5) _____ Inundation Visible on Aerial Imagery (B7) _____ Water-Stained Leaves (B9) _____ Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> _____ Surface Soil Cracks (B6) _____ Sparsely Vegetated Concave Surface (B8) _____ Drainage Patterns (B10) _____ Moss Trim Lines (B16) _____ Dry-Season Water Table (C2) _____ Crayfish Burrows (C8) _____ Saturation Visible on Aerial Imagery (C9) _____ Stunted or Stressed Plants (D1) _____ Geomorphic Position (D2) _____ Shallow Aquitard (D3) _____ Microtopographic Relief (D4) _____ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0</u> Water Table Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0-12+</u> Saturation Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0-12+</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Wetland P-Q - DP 5
Sampling Point: _____

	Absolute % Cover	Dominant Species?	Indicator Status	
Tree Stratum (Plot size: <u>30'</u>)				Dominance Test worksheet:
1. _____	_____	_____	_____	Number of Dominant Species That Are OBL, FACW, or FAC: <u>1</u> (A)
2. _____	_____	_____	_____	Total Number of Dominant Species Across All Strata: <u>1</u> (B)
3. _____	_____	_____	_____	Percent of Dominant Species That Are OBL, FACW, or FAC: <u>1</u> (A/B)
4. _____	_____	_____	_____	Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
_____ = Total Cover				
Sapling/Shrub Stratum (Plot size: <u>15'</u>)				
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
_____ = Total Cover				
Herb Stratum (Plot size: <u>5'</u>)				Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
1. <u>Polygonum persicaria</u>	<u>80</u>	<u>Yes</u>	<u>FACW</u>	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	
12. _____	_____	_____	_____	
_____ = Total Cover				
Woody Vine Stratum (Plot size: <u>30'</u>)				Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
_____ = Total Cover				
Remarks: (Include photo numbers here or on a separate sheet.)				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

SOIL

Wetland P-Q - DP 5
 Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-2	10YR 5/2	80	10YR 6/6	20	C	PL	SiL	
2-12+	10YR 6/2	80	10YR 5/6	20	C	PL	SiL	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) (**LRR N**)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) (**LRR N, MLRA 147, 148**)
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) (**MLRA 147, 148**)
- Thin Dark Surface (S9) (**MLRA 147, 148**)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) (**LRR N, MLRA 136**)
- Umbric Surface (F13) (**MLRA 136, 122**)
- Piedmont Floodplain Soils (F19) (**MLRA 148**)

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) (**MLRA 147**)
- Coast Prairie Redox (A16) (**MLRA 147, 148**)
- Piedmont Floodplain Soils (F19) (**MLRA 136, 147**)
- Red Parent Material (TF2)
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____
 Depth (inches): _____

Hydric Soil Present? Yes No _____

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Catfish Pond Mitigation Site City/County: Durham/Durham Sampling Date: 8/1/2018
 Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland R-S - DP 6
 Investigator(s): Charlie Neaves Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): none Slope (%): 0
 Subregion (LRR or MLRA): MLRA 136 Lat: 36.163673, Long: -78.916914 Datum: _____
 Soil Map Unit Name: Wehadkee Silt Loam NWI classification: n/a

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation , Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____ Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____ Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Remarks: Vegetation significantly disturbed due to livestock grazing.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input checked="" type="checkbox"/> Surface Water (A1) _____ True Aquatic Plants (B14) <input checked="" type="checkbox"/> High Water Table (A2) _____ Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Saturation (A3) _____ <input checked="" type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) _____ Water Marks (B1) _____ Presence of Reduced Iron (C4) _____ Sediment Deposits (B2) _____ Recent Iron Reduction in Tilled Soils (C6) _____ Drift Deposits (B3) _____ Thin Muck Surface (C7) _____ Algal Mat or Crust (B4) _____ Other (Explain in Remarks) _____ Iron Deposits (B5) _____ Inundation Visible on Aerial Imagery (B7) _____ Water-Stained Leaves (B9) _____ Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> _____ Surface Soil Cracks (B6) _____ Sparsely Vegetated Concave Surface (B8) <input checked="" type="checkbox"/> Drainage Patterns (B10) _____ Moss Trim Lines (B16) _____ Dry-Season Water Table (C2) _____ Crayfish Burrows (C8) _____ Saturation Visible on Aerial Imagery (C9) _____ Stunted or Stressed Plants (D1) _____ Geomorphic Position (D2) _____ Shallow Aquitard (D3) _____ Microtopographic Relief (D4) _____ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0</u> Water Table Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0-12+</u> Saturation Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0-12+</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:	
Remarks:	

VEGETATION (Four Strata) – Use scientific names of plants.

<u>Tree Stratum</u> (Plot size: <u>30'</u>)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:
1. _____	_____	_____	_____	Number of Dominant Species That Are OBL, FACW, or FAC: <u>2</u> (A) Total Number of Dominant Species Across All Strata: <u>2</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
_____ = Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
<u>Sapling/Shrub Stratum</u> (Plot size: <u>15'</u>)	Absolute % Cover	Dominant Species?	Indicator Status	
1. <u>Liquidambar styraciflua</u>	<u>30</u>	<u>Yes</u>	<u>FAC</u>	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
_____ = Total Cover				
<u>Herb Stratum</u> (Plot size: <u>5'</u>)	Absolute % Cover	Dominant Species?	Indicator Status	
1. <u>Microstegium vimineum</u>	<u>40</u>	<u>Yes</u>	<u>FAC</u>	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	
12. _____	_____	_____	_____	
_____ = Total Cover				
<u>Woody Vine Stratum</u> (Plot size: <u>30'</u>)	Absolute % Cover	Dominant Species?	Indicator Status	
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
_____ = Total Cover				
Remarks: (Include photo numbers here or on a separate sheet.)				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
				Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)

SOIL

Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-12+	10YR 6/2	90	10YR 6/8	10	C	PL	CL	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) (LRR N)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148)
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) (MLRA 147, 148)
- Thin Dark Surface (S9) (MLRA 147, 148)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) (LRR N, MLRA 136)
- Umbric Surface (F13) (MLRA 136, 122)
- Piedmont Floodplain Soils (F19) (MLRA 148)

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) (MLRA 147)
- Coast Prairie Redox (A16) (MLRA 147, 148)
- Piedmont Floodplain Soils (F19) (MLRA 136, 147)
- Red Parent Material (TF2)
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____
Depth (inches): _____

Hydric Soil Present? Yes No

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Catfish Pond Mitigation Site City/County: Durham/Durham Sampling Date: 8/3/2018
 Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland T-U - DP 7
 Investigator(s): Charlie Neaves Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): Concave Slope (%): 0
 Subregion (LRR or MLRA): MLRA 136 Lat: 36.164400 Long: -78.916073 Datum: _____
 Soil Map Unit Name: Wehadkee Silt Loam NWI classification: n/a

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation , Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____ Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____ Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Remarks: Vegetation significantly disturbed due to livestock grazing. Groundwater discharge is intercepted by an oxbow feature and drains to stream.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input checked="" type="checkbox"/> Surface Water (A1) _____ True Aquatic Plants (B14) <input checked="" type="checkbox"/> High Water Table (A2) _____ Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Saturation (A3) <input checked="" type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) _____ Water Marks (B1) _____ Presence of Reduced Iron (C4) _____ Sediment Deposits (B2) _____ Recent Iron Reduction in Tilled Soils (C6) _____ Drift Deposits (B3) _____ Thin Muck Surface (C7) _____ Algal Mat or Crust (B4) _____ Other (Explain in Remarks) _____ Iron Deposits (B5) _____ Inundation Visible on Aerial Imagery (B7) _____ Water-Stained Leaves (B9) _____ Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> _____ Surface Soil Cracks (B6) _____ Sparsely Vegetated Concave Surface (B8) _____ Drainage Patterns (B10) _____ Moss Trim Lines (B16) _____ Dry-Season Water Table (C2) _____ Crayfish Burrows (C8) _____ Saturation Visible on Aerial Imagery (C9) _____ Stunted or Stressed Plants (D1) _____ Geomorphic Position (D2) _____ Shallow Aquitard (D3) _____ Microtopographic Relief (D4) _____ FAC-Neutral Test (D5)
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Field Observations: Surface Water Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0</u> Water Table Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0-12+</u> Saturation Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0-12+</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____
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Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Wetland T-U - DP 7
Sampling Point: _____

	Absolute % Cover	Dominant Species?	Indicator Status		
Tree Stratum (Plot size: <u>30'</u>)					
1. _____	_____	_____	_____	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>1</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)	
2. _____	_____	_____	_____		
3. _____	_____	_____	_____		
4. _____	_____	_____	_____		
5. _____	_____	_____	_____		
6. _____	_____	_____	_____		
7. _____	_____	_____	_____		
8. _____	_____	_____	_____		
_____ = Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____	
Sapling/Shrub Stratum (Plot size: <u>15'</u>)					
1. _____	_____	_____	_____		
2. _____	_____	_____	_____		
3. _____	_____	_____	_____		
4. _____	_____	_____	_____		
5. _____	_____	_____	_____		
6. _____	_____	_____	_____		
7. _____	_____	_____	_____		
8. _____	_____	_____	_____		
_____ = Total Cover				Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)	
Herb Stratum (Plot size: <u>5'</u>)					
1. <u>Microstegium vimineum</u>	<u>80</u>	<u>Yes</u>	<u>FAC</u>		
2. _____	_____	_____	_____		
3. _____	_____	_____	_____		
4. _____	_____	_____	_____		
5. _____	_____	_____	_____		
6. _____	_____	_____	_____		
7. _____	_____	_____	_____		
8. _____	_____	_____	_____		
_____ = Total Cover				Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.	
Woody Vine Stratum (Plot size: <u>30'</u>)					
1. _____	_____	_____	_____		
2. _____	_____	_____	_____		
3. _____	_____	_____	_____		
4. _____	_____	_____	_____		
5. _____	_____	_____	_____		
6. _____	_____	_____	_____		
_____ = Total Cover					Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____
Remarks: (Include photo numbers here or on a separate sheet.)					

SOIL

Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-12+	10YR 5/1	90	7.5YR 6/8	10	C	PL	CL	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:		Indicators for Problematic Hydric Soils³:	
<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Dark Surface (S7)	<input type="checkbox"/> 2 cm Muck (A10) (MLRA 147)	
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Polyvalue Below Surface (S8) (MLRA 147, 148)	<input type="checkbox"/> Coast Prairie Redox (A16)	
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Thin Dark Surface (S9) (MLRA 147, 148)	<input type="checkbox"/> (MLRA 147, 148)	
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	<input type="checkbox"/> Piedmont Floodplain Soils (F19)	
<input type="checkbox"/> Stratified Layers (A5)	<input checked="" type="checkbox"/> Depleted Matrix (F3)	<input type="checkbox"/> (MLRA 136, 147)	
<input type="checkbox"/> 2 cm Muck (A10) (LRR N)	<input type="checkbox"/> Redox Dark Surface (F6)	<input type="checkbox"/> Red Parent Material (TF2)	
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input type="checkbox"/> Depleted Dark Surface (F7)	<input type="checkbox"/> Very Shallow Dark Surface (TF12)	
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Redox Depressions (F8)	<input type="checkbox"/> Other (Explain in Remarks)	
<input type="checkbox"/> Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148)	<input type="checkbox"/> Iron-Manganese Masses (F12) (LRR N, MLRA 136)		
<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> Umbric Surface (F13) (MLRA 136, 122)		
<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 148)		
<input type="checkbox"/> Stripped Matrix (S6)			

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):
 Type: _____
 Depth (inches): _____

Hydric Soil Present? Yes No

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Catfish Pond Mitigation Site City/County: Durham/Durham Sampling Date: 8/3/2018
 Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland DP 8
 Investigator(s): Charlie Neaves Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): none Slope (%): 4
 Subregion (LRR or MLRA): MLRA 136 Lat: 36.161755 Long: -78.912225 Datum: _____
 Soil Map Unit Name: Wehadkee Silt Loam NWI classification: n/a

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation , Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/> Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/> Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes _____ No <input checked="" type="checkbox"/>
Remarks: Vegetation significantly disturbed due to livestock grazing and pasture management.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ___ Surface Water (A1) ___ True Aquatic Plants (B14) ___ High Water Table (A2) ___ Hydrogen Sulfide Odor (C1) ___ Saturation (A3) ___ Oxidized Rhizospheres on Living Roots (C3) ___ Water Marks (B1) ___ Presence of Reduced Iron (C4) ___ Sediment Deposits (B2) ___ Recent Iron Reduction in Tilled Soils (C6) ___ Drift Deposits (B3) ___ Thin Muck Surface (C7) ___ Algal Mat or Crust (B4) ___ Other (Explain in Remarks) ___ Iron Deposits (B5) ___ Inundation Visible on Aerial Imagery (B7) ___ Water-Stained Leaves (B9) ___ Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> ___ Surface Soil Cracks (B6) ___ Sparsely Vegetated Concave Surface (B8) ___ Drainage Patterns (B10) ___ Moss Trim Lines (B16) ___ Dry-Season Water Table (C2) ___ Crayfish Burrows (C8) ___ Saturation Visible on Aerial Imagery (C9) ___ Stunted or Stressed Plants (D1) ___ Geomorphic Position (D2) ___ Shallow Aquitard (D3) ___ Microtopographic Relief (D4) ___ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ (includes capillary fringe)	Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:	
Remarks:	

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland DP 8

	Absolute % Cover	Dominant Species?	Indicator Status	
Tree Stratum (Plot size: <u>30'</u>)				Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>0</u> (A) Total Number of Dominant Species Across All Strata: <u>1</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>0</u> (A/B)
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
_____ = Total Cover				
Sapling/Shrub Stratum (Plot size: <u>15'</u>)				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
_____ = Total Cover				
Herb Stratum (Plot size: <u>5'</u>)				Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)
1. <u>Schedonorus arundinaceus</u>	<u>100</u>	<u>Yes</u>	<u>FACU</u>	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	
_____ = Total Cover				
Woody Vine Stratum (Plot size: <u>30'</u>)				Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
_____ = Total Cover				
Remarks: (Include photo numbers here or on a separate sheet.)				Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/>

SOIL

Sampling Point: Upland DP 8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-1	10YR 5/1	90	7.5YR 6/6	10	C	PL	SiL	
1-8	10YR 6/4	95	2.5 YR	5	C	M	SiL	
8-12	7.5YR 5/6	100					L	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:		Indicators for Problematic Hydric Soils³:	
<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Dark Surface (S7)	<input type="checkbox"/> 2 cm Muck (A10) (MLRA 147)	
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Polyvalue Below Surface (S8) (MLRA 147, 148)	<input type="checkbox"/> Coast Prairie Redox (A16)	
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Thin Dark Surface (S9) (MLRA 147, 148)	<input type="checkbox"/> (MLRA 147, 148)	
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	<input type="checkbox"/> Piedmont Floodplain Soils (F19)	
<input type="checkbox"/> Stratified Layers (A5)	<input type="checkbox"/> Depleted Matrix (F3)	<input type="checkbox"/> (MLRA 136, 147)	
<input type="checkbox"/> 2 cm Muck (A10) (LRR N)	<input type="checkbox"/> Redox Dark Surface (F6)	<input type="checkbox"/> Red Parent Material (TF2)	
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input type="checkbox"/> Depleted Dark Surface (F7)	<input type="checkbox"/> Very Shallow Dark Surface (TF12)	
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Redox Depressions (F8)	<input type="checkbox"/> Other (Explain in Remarks)	
<input type="checkbox"/> Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148)	<input type="checkbox"/> Iron-Manganese Masses (F12) (LRR N, MLRA 136)		
<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> Umbric Surface (F13) (MLRA 136, 122)		
<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 148)		
<input type="checkbox"/> Stripped Matrix (S6)			

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed): Type: _____ Depth (inches): _____	Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/>
---	---

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Catfish Pond Mitigation Site City/County: Durham/Durham Sampling Date: 8/3/2018
 Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland DP 9
 Investigator(s): Charlie Neaves Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): none Slope (%): 8
 Subregion (LRR or MLRA): MLRA 136 Lat: 36.163811 Long: -78.915347 Datum: _____
 Soil Map Unit Name: Wehadkee Silt Loam NWI classification: n/a

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation , Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/> Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/> Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes _____ No <input checked="" type="checkbox"/>
Remarks: Vegetation significantly disturbed due to livestock grazing and pasture management.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ___ Surface Water (A1) ___ True Aquatic Plants (B14) ___ High Water Table (A2) ___ Hydrogen Sulfide Odor (C1) ___ Saturation (A3) ___ Oxidized Rhizospheres on Living Roots (C3) ___ Water Marks (B1) ___ Presence of Reduced Iron (C4) ___ Sediment Deposits (B2) ___ Recent Iron Reduction in Tilled Soils (C6) ___ Drift Deposits (B3) ___ Thin Muck Surface (C7) ___ Algal Mat or Crust (B4) ___ Other (Explain in Remarks) ___ Iron Deposits (B5) ___ Inundation Visible on Aerial Imagery (B7) ___ Water-Stained Leaves (B9) ___ Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> ___ Surface Soil Cracks (B6) ___ Sparsely Vegetated Concave Surface (B8) ___ Drainage Patterns (B10) ___ Moss Trim Lines (B16) ___ Dry-Season Water Table (C2) ___ Crayfish Burrows (C8) ___ Saturation Visible on Aerial Imagery (C9) ___ Stunted or Stressed Plants (D1) ___ Geomorphic Position (D2) ___ Shallow Aquitard (D3) ___ Microtopographic Relief (D4) ___ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ (includes capillary fringe)	Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland DP 9

	Absolute % Cover	Dominant Species?	Indicator Status	
Tree Stratum (Plot size: <u>30'</u>)				Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>0</u> (A) Total Number of Dominant Species Across All Strata: <u>2</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>0</u> (A/B)
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
_____ = Total Cover				
Sapling/Shrub Stratum (Plot size: <u>15'</u>)				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
_____ = Total Cover				
Herb Stratum (Plot size: <u>5'</u>)				Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)
1. <u>Schedonorus arundinaceus</u>	<u>50</u>	<u>Yes</u>	<u>FACU</u>	
2. <u>Cynodon dactylon</u>	<u>50</u>	<u>Yes</u>	<u>FACU</u>	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	
12. _____	_____	_____	_____	
_____ = Total Cover				
Woody Vine Stratum (Plot size: <u>30'</u>)				Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
_____ = Total Cover				
Remarks: (Include photo numbers here or on a separate sheet.)				Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/>

SOIL

Sampling Point: Upland DP 9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-2	7.5YR 5/6	100					SiL	
2-12+	2.5YR 5/8	100					CL	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:		Indicators for Problematic Hydric Soils ³ :	
<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Dark Surface (S7)	<input type="checkbox"/> 2 cm Muck (A10) (MLRA 147)	
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Polyvalue Below Surface (S8) (MLRA 147, 148)	<input type="checkbox"/> Coast Prairie Redox (A16) (MLRA 147, 148)	
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Thin Dark Surface (S9) (MLRA 147, 148)	<input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 136, 147)	
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	<input type="checkbox"/> Red Parent Material (TF2)	
<input type="checkbox"/> Stratified Layers (A5)	<input type="checkbox"/> Depleted Matrix (F3)	<input type="checkbox"/> Very Shallow Dark Surface (TF12)	
<input type="checkbox"/> 2 cm Muck (A10) (LRR N)	<input type="checkbox"/> Redox Dark Surface (F6)	<input type="checkbox"/> Other (Explain in Remarks)	
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input type="checkbox"/> Depleted Dark Surface (F7)		
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Redox Depressions (F8)		
<input type="checkbox"/> Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148)	<input type="checkbox"/> Iron-Manganese Masses (F12) (LRR N, MLRA 136)		
<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> Umbric Surface (F13) (MLRA 136, 122)		
<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 148)		
<input type="checkbox"/> Stripped Matrix (S6)			

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed): Type: _____ Depth (inches): _____	Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/>
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Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Catfish Pond Mitigation Site City/County: Durham/Durham Sampling Date: 3/7/2018
 Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland W- DP10
 Investigator(s): Win Taylor Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): concave Slope (%): 0
 Subregion (LRR or MLRA): MLRA 136 Lat: N 36.162453 Long: -78.908308 Datum: _____
 Soil Map Unit Name: Tatum Gravelly Silt Loam (TaE) & Chewacla and Wehadkee (Ch) NWI classification: n/a

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation , Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____ Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____ Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Remarks: Vegetation significantly disturbed due to livestock grazing.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ___ Surface Water (A1) ___ True Aquatic Plants (B14) ___ High Water Table (A2) ___ Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Saturation (A3) ___ Oxidized Rhizospheres on Living Roots (C3) ___ Water Marks (B1) ___ Presence of Reduced Iron (C4) ___ Sediment Deposits (B2) ___ Recent Iron Reduction in Tilled Soils (C6) ___ Drift Deposits (B3) ___ Thin Muck Surface (C7) ___ Algal Mat or Crust (B4) ___ Other (Explain in Remarks) ___ Iron Deposits (B5) ___ Inundation Visible on Aerial Imagery (B7) ___ Water-Stained Leaves (B9) ___ Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> ___ Surface Soil Cracks (B6) ___ Sparsely Vegetated Concave Surface (B8) <input checked="" type="checkbox"/> Drainage Patterns (B10) ___ Moss Trim Lines (B16) ___ Dry-Season Water Table (C2) ___ Crayfish Burrows (C8) ___ Saturation Visible on Aerial Imagery (C9) ___ Stunted or Stressed Plants (D1) ___ Geomorphic Position (D2) ___ Shallow Aquitard (D3) ___ Microtopographic Relief (D4) ___ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0 - 12+</u>	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Wetland W- DP10
Sampling Point: _____

	Absolute % Cover	Dominant Species?	Indicator Status	
Tree Stratum (Plot size: <u>30'</u>)				Dominance Test worksheet:
1. _____	_____	_____	_____	Number of Dominant Species That Are OBL, FACW, or FAC: <u>3</u> (A)
2. _____	_____	_____	_____	Total Number of Dominant Species Across All Strata: <u>3</u> (B)
3. _____	_____	_____	_____	Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)
4. _____	_____	_____	_____	Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
0 = Total Cover				
Sapling/Shrub Stratum (Plot size: <u>15'</u>)				
1. <u>Salix nigra</u>	<u>5</u>	<u>Yes</u>	<u>OBL</u>	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
5 = Total Cover				
Herb Stratum (Plot size: <u>5'</u>)				
1. <u>Microstegium vimineum</u>	<u>10</u>	<u>Yes</u>	<u>FAC</u>	
2. <u>Impatiens pallida</u>	<u>5</u>	<u>Yes</u>	<u>FACW</u>	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	
12. _____	_____	_____	_____	
15 = Total Cover				
Woody Vine Stratum (Plot size: <u>30'</u>)				
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
0 = Total Cover				
Remarks: (Include photo numbers here or on a separate sheet.)				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

SOIL

Wetland W- DP10
Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-12	10YR 3/2	95	10YR 5/6	5	C	PL	Loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:	Indicators for Problematic Hydric Soils ³ :
<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> 2 cm Muck (A10) (MLRA 147)
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Coast Prairie Redox (A16)
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> (MLRA 147, 148)
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Piedmont Floodplain Soils (F19)
<input type="checkbox"/> Stratified Layers (A5)	<input type="checkbox"/> (MLRA 136, 147)
<input type="checkbox"/> 2 cm Muck (A10) (LRR N)	<input type="checkbox"/> Red Parent Material (TF2)
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input type="checkbox"/> Very Shallow Dark Surface (TF12)
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Other (Explain in Remarks)
<input type="checkbox"/> Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148)	
<input type="checkbox"/> Sandy Gleyed Matrix (S4)	
<input type="checkbox"/> Sandy Redox (S5)	
<input type="checkbox"/> Stripped Matrix (S6)	
<input type="checkbox"/> Dark Surface (S7)	
<input type="checkbox"/> Polyvalue Below Surface (S8) (MLRA 147, 148)	
<input type="checkbox"/> Thin Dark Surface (S9) (MLRA 147, 148)	
<input type="checkbox"/> Loamy Gleyed Matrix (F2)	
<input checked="" type="checkbox"/> Depleted Matrix (F3)	
<input type="checkbox"/> Redox Dark Surface (F6)	
<input type="checkbox"/> Depleted Dark Surface (F7)	
<input type="checkbox"/> Redox Depressions (F8)	
<input type="checkbox"/> Iron-Manganese Masses (F12) (LRR N, MLRA 136)	
<input type="checkbox"/> Umbric Surface (F13) (MLRA 136, 122)	
<input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 148)	

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):
 Type: _____
 Depth (inches): _____

Hydric Soil Present? Yes No _____

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Catfish Pond Mitigation Site City/County: Durham/Durham Sampling Date: 3/8/2018
 Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland V - DP11
 Investigator(s): Win Taylor Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): concave Slope (%): <1
 Subregion (LRR or MLRA): MLRA 136 Lat: N 36.162286 Long: -78.908970 Datum: _____
 Soil Map Unit Name: Tatum Gravelly Silt Loam (TaE) & Chewacla and Wehadkee (Ch) NWI classification: n/a

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation , Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____ Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____ Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Remarks: Vegetation significantly disturbed due to livestock grazing.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ___ Surface Water (A1) ___ True Aquatic Plants (B14) ___ High Water Table (A2) ___ Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Saturation (A3) ___ Oxidized Rhizospheres on Living Roots (C3) ___ Water Marks (B1) ___ Presence of Reduced Iron (C4) ___ Sediment Deposits (B2) ___ Recent Iron Reduction in Tilled Soils (C6) ___ Drift Deposits (B3) ___ Thin Muck Surface (C7) ___ Algal Mat or Crust (B4) ___ Other (Explain in Remarks) <input checked="" type="checkbox"/> Iron Deposits (B5) ___ Inundation Visible on Aerial Imagery (B7) <input checked="" type="checkbox"/> Water-Stained Leaves (B9) ___ Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> ___ Surface Soil Cracks (B6) ___ Sparsely Vegetated Concave Surface (B8) ___ Drainage Patterns (B10) ___ Moss Trim Lines (B16) ___ Dry-Season Water Table (C2) ___ Crayfish Burrows (C8) ___ Saturation Visible on Aerial Imagery (C9) ___ Stunted or Stressed Plants (D1) ___ Geomorphic Position (D2) ___ Shallow Aquitard (D3) ___ Microtopographic Relief (D4) ___ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0 - 12+</u>	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Wetland V - DP11
Sampling Point: _____

	Absolute % Cover	Dominant Species?	Indicator Status		
Tree Stratum (Plot size: <u>30'</u>)					
1. <u>Platanus occidentalis</u>	40	Yes	FACW	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>5</u> (A) Total Number of Dominant Species Across All Strata: <u>6</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>83</u> (A/B)	
2. <u>Liquidambar styraciflua</u>	5	No	FAC		
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
	45	= Total Cover		Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____	
Sapling/Shrub Stratum (Plot size: <u>15'</u>)					
1. <u>Alnus serrulata</u>	10	Yes	OBL		
2. <u>Ligustrum sinense</u>	5	Yes	FACU		
3. <u>Liquidambar styraciflua</u>	2	No	FAC		
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
	17	= Total Cover			
Herb Stratum (Plot size: <u>5'</u>)					
1. <u>Microstegium vimineum</u>	20	Yes	FAC	Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)	
2. <u>Impatiens pallida</u>	5	Yes	FACW		
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
11. _____					
12. _____					
	25	= Total Cover			
Woody Vine Stratum (Plot size: <u>30'</u>)					
1. _____					
2. _____					
3. _____					
4. _____					
5. _____					
6. _____					
	0	= Total Cover		Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.	
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>					
Remarks: (Include photo numbers here or on a separate sheet.)					

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Catfish Pond Mitigation Site City/County: Durham/Durham Sampling Date: 3/8/2018
 Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP12
 Investigator(s): Win Taylor Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): concave Slope (%): <1
 Subregion (LRR or MLRA): MLRA 136 Lat: N 36.162495 Long: -78.909099 Datum: _____
 Soil Map Unit Name: Tatum Gravelly Silt Loam (TaE) NWI classification: n/a

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation , Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/> Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/> Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes _____ No <input checked="" type="checkbox"/>
Remarks: Vegetation significantly disturbed due to livestock grazing.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ___ Surface Water (A1) ___ True Aquatic Plants (B14) ___ High Water Table (A2) ___ Hydrogen Sulfide Odor (C1) ___ Saturation (A3) ___ Oxidized Rhizospheres on Living Roots (C3) ___ Water Marks (B1) ___ Presence of Reduced Iron (C4) ___ Sediment Deposits (B2) ___ Recent Iron Reduction in Tilled Soils (C6) ___ Drift Deposits (B3) ___ Thin Muck Surface (C7) ___ Algal Mat or Crust (B4) ___ Other (Explain in Remarks) ___ Iron Deposits (B5) ___ Inundation Visible on Aerial Imagery (B7) ___ Water-Stained Leaves (B9) ___ Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> ___ Surface Soil Cracks (B6) ___ Sparsely Vegetated Concave Surface (B8) ___ Drainage Patterns (B10) ___ Moss Trim Lines (B16) ___ Dry-Season Water Table (C2) ___ Crayfish Burrows (C8) ___ Saturation Visible on Aerial Imagery (C9) ___ Stunted or Stressed Plants (D1) ___ Geomorphic Position (D2) ___ Shallow Aquitard (D3) ___ Microtopographic Relief (D4) ___ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No _____ Depth (inches): _____ Water Table Present? Yes _____ No _____ Depth (inches): _____ Saturation Present? Yes _____ No _____ Depth (inches): _____ (includes capillary fringe)	Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:	
Remarks:	

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP12

	Absolute % Cover	Dominant Species?	Indicator Status															
Tree Stratum (Plot size: <u>30'</u>)																		
1. <u>Platanus occidentalis</u>	<u>10</u>	<u>Yes</u>	<u>FACW</u>	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>4</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>25</u> (A/B)														
2. <u>Juglans nigra</u>	<u>10</u>	<u>Yes</u>	<u>FACU</u>															
3. _____	_____	_____	_____															
4. _____	_____	_____	_____															
5. _____	_____	_____	_____															
6. _____	_____	_____	_____															
7. _____	_____	_____	_____															
8. _____	_____	_____	_____															
	<u>20</u>	= Total Cover																
Sapling/Shrub Stratum (Plot size: <u>15'</u>)																		
1. <u>Juniperus virginiana</u>	<u>5</u>	<u>Yes</u>	<u>FACU</u>	Prevalence Index worksheet: <table style="width:100%; border:none;"> <tr> <td style="text-align:right;">Total % Cover of:</td> <td style="text-align:right;">Multiply by:</td> </tr> <tr> <td>OBL species <u>0</u></td> <td>x 1 = <u>0</u></td> </tr> <tr> <td>FACW species <u>10</u></td> <td>x 2 = <u>20</u></td> </tr> <tr> <td>FAC species <u>15</u></td> <td>x 3 = <u>45</u></td> </tr> <tr> <td>FACU species <u>85</u></td> <td>x 4 = <u>340</u></td> </tr> <tr> <td>UPL species <u>0</u></td> <td>x 5 = <u>0</u></td> </tr> <tr> <td>Column Totals: <u>110</u> (A)</td> <td><u>405</u> (B)</td> </tr> </table> Prevalence Index = B/A = <u>3.7</u>	Total % Cover of:	Multiply by:	OBL species <u>0</u>	x 1 = <u>0</u>	FACW species <u>10</u>	x 2 = <u>20</u>	FAC species <u>15</u>	x 3 = <u>45</u>	FACU species <u>85</u>	x 4 = <u>340</u>	UPL species <u>0</u>	x 5 = <u>0</u>	Column Totals: <u>110</u> (A)	<u>405</u> (B)
Total % Cover of:	Multiply by:																	
OBL species <u>0</u>	x 1 = <u>0</u>																	
FACW species <u>10</u>	x 2 = <u>20</u>																	
FAC species <u>15</u>	x 3 = <u>45</u>																	
FACU species <u>85</u>	x 4 = <u>340</u>																	
UPL species <u>0</u>	x 5 = <u>0</u>																	
Column Totals: <u>110</u> (A)	<u>405</u> (B)																	
2. _____	_____	_____	_____															
3. _____	_____	_____	_____															
4. _____	_____	_____	_____															
5. _____	_____	_____	_____															
6. _____	_____	_____	_____															
7. _____	_____	_____	_____															
8. _____	_____	_____	_____															
9. _____	_____	_____	_____															
10. _____	_____	_____	_____															
	<u>5</u>	= Total Cover																
Herb Stratum (Plot size: <u>5'</u>)																		
1. <u>Festuca rubra</u>	<u>60</u>	<u>Yes</u>	<u>FACU</u>	Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)														
2. <u>Trifolium repens</u>	<u>10</u>	<u>No</u>	<u>FACU</u>															
3. <u>Microstegium vimineum</u>	<u>15</u>	<u>No</u>	<u>FAC</u>															
4. _____	_____	_____	_____															
5. _____	_____	_____	_____															
6. _____	_____	_____	_____															
7. _____	_____	_____	_____															
8. _____	_____	_____	_____															
9. _____	_____	_____	_____															
10. _____	_____	_____	_____															
11. _____	_____	_____	_____															
12. _____	_____	_____	_____															
	<u>85</u>	= Total Cover																
Woody Vine Stratum (Plot size: <u>30'</u>)																		
1. _____	_____	_____	_____	Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.														
2. _____	_____	_____	_____															
3. _____	_____	_____	_____															
4. _____	_____	_____	_____															
5. _____	_____	_____	_____															
6. _____	_____	_____	_____															
	<u>0</u>	= Total Cover																
<table style="width:100%; border:none;"> <tr> <td style="width:60%;">Hydrophytic Vegetation Present?</td> <td style="width:20%;">Yes _____</td> <td style="width:20%;">No <input checked="" type="checkbox"/></td> </tr> </table>					Hydrophytic Vegetation Present?	Yes _____	No <input checked="" type="checkbox"/>											
Hydrophytic Vegetation Present?	Yes _____	No <input checked="" type="checkbox"/>																
Remarks: (Include photo numbers here or on a separate sheet.)																		

SOIL

Sampling Point: Upland - DP12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-4	10YR 5/3						Loam	
4-12	10YR 5/4						Loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:		Indicators for Problematic Hydric Soils ³ :	
<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Dark Surface (S7)	<input type="checkbox"/> 2 cm Muck (A10) (MLRA 147)	
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Polyvalue Below Surface (S8) (MLRA 147, 148)	<input type="checkbox"/> Coast Prairie Redox (A16) (MLRA 147, 148)	
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Thin Dark Surface (S9) (MLRA 147, 148)	<input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 136, 147)	
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	<input type="checkbox"/> Red Parent Material (TF2)	
<input type="checkbox"/> Stratified Layers (A5)	<input type="checkbox"/> Depleted Matrix (F3)	<input type="checkbox"/> Very Shallow Dark Surface (TF12)	
<input type="checkbox"/> 2 cm Muck (A10) (LRR N)	<input type="checkbox"/> Redox Dark Surface (F6)	<input type="checkbox"/> Other (Explain in Remarks)	
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input type="checkbox"/> Depleted Dark Surface (F7)		
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Redox Depressions (F8)		
<input type="checkbox"/> Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148)	<input type="checkbox"/> Iron-Manganese Masses (F12) (LRR N, MLRA 136)		
<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> Umbric Surface (F13) (MLRA 136, 122)		
<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 148)		
<input type="checkbox"/> Stripped Matrix (S6)			

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed): Type: _____ Depth (inches): _____	Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/>
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Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Catfish Pond Mitigation Site City/County: Durham/Durham Sampling Date: 3/8/2018
 Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland X - DP13
 Investigator(s): Win Taylor Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): concave Slope (%): 0
 Subregion (LRR or MLRA): MLRA 136 Lat: N 36.162685 Long: -78.909741 Datum: _____
 Soil Map Unit Name: Tatum Gravelly Silt Loam (TaE) NWI classification: n/a

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation , Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____ Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____ Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Remarks: Vegetation significantly disturbed due to livestock grazing.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ___ Surface Water (A1) ___ True Aquatic Plants (B14) ___ High Water Table (A2) ___ Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Saturation (A3) ___ Oxidized Rhizospheres on Living Roots (C3) ___ Water Marks (B1) ___ Presence of Reduced Iron (C4) ___ Sediment Deposits (B2) ___ Recent Iron Reduction in Tilled Soils (C6) ___ Drift Deposits (B3) ___ Thin Muck Surface (C7) ___ Algal Mat or Crust (B4) ___ Other (Explain in Remarks) ___ Iron Deposits (B5) ___ Inundation Visible on Aerial Imagery (B7) <input checked="" type="checkbox"/> Water-Stained Leaves (B9) ___ Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> ___ Surface Soil Cracks (B6) ___ Sparsely Vegetated Concave Surface (B8) ___ Drainage Patterns (B10) ___ Moss Trim Lines (B16) ___ Dry-Season Water Table (C2) ___ Crayfish Burrows (C8) ___ Saturation Visible on Aerial Imagery (C9) ___ Stunted or Stressed Plants (D1) ___ Geomorphic Position (D2) ___ Shallow Aquitard (D3) ___ Microtopographic Relief (D4) ___ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0 - 12+</u>	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Wetland X - DP13
Sampling Point: _____

	Absolute % Cover	Dominant Species?	Indicator Status	
Tree Stratum (Plot size: <u>30'</u>)				Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>4</u> (A) Total Number of Dominant Species Across All Strata: <u>4</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)
1. <u>Salix nigra</u>	<u>5</u>	<u>Yes</u>	<u>OBL</u>	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
_____	_____	_____	_____	
<u>0</u> = Total Cover				
Sapling/Shrub Stratum (Plot size: <u>15'</u>)				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
1. <u>Alnus serrulata</u>	<u>5</u>	<u>Yes</u>	<u>OBL</u>	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
<u>5</u> = Total Cover				
Herb Stratum (Plot size: <u>5'</u>)				Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)
1. <u>Microstegium vimineum</u>	<u>5</u>	<u>Yes</u>	<u>FAC</u>	
2. <u>Impatiens pallida</u>	<u>20</u>	<u>Yes</u>	<u>FACW</u>	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	
12. _____	_____	_____	_____	
<u>25</u> = Total Cover				
Woody Vine Stratum (Plot size: <u>30'</u>)				Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
_____	_____	_____	_____	
_____	_____	_____	_____	
_____	_____	_____	_____	
<u>0</u> = Total Cover				
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____				
Remarks: (Include photo numbers here or on a separate sheet.)				

SOIL

Sampling Point: Wetland X - DP13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-6	10YR 4/2	98	10YR 4/4	2	C	PL	Clay Loam	
6-12	10YR 4/2	95	10YR 4/6	5	C	PL	Clay Loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) (**LRR N**)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) (**LRR N, MLRA 147, 148**)
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) (**MLRA 147, 148**)
- Thin Dark Surface (S9) (**MLRA 147, 148**)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) (**LRR N, MLRA 136**)
- Umbric Surface (F13) (**MLRA 136, 122**)
- Piedmont Floodplain Soils (F19) (**MLRA 148**)

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) (**MLRA 147**)
- Coast Prairie Redox (A16) (**MLRA 147, 148**)
- Piedmont Floodplain Soils (F19) (**MLRA 136, 147**)
- Red Parent Material (TF2)
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____
Depth (inches): _____

Hydric Soil Present? Yes No

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Catfish Pond Mitigation Site City/County: Durham/Durham Sampling Date: 3/8/2018
 Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland Y - DP14
 Investigator(s): Win Taylor Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): concave Slope (%): 0
 Subregion (LRR or MLRA): MLRA 136 Lat: N 36.163186 Long: -78.910526 Datum: _____
 Soil Map Unit Name: Tatum Gravelly Silt Loam (TaE) NWI classification: n/a

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation , Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____ Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____ Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Remarks: Vegetation significantly disturbed due to livestock grazing.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input checked="" type="checkbox"/> Surface Water (A1) _____ True Aquatic Plants (B14) <input checked="" type="checkbox"/> High Water Table (A2) _____ Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Saturation (A3) _____ Oxidized Rhizospheres on Living Roots (C3) _____ Water Marks (B1) _____ Presence of Reduced Iron (C4) _____ Sediment Deposits (B2) _____ Recent Iron Reduction in Tilled Soils (C6) _____ Drift Deposits (B3) _____ Thin Muck Surface (C7) _____ Algal Mat or Crust (B4) _____ Other (Explain in Remarks) <input checked="" type="checkbox"/> Iron Deposits (B5) _____ Inundation Visible on Aerial Imagery (B7) <input checked="" type="checkbox"/> Water-Stained Leaves (B9) _____ Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> _____ Surface Soil Cracks (B6) _____ Sparsely Vegetated Concave Surface (B8) _____ Drainage Patterns (B10) _____ Moss Trim Lines (B16) _____ Dry-Season Water Table (C2) _____ Crayfish Burrows (C8) _____ Saturation Visible on Aerial Imagery (C9) _____ Stunted or Stressed Plants (D1) _____ Geomorphic Position (D2) _____ Shallow Aquitard (D3) _____ Microtopographic Relief (D4) _____ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0.25</u> Water Table Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0 - 12+</u> Saturation Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0 - 12+</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:	
Remarks:	

VEGETATION (Four Strata) – Use scientific names of plants.

Wetland Y - DP14
Sampling Point: _____

	Absolute % Cover	Dominant Species?	Indicator Status	
Tree Stratum (Plot size: <u>30'</u>)				
1. <u>Liquidambar styraciflua</u>	<u>30</u>	<u>Yes</u>	<u>FAC</u>	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>3</u> (A) Total Number of Dominant Species Across All Strata: <u>3</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
<u>30</u> = Total Cover				
Sapling/Shrub Stratum (Plot size: <u>15'</u>)				
1. <u>Alnus serrulata</u>	<u>10</u>	<u>Yes</u>	<u>OBL</u>	Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
<u>10</u> = Total Cover				
Herb Stratum (Plot size: <u>5'</u>)				
1. <u>Impatiens pallida</u>	<u>5</u>	<u>Yes</u>	<u>FAC</u>	Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	
12. _____	_____	_____	_____	
<u>5</u> = Total Cover				
Woody Vine Stratum (Plot size: <u>30'</u>)				
1. _____	_____	_____	_____	Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
6. _____	_____	_____	_____	
<u>0</u> = Total Cover				
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____				
Remarks: (Include photo numbers here or on a separate sheet.)				

SOIL

Sampling Point: Wetland Y - DP14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-12	10YR 5/2	98	10YR 4/6	2	C	PL	Clay Loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) (**LRR N**)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) (**LRR N, MLRA 147, 148**)
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) (**MLRA 147, 148**)
- Thin Dark Surface (S9) (**MLRA 147, 148**)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) (**LRR N, MLRA 136**)
- Umbric Surface (F13) (**MLRA 136, 122**)
- Piedmont Floodplain Soils (F19) (**MLRA 148**)

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) (**MLRA 147**)
- Coast Prairie Redox (A16) (**MLRA 147, 148**)
- Piedmont Floodplain Soils (F19) (**MLRA 136, 147**)
- Red Parent Material (TF2)
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____
 Depth (inches): _____

Hydric Soil Present? Yes No _____

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Catfish Pond Mitigation Site City/County: Durham/Durham Sampling Date: 3/7/2018
 Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland Z - DP15
 Investigator(s): Win Taylor Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): concave Slope (%): 0
 Subregion (LRR or MLRA): MLRA 136 Lat: N 36.165525 Long: -78.914278 Datum: _____
 Soil Map Unit Name: Georgeville Silt Loam (GeC) NWI classification: n/a

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation , Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____ Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____ Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Remarks: Vegetation disturbed due to livestock grazing.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ___ Surface Water (A1) ___ True Aquatic Plants (B14) ___ High Water Table (A2) ___ Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Saturation (A3) ___ Oxidized Rhizospheres on Living Roots (C3) ___ Water Marks (B1) ___ Presence of Reduced Iron (C4) ___ Sediment Deposits (B2) ___ Recent Iron Reduction in Tilled Soils (C6) ___ Drift Deposits (B3) ___ Thin Muck Surface (C7) ___ Algal Mat or Crust (B4) ___ Other (Explain in Remarks) ___ Iron Deposits (B5) ___ Inundation Visible on Aerial Imagery (B7) <input checked="" type="checkbox"/> Water-Stained Leaves (B9) ___ Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> ___ Surface Soil Cracks (B6) ___ Sparsely Vegetated Concave Surface (B8) ___ Drainage Patterns (B10) ___ Moss Trim Lines (B16) ___ Dry-Season Water Table (C2) ___ Crayfish Burrows (C8) ___ Saturation Visible on Aerial Imagery (C9) ___ Stunted or Stressed Plants (D1) ___ Geomorphic Position (D2) ___ Shallow Aquitard (D3) ___ Microtopographic Relief (D4) ___ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0 - 12+</u>	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Wetland Z - DP15
Sampling Point: _____

<u>Tree Stratum</u> (Plot size: <u>30'</u>)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:
1. _____	_____	_____	_____	Number of Dominant Species That Are OBL, FACW, or FAC: <u>2</u> (A)
2. _____	_____	_____	_____	Total Number of Dominant Species Across All Strata: <u>2</u> (B)
3. _____	_____	_____	_____	Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)
4. _____	_____	_____	_____	Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
<u>0</u> = Total Cover				
Sapling/Shrub Stratum (Plot size: <u>15'</u>)				
1. <u>Liquidambar styraciflua</u>	<u>30</u>	<u>Yes</u>	<u>FAC</u>	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
<u>30</u> = Total Cover				
Herb Stratum (Plot size: <u>5'</u>)				
1. <u>Microstegium vimineum</u>	<u>20</u>	<u>Yes</u>	<u>FAC</u>	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	
12. _____	_____	_____	_____	
<u>20</u> = Total Cover				
Woody Vine Stratum (Plot size: <u>30'</u>)				
1. <u>Lonicera japonica</u>	<u>2</u>	<u>No</u>	<u>FACU</u>	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
<u>2</u> = Total Cover				
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____				
				Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)
Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.				
Remarks: (Include photo numbers here or on a separate sheet.) 				

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-4	10YR 3/2						Loam	
4-12	10YR 5/1	95	10YR 5/6	5	C	PL	Clay Loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

<p>Hydric Soil Indicators:</p> <p><input type="checkbox"/> Histosol (A1)</p> <p><input type="checkbox"/> Histic Epipedon (A2)</p> <p><input type="checkbox"/> Black Histic (A3)</p> <p><input type="checkbox"/> Hydrogen Sulfide (A4)</p> <p><input type="checkbox"/> Stratified Layers (A5)</p> <p><input type="checkbox"/> 2 cm Muck (A10) (LRR N)</p> <p><input type="checkbox"/> Depleted Below Dark Surface (A11)</p> <p><input type="checkbox"/> Thick Dark Surface (A12)</p> <p><input type="checkbox"/> Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148)</p> <p><input type="checkbox"/> Sandy Gleyed Matrix (S4)</p> <p><input type="checkbox"/> Sandy Redox (S5)</p> <p><input type="checkbox"/> Stripped Matrix (S6)</p>	<p><input type="checkbox"/> Dark Surface (S7)</p> <p><input type="checkbox"/> Polyvalue Below Surface (S8) (MLRA 147, 148)</p> <p><input type="checkbox"/> Thin Dark Surface (S9) (MLRA 147, 148)</p> <p><input type="checkbox"/> Loamy Gleyed Matrix (F2)</p> <p><input checked="" type="checkbox"/> Depleted Matrix (F3)</p> <p><input type="checkbox"/> Redox Dark Surface (F6)</p> <p><input type="checkbox"/> Depleted Dark Surface (F7)</p> <p><input type="checkbox"/> Redox Depressions (F8)</p> <p><input type="checkbox"/> Iron-Manganese Masses (F12) (LRR N, MLRA 136)</p> <p><input type="checkbox"/> Umbric Surface (F13) (MLRA 136, 122)</p> <p><input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 148)</p>	<p>Indicators for Problematic Hydric Soils³:</p> <p><input type="checkbox"/> 2 cm Muck (A10) (MLRA 147)</p> <p><input type="checkbox"/> Coast Prairie Redox (A16) (MLRA 147, 148)</p> <p><input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 136, 147)</p> <p><input type="checkbox"/> Red Parent Material (TF2)</p> <p><input type="checkbox"/> Very Shallow Dark Surface (TF12)</p> <p><input type="checkbox"/> Other (Explain in Remarks)</p>
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³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

<p>Restrictive Layer (if observed):</p> <p>Type: _____</p> <p>Depth (inches): _____</p>	<p>Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p>
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Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Catfish Pond Mitigation Site City/County: Durham/Durham Sampling Date: 3/7/2018
 Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland AA- DP16
 Investigator(s): Win Taylor Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): concave Slope (%): 0
 Subregion (LRR or MLRA): MLRA 136 Lat: N 36.165970 Long: W -78.913447 Datum: _____
 Soil Map Unit Name: Georgeville Silt Loam (GeC) NWI classification: n/a

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation , Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____ Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____ Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Remarks: Vegetation disturbed due to livestock grazing.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ___ Surface Water (A1) ___ True Aquatic Plants (B14) ___ High Water Table (A2) ___ Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Saturation (A3) ___ Oxidized Rhizospheres on Living Roots (C3) ___ Water Marks (B1) ___ Presence of Reduced Iron (C4) ___ Sediment Deposits (B2) ___ Recent Iron Reduction in Tilled Soils (C6) <input checked="" type="checkbox"/> Drift Deposits (B3) ___ Thin Muck Surface (C7) ___ Algal Mat or Crust (B4) ___ Other (Explain in Remarks) ___ Iron Deposits (B5) ___ Inundation Visible on Aerial Imagery (B7) <input checked="" type="checkbox"/> Water-Stained Leaves (B9) ___ Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> ___ Surface Soil Cracks (B6) ___ Sparsely Vegetated Concave Surface (B8) ___ Drainage Patterns (B10) ___ Moss Trim Lines (B16) ___ Dry-Season Water Table (C2) ___ Crayfish Burrows (C8) ___ Saturation Visible on Aerial Imagery (C9) ___ Stunted or Stressed Plants (D1) ___ Geomorphic Position (D2) ___ Shallow Aquitard (D3) ___ Microtopographic Relief (D4) ___ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0 - 12+</u>	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:	
Remarks:	

VEGETATION (Four Strata) – Use scientific names of plants.

Wetland AA- DP16
Sampling Point: _____

	Absolute % Cover	Dominant Species?	Indicator Status		
Tree Stratum (Plot size: <u>30'</u>)					
1. <u>Liquidambar styraciflua</u>	5	Yes	FAC	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>5</u> (A) Total Number of Dominant Species Across All Strata: <u>6</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>83</u> (A/B)	
2. <u>Acer rubrum</u>	5	Yes	FAC		
3. <u>Quercus alba</u>	5	Yes	FACU		
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
<u>15</u> = Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____	
Sapling/Shrub Stratum (Plot size: <u>15'</u>)					
1. <u>Platanus occidentalis</u>	10	Yes	FACW		
2. <u>Liquidambar styraciflua</u>	2	No	FAC		
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
<u>12</u> = Total Cover				Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
Herb Stratum (Plot size: <u>5'</u>)					
1. <u>Microstegium vimineum</u>	20	Yes	FAC		
2. _____					
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
11. _____					
12. _____					
<u>20</u> = Total Cover				Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.	
Woody Vine Stratum (Plot size: <u>30'</u>)					
1. _____					
2. _____					
3. _____					
4. _____					
5. _____					
6. _____					
<u>0</u> = Total Cover				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Remarks: (Include photo numbers here or on a separate sheet.)					

SOIL

Sampling Point: Wetland AA- DP16

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-6	10YR 5/2	95	10YR 4/6	5	C	PL	Loam	
6-12	2.5Y 5/2	80	10YR 4/6	20	C	PL	Loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:		Indicators for Problematic Hydric Soils³:	
<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Dark Surface (S7)	<input type="checkbox"/> 2 cm Muck (A10) (MLRA 147)	
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Polyvalue Below Surface (S8) (MLRA 147, 148)	<input type="checkbox"/> Coast Prairie Redox (A16)	
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Thin Dark Surface (S9) (MLRA 147, 148)	<input type="checkbox"/> (MLRA 147, 148)	
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	<input type="checkbox"/> Piedmont Floodplain Soils (F19)	
<input type="checkbox"/> Stratified Layers (A5)	<input checked="" type="checkbox"/> Depleted Matrix (F3)	<input type="checkbox"/> (MLRA 136, 147)	
<input type="checkbox"/> 2 cm Muck (A10) (LRR N)	<input type="checkbox"/> Redox Dark Surface (F6)	<input type="checkbox"/> Red Parent Material (TF2)	
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input type="checkbox"/> Depleted Dark Surface (F7)	<input type="checkbox"/> Very Shallow Dark Surface (TF12)	
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Redox Depressions (F8)	<input type="checkbox"/> Other (Explain in Remarks)	
<input type="checkbox"/> Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148)	<input type="checkbox"/> Iron-Manganese Masses (F12) (LRR N, MLRA 136)		
<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> Umbric Surface (F13) (MLRA 136, 122)		
<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 148)		
<input type="checkbox"/> Stripped Matrix (S6)			

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed): Type: _____ Depth (inches): _____	Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____
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Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Catfish Pond Mitigation Site City/County: Durham/Durham Sampling Date: 3/7/2018
 Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland BB - DP17
 Investigator(s): Win Taylor Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): concave Slope (%): 0
 Subregion (LRR or MLRA): MLRA 136 Lat: N 36.166107 Long: -78.913458 Datum: _____
 Soil Map Unit Name: Georgeville Silt Loam (GeC) NWI classification: n/a

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation , Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____ Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____ Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Remarks: Vegetation disturbed due to livestock grazing.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ___ Surface Water (A1) ___ True Aquatic Plants (B14) ___ High Water Table (A2) ___ Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Saturation (A3) ___ Oxidized Rhizospheres on Living Roots (C3) ___ Water Marks (B1) ___ Presence of Reduced Iron (C4) ___ Sediment Deposits (B2) ___ Recent Iron Reduction in Tilled Soils (C6) ___ Drift Deposits (B3) ___ Thin Muck Surface (C7) ___ Algal Mat or Crust (B4) ___ Other (Explain in Remarks) ___ Iron Deposits (B5) ___ Inundation Visible on Aerial Imagery (B7) <input checked="" type="checkbox"/> Water-Stained Leaves (B9) ___ Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> ___ Surface Soil Cracks (B6) <input checked="" type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input checked="" type="checkbox"/> Drainage Patterns (B10) ___ Moss Trim Lines (B16) ___ Dry-Season Water Table (C2) ___ Crayfish Burrows (C8) ___ Saturation Visible on Aerial Imagery (C9) ___ Stunted or Stressed Plants (D1) ___ Geomorphic Position (D2) ___ Shallow Aquitard (D3) ___ Microtopographic Relief (D4) ___ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0 - 12+</u>	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:	
Remarks:	

VEGETATION (Four Strata) – Use scientific names of plants.

Wetland BB - DP17
Sampling Point: _____

	Absolute % Cover	Dominant Species?	Indicator Status	
Tree Stratum (Plot size: <u>30'</u>)				Dominance Test worksheet:
1. _____	_____	_____	_____	Number of Dominant Species That Are OBL, FACW, or FAC: <u>2</u> (A)
2. _____	_____	_____	_____	Total Number of Dominant Species Across All Strata: <u>2</u> (B)
3. _____	_____	_____	_____	Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)
4. _____	_____	_____	_____	Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
0 = Total Cover				
Sapling/Shrub Stratum (Plot size: <u>15'</u>)				
1. <u>Liquidambar styraciflua</u>	<u>5</u>	<u>Yes</u>	<u>FAC</u>	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
5 = Total Cover				
Herb Stratum (Plot size: <u>5'</u>)				
1. <u>Microstegium vimineum</u>	<u>10</u>	<u>Yes</u>	<u>FAC</u>	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	
12. _____	_____	_____	_____	
10 = Total Cover				
Woody Vine Stratum (Plot size: <u>30'</u>)				
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
0 = Total Cover				
Remarks: (Include photo numbers here or on a separate sheet.)				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

SOIL

Sampling Point: Wetland BB - DP17

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-8	10YR 5/2	98	10YR 4/6	5	C	PL	Loam	
8-12	2.5Y 6/2	85	10YR 4/6	15	C	PL	Loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:		Indicators for Problematic Hydric Soils ³ :
<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Dark Surface (S7)	<input type="checkbox"/> 2 cm Muck (A10) (MLRA 147)
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Polyvalue Below Surface (S8) (MLRA 147, 148)	<input type="checkbox"/> Coast Prairie Redox (A16)
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Thin Dark Surface (S9) (MLRA 147, 148)	<input type="checkbox"/> (MLRA 147, 148)
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	<input type="checkbox"/> Piedmont Floodplain Soils (F19)
<input type="checkbox"/> Stratified Layers (A5)	<input checked="" type="checkbox"/> Depleted Matrix (F3)	<input type="checkbox"/> (MLRA 136, 147)
<input type="checkbox"/> 2 cm Muck (A10) (LRR N)	<input type="checkbox"/> Redox Dark Surface (F6)	<input type="checkbox"/> Red Parent Material (TF2)
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input type="checkbox"/> Depleted Dark Surface (F7)	<input type="checkbox"/> Very Shallow Dark Surface (TF12)
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Redox Depressions (F8)	<input type="checkbox"/> Other (Explain in Remarks)
<input type="checkbox"/> Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148)	<input type="checkbox"/> Iron-Manganese Masses (F12) (LRR N, MLRA 136)	
<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> Umbric Surface (F13) (MLRA 136, 122)	
<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 148)	
<input type="checkbox"/> Stripped Matrix (S6)		

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):
 Type: _____
 Depth (inches): _____

Hydric Soil Present? Yes No

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Catfish Pond Mitigation Site City/County: Durham/Durham Sampling Date: 3/7/2018
 Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP18
 Investigator(s): Win Taylor Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): concave Slope (%): 0
 Subregion (LRR or MLRA): MLRA 136 Lat: N 36.165979 Long: -78.913396 Datum: _____
 Soil Map Unit Name: Georgeville Silt Loam (GeC) NWI classification: n/a

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation , Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/> Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/> Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes _____ No <input checked="" type="checkbox"/>
Remarks: Vegetation disturbed due to livestock grazing.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ___ Surface Water (A1) ___ True Aquatic Plants (B14) ___ High Water Table (A2) ___ Hydrogen Sulfide Odor (C1) ___ Saturation (A3) ___ Oxidized Rhizospheres on Living Roots (C3) ___ Water Marks (B1) ___ Presence of Reduced Iron (C4) ___ Sediment Deposits (B2) ___ Recent Iron Reduction in Tilled Soils (C6) ___ Drift Deposits (B3) ___ Thin Muck Surface (C7) ___ Algal Mat or Crust (B4) ___ Other (Explain in Remarks) ___ Iron Deposits (B5) ___ Inundation Visible on Aerial Imagery (B7) ___ Water-Stained Leaves (B9) ___ Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> ___ Surface Soil Cracks (B6) ___ Sparsely Vegetated Concave Surface (B8) ___ Drainage Patterns (B10) ___ Moss Trim Lines (B16) ___ Dry-Season Water Table (C2) ___ Crayfish Burrows (C8) ___ Saturation Visible on Aerial Imagery (C9) ___ Stunted or Stressed Plants (D1) ___ Geomorphic Position (D2) ___ Shallow Aquitard (D3) ___ Microtopographic Relief (D4) ___ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No _____ Depth (inches): _____ Water Table Present? Yes _____ No _____ Depth (inches): _____ Saturation Present? Yes _____ No _____ Depth (inches): _____ (includes capillary fringe)	Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP18

	Absolute % Cover	Dominant Species?	Indicator Status															
Tree Stratum (Plot size: <u>30'</u>)																		
1. <u>Liquidambar styraciflua</u>	<u>60</u>	<u>Yes</u>	<u>FAC</u>	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>2</u> (A) Total Number of Dominant Species Across All Strata: <u>3</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>66</u> (A/B)														
2. _____	_____	_____	_____															
3. _____	_____	_____	_____															
4. _____	_____	_____	_____															
5. _____	_____	_____	_____															
6. _____	_____	_____	_____															
7. _____	_____	_____	_____															
8. _____	_____	_____	_____															
	<u>60</u>	= Total Cover																
Sapling/Shrub Stratum (Plot size: <u>15'</u>)																		
1. <u>Juniperus virginiana</u>	<u>20</u>	<u>Yes</u>	<u>FacU</u>	Prevalence Index worksheet: <table style="width:100%; border:none;"> <tr> <td style="text-align:right;">Total % Cover of:</td> <td style="text-align:right;">Multiply by:</td> </tr> <tr> <td>OBL species <u>0</u></td> <td>x 1 = <u>0</u></td> </tr> <tr> <td>FACW species <u>0</u></td> <td>x 2 = <u>0</u></td> </tr> <tr> <td>FAC species <u>85</u></td> <td>x 3 = <u>255</u></td> </tr> <tr> <td>FacU species <u>25</u></td> <td>x 4 = <u>100</u></td> </tr> <tr> <td>UPL species <u>0</u></td> <td>x 5 = <u>0</u></td> </tr> <tr> <td>Column Totals: <u>110</u> (A)</td> <td><u>355</u> (B)</td> </tr> </table> Prevalence Index = B/A = <u>3.2</u>	Total % Cover of:	Multiply by:	OBL species <u>0</u>	x 1 = <u>0</u>	FACW species <u>0</u>	x 2 = <u>0</u>	FAC species <u>85</u>	x 3 = <u>255</u>	FacU species <u>25</u>	x 4 = <u>100</u>	UPL species <u>0</u>	x 5 = <u>0</u>	Column Totals: <u>110</u> (A)	<u>355</u> (B)
Total % Cover of:	Multiply by:																	
OBL species <u>0</u>	x 1 = <u>0</u>																	
FACW species <u>0</u>	x 2 = <u>0</u>																	
FAC species <u>85</u>	x 3 = <u>255</u>																	
FacU species <u>25</u>	x 4 = <u>100</u>																	
UPL species <u>0</u>	x 5 = <u>0</u>																	
Column Totals: <u>110</u> (A)	<u>355</u> (B)																	
2. <u>Liquidambar styraciflua</u>	<u>5</u>	<u>No</u>	<u>FAC</u>															
3. <u>Liriodendron tulipifera</u>	<u>3</u>	<u>No</u>	<u>FacU</u>															
4. _____	_____	_____	_____															
5. _____	_____	_____	_____															
6. _____	_____	_____	_____															
7. _____	_____	_____	_____															
8. _____	_____	_____	_____															
9. _____	_____	_____	_____															
10. _____	_____	_____	_____															
	<u>28</u>	= Total Cover																
Herb Stratum (Plot size: <u>5'</u>)																		
1. <u>Microstegium vimineum</u>	<u>20</u>	<u>Yes</u>	<u>FAC</u>	Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)														
2. _____	_____	_____	_____															
3. _____	_____	_____	_____															
4. _____	_____	_____	_____															
5. _____	_____	_____	_____															
6. _____	_____	_____	_____															
7. _____	_____	_____	_____															
8. _____	_____	_____	_____															
9. _____	_____	_____	_____															
10. _____	_____	_____	_____															
11. _____	_____	_____	_____															
12. _____	_____	_____	_____															
	<u>20</u>	= Total Cover																
Woody Vine Stratum (Plot size: <u>30'</u>)																		
1. <u>Lonicera japonica</u>	<u>2</u>	<u>No</u>	<u>FacU</u>	Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.														
2. _____	_____	_____	_____															
3. _____	_____	_____	_____															
4. _____	_____	_____	_____															
5. _____	_____	_____	_____															
6. _____	_____	_____	_____															
	<u>0</u>	= Total Cover																
<table style="width:100%; border:none;"> <tr> <td style="width:60%;">Hydrophytic Vegetation Present?</td> <td style="width:20%;">Yes _____</td> <td style="width:20%;">No <input checked="" type="checkbox"/></td> </tr> </table>					Hydrophytic Vegetation Present?	Yes _____	No <input checked="" type="checkbox"/>											
Hydrophytic Vegetation Present?	Yes _____	No <input checked="" type="checkbox"/>																
Remarks: (Include photo numbers here or on a separate sheet.)																		

SOIL

Sampling Point: Upland - DP18

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-8	10YR 4/3						Loam	
8-12	10YR 5/4						Clay Loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:		Indicators for Problematic Hydric Soils ³ :	
<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Dark Surface (S7)	<input type="checkbox"/> 2 cm Muck (A10) (MLRA 147)	
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Polyvalue Below Surface (S8) (MLRA 147, 148)	<input type="checkbox"/> Coast Prairie Redox (A16) (MLRA 147, 148)	
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Thin Dark Surface (S9) (MLRA 147, 148)	<input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 136, 147)	
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	<input type="checkbox"/> Red Parent Material (TF2)	
<input type="checkbox"/> Stratified Layers (A5)	<input type="checkbox"/> Depleted Matrix (F3)	<input type="checkbox"/> Very Shallow Dark Surface (TF12)	
<input type="checkbox"/> 2 cm Muck (A10) (LRR N)	<input type="checkbox"/> Redox Dark Surface (F6)	<input type="checkbox"/> Other (Explain in Remarks)	
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input type="checkbox"/> Depleted Dark Surface (F7)		
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Redox Depressions (F8)		
<input type="checkbox"/> Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148)	<input type="checkbox"/> Iron-Manganese Masses (F12) (LRR N, MLRA 136)		
<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> Umbric Surface (F13) (MLRA 136, 122)		
<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 148)		
<input type="checkbox"/> Stripped Matrix (S6)			

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed): Type: _____ Depth (inches): _____	Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/>
---	---

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Catfish Pond Mitigation Site City/County: Durham/Durham Sampling Date: 3/7/2018
 Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland CC - DP19
 Investigator(s): Win Taylor Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): concave Slope (%): 0
 Subregion (LRR or MLRA): MLRA 136 Lat: N 36.166225 Long: W -78.913292 Datum: _____
 Soil Map Unit Name: Georgeville Silt Loam (GeC) NWI classification: n/a

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation , Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____ Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____ Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Remarks: Vegetation disturbed due to livestock grazing.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ___ Surface Water (A1) ___ True Aquatic Plants (B14) ___ High Water Table (A2) ___ Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Saturation (A3) ___ Oxidized Rhizospheres on Living Roots (C3) ___ Water Marks (B1) ___ Presence of Reduced Iron (C4) ___ Sediment Deposits (B2) ___ Recent Iron Reduction in Tilled Soils (C6) ___ Drift Deposits (B3) ___ Thin Muck Surface (C7) ___ Algal Mat or Crust (B4) ___ Other (Explain in Remarks) ___ Iron Deposits (B5) ___ Inundation Visible on Aerial Imagery (B7) <input checked="" type="checkbox"/> Water-Stained Leaves (B9) ___ Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> ___ Surface Soil Cracks (B6) ___ Sparsely Vegetated Concave Surface (B8) ___ Drainage Patterns (B10) ___ Moss Trim Lines (B16) ___ Dry-Season Water Table (C2) ___ Crayfish Burrows (C8) ___ Saturation Visible on Aerial Imagery (C9) ___ Stunted or Stressed Plants (D1) ___ Geomorphic Position (D2) ___ Shallow Aquitard (D3) ___ Microtopographic Relief (D4) ___ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0 - 12+</u>	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:	
Remarks:	

VEGETATION (Four Strata) – Use scientific names of plants.

Wetland CC - DP19
Sampling Point: _____

	Absolute % Cover	Dominant Species?	Indicator Status	
Tree Stratum (Plot size: <u>30'</u>)				
1. <u>Platanus occidentalis</u>	<u>15</u>	<u>Yes</u>	<u>FACW</u>	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>4</u> (A) Total Number of Dominant Species Across All Strata: <u>4</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)
2. <u>Acer rubrum</u>	<u>15</u>	<u>Yes</u>	<u>FAC</u>	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
<u>30</u> = Total Cover				
Sapling/Shrub Stratum (Plot size: <u>15'</u>)				
1. <u>Liquidambar styraciflua</u>	<u>5</u>	<u>Yes</u>	<u>FAC</u>	Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
<u>5</u> = Total Cover				
Herb Stratum (Plot size: <u>5'</u>)				
1. <u>Microstegium vimineum</u>	<u>35</u>	<u>Yes</u>	<u>FAC</u>	Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	
12. _____	_____	_____	_____	
<u>35</u> = Total Cover				
Woody Vine Stratum (Plot size: <u>30'</u>)				
1. _____	_____	_____	_____	Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
6. _____	_____	_____	_____	
<u>0</u> = Total Cover				
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____				
Remarks: (Include photo numbers here or on a separate sheet.)				

SOIL

Wetland CC - DP19
 Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-6	10YR 5/2	98	10YR 4/6	2	C	PL	Clay Loam	
6-12	2.5Y 5/2	95	10YR 5/6	5	C	PL	Loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:		Indicators for Problematic Hydric Soils³:
<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Dark Surface (S7)	<input type="checkbox"/> 2 cm Muck (A10) (MLRA 147)
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Polyvalue Below Surface (S8) (MLRA 147, 148)	<input type="checkbox"/> Coast Prairie Redox (A16)
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Thin Dark Surface (S9) (MLRA 147, 148)	(MLRA 147, 148)
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	<input type="checkbox"/> Piedmont Floodplain Soils (F19)
<input type="checkbox"/> Stratified Layers (A5)	<input checked="" type="checkbox"/> Depleted Matrix (F3)	(MLRA 136, 147)
<input type="checkbox"/> 2 cm Muck (A10) (LRR N)	<input type="checkbox"/> Redox Dark Surface (F6)	<input type="checkbox"/> Red Parent Material (TF2)
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input type="checkbox"/> Depleted Dark Surface (F7)	<input type="checkbox"/> Very Shallow Dark Surface (TF12)
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Redox Depressions (F8)	<input type="checkbox"/> Other (Explain in Remarks)
<input type="checkbox"/> Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148)	<input type="checkbox"/> Iron-Manganese Masses (F12) (LRR N, MLRA 136)	
<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> Umbric Surface (F13) (MLRA 136, 122)	
<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 148)	
<input type="checkbox"/> Stripped Matrix (S6)		

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed): Type: _____ Depth (inches): _____	Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____
---	--

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Catfish Pond Mitigation Site City/County: Durham/Durham Sampling Date: 3/7/2018
 Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland DD - DP20
 Investigator(s): Win Taylor Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): concave Slope (%): 0
 Subregion (LRR or MLRA): MLRA 136 Lat: N 36.166372 Long: -78.912973 Datum: _____
 Soil Map Unit Name: Georgeville Silt Loam (GeC & GeB) & Wehadkee Silt Loam (Wh) NWI classification: n/a

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation , Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____ Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____ Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Remarks: Vegetation disturbed due to livestock grazing.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input checked="" type="checkbox"/> Surface Water (A1) _____ True Aquatic Plants (B14) <input checked="" type="checkbox"/> High Water Table (A2) _____ Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Saturation (A3) _____ Oxidized Rhizospheres on Living Roots (C3) _____ Water Marks (B1) _____ Presence of Reduced Iron (C4) _____ Sediment Deposits (B2) _____ Recent Iron Reduction in Tilled Soils (C6) _____ Drift Deposits (B3) _____ Thin Muck Surface (C7) _____ Algal Mat or Crust (B4) _____ Other (Explain in Remarks) _____ Iron Deposits (B5) _____ Inundation Visible on Aerial Imagery (B7) <input checked="" type="checkbox"/> Water-Stained Leaves (B9) _____ Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> _____ Surface Soil Cracks (B6) _____ Sparsely Vegetated Concave Surface (B8) _____ Drainage Patterns (B10) _____ Moss Trim Lines (B16) _____ Dry-Season Water Table (C2) _____ Crayfish Burrows (C8) _____ Saturation Visible on Aerial Imagery (C9) _____ Stunted or Stressed Plants (D1) _____ Geomorphic Position (D2) _____ Shallow Aquitard (D3) _____ Microtopographic Relief (D4) _____ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>1</u> Water Table Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0-12+</u> Saturation Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>0 - 12+</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:	
Remarks:	

VEGETATION (Four Strata) – Use scientific names of plants.

Wetland DD - DP20
Sampling Point: _____

	Absolute % Cover	Dominant Species?	Indicator Status		
Tree Stratum (Plot size: <u>30'</u>)					
1. <u>Liquidambar styraciflua</u>	40	Yes	FAC	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>6</u> (A) Total Number of Dominant Species Across All Strata: <u>6</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)	
2. <u>Acer rubrum</u>	20	Yes	FAC		
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
	60	= Total Cover		Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____	
Sapling/Shrub Stratum (Plot size: <u>15'</u>)					
1. <u>Acer rubrum</u>	5	Yes	FAC		
2. <u>Platanus occidentalis</u>	5	Yes	FACW		
3. <u>Liquidambar styraciflua</u>	2	No	FAC		
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
	12	= Total Cover			
Herb Stratum (Plot size: <u>5'</u>)					
1. <u>Microstegium vimineum</u>	5	Yes	FAC	Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
2. _____					
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
11. _____					
12. _____					
	5	= Total Cover			
Woody Vine Stratum (Plot size: <u>30'</u>)					
1. <u>Smilax rotundifolia</u>	5	Yes	FAC	Definitions of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vine – All woody vines greater than 3.28 ft in height.	
2. _____					
3. _____					
4. _____					
5. _____					
6. _____					
	5	= Total Cover			
Hydrophytic Vegetation Present?				Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Remarks: (Include photo numbers here or on a separate sheet.)					

Appendix 5

Table of Contents

- A. IRT Site Visit Meeting Minutes
- B. Historic Aerial Photographs
- C. Existing Conditions Photographs
- D. Existing Geomorphology Data
- E. Proposed Geomorphology Data
- F. Nutrient Loading
- G. Habitat Assessment

Meeting Attendees

Ross Sullivan/USACE
Mac Haupt/NCDWR
Katie Merritt/NCDWR
Jeff Schaffer/NCDMS
Greg Melia/NCDMS
John Hutton/Wildlands
Chris Roessler/Wildlands

John Hutton and Chris Roessler of Wildlands Engineering, Inc. (Wildlands) led the group on a tour of the Catfish Pond mitigation site in Bahama, NC. The purpose of the tour was to present the site to a group of IRT members and to get input on the management/mitigation options proposed for the site. During the tour, the group openly discussed the condition of the stream channels on the site and the design options and crediting scenarios they felt would be most appropriate to restore and enhance the channels. The accompanying map identifies the stream reach names.

The tour began with UT1, then visited Catfish Creek and its headwater reaches, and concluded with Mountain Tributary. Comments provided during the site visit are listed below by reach.

UT1

Reach 1 includes an enhancement 2 approach to repair eroding banks and exclude livestock. The existing RCP crossing pipe will be evaluated and replaced if it is deemed to be inadequate. A wetland area shown on the accompanying map will be added to the project to protect that resource.

The group discussed the restoration approach on Reach 2 and eventually agreed with the proposal. The drainage area is 77 acres and the channel becomes weakly defined through a wetland area due to livestock trampling. The downstream end of the restoration reach should stably tie in with the existing stream channel and remove the perched culvert. Another culvert will be installed where the proposed crossing is located.

A ditch draining to Reach 2 is eligible for nutrient/buffer credit if it is shown to be at least 1 foot deep and less than 3 feet deep. The BMP that was proposed for this ditch will no longer be implemented because that precludes buffer/nutrient credits. The treatment effect of buffering the ditch will also eliminate the need for the bmp.

Lower Reach 3 is enhancement 2. The IRT agreed with the approaches and credit generation on all segments of UT1.

Catfish Creek

On Catfish Creek, the group started at Reach 6 and walked upstream. The IRT agreed with the enhancement 2 approach on Reach 6 and the restoration approach on Reaches 3 and 5. The IRT expressed some concerns about the extent to which cattle access Reaches 1A, 1B, 2, and 4, as well as UT2. However, after some consideration the IRT accepted an enhancement 2 approach at a 2.5:1 ratio on these reaches due to the overall uplift provided by the project and the immediate benefit to known

sensitive mussel populations in Mountain Creek. Wildlands also agreed that protecting the wetland draining into UT1 was an important part of protecting water quality on the site and will add this to the easement area.

Mountain Tributary

The IRT expressed some concerns on Mountain Tributary similar to the concerns above and due to the disconnected nature of this reach. However, based on the considerations discussed above, the fact that the IRT was just now letting providers know about the preference for connectivity, and the fact that the two drainages were immediately adjacent the IRT accepted Mountain Tributary using an enhancement 2 approach at 2.5:1.

Summary and Conclusion

The IRT generally agreed with the light touch approach by Wildlands for the Site. However, Mac Haupt said this was a notification that in the future reaches that are either disconnected from the main project area or focused on cattle exclusion with minimal pressure or erosion would be subject to more along the lines of a 3:1 or 4:1 credit ratio.

Contacts

Jeff Schaffer will serve as the Project Manager for NCDMS and the main point of contact. Chris Roessler will be the Wildlands Project Manager and coordinate/submit project deliverables directly to Jeff Schaffer for distribution to all NCIRT team members.

Action Items and Next Steps

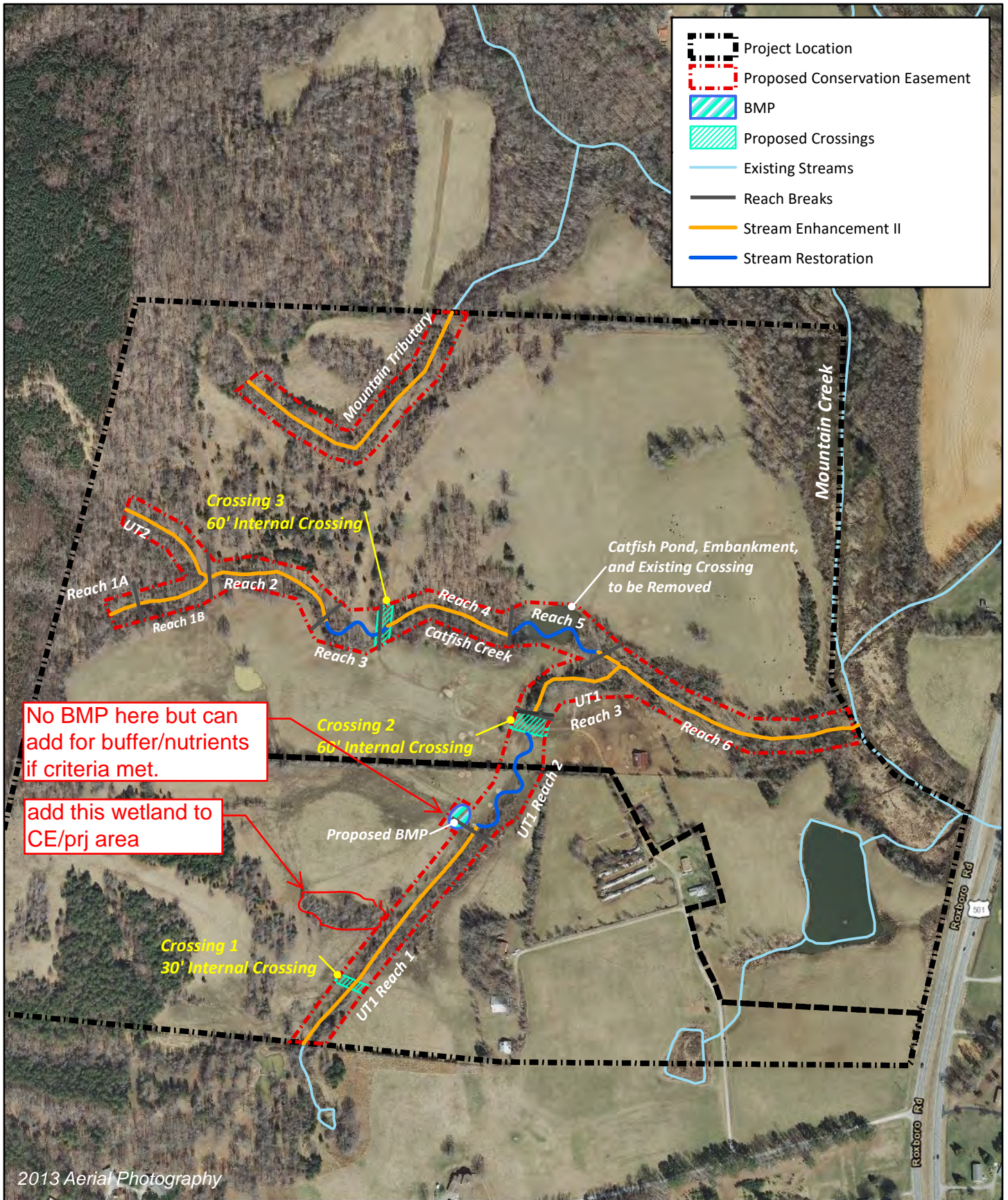
- Project Schedule – Wildlands is ready to proceed immediately with the Task 1 deliverable (Categorical Exclusion) and does not anticipate project delays.
- After the jurisdictional determination has been conducted, any wetland areas that will be impacted by the proposed work (filled or drained) will need to be identified and functional replacement for those losses should be proposed and discussed in the draft mitigation plan.
- USACE requires Jurisdictional (JD) stream/wetland calls for the project. Wildlands will coordinate with Samantha Daley (or assigned) for on-site JD verification prior to mitigation plan submittal.
- Signage will be needed on all conservation easement areas.

This represents Wildlands' interpretation of the meeting discussions. If any meeting attendees should find any information contained in these meeting minutes to be in error and/or incomplete based on individual comments or conversations, please notify Chris Roessler with corrections/additions as soon as possible.

Sincerely,



Chris Roessler
croessler@wildlandseng.com
919.624.0905



	Project Location
	Proposed Conservation Easement
	BMP
	Proposed Crossings
	Existing Streams
	Reach Breaks
	Stream Enhancement II
	Stream Restoration

No BMP here but can add for buffer/nutrients if criteria met.

add this wetland to CE/prj area

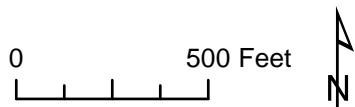


Figure 6A Concept Map (Option 1)
 Catfish Pond Mitigation Site
 Neuse River Basin 03020201

Chris Roessler

From: Haupt, Mac <mac.haupt@ncdenr.gov>
Sent: Friday, March 9, 2018 10:39 AM
To: Chris Roessler; Sullivan, Roscoe L III CIV (US); Merritt, Katie; Wilson, Travis W.; Todd Tugwell; andrea.w.hughes@usace.army.mil
Cc: John Hutton; Schaffer, Jeff; Melia, Gregory
Subject: RE: [External] Fwd: Catfish IRT minutes

Chris,

I believe your notes accurately reflected what was discussed on site. One thing I would like to emphasize is that final agreement to ratios is at the Mitigation Plan stage.

Also, there was discussion about the need for addressing Crossing 2 and I believe you mentioned that in your notes as well.

I do like the inclusion of the wetland area along UT1 Reach 1 and is why I agreed in general to the approach for the upper reaches you noted (of apparent lesser cattle access). In addition, I am glad you noted our concerns for disconnected reaches.

I am fine with the notes.

Thanks,
Mac

From: Chris Roessler [mailto:croessler@wildlandseng.com]
Sent: Friday, March 02, 2018 7:38 AM
To: Haupt, Mac <mac.haupt@ncdenr.gov>; Sullivan, Roscoe L III CIV (US) <Roscoe.L.Sullivan@usace.army.mil>; Merritt, Katie <katie.merritt@ncdenr.gov>; Wilson, Travis W. <travis.wilson@ncwildlife.org>; Todd Tugwell <todd.tugwell@usace.army.mil>; andrea.w.hughes@usace.army.mil
Cc: John Hutton <jhutton@wildlandseng.com>; Schaffer, Jeff <jeff.schaffer@ncdenr.gov>; Melia, Gregory <gregory.melia@ncdenr.gov>
Subject: [External] Fwd: Catfish IRT minutes

CAUTION: External email. Do not click links or open attachments unless verified. Send all suspicious email as an attachment to [Report Spam](#).

Hi IRT members. Attached are the meeting minutes and map from last Friday's meeting at the Catfish Pond full delivery site. Please let me know if you have comments on them.

Thanks and have a great weekend, Chris

Get [Outlook for iOS](#)

From: Chris Roessler <croessler@wildlandseng.com>
Sent: Thursday, March 1, 2018 2:05 PM
Subject: Catfish IRT minutes
To: Schaffer, Jeff <jeff.schaffer@ncdenr.gov>



INQUIRY #: 4382018.1

YEAR: 1940

| = 500'





INQUIRY #: 4382018.1

YEAR: 1955

| = 500'





INQUIRY #: 4382018.1

YEAR: 1972

| = 500'





INQUIRY #: 4382018.1

YEAR: 1983

| = 500'





INQUIRY #: 4382018.1

YEAR: 1993

| = 500'





INQUIRY #: 4382018.1

YEAR: 2005

| = 500'





INQUIRY #: 4382018.1

YEAR: 2006

| = 500'





INQUIRY #: 4382018.1

YEAR: 2008

— = 500'





INQUIRY #: 4382018.1

YEAR: 2009

| = 500'





INQUIRY #: 4382018.1

YEAR: 2010

| = 500'





INQUIRY #: 4382018.1

YEAR: 2012

| = 500'



Catfish Pond Existing Conditions Photographs



Catfish Creek (R1-R2)



Catfish Creek (R3)



Catfish Creek (R4)



Catfish Creek (R5)



Catfish Creek (R6)



Catfish Creek (R7)



Mountain Tributary



UT1 (R1)



UT1 (R2-R3)



UT1 (R4)



UT1 tributary (buffer credit only)



UT2



Catfish Pond livestock

Catfish Pond Existing Conditions Geomorphic Parameters

Parameter	Notation	Units	Catfish Creek - Reach 4		Catfish Creek - Reach 6		UT1 Reach 2	
			min	max	min	max	min	max
stream type			E6		-		C6b	
drainage area	DA	sq mi	0.09		0.10		0.16	
bankfull cross-sectional area	A_{bkf}	SF	6.4		-		7.1	
avg velocity during bankfull event	v_{bkf}	fps	2.8		-		3.0	
Cross Section								
width at bankfull	w_{bkf}	feet	7.0		-		16.7	
maximum depth at bankfull	d_{max}	feet	1.3		-		0.9	
mean depth at bankfull	d_{bkf}	feet	0.9		-		0.4	
bankfull width to depth ratio	w_{bkf}/d_{bkf}		7.7		-		39.5	
low bank height		feet	2.9		-		1.9	
bank height ratio	BHR		2.2		-		2.2	
floodprone area width	w_{fpa}	feet	12		-		22	
entrenchment ratio	ER		1.7		-		1.3	
Slope								
valley slope	S_{valley}	feet/foot	0.016		0.049		0.020	
channel slope	$S_{channel}$	feet/foot	0.008		-		0.020	
Profile								
Bkf pool cross-sectional area	A_{pool}	SF	6.9		-		-	
pool area ratio	A_{pool}/A_{bkf}		0.8		-		-	
max pool depth at bankfull	d_{pool}	feet	1.4		-		-	
pool depth ratio	d_{pool}/d_{bkf}		1.17		-		-	
pool width at bankfull	w_{pool}	feet	7.1		-		-	
pool width ratio	w_{pool}/w_{bkf}		0.8		-		-	
Pattern								
sinuosity	K		1.1		1.04		1.06	
belt width	w_{bit}	feet	NA		NA		NA	
meander width ratio	w_{bit}/w_{bkf}		NA		NA		NA	
meander length	L_m	feet	NA		NA		NA	
meander length ratio	L_m/w_{bkf}		NA		NA		NA	
linear wavelength	LW		NA		NA		NA	
linear wavelength ratio	LW/w_{bkf}		NA		NA		NA	
radius of curvature	R_c	feet	NA		NA		NA	
radius of curvature ratio	R_c/w_{bkf}		NA		NA		NA	

Catfish Pond Existing Conditions Geomorphic Parameters

Parameter	Notation	Units	Catfish Creek - Reach 2		Catfish Creek - Reach 3		Catfish Creek - Reach 5		Catfish Creek - Reach 7		
			min	max	min	max	min	max	min	max	above confluence
stream type			E5b/E4b		E4		C4b		C4b		
drainage area	DA	sq mi	0.03		0.08		0.10		0.31		
bankfull cross-sectional area	A _{bkf}	SF	1.8		4.7		4.4	6.2	7.5	14.9	3.8
avg velocity during bankfull event	v _{bkf}	fps	4.0		3.8		3.1	4.2	5.6	7.5	5.0
Cross Section											
width at bankfull	w _{bkf}	feet	3.3		5.8		8.0	10.9	7.2	8.6	7.5
maximum depth at bankfull	d _{max}	feet	0.7		1.2		0.8	0.9	1.2	2.2	0.9
mean depth at bankfull	d _{bkf}	feet	0.6		0.8		0.5	0.6	0.7	1.0	0.5
bankfull width to depth ratio	w _{bkf} /d _{bkf}		5.9		7.2		14.4	19.0	6.9	18.9	14.8
low bank height		feet	1.3		1.7		1.1	1.3	1.3	2.1	1.2
bank height ratio	BHR		2.0		1.4		1.4	1.5	1.1	1.7	1.4
floodprone area width	w _{fpw}	feet	3.5		28		16	35	10	31	18
entrenchment ratio	ER		1.1		4.9		1.5	4.4	1.4	2.4	2.4
Slope											
valley slope	S _{valley}	feet/foot	0.048		0.017		0.036		0.026		0.05
channel slope	S _{channel}	feet/foot	0.04		0.018		0.031		0.027		0.049
Profile											
Bkf pool cross-sectional area	A _{pool}	SF	-		-		-		-		
pool area ratio	A _{pool} /A _{bkf}		-		-		-		-		
max pool depth at bankfull	d _{pool}	feet	-		-		-		-		
pool depth ratio	d _{pool} /d _{bkf}		-		-		-		-		
pool width at bankfull	w _{pool}	feet	-		-		-		-		
pool width ratio	w _{pool} /w _{bkf}		-		-		-		-		
Pattern											
sinuosity	K		1.15		1.14		1.05		1.04		
belt width	w _{blt}	feet	NA		NA		NA		NA		
meander width ratio	w _{blt} /w _{bkf}		NA		NA		NA		NA		
meander length	L _m	feet	NA		NA		NA		NA		
meander length ratio	L _m /w _{bkf}		NA		NA		NA		NA		
linear wavelength	LW		NA		NA		NA		NA		
linear wavelength ratio	LW/w _{bkf}		NA		NA		NA		NA		
radius of curvature	R _c	feet	NA		NA		NA		NA		
radius of curvature ratio	R _c /w _{bkf}		NA		NA		NA		NA		

Catfish Pond Existing Conditions Geomorphic Parameters

Parameter	Notation	Units	UT1 Reach 1		UT1 Reach 4		UT2		Mountain Trib	
			min	max	min	max	min	max	min	max
stream type			E4		E4b		C3b/C4b		E4b	
drainage area	DA	sq mi	0.09		0.17		0.05		0.05	
bankfull cross-sectional area	A_{bkf}	SF	3.9	5.1	4.2	6.2	2.1		2.5	
avg velocity during bankfull event	v_{bkf}	fps	3.2	3.4	3.5	5.1	5.2		4.4	
Cross Section										
width at bankfull	w_{bkf}	feet	6.0	8.0	6.2	8.1	4.6		4.6	
maximum depth at bankfull	d_{max}	feet	0.9	1.5	0.9	1.1	0.7		0.8	
mean depth at bankfull	d_{bkf}	feet	0.6	0.8	0.7	0.8	0.5		0.5	
bankfull width to depth ratio	w_{bkf}/d_{bkf}		7.3	12.4	9.2	10.5	10.0		8.3	
low bank height		feet	1.5	2.1	1.1	1.7	1.9		1.2	
bank height ratio	BHR		1.4	1.8	1.2	1.5	2.6		1.4	
floodprone area width	w_{fpa}	feet	10	38	22		8		12	
entrenchment ratio	ER		1.3	6.4	2.8	3.6	1.7		2.7	
Slope										
valley slope	S_{valley}	feet/foot	0.015		0.043		0.07		0.04	
channel slope	$S_{channel}$	feet/foot	0.014		0.038		0.063		0.034	
Profile										
Bkf pool cross-sectional area	A_{pool}	SF	-	-	-	-	-		-	
pool area ratio	A_{pool}/A_{bkf}		-	-	-	-	-		-	
max pool depth at bankfull	d_{pool}	feet	-	-	-	-	-		-	
pool depth ratio	d_{pool}/d_{bkf}		-	-	-	-	-		-	
pool width at bankfull	w_{pool}	feet	-	-	-	-	-		-	
pool width ratio	w_{pool}/w_{bkf}		-	-	-	-	-		-	
Pattern										
sinuosity	K		1.11		1.10		1.13		1.17	
belt width	w_{bit}	feet	NA		NA		NA		NA	
meander width ratio	w_{bit}/w_{bkf}		NA		NA		NA		NA	
meander length	L_m	feet	NA		NA		NA		NA	
meander length ratio	L_m/w_{bkf}		NA		NA		NA		NA	
linear wavelength	LW		NA		NA		NA		NA	
linear wavelength ratio	LW/w_{bkf}		NA		NA		NA		NA	
radius of curvature	R_c	feet	NA		NA		NA		NA	
radius of curvature ratio	R_c/w_{bkf}		NA		NA		NA		NA	

Proposed Geomorphic Parameters – Catfish Pond Mitigation Site

	Notation	Units	Catfish R4		Catfish R6		UT1 R2		UT1 R3	
			Min	Max	Min	Max	Min	Max	Min	Max
stream type			C4		B4a		C4		B4a	
drainage area	DA	sq mi	0.09		0.11		0.16		0.16	
design discharge	Q	cfs	17.0		20.9		20.6		21.8	
bankfull cross-sectional area	A _{bkf}	SF	5.8		5.3		9.9		4.9	
avg velocity during bankfull event	V _{bkf}	fps	3.0		4.0		2.1		4.4	
Cross-Section										
width at bankfull	w _{bkf}	feet	8.5		8.5		11.5		8.0	
maximum depth at bankfull	d _{max}	feet	0.9	1.2	0.9	1.1	1.0	1.3	0.9	1.1
mean depth at bankfull	d _{bkf}	feet	0.7		0.6		0.9		0.6	
bankfull width to depth ratio	w _{bkf} /d _{bkf}		12.6		13.8		13.4		13.0	
max depth ratio	d _{max} /d _{bkf}	feet	1.6		1.6		1.5		1.5	
bank height ratio	BHR		1.0	1.0	1.0	1.0	1.0	1.1	1.0	1.0
floodprone area width	w _{fpa}	feet	19	-	12	21	25	58	11	20
entrenchment ratio	ER		2.2	-	1.4	2.5	2.2	5.0	1.4	2.5
Slope										
valley slope	S _{valley}	feet/foot	0.0199		0.0457		0.0225		0.0400	
channel slope	S _{chnl}	feet/foot	0.0142		0.0428		0.0051		0.0536	
Profile										
riffle slope	S _{riffle}	feet/foot	0.0158	0.0264	0.0310	0.0450	0.0069	0.0123	0.0486	0.0554
riffle slope ratio	S _{riffle} /S _{chnl}		1.1	1.9	0.8	1.1	1.4	2.4	0.9	1.0
pool slope	S _p	feet/foot	0.0000	0.0057	0.0400	0.0610	0.0000	0.0020	0.0517	0.0517
pool slope ratio	S _p /S _{chnl}		0.0	0.4	1.0	1.5	0.0	0.4	1.0	1.0
pool-to-pool spacing	L _{p-p}	feet	48	61	13	51	36	64	11	28
pool spacing ratio	L _{p-p} /w _{bkf}		5.7	7.2	1.5	6.0	3.4	5.6	1.4	3.5
pool cross-sectional area	A _{pool}	SF	17.4		9.9		19.4		12.6	

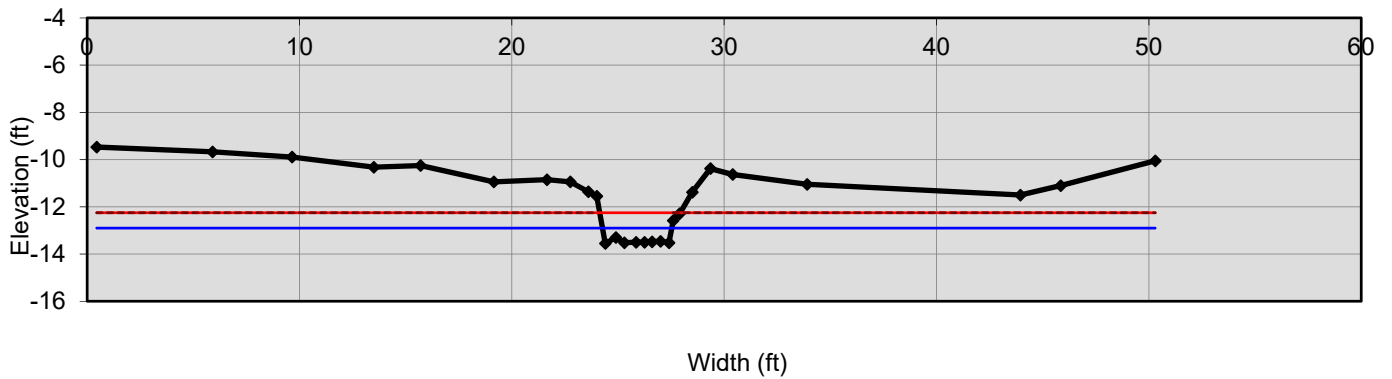
	Notation	Units	Catfish R4		Catfish R6		UT1 R2		UT1 R3	
			Min	Max	Min	Max	Min	Max	Min	Max
pool area ratio	A_{pool}/A_{bkf}		3.0		1.9		2.0		2.6	
maximum pool depth	d_{pool}	<i>feet</i>	2.3		2.3		2.6		3.0	
pool depth ratio	d_{pool}/d_{bkf}		3.3		3.8		2.9		5.0	
pool width at bankfull	w_{pool}	<i>feet</i>	13.3		10.2		13.5		10.8	
pool width ratio	w_{pool}/w_{bkf}		1.6		1.2		1.2		1.4	
Pattern										
sinuosity	K		1.18		1.04		1.23		1.02	
belt width	w_{bit}	<i>feet</i>	21	38	-	-	33	48	-	-
meander width ratio	w_{bit}/w_{bkf}		2.5	4.5	-	-	2.9	4.2	-	-
linear wavelength (formerly meander length)	LW	<i>feet</i>	51	89	-	-	77	101	-	-
linear wavelength ratio (formerly meander length ratio)	LW/w_{bkf}		6.0	10.5	-	-	6.7	8.8	-	-
meander length	L_m	<i>feet</i>	109	120	-	-	93	125	-	-
meander length ratio	L_m/w_{bkf}		12.8	14.1	-	-	8.1	10.9	-	-
radius of curvature	R_c	<i>feet</i>	21	35	-	-	18	26	-	-
radius of curvature ratio	R_c/w_{bkf}		2.5	4.1	-	-	1.6	2.3	-	-

Reference Reach Geomorphic Parameters – Catfish Pond Mitigation Site

Parameter	Notation	Units	UT to Varnals Creek		UT to Wells Creek		Agony Acres		UT to Cedar Creek		UT to Henry Fork	
			min	max	min	max	min	max	Min	Max	min	max
stream type			C4/E4		C4/1		B3		C4		B4a	
drainage area	DA	sq mi	0.41		0.13		0.15		0.11		0.05	
bankfull discharge	Q _{bkf}	cfs	54.0		15		37		23.6		12	
bankfull cross-sectional area	A _{bkf}	SF	10.3	12.3	3.9	6.3	7.4		4.2		1.3	3.6
average velocity during bankfull event	V _{bkf}	fps	4.4	5.2	3.8		4.9		5.2	6.1	3.8	5.4
Cross-Section												
width at bankfull	w _{bkf}	feet	9.3	10.5	6.2	8.6	11.1		7.3		3.2	7.7
maximum depth at bankfull	d _{max}	feet	1.5	1.7	0.9	1.4	1		1.1		0.8	0.7
mean depth at bankfull	d _{bkf}	feet	1.1	1.2	0.6	1.0	0.7		0.6		0.5	0.6
bankfull width to depth ratio	w _{bkf} /d _{bkf}		8.1	9.3	6.1	12.6	16.6		12.6		5.2	16.4
depth ratio	d _{max} /d _{bkf}		1.4	1.4	1.4	2.2	1		1.9		1.3	1.5
bank height ratio	BHR		1.0		1.4	2.5	1.0		1.0		1.0	1.3
floodprone area width	w _{fpa}	feet	60	100	16	22	25		20.1		6.3	13.3
entrenchment ratio	ER		5.7	10	1.9	3.4	2.3		2.7		1.7	2.0
Slope												
valley slope	S _{valley}	ft/ft	0.020		0.028		0.05		0.0173		0.046	
channel slope	S _{channel}	ft/ft	0.017		0.0197		0.049		0.0156		0.042	
Profile												
riffle slope	S _{riffle}	ft/ft	0.024	0.057	0.017	0.078	N/A	N/A	0.0064	0.0493	0.05	0.07
riffle slope ratio	S _{riffle} /S _{channel}		1.4	3.4	0.9	4.0	N/A	N/A	0.4	3.2	1.3	1.8
pool slope	S _{pool}	ft/ft	0.00	0.015	0.0	0.008	N/A	N/A	0.0078	0.0136	0.000	0.016
pool slope ratio	S _{pool} /S _{channel}		0.00	0.015	0.00	0.40	N/A	N/A	0.5	0.9	0.0	0.4
pool-to-pool spacing	L _{p-p}	feet	7.8	82	17	63	N/A	N/A	17.6	24.1	14.1	24.9
pool spacing ratio	L _{p-p} /w _{bkf}		0.5	5.6	2.1	7.9	N/A	N/A	2.4	3.3	2.6	4.6
pool cross-sectional area at bankfull	A _{pool}	SF	22.0	22.7	6.2	8.9	9.8		N/A	N/A	N/A	N/A
pool area ratio	A _{pool} /A _{bkf}		1.8	1.9	1.2	1.7	1.3		1.0		N/A	N/A
maximum pool depth at bankfull	d _{pool}	feet	2.5	2.6	1.6	1.9	1.6		1.4	1.5	N/A	N/A

Parameter	Notation	Units	UT to Varnals Creek		UT to Wells Creek		Agony Acres		UT to Cedar Creek		UT to Henry Fork	
			min	max	min	max	min	max	Min	Max	min	max
pool depth ratio	d_{pool}/d_{bkf}		3.0	3.1	2.3	2.7	2.3		2.5		N/A	N/A
pool width at bankfull	w_{pool}	feet	15.1	18.6	6.0	10.0	8.5		4.1		N/A	N/A
pool width ratio	w_{pool}/w_{bkf}		1.0	1.3	0.9	1.5	0.8		0.6		N/A	N/A
Pattern												
sinuosity	K		1.20		1.4		1.04		1.05		1.1	
belt width	w_{bit}	feet	15	45	10	35	N/A	N/A	3.2	5.7	N/A	N/A
meander width ratio	w_{bit}/w_{bkf}		1.0	3.0	1.3	4.4	N/A	N/A	0.4	0.8	N/A	N/A
linear wavelength (formerly meander length)	L_m	feet	16	47	35	70	N/A	N/A	N/A	N/A	N/A	N/A
linear wavelength ratio (formerly meander length ratio)	L_m/w_{bkf}		1.1	3.2	4.4	8.8	N/A	N/A	N/A	N/A	N/A	N/A
meander length	L_m	feet	--	--	--	--	N/A	N/A	10.2	17	N/A	N/A
meander length ratio	L_m/w_{bkf}		--	--	--	--	N/A	N/A	1.4	2.3	N/A	N/A
radius of curvature	R_c	feet	8.3	47.3	2.3	32	N/A	N/A	5.3	12.6	N/A	N/A
radius of curvature ratio	R_c/w_{bkf}		0.57	3.2	0.3	4.0	N/A	N/A	0.7	1.7	N/A	N/A
Sediment												
d_{50} Description												(Riffle only count)
Reach Wide	d_{16}	mm	2.9		0.1		2.0		-			2.8
	d_{35}	mm	9.2		0.6		12.9		-			16
	d_{50}	mm	15		4.5		50.6		-			34
	d_{84}	mm	56		53		168.1		-			64
	d_{95}	mm	88		96		>2048.0		-			101

Catfish Creek R2 – XS 4 Riffle



Bankfull Dimensions

1.8	x-section area (ft.sq.)
3.3	width (ft)
0.6	mean depth (ft)
0.7	max depth (ft)
4.4	wetted perimeter (ft)
0.4	hydraulic radius (ft)
5.9	width-depth ratio

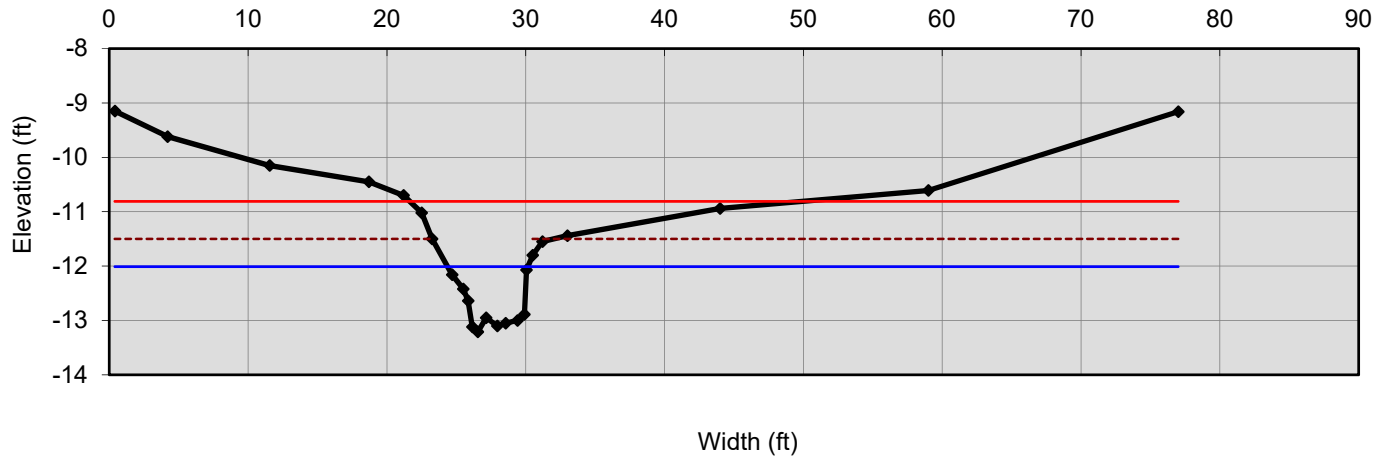
Flood Dimensions

3.5	W flood prone area (ft)
1.1	entrenchment ratio
1.3	low bank height (ft)
2.0	low bank height ratio

Bankfull Flow

4.0	velocity (ft/s)
7.2	discharge rate (cfs)
1.10	Froude number

Catfish Creek R3 – XS 11 Riffle



Bankfull Dimensions

4.7	x-section area (ft.sq.)
5.8	width (ft)
0.8	mean depth (ft)
1.2	max depth (ft)
7.0	wetted perimeter (ft)
0.7	hydraulic radius (ft)
7.2	width-depth ratio

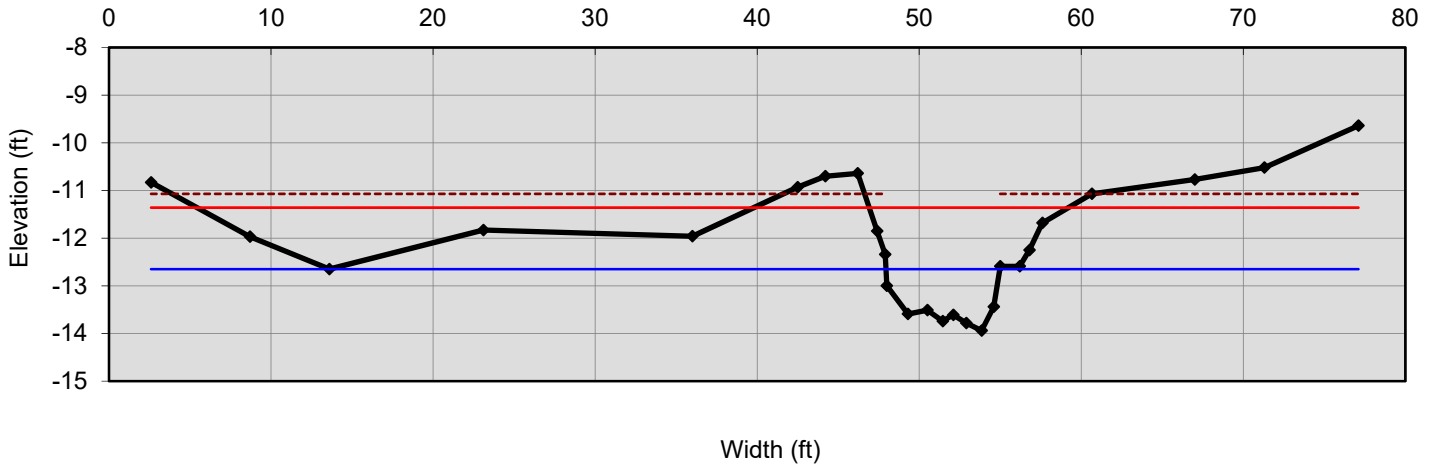
Flood Dimensions

28.3	W flood prone area (ft)
4.9	entrenchment ratio
1.7	low bank height (ft)
1.4	low bank height ratio

Bankfull Flow

3.8	velocity (ft/s)
17.7	discharge rate (cfs)
0.82	Froude number

Catfish Creek R4 – XS 6 Run



Bankfull Dimensions

6.4	x-section area (ft.sq.)
7.0	width (ft)
0.9	mean depth (ft)
1.3	max depth (ft)
8.2	wetted perimeter (ft)
0.8	hydraulic radius (ft)
7.7	width-depth ratio

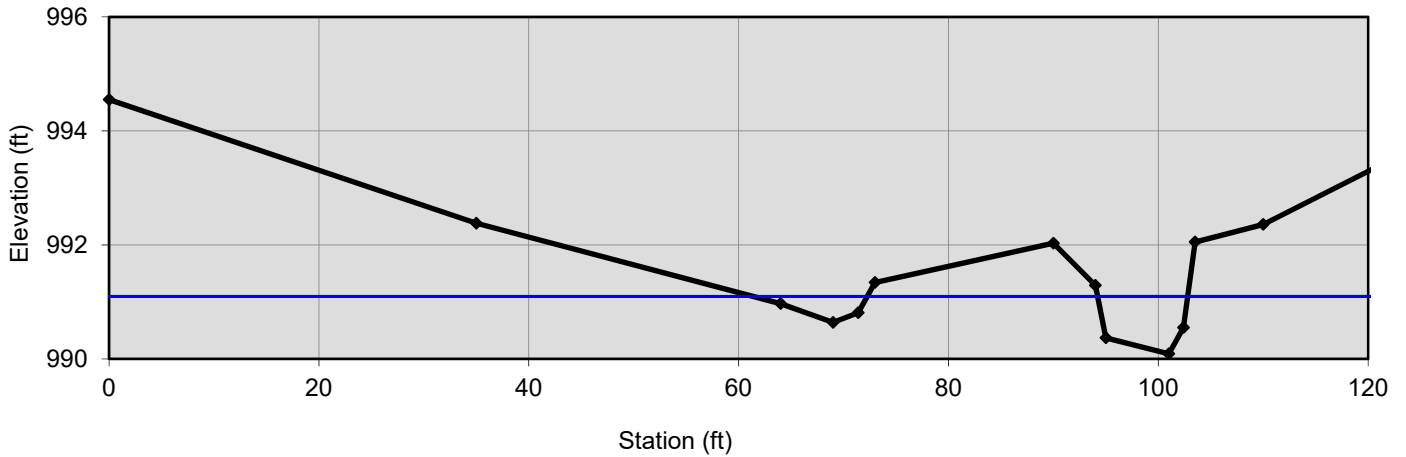
Flood Dimensions

12.0	W flood prone area (ft)
1.7	entrenchment ratio
2.9	low bank height (ft)
2.2	low bank height ratio

Bankfull Flow

2.8	velocity (ft/s)
18.3	discharge rate (cfs)
0.56	Froude number

Catfish Creek R4 – XS D Riffle



Bankfull Dimensions

6.7	x-section area (ft.sq.)
8.6	width (ft)
0.8	mean depth (ft)
1.0	max depth (ft)
9.2	wetted perimeter (ft)
0.7	hydraulic radius (ft)
11.0	width-depth ratio

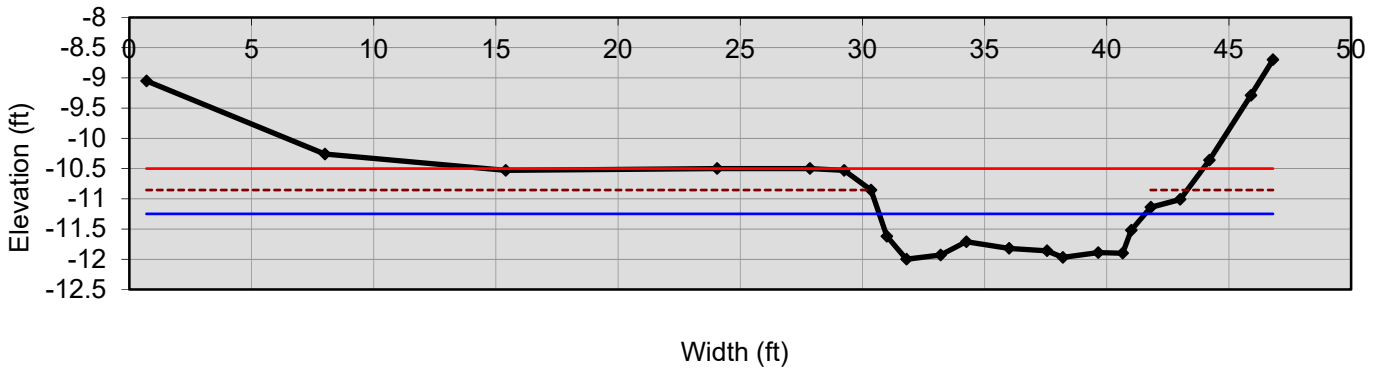
Flood Dimensions

44.0	W flood prone area (ft)
5.1	entrenchment ratio
1.9	low bank height (ft)
1.9	low bank height ratio

Bankfull Flow

2.7	velocity (ft/s)
18.1	discharge rate (cfs)
0.56	Froude number

Catfish Creek R5 – XS 7 Riffle

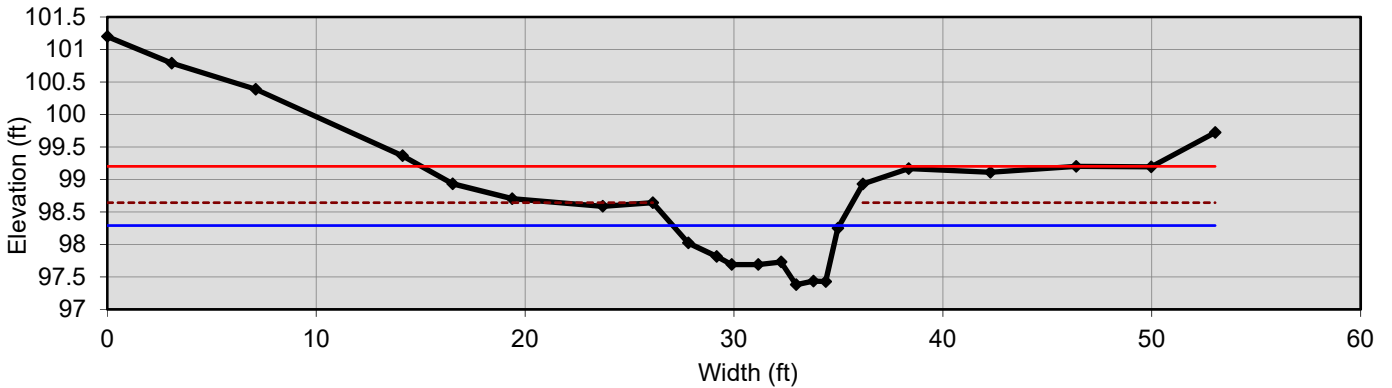


Bankfull Dimensions	
6.2	x-section area (ft.sq.)
10.9	width (ft)
0.6	mean depth (ft)
0.8	max depth (ft)
11.4	wetted perimeter (ft)
0.5	hydraulic radius (ft)
19.0	width-depth ratio

Flood Dimensions	
16.0	W flood prone area (ft)
1.5	entrenchment ratio
1.1	low bank height (ft)
1.5	low bank height ratio

Bankfull Flow	
3.1	velocity (ft/s)
19.3	discharge rate (cfs)
0.74	Froude number

Catfish Creek R5 – XS 15 Riffle

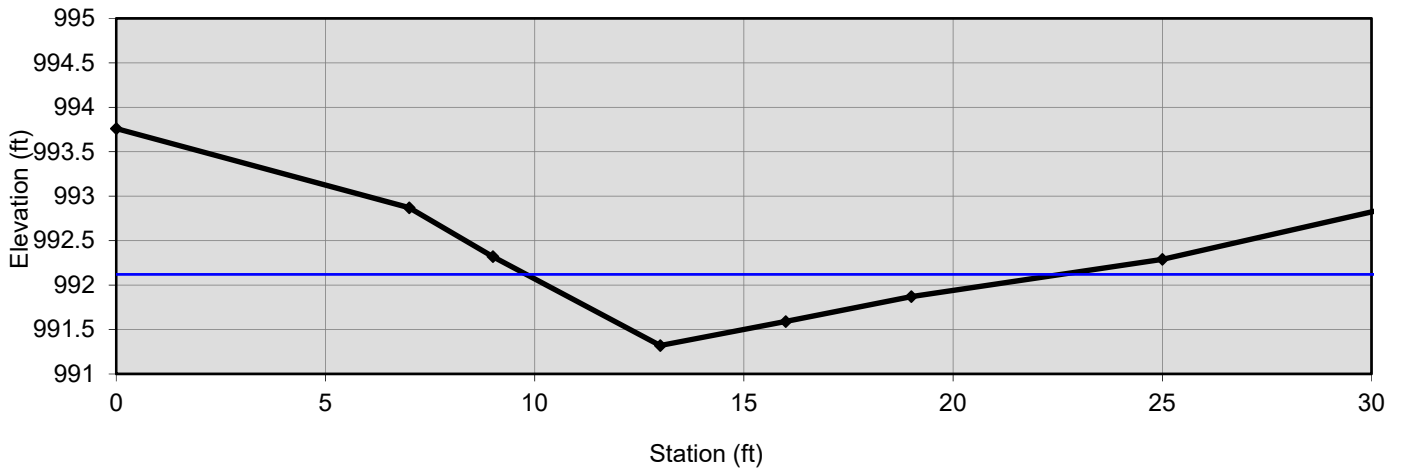


Bankfull Dimensions	
4.4	x-section area (ft.sq.)
8.0	width (ft)
0.6	mean depth (ft)
0.9	max depth (ft)
8.6	wetted perimeter (ft)
0.5	hydraulic radius (ft)
14.4	width-depth ratio

Flood Dimensions	
35.0	W flood prone area (ft)
4.4	entrenchment ratio
1.3	low bank height (ft)
1.4	low bank height ratio

Bankfull Flow	
4.2	velocity (ft/s)
18.7	discharge rate (cfs)
1.04	Froude number

Catfish Creek R6 - XS C Riffle



Bankfull Dimensions

4.9	x-section area (ft.sq.)
12.8	width (ft)
0.4	mean depth (ft)
0.8	max depth (ft)
12.9	wetted perimeter (ft)
0.4	hydraulic radius (ft)
33.3	width-depth ratio

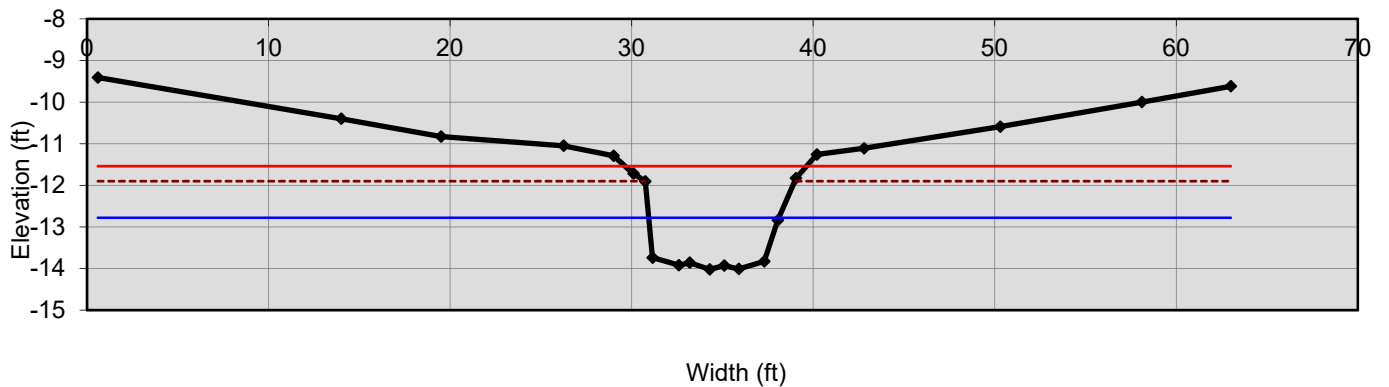
Flood Dimensions

24.3	W flood prone area (ft)
1.9	entrenchment ratio
1.0	low bank height (ft)
1.2	low bank height ratio

Bankfull Flow

3.9	velocity (ft/s)
19.1	discharge rate (cfs)
1.12	Froude number

Catfish Creek R7 - XS 9 Riffle



Bankfull Dimensions

7.5	x-section area (ft.sq.)
7.2	width (ft)
1.0	mean depth (ft)
1.2	max depth (ft)
8.5	wetted perimeter (ft)
0.9	hydraulic radius (ft)
6.9	width-depth ratio

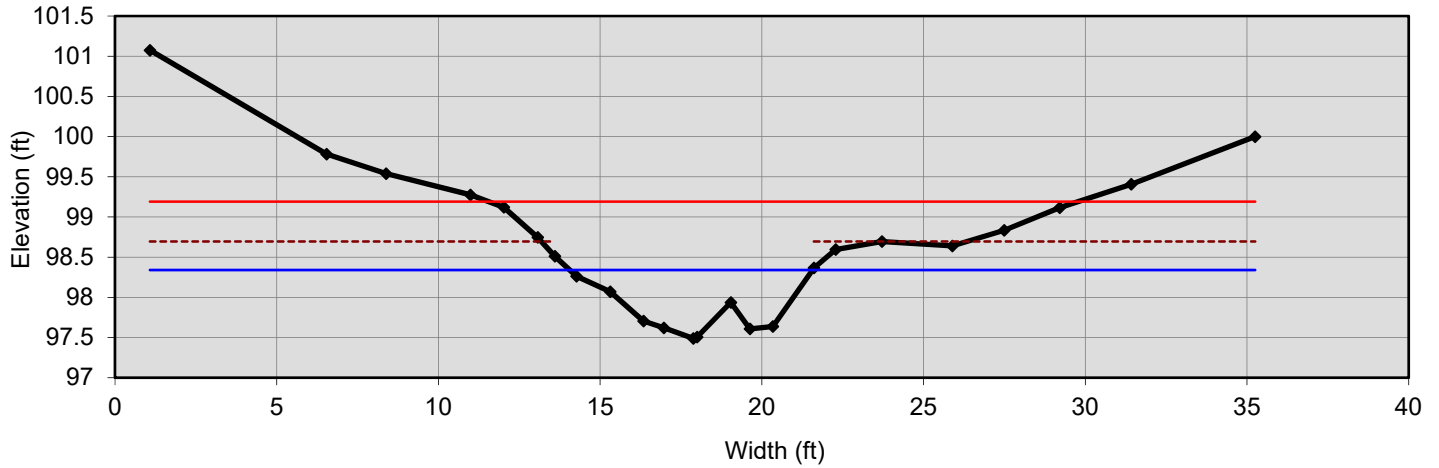
Flood Dimensions

10.0	W flood prone area (ft)
1.4	entrenchment ratio
2.1	low bank height (ft)
1.7	low bank height ratio

Bankfull Flow

5.6	velocity (ft/s)
42.1	discharge rate (cfs)
1.06	Froude number

Catfish Creek R7 - XS 14 Riffle (above UT1 confluence)



Bankfull Dimensions

3.8	x-section area (ft.sq.)
7.5	width (ft)
0.5	mean depth (ft)
0.9	max depth (ft)
8.0	wetted perimeter (ft)
0.5	hydraulic radius (ft)
14.8	width-depth ratio

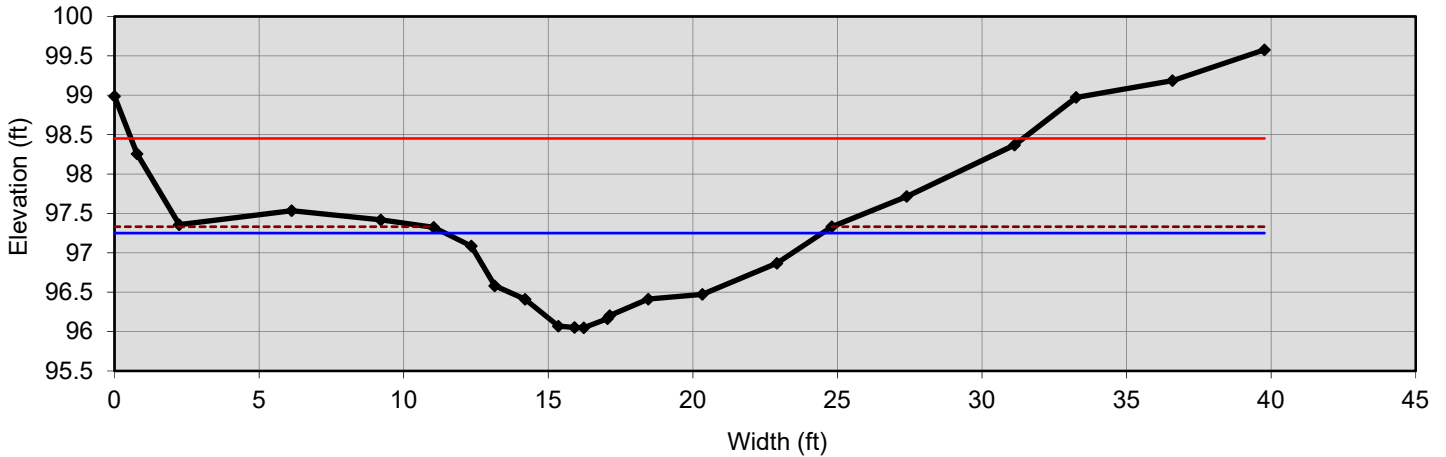
Flood Dimensions

18.2	W flood prone area (ft)
2.4	entrenchment ratio
1.2	low bank height (ft)
1.4	low bank height ratio

Bankfull Flow

5.0	velocity (ft/s)
19.2	discharge rate (cfs)
1.29	Froude number

Catfish Creek R7 - XS 16 Riffle



Bankfull Dimensions

9.0	x-section area (ft.sq.)
13.0	width (ft)
0.7	mean depth (ft)
1.2	max depth (ft)
13.4	wetted perimeter (ft)
0.7	hydraulic radius (ft)
18.9	width-depth ratio

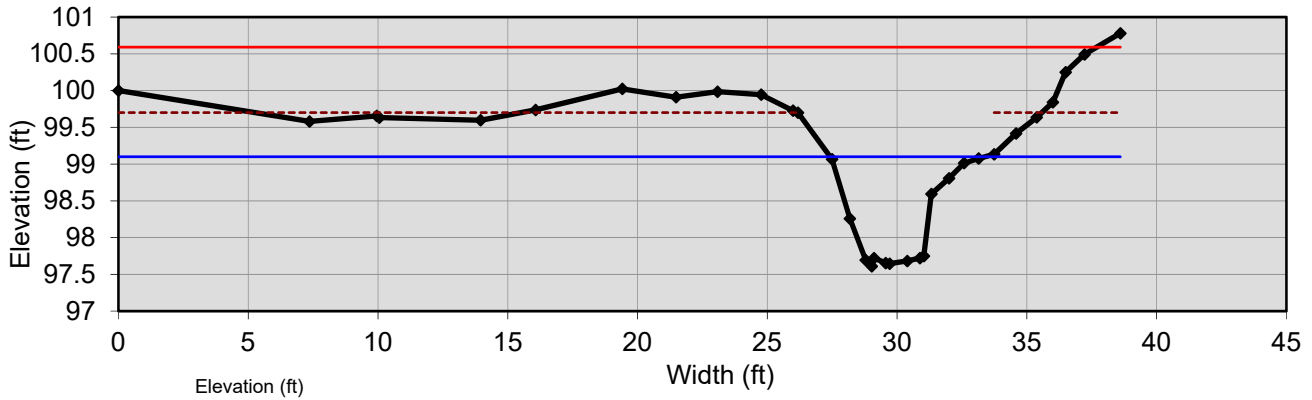
Flood Dimensions

30.9	W flood prone area (ft)
2.4	entrenchment ratio
1.3	low bank height (ft)
1.1	low bank height ratio

Bankfull Flow

4.7	velocity (ft/s)
42.3	discharge rate (cfs)
1.01	Froude number

UT1 R1 - XS 12 Riffle



Bankfull Dimensions

4.9	x-section area (ft.sq.)
6.0	width (ft)
0.8	mean depth (ft)
1.5	max depth (ft)
7.3	wetted perimeter (ft)
0.7	hydraulic radius (ft)
7.3	width-depth ratio

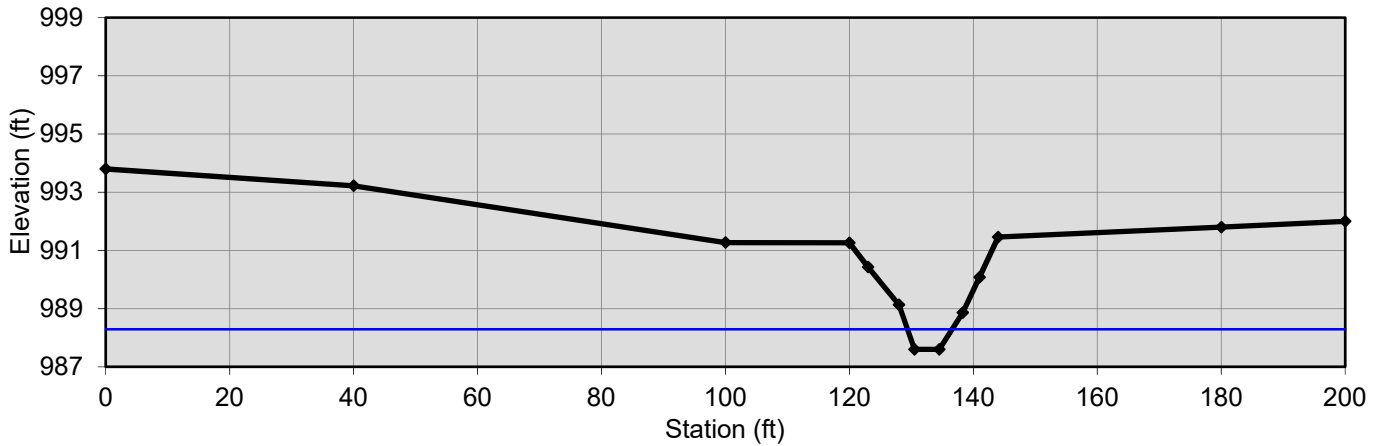
Flood Dimensions

38.0	W flood prone area (ft)
6.4	entrenchment ratio
2.1	low bank height (ft)
1.4	low bank height ratio

Bankfull Flow

3.4	velocity (ft/s)
16.3	discharge rate (cfs)
0.73	Froude number

UT1 R1 - XS B Riffle



Bankfull Dimensions

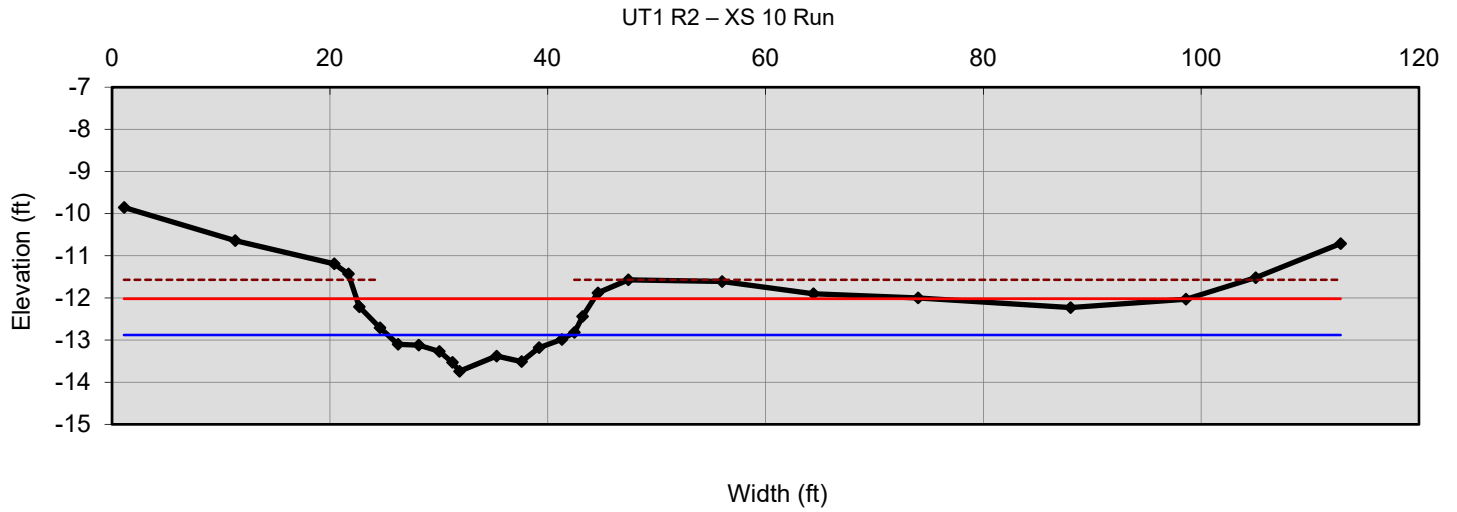
5.1	x-section area (ft.sq.)
8.0	width (ft)
0.6	mean depth (ft)
0.9	max depth (ft)
8.3	wetted perimeter (ft)
0.6	hydraulic radius (ft)
12.4	width-depth ratio

Flood Dimensions

10.3	W flood prone area (ft)
1.3	entrenchment ratio
1.5	low bank height (ft)
1.8	low bank height ratio

Bankfull Flow

3.2	velocity (ft/s)
16.1	discharge rate (cfs)
0.72	Froude number



Bankfull Dimensions

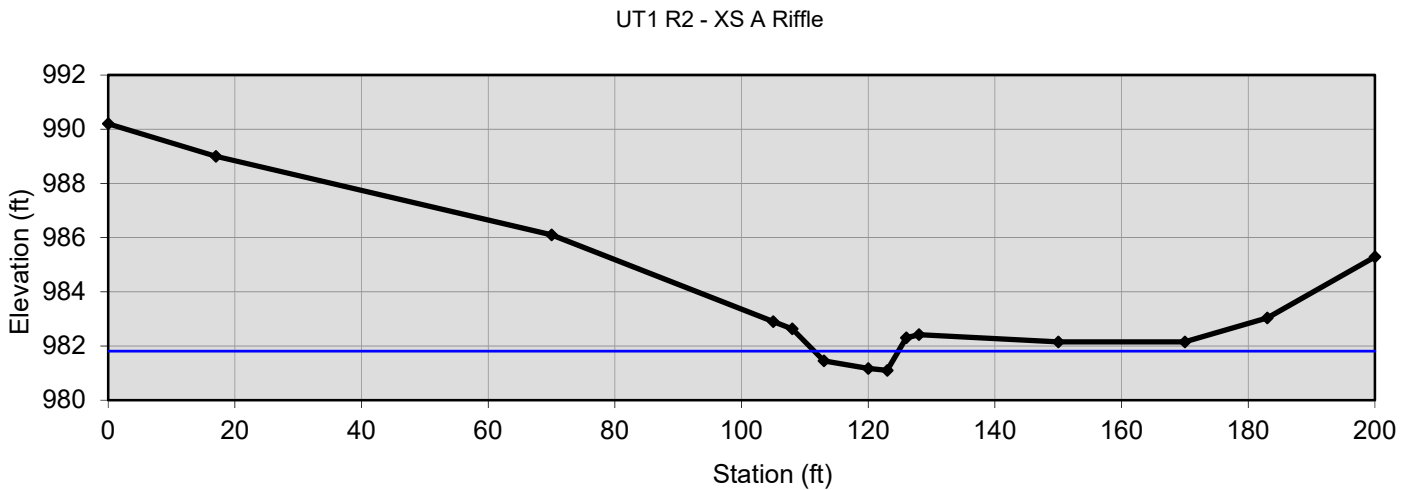
7.1	x-section area (ft.sq.)
16.7	width (ft)
0.4	mean depth (ft)
0.9	max depth (ft)
16.9	wetted perimeter (ft)
0.4	hydraulic radius (ft)
39.5	width-depth ratio

Flood Dimensions

22.0	W flood prone area (ft)
1.3	entrenchment ratio
1.9	low bank height (ft)
2.2	low bank height ratio

Bankfull Flow

3.0	velocity (ft/s)
20.9	discharge rate (cfs)
0.80	Froude number



Bankfull Dimensions

6.4	x-section area (ft.sq.)
13.3	width (ft)
0.5	mean depth (ft)
0.7	max depth (ft)
13.5	wetted perimeter (ft)
0.5	hydraulic radius (ft)
27.5	width-depth ratio

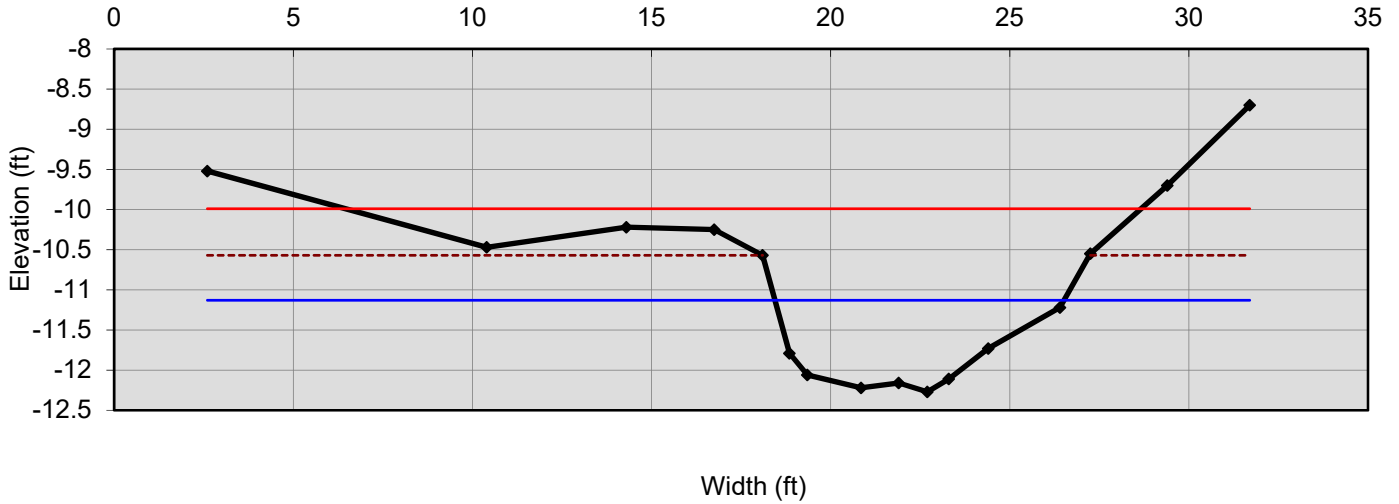
Flood Dimensions

22.0	W flood prone area (ft)
1.7	entrenchment ratio
1.2	low bank height (ft)
1.7	low bank height ratio

Bankfull Flow

3.2	velocity (ft/s)
20.7	discharge rate (cfs)
0.82	Froude numb

UT1 R4 - XS 8 Riffle



Bankfull Dimensions

6.2	x-section area (ft.sq.)
8.1	width (ft)
0.8	mean depth (ft)
1.1	max depth (ft)
8.7	wetted perimeter (ft)
0.7	hydraulic radius (ft)
10.5	width-depth ratio

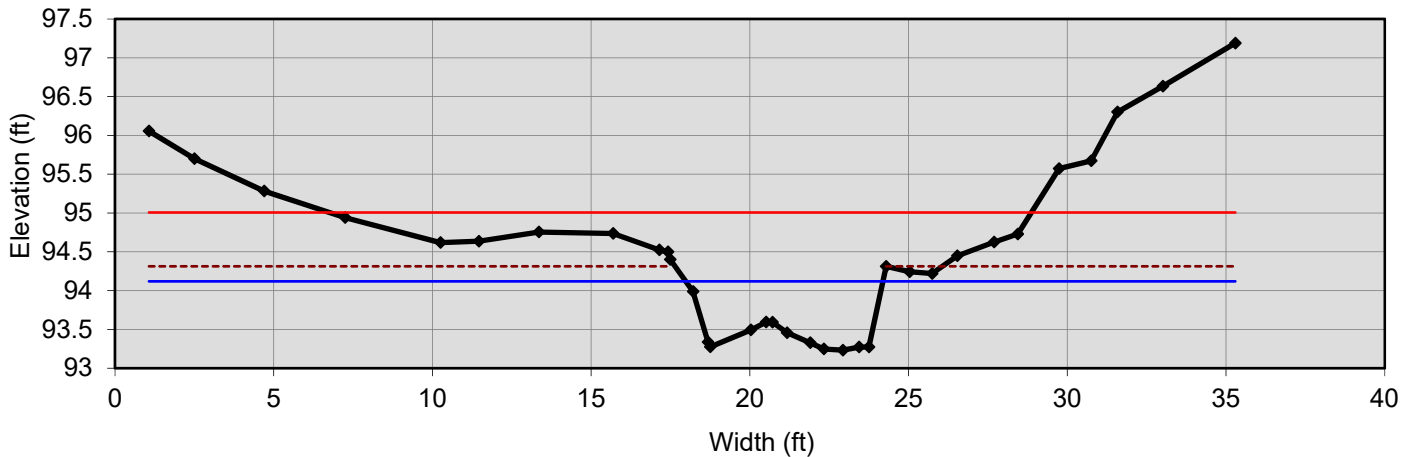
Flood Dimensions

22.2	W flood prone area (ft)
2.8	entrenchment ratio
1.7	low bank height (ft)
1.5	low bank height ratio

Bankfull Flow

3.5	velocity (ft/s)
22.0	discharge rate (cfs)
0.73	Froude number

UT1 R4 - XS 13 Riffle



Bankfull Dimensions

4.2	x-section area (ft.sq.)
6.2	width (ft)
0.7	mean depth (ft)
0.9	max depth (ft)
7.2	wetted perimeter (ft)
0.6	hydraulic radius (ft)
9.2	width-depth ratio

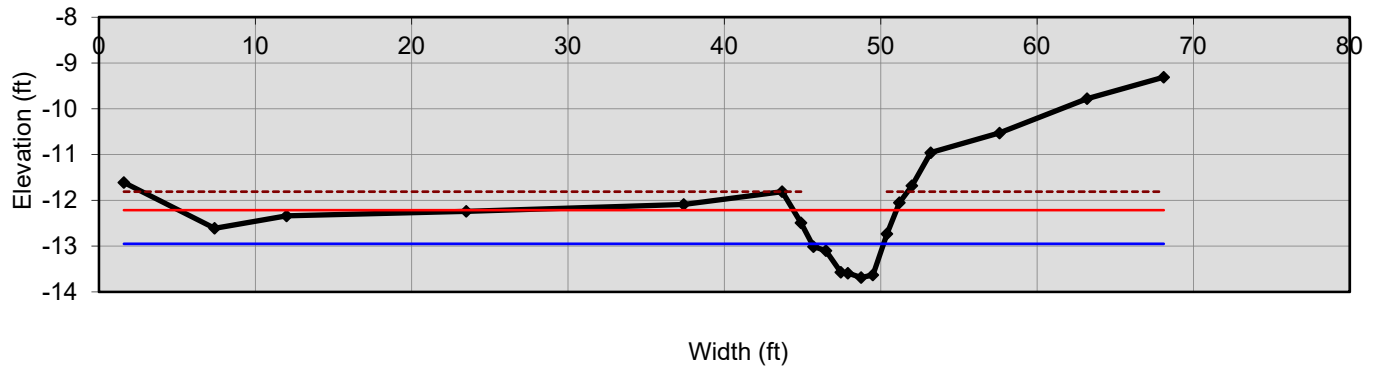
Flood Dimensions

22.1	W flood prone area (ft)
3.6	entrenchment ratio
1.1	low bank height (ft)
1.2	low bank height ratio

Bankfull Flow

5.1	velocity (ft/s)
21.3	discharge rate (cfs)
1.17	Froude number

UT2 - XS 5 Riffle



Bankfull Dimensions

2.1	x-section area (ft.sq.)
4.6	width (ft)
0.5	mean depth (ft)
0.7	max depth (ft)
5.0	wetted perimeter (ft)
0.4	hydraulic radius (ft)
10.0	width-depth ratio

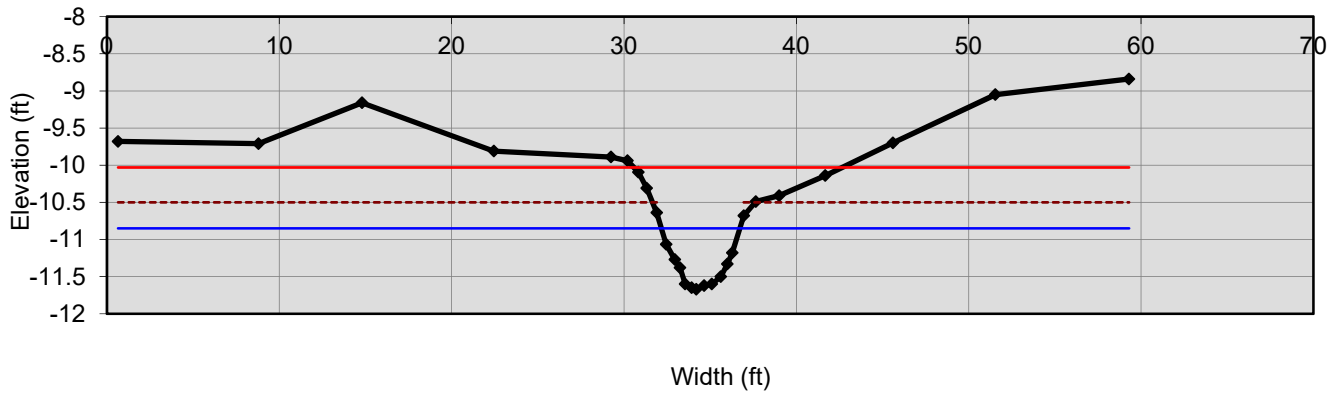
Flood Dimensions

8.0	W flood prone area (ft)
1.7	entrenchment ratio
1.9	low bank height (ft)
2.6	low bank height ratio

Bankfull Flow

5.2	velocity (ft/s)
10.9	discharge rate (cfs)
1.42	Froude number

Mountain Tributary - XS 3 Riffle



Bankfull Dimensions

2.5	x-section area (ft.sq.)
4.6	width (ft)
0.5	mean depth (ft)
0.8	max depth (ft)
5.0	wetted perimeter (ft)
0.5	hydraulic radius (ft)
8.3	width-depth ratio

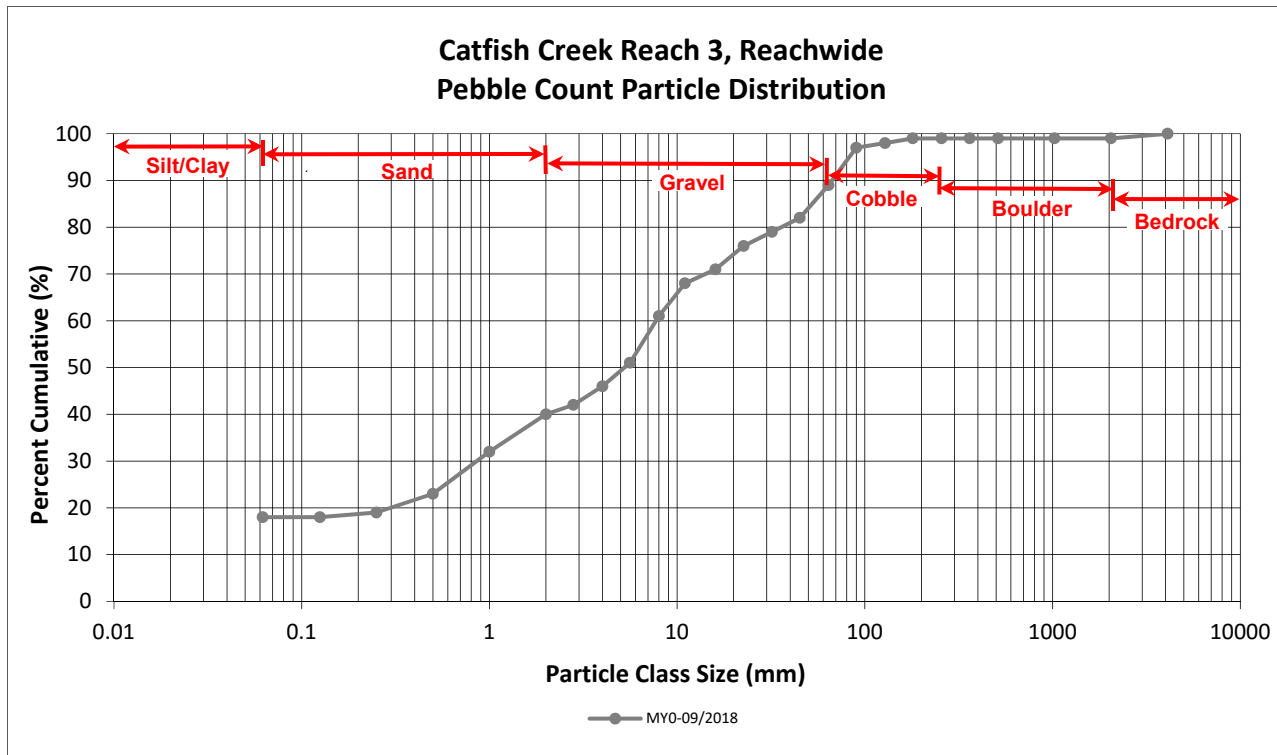
Flood Dimensions

12.1	W flood prone area (ft)
2.7	entrenchment ratio
1.2	low bank height (ft)
1.4	low bank height ratio

Bankfull Flow

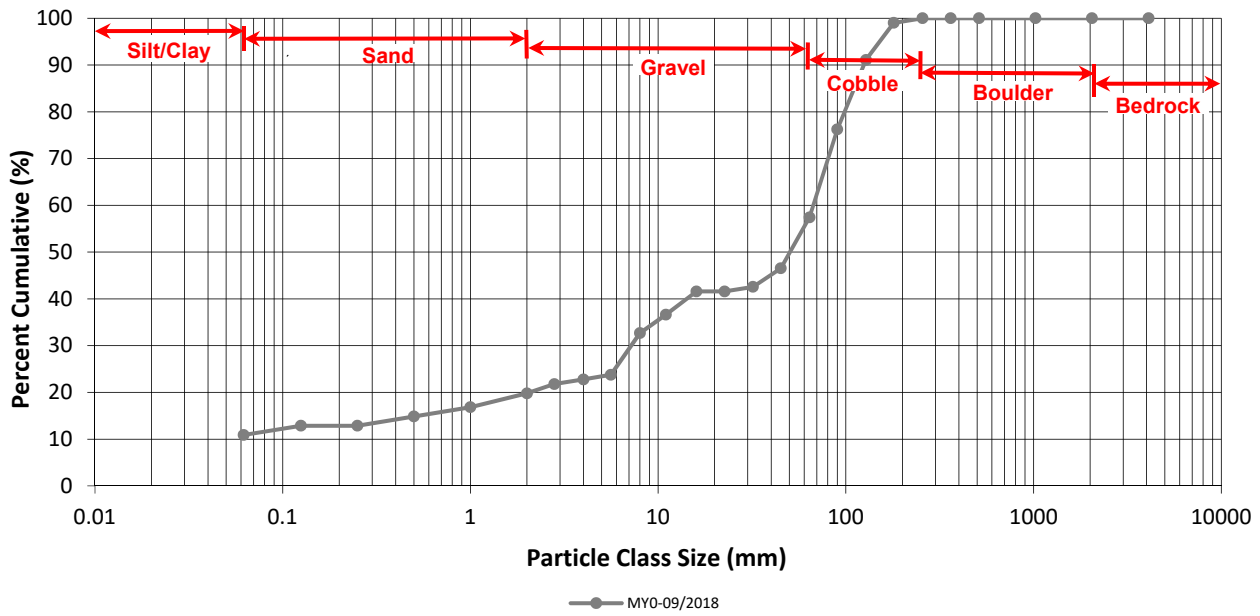
4.4	velocity (ft/s)
10.9	discharge rate (cfs)
1.08	Froude number

Catfish Pond Reachwide Pebble Counts

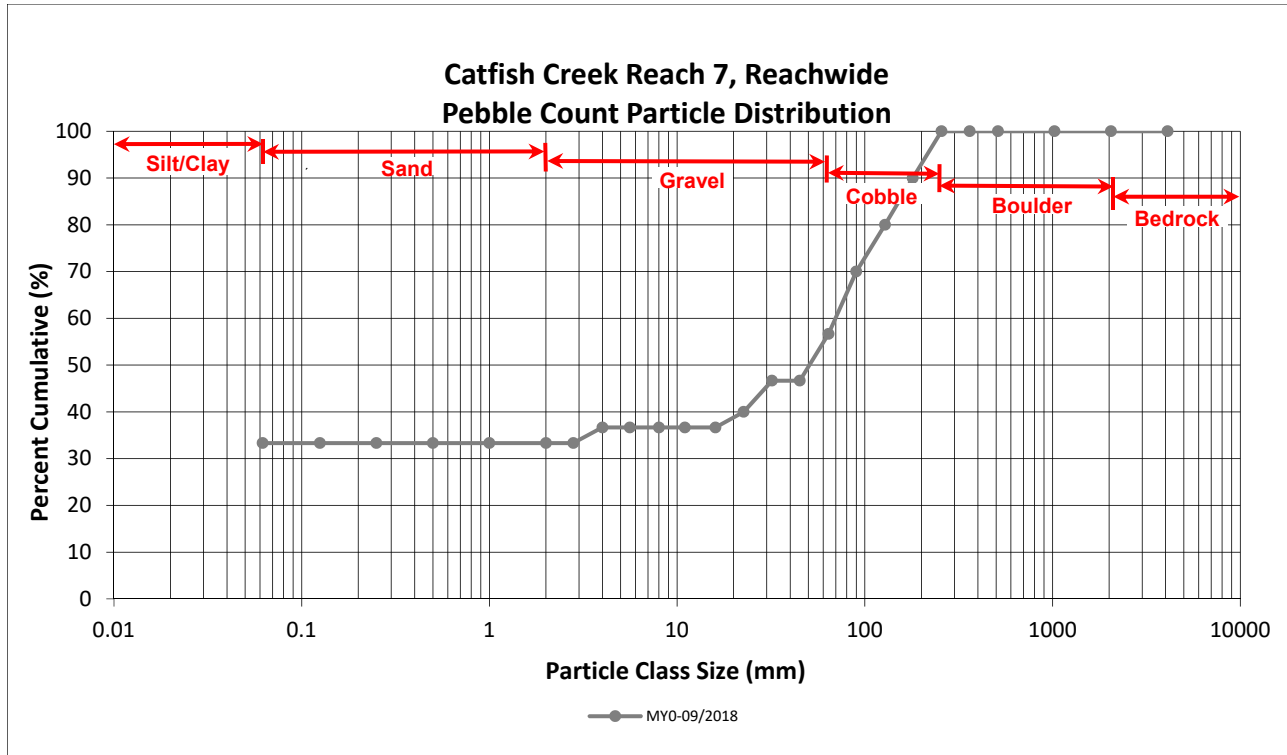


Reachwide	
Channel materials (mm)	
D ₁₆ =	Silt/Clay
D ₃₅ =	1.30
D ₅₀ =	5.2
D ₈₄ =	49.8
D ₉₅ =	82.6
D ₁₀₀ =	>2048

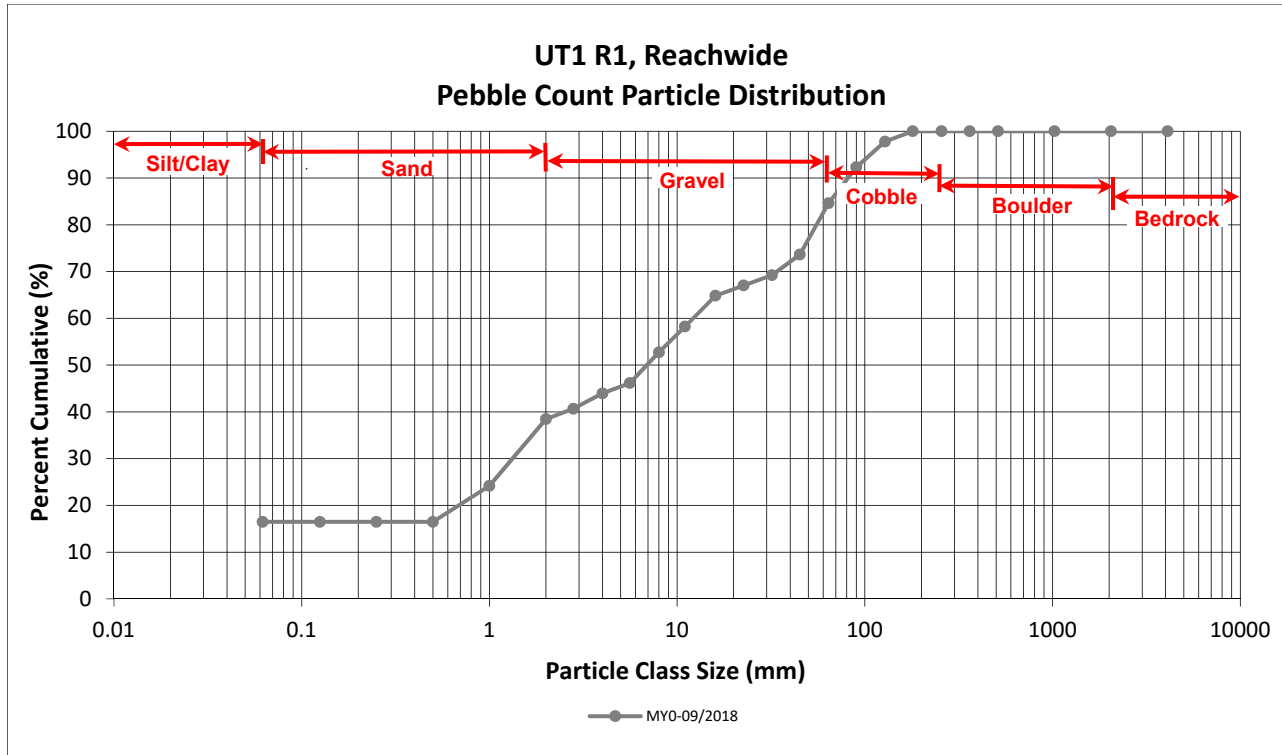
**Catfish Creek Reach 5, Reachwide
Pebble Count Particle Distribution**



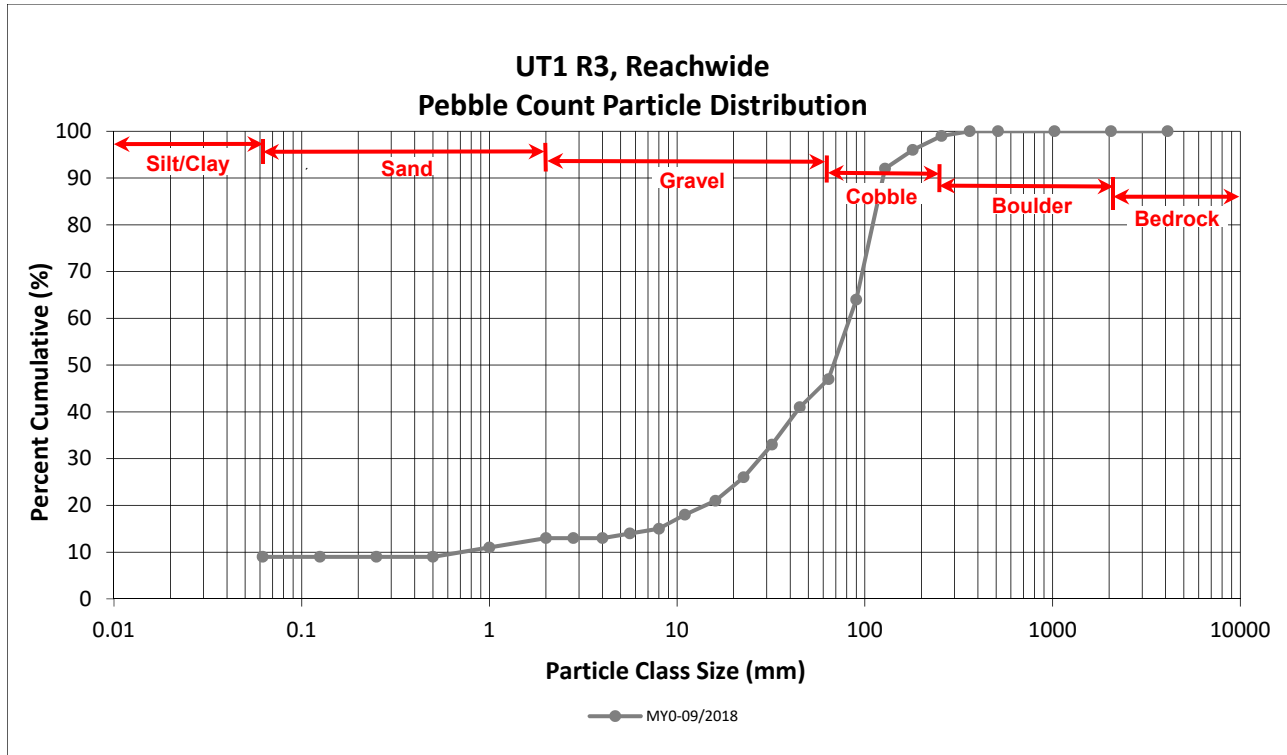
Reachwide	
Channel materials (mm)	
D ₁₆ =	0.75
D ₃₅ =	9.65
D ₅₀ =	50.3
D ₈₄ =	108.2
D ₉₅ =	151.5
D ₁₀₀ =	256.0



Reachwide	
Channel materials (mm)	
$D_{16} =$	Silt/Clay
$D_{35} =$	3.35
$D_{50} =$	50.6
$D_{84} =$	146.7
$D_{95} =$	214.7
$D_{100} =$	256.0



Reachwide	
Channel materials (mm)	
D ₁₆ =	Silt/Clay
D ₃₅ =	1.69
D ₅₀ =	6.9
D ₈₄ =	62.8
D ₉₅ =	107.0
D ₁₀₀ =	180.0



Reachwide	
Channel materials (mm)	
D ₁₆ =	8.90
D ₃₅ =	34.85
D ₅₀ =	68.0
D ₈₄ =	115.7
D ₉₅ =	165.3
D ₁₀₀ =	362.0

Catfish Pond Mitigation Site Nutrient Removal Calculations

Use the dominant land use so livestock exclusion where this applies (acc. Greg Melia).

Use agricultural runoff filtration where hay is grown. Use dominant land use on lateral drainages.

Don't double count livestock exclusion and nutrient removal from agricultural runoff.

Some area is mostly fallow/buffer so no nutrient removal there.

Cattle Exclusion

20.65 total area (acres) of restored riparian buffers inside of livestock exclusion fences. CE as of 31Jan2019

1054.0 TN (51.04 lbs per acre)

87.3 TP (4.23 lbs per acre)

Agriculture

0 total area (acres) of restored riparian buffers adjacent to agricultural fields (where hay is grown)

0.0 TN (75.77 lbs per acre)

0.0 TP (4.88 lbs per acre)

Total nutrient removal

1054.0 TN lbs

87.3 TP lbs

Fecal Coliform Reduction

Estimating the amount of fecal coliform prevented from entering stream due to livestock exclusion

6.55E+11 colonies reduced per day not about exclusion area, only about animal units.
 2.39E+14 colonies reduced per year

Animal Un 35 46 animals, including 19 calves and 1 bull

Estimating fecal coliform reduction due to riparian buffer filtration

Runoff volume before mitigation			
38.33 Q - accumulated direct runoff (in)	how much B, C, D soils?		
4.70 S - potential maximum retention	% of total washed	For only where cows are present.	CN
	84.7 B		65.0
	3.24 C		76.0
	12 D		82.0
	99.94		overall 67.4

Runoff volume after mitigation			
37.90 Q - accumulated direct runoff (in)	how much B, C, D soils?		
5.13 S - potential maximum retention	% of total washed	For only where cows are present.	CN by reac
	84.7 B		63.0
	3.24 C		74.0
	12 D		81.0
	99.94		overall 65.5

Draw area in pasture that will be subject to these runoff estimates.						Load	Load
						reduction	reduction
						(colonies)	(%)
Before	acres		Q (in)	S	Q (gallons)	Annual load	
	130.9	Catfish Pond	38.18	4.85	1.36E+08	2.57E+14	
	130.9					2.57E+14	
After			Q (in)	S	Q (gallons)		
	110.25	Catfish Pond	37.76	5.27	1.13E+08	3.21E+13	2.25E+14
	110.25					3.21E+13	2.25E+14
							87.5%

concentration is 1.894*10^6 for pastures under continual year-round grazing.

4.64E+14 total load reduction (colonies) from exclusion and buffer filtration

NC SAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 2.1

USACE AID #:	NCDWR #:
<p>INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if any supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.</p> <p>NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).</p>	
PROJECT / SITE INFORMATION:	
1. Project name (if any): <u>Catfish</u>	2. Date of evaluation: <u>4/13/18</u>
3. Applicant/owner name: <u>Wildland Eng</u>	4. Assessor name/organization: <u>C.Lanza</u>
5. County: <u>Durham</u>	6. Nearest named water body
7. River Basin: <u>Neuse</u>	on USGS 7.5-minute quad: <u>Mountain Creek</u>
8. Site coordinates (decimal degrees, at lower end of assessment reach): _____	
STREAM INFORMATION: (depth and width can be approximations)	
9. Site number (show on attached map): <u>Catfish R1A</u>	10. Length of assessment reach evaluated (feet): _____
11. Channel depth from bed (in riffle, if present) to top of bank (feet): <u>2</u>	<input type="checkbox"/> Unable to assess channel depth.
12. Channel width at top of bank (feet): <u>3</u>	13. Is assessment reach a swamp stream? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
14. Feature type: <input type="checkbox"/> Perennial flow <input checked="" type="checkbox"/> Intermittent flow <input type="checkbox"/> Tidal Marsh Stream	
STREAM RATING INFORMATION:	
15. NC SAM Zone: <input type="checkbox"/> Mountains (M) <input checked="" type="checkbox"/> Piedmont (P) <input type="checkbox"/> Inner Coastal Plain (I) <input type="checkbox"/> Outer Coastal Plain (O)	
16. Estimated geomorphic valley shape (skip for Tidal Marsh Stream): <input checked="" type="checkbox"/> a (more sinuous stream, flatter valley slope) <input type="checkbox"/> b (less sinuous stream, steeper valley slope)	
17. Watershed size: (skip for Tidal Marsh Stream) <input checked="" type="checkbox"/> Size 1 (< 0.1 mi ²) <input type="checkbox"/> Size 2 (0.1 to < 0.5 mi ²) <input type="checkbox"/> Size 3 (0.5 to < 5 mi ²) <input type="checkbox"/> Size 4 (≥ 5 mi ²)	
ADDITIONAL INFORMATION:	
18. Were regulatory considerations evaluated? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes, check all that apply to the assessment area.	
<input type="checkbox"/> Section 10 water	<input type="checkbox"/> Classified Trout Waters
<input type="checkbox"/> Essential Fish Habitat	<input type="checkbox"/> Primary Nursery Area
<input type="checkbox"/> Publicly owned property	<input type="checkbox"/> NCDWR riparian buffer rule in effect
<input type="checkbox"/> Anadromous fish	<input type="checkbox"/> 303(d) List
<input type="checkbox"/> Documented presence of a federal and/or state listed protected species within the assessment area.	<input type="checkbox"/> Water Supply Watershed (<input type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/> V)
<input type="checkbox"/> Nutrient Sensitive Waters	<input type="checkbox"/> High Quality Waters/Outstanding Resource Waters
<input type="checkbox"/> CAMA Area of Environmental Concern (AEC)	<input type="checkbox"/> CAMA Area of Environmental Concern (AEC)
List species: _____	
<input type="checkbox"/> Designated Critical Habitat (list species): _____	
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? <input type="checkbox"/> Yes <input type="checkbox"/> No	

1. **Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)**
 - A Water throughout assessment reach.
 - B No flow, water in pools only.
 - C No water in assessment reach.

2. **Evidence of Flow Restriction – assessment reach metric**
 - A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is adversely affected by a flow restriction or fill to the point of obstructing flow or a channel choked with aquatic macrophytes or ponded water or impounded on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates).
 - B Not A

3. **Feature Pattern – assessment reach metric**
 - A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
 - B Not A.

4. **Feature Longitudinal Profile – assessment reach metric**
 - A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
 - B Not A

5. **Signs of Active Instability – assessment reach metric**
Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).
 - A < 10% of channel unstable
 - B 10 to 25% of channel unstable
 - C > 25% of channel unstable

6. **Streamside Area Interaction – streamside area metric**
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Little or no evidence of conditions that adversely affect reference interaction
<input type="checkbox"/> B	<input type="checkbox"/> B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
<input type="checkbox"/> C	<input type="checkbox"/> C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] <u>or</u> too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) <u>or</u> floodplain/intertidal zone unnaturally absent <u>or</u> assessment reach is a man-made feature on an interstream divide

7. **Water Quality Stressors – assessment reach/intertidal zone metric**
Check all that apply.
 - A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
 - B Excessive sedimentation (burying of stream features or intertidal zone)

- C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
- D Odor (not including natural sulfide odors)
- E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in the "Notes/Sketch" section.
- F Livestock with access to stream or intertidal zone
- G Excessive algae in stream or intertidal zone
- H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc.)
- I Other: _____ (explain in "Notes/Sketch" section)
- J Little to no stressors

8. Recent Weather – watershed metric

For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.

- A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
- B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
- C No drought conditions

9 Large or Dangerous Stream – assessment reach metric

Yes No Is stream is too large or dangerous to assess? **If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).**

10. Natural In-stream Habitat Types – assessment reach metric

10a. Yes No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**

- | | | |
|--|------------------------------------|---|
| <ul style="list-style-type: none"> <input checked="" type="checkbox"/> A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats) <input checked="" type="checkbox"/> B Multiple sticks and/or leaf packs and/or emergent vegetation <input type="checkbox"/> C Multiple snags and logs (including lap trees) <input checked="" type="checkbox"/> D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter <input type="checkbox"/> E Little or no habitat | Check for Tidal Marsh Streams only | <ul style="list-style-type: none"> <input type="checkbox"/> F 5% oysters or other natural hard bottoms <input type="checkbox"/> G Submerged aquatic vegetation <input type="checkbox"/> H Low-tide refugia (pools) <input type="checkbox"/> I Sand bottom <input type="checkbox"/> J 5% vertical bank along the marsh <input type="checkbox"/> K Little or no habitat |
|--|------------------------------------|---|

*****REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS*****

11. Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

11a. Yes No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**

- A Riffle-run section (evaluate 11c)
- B Pool-glide section (evaluate 11d)
- C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffles sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain Streams and Tidal Marsh Streams).** Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Bedrock/saprolite
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Boulder (256 – 4096 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cobble (64 – 256 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gravel (2 – 64 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sand (.062 – 2 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Silt/clay (< 0.062 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Detritus
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Artificial (rip-rap, concrete, etc.)

11d. Yes No Are pools filled with sediment? **(skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**

12. Aquatic Life – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

12a. Yes No Was an in-stream aquatic life assessment performed as described in the User Manual?

If No, select one of the following reasons and skip to Metric 13. No Water Other: _____

12b. Yes No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

- 1 >1 Numbers over columns refer to "individuals" for size 1 and 2 streams and "taxa" for size 3 and 4 streams.
- Adult frogs
 - Aquatic reptiles
 - Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
 - Beetles (including water pennies)
 - Caddisfly larvae (Trichoptera [T])
 - Asian clam (*Corbicula*)
 - Crustacean (isopod/amphipod/crayfish/shrimp)
 - Damselfly and dragonfly larvae
 - Dipterans (true flies)
 - Mayfly larvae (Ephemeroptera [E])
 - Megaloptera (alderfly, fishfly, dobsonfly larvae)
 - Midges/mosquito larvae
 - Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
 - Mussels/Clams (not *Corbicula*)
 - Other fish
 - Salamanders/tadpoles
 - Snails
 - Stonefly larvae (Plecoptera [P])
 - Tipulid larvae

Worms/leeches

13. **Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)**
Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Little or no alteration to water storage capacity over a majority of the streamside area
<input type="checkbox"/> B	<input type="checkbox"/> B	Moderate alteration to water storage capacity over a majority of the streamside area
<input type="checkbox"/> C	<input type="checkbox"/> C	Severe alteration to water storage capacity over a majority of the streamside area (examples include: ditches, fill, soil, compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. **Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)**
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Majority of streamside area with depressions able to pond water \geq 6 inches deep
<input type="checkbox"/> B	<input type="checkbox"/> B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
<input type="checkbox"/> C	<input type="checkbox"/> C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. **Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)**

Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB	RB	
<input type="checkbox"/> Y	<input type="checkbox"/> Y	Are wetlands present in the streamside area?
<input type="checkbox"/> N	<input type="checkbox"/> N	

16. **Baseflow Contributors – assessment reach metric (skip for size 4 streams and Tidal Marsh Streams)**

Check all contributors within the assessment reach or within view of and draining to the assessment reach.

A Streams and/or springs (jurisdictional discharges)
 B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
 C Obstruction that passes some flow during low-flow periods within assessment area (beaver dam, bottom-release dam)
 D Evidence of bank seepage or sweating (iron oxidizing bacteria in water indicates seepage)
 E Stream bed or bank soil reduced (dig through deposited sediment if present)
 F None of the above

17. **Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)**

Check all that apply.

A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
 B Obstruction not passing flow during low flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
 C Urban stream (\geq 24% impervious surface for watershed)
 D Evidence that the stream-side area has been modified resulting in accelerated drainage into the assessment reach
 E Assessment reach relocated to valley edge
 F None of the above

18. **Shading – assessment reach metric (skip for Tidal Marsh Streams)**

Consider aspect. Consider "leaf-on" condition.

A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
 B Degraded (example: scattered trees)
 C Stream shading is gone or largely absent

19. **Buffer Width – streamside area metric (skip for Tidal Marsh Streams)**

Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated		Wooded		
LB	RB	LB	RB	
<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> A	\geq 100-foot wide <u>or</u> extends to the edge of the watershed
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	From 50 to < 100-foot wide
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	From 30 to < 50-foot wide
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	From 10 to < 30-foot wide
<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	< 10-foot wide <u>or</u> no trees

20. **Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)**

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> A	Mature forest
<input type="checkbox"/> B	<input type="checkbox"/> B	Non-mature woody vegetation <u>or</u> modified vegetation structure
<input type="checkbox"/> C	<input type="checkbox"/> C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
<input type="checkbox"/> D	<input type="checkbox"/> D	Maintained shrubs
<input type="checkbox"/> E	<input type="checkbox"/> E	Little or no vegetation

21. **Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)**

Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).

If none of the following stressors occurs on either bank, check here and skip to Metric 22:

Abuts		< 30 feet		30-50 feet		
LB	RB	LB	RB	LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	Row crops
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	Maintained turf
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	Pasture (no livestock)/commercial horticulture
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	Pasture (active livestock use)

22. **Stem Density – streamside area metric (skip for Tidal Marsh Streams)**

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> A	Medium to high stem density
<input type="checkbox"/> B	<input type="checkbox"/> B	Low stem density
<input type="checkbox"/> C	<input type="checkbox"/> C	No wooded riparian buffer <u>or</u> predominantly herbaceous species <u>or</u> bare ground

23. **Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)**

Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10-feet wide.

LB RB

- A A The total length of buffer breaks is < 25 percent.
B B The total length of buffer breaks is between 25 and 50 percent.
C C The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – First 100 feet of streamside area metric (skip for Tidal Marsh Streams)

Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB RB

- A A Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
B B Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
C C Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)

25a. Yes No Was a conductivity measurement recorded?

If No, select one of the following reasons.

No Water

Other: _____

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).

A <46

B 46 to < 67

C 67 to < 79

D 79 to < 230

E ≥ 230

Notes/Sketch:

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name Catfish
 Stream Category Pa1

Date of Evaluation 4/13/18
 Assessor Name/Organization C.Lanza

Notes of Field Assessment Form (Y/N) NO
 Presence of regulatory considerations (Y/N) NO
 Additional stream information/supplementary measurements included (Y/N) _____
 NC SAM feature type (perennial, intermittent, Tidal Marsh Stream) Intermittent

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	HIGH	HIGH
(2) Baseflow	MEDIUM	MEDIUM
(2) Flood Flow	HIGH	HIGH
(3) Streamside Area Attenuation	HIGH	HIGH
(4) Floodplain Access	MEDIUM	MEDIUM
(4) Wooded Riparian Buffer	HIGH	HIGH
(4) Microtopography	MEDIUM	MEDIUM
(3) Stream Stability	MEDIUM	MEDIUM
(4) Channel Stability	MEDIUM	MEDIUM
(4) Sediment Transport	MEDIUM	MEDIUM
(4) Stream Geomorphology	HIGH	HIGH
(2) Stream/Intertidal Zone Interaction	NA	NA
(2) Longitudinal Tidal Flow	NA	NA
(2) Tidal Marsh Stream Stability	NA	NA
(3) Tidal Marsh Channel Stability	NA	NA
(3) Tidal Marsh Stream Geomorphology	NA	NA
(1) Water Quality	LOW	LOW
(2) Baseflow	MEDIUM	MEDIUM
(2) Streamside Area Vegetation	MEDIUM	MEDIUM
(3) Upland Pollutant Filtration	LOW	LOW
(3) Thermoregulation	HIGH	HIGH
(2) Indicators of Stressors	YES	YES
(2) Aquatic Life Tolerance	LOW	NA
(2) Intertidal Zone Filtration	NA	NA
(1) Habitat	HIGH	HIGH
(2) In-stream Habitat	HIGH	HIGH
(3) Baseflow	MEDIUM	MEDIUM
(3) Substrate	MEDIUM	MEDIUM
(3) Stream Stability	MEDIUM	MEDIUM
(3) In-stream Habitat	HIGH	HIGH
(2) Stream-side Habitat	HIGH	HIGH
(3) Stream-side Habitat	HIGH	HIGH
(3) Thermoregulation	HIGH	HIGH
(2) Tidal Marsh In-stream Habitat	NA	NA
(3) Flow Restriction	NA	NA
(3) Tidal Marsh Stream Stability	NA	NA
(4) Tidal Marsh Channel Stability	NA	NA
(4) Tidal Marsh Stream Geomorphology	NA	NA
(3) Tidal Marsh In-stream Habitat	NA	NA
(2) Intertidal Zone Habitat	NA	NA
Overall	HIGH	HIGH

NC SAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 2.1

USACE AID #:	NCDWR #:
<p>INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if any supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.</p> <p>NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).</p>	
PROJECT / SITE INFORMATION:	
1. Project name (if any):	Catfish
2. Date of evaluation:	4/13/18
3. Applicant/owner name:	Wildland Eng
4. Assessor name/organization:	C. Lanza
5. County:	Durham
6. Nearest named water body	
7. River Basin:	Neuse
on USGS 7.5-minute quad: Mountain Creek	
8. Site coordinates (decimal degrees, at lower end of assessment reach):	
STREAM INFORMATION: (depth and width can be approximations)	
9. Site number (show on attached map):	Catfish R1-R2
10. Length of assessment reach evaluated (feet):	
11. Channel depth from bed (in riffle, if present) to top of bank (feet):	3 <input type="checkbox"/> Unable to assess channel depth.
12. Channel width at top of bank (feet):	3-5
13. Is assessment reach a swamp stream?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
14. Feature type:	<input checked="" type="checkbox"/> Perennial flow <input type="checkbox"/> Intermittent flow <input type="checkbox"/> Tidal Marsh Stream
STREAM RATING INFORMATION:	
15. NC SAM Zone:	<input type="checkbox"/> Mountains (M) <input checked="" type="checkbox"/> Piedmont (P) <input type="checkbox"/> Inner Coastal Plain (I) <input type="checkbox"/> Outer Coastal Plain (O)
16. Estimated geomorphic valley shape (skip for Tidal Marsh Stream):	<input checked="" type="checkbox"/> a (more sinuous stream, flatter valley slope) <input type="checkbox"/> b (less sinuous stream, steeper valley slope)
17. Watershed size: (skip for Tidal Marsh Stream)	<input checked="" type="checkbox"/> Size 1 (< 0.1 mi ²) <input type="checkbox"/> Size 2 (0.1 to < 0.5 mi ²) <input type="checkbox"/> Size 3 (0.5 to < 5 mi ²) <input type="checkbox"/> Size 4 (≥ 5 mi ²)
ADDITIONAL INFORMATION:	
18. Were regulatory considerations evaluated? <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, check all that apply to the assessment area.	
<input type="checkbox"/> Section 10 water <input type="checkbox"/> Classified Trout Waters <input type="checkbox"/> Water Supply Watershed (<input type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/> V) <input type="checkbox"/> Essential Fish Habitat <input type="checkbox"/> Primary Nursery Area <input type="checkbox"/> High Quality Waters/Outstanding Resource Waters <input type="checkbox"/> Publicly owned property <input type="checkbox"/> NCDWR riparian buffer rule in effect <input type="checkbox"/> Nutrient Sensitive Waters <input type="checkbox"/> Anadromous fish <input type="checkbox"/> 303(d) List <input type="checkbox"/> CAMA Area of Environmental Concern (AEC) <input type="checkbox"/> Documented presence of a federal and/or state listed protected species within the assessment area. List species: _____ <input type="checkbox"/> Designated Critical Habitat (list species): _____	
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? <input type="checkbox"/> Yes <input type="checkbox"/> No	

1. **Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)**
 - A Water throughout assessment reach.
 - B No flow, water in pools only.
 - C No water in assessment reach.
2. **Evidence of Flow Restriction – assessment reach metric**
 - A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is adversely affected by a flow restriction or fill to the point of obstructing flow or a channel choked with aquatic macrophytes or ponded water or impounded on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates).
 - B Not A
3. **Feature Pattern – assessment reach metric**
 - A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
 - B Not A.
4. **Feature Longitudinal Profile – assessment reach metric**
 - A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
 - B Not A
5. **Signs of Active Instability – assessment reach metric**
Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).
 - A < 10% of channel unstable
 - B 10 to 25% of channel unstable
 - C > 25% of channel unstable
6. **Streamside Area Interaction – streamside area metric**
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
<input type="radio"/> A	<input type="radio"/> A	Little or no evidence of conditions that adversely affect reference interaction
<input type="radio"/> B	<input type="radio"/> B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
<input type="radio"/> C	<input type="radio"/> C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] <u>or</u> too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) <u>or</u> floodplain/intertidal zone unnaturally absent <u>or</u> assessment reach is a man-made feature on an interstream divide
7. **Water Quality Stressors – assessment reach/intertidal zone metric**
Check all that apply.
 - A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
 - B Excessive sedimentation (burying of stream features or intertidal zone)

- C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
- D Odor (not including natural sulfide odors)
- E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in the "Notes/Sketch" section.
- F Livestock with access to stream or intertidal zone
- G Excessive algae in stream or intertidal zone
- H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc.)
- I Other: _____ (explain in "Notes/Sketch" section)
- J Little to no stressors

8. Recent Weather – watershed metric

For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.

- A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
- B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
- C No drought conditions

9 Large or Dangerous Stream – assessment reach metric

Yes No Is stream is too large or dangerous to assess? **If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).**

10. Natural In-stream Habitat Types – assessment reach metric

10a. Yes No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**

- | | | |
|---|--|---|
| <ul style="list-style-type: none"> <input checked="" type="checkbox"/> A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats) <input checked="" type="checkbox"/> B Multiple sticks and/or leaf packs and/or emergent vegetation <input type="checkbox"/> C Multiple snags and logs (including lap trees) <input type="checkbox"/> D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter <input type="checkbox"/> E Little or no habitat | Check for Tidal
Marsh Streams
only | <ul style="list-style-type: none"> <input type="checkbox"/> F 5% oysters or other natural hard bottoms <input type="checkbox"/> G Submerged aquatic vegetation <input type="checkbox"/> H Low-tide refugia (pools) <input type="checkbox"/> I Sand bottom <input type="checkbox"/> J 5% vertical bank along the marsh <input type="checkbox"/> K Little or no habitat |
|---|--|---|

*****REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS*****

11. Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

11a. Yes No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**

- A Riffle-run section (evaluate 11c)
- B Pool-glide section (evaluate 11d)
- C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffles sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain Streams and Tidal Marsh Streams).** Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Bedrock/saprolite
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Boulder (256 – 4096 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cobble (64 – 256 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gravel (2 – 64 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sand (.062 – 2 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Silt/clay (< 0.062 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Detritus
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Artificial (rip-rap, concrete, etc.)

11d. Yes No Are pools filled with sediment? **(skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**

12. Aquatic Life – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

12a. Yes No Was an in-stream aquatic life assessment performed as described in the User Manual?

If No, select one of the following reasons and skip to Metric 13. No Water Other: _____

12b. Yes No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

- 1 >1 Numbers over columns refer to "individuals" for size 1 and 2 streams and "taxa" for size 3 and 4 streams.
- Adult frogs
 - Aquatic reptiles
 - Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
 - Beetles (including water pennies)
 - Caddisfly larvae (Trichoptera [T])
 - Asian clam (*Corbicula*)
 - Crustacean (isopod/amphipod/crayfish/shrimp)
 - Damselfly and dragonfly larvae
 - Dipterans (true flies)
 - Mayfly larvae (Ephemeroptera [E])
 - Megaloptera (alderfly, fishfly, dobsonfly larvae)
 - Midges/mosquito larvae
 - Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
 - Mussels/Clams (not *Corbicula*)
 - Other fish
 - Salamanders/tadpoles
 - Snails
 - Stonefly larvae (Plecoptera [P])
 - Tipulid larvae

Worms/leeches

13. **Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)**
Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Little or no alteration to water storage capacity over a majority of the streamside area
<input type="checkbox"/> B	<input type="checkbox"/> B	Moderate alteration to water storage capacity over a majority of the streamside area
<input type="checkbox"/> C	<input type="checkbox"/> C	Severe alteration to water storage capacity over a majority of the streamside area (examples include: ditches, fill, soil, compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. **Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)**
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Majority of streamside area with depressions able to pond water \geq 6 inches deep
<input type="checkbox"/> B	<input type="checkbox"/> B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
<input type="checkbox"/> C	<input type="checkbox"/> C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. **Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)**

Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB	RB	
<input type="checkbox"/> Y	<input type="checkbox"/> Y	Are wetlands present in the streamside area?
<input type="checkbox"/> N	<input type="checkbox"/> N	

16. **Baseflow Contributors – assessment reach metric (skip for size 4 streams and Tidal Marsh Streams)**

Check all contributors within the assessment reach or within view of and draining to the assessment reach.

A Streams and/or springs (jurisdictional discharges)
 B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
 C Obstruction that passes some flow during low-flow periods within assessment area (beaver dam, bottom-release dam)
 D Evidence of bank seepage or sweating (iron oxidizing bacteria in water indicates seepage)
 E Stream bed or bank soil reduced (dig through deposited sediment if present)
 F None of the above

17. **Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)**

Check all that apply.

A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
 B Obstruction not passing flow during low flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
 C Urban stream (\geq 24% impervious surface for watershed)
 D Evidence that the stream-side area has been modified resulting in accelerated drainage into the assessment reach
 E Assessment reach relocated to valley edge
 F None of the above

18. **Shading – assessment reach metric (skip for Tidal Marsh Streams)**

Consider aspect. Consider "leaf-on" condition.

A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
 B Degraded (example: scattered trees)
 C Stream shading is gone or largely absent

19. **Buffer Width – streamside area metric (skip for Tidal Marsh Streams)**

Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated		Wooded		
LB	RB	LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	\geq 100-foot wide <u>or</u> extends to the edge of the watershed
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	From 50 to < 100-foot wide
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	From 30 to < 50-foot wide
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	From 10 to < 30-foot wide
<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	< 10-foot wide <u>or</u> no trees

20. **Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)**

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Mature forest
<input type="checkbox"/> B	<input type="checkbox"/> B	Non-mature woody vegetation <u>or</u> modified vegetation structure
<input type="checkbox"/> C	<input type="checkbox"/> C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
<input type="checkbox"/> D	<input type="checkbox"/> D	Maintained shrubs
<input type="checkbox"/> E	<input type="checkbox"/> E	Little or no vegetation

21. **Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)**

Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).

If none of the following stressors occurs on either bank, check here and skip to Metric 22:

Abuts		< 30 feet		30-50 feet		
LB	RB	LB	RB	LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	Row crops
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	Maintained turf
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	Pasture (no livestock)/commercial horticulture
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	Pasture (active livestock use)

22. **Stem Density – streamside area metric (skip for Tidal Marsh Streams)**

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Medium to high stem density
<input type="checkbox"/> B	<input type="checkbox"/> B	Low stem density
<input type="checkbox"/> C	<input type="checkbox"/> C	No wooded riparian buffer <u>or</u> predominantly herbaceous species <u>or</u> bare ground

23. **Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)**

Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10-feet wide.

LB RB

- A A The total length of buffer breaks is < 25 percent.
B B The total length of buffer breaks is between 25 and 50 percent.
C C The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – First 100 feet of streamside area metric (skip for Tidal Marsh Streams)

Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB RB

- A A Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
B B Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
C C Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)

25a. Yes No Was a conductivity measurement recorded?

If No, select one of the following reasons.

No Water

Other: _____

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).

A <46

B 46 to < 67

C 67 to < 79

D 79 to < 230

E ≥ 230

Notes/Sketch:

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name Catfish
 Stream Category Pa1

Date of Evaluation 4/13/18
 Assessor Name/Organization C.Lanza

Notes of Field Assessment Form (Y/N) NO
 Presence of regulatory considerations (Y/N) NO
 Additional stream information/supplementary measurements included (Y/N) _____
 NC SAM feature type (perennial, intermittent, Tidal Marsh Stream) Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	HIGH	
(2) Baseflow	MEDIUM	
(2) Flood Flow	HIGH	
(3) Streamside Area Attenuation	HIGH	
(4) Floodplain Access	MEDIUM	
(4) Wooded Riparian Buffer	HIGH	
(4) Microtopography	MEDIUM	
(3) Stream Stability	MEDIUM	
(4) Channel Stability	MEDIUM	
(4) Sediment Transport	MEDIUM	
(4) Stream Geomorphology	HIGH	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	MEDIUM	
(2) Baseflow	MEDIUM	
(2) Streamside Area Vegetation	MEDIUM	
(3) Upland Pollutant Filtration	LOW	
(3) Thermoregulation	HIGH	
(2) Indicators of Stressors	YES	
(2) Aquatic Life Tolerance	HIGH	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	HIGH	
(2) In-stream Habitat	MEDIUM	
(3) Baseflow	MEDIUM	
(3) Substrate	MEDIUM	
(3) Stream Stability	MEDIUM	
(3) In-stream Habitat	MEDIUM	
(2) Stream-side Habitat	HIGH	
(3) Stream-side Habitat	HIGH	
(3) Thermoregulation	HIGH	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	HIGH	

NC SAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 2.1

USACE AID #:	NCDWR #:
<p>INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if any supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.</p> <p>NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).</p>	
PROJECT / SITE INFORMATION:	
1. Project name (if any): <u>Catfish Pond</u>	2. Date of evaluation: <u>4/13/18</u>
3. Applicant/owner name: <u>Wildlands Eng.</u>	4. Assessor name/organization: <u>C.Lanza</u>
5. County: <u>Durham</u>	6. Nearest named water body
7. River Basin: <u>Neuse</u>	on USGS 7.5-minute quad: <u>Mountain Creek</u>
8. Site coordinates (decimal degrees, at lower end of assessment reach): _____	
STREAM INFORMATION: (depth and width can be approximations)	
9. Site number (show on attached map): <u>Catfish R3</u>	10. Length of assessment reach evaluated (feet): _____
11. Channel depth from bed (in riffle, if present) to top of bank (feet): <u>2</u>	<input type="checkbox"/> Unable to assess channel depth.
12. Channel width at top of bank (feet): <u>6</u>	13. Is assessment reach a swamp stream? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
14. Feature type: <input checked="" type="checkbox"/> Perennial flow <input type="checkbox"/> Intermittent flow <input type="checkbox"/> Tidal Marsh Stream	
STREAM RATING INFORMATION:	
15. NC SAM Zone: <input type="checkbox"/> Mountains (M) <input checked="" type="checkbox"/> Piedmont (P) <input type="checkbox"/> Inner Coastal Plain (I) <input type="checkbox"/> Outer Coastal Plain (O)	
16. Estimated geomorphic valley shape (skip for Tidal Marsh Stream): <input checked="" type="checkbox"/> a (more sinuous stream, flatter valley slope) <input type="checkbox"/> b (less sinuous stream, steeper valley slope)	
17. Watershed size: (skip for Tidal Marsh Stream) <input checked="" type="checkbox"/> Size 1 (< 0.1 mi ²) <input type="checkbox"/> Size 2 (0.1 to < 0.5 mi ²) <input type="checkbox"/> Size 3 (0.5 to < 5 mi ²) <input type="checkbox"/> Size 4 (≥ 5 mi ²)	
ADDITIONAL INFORMATION:	
18. Were regulatory considerations evaluated? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes, check all that apply to the assessment area.	
<input type="checkbox"/> Section 10 water	<input type="checkbox"/> Classified Trout Waters
<input type="checkbox"/> Essential Fish Habitat	<input type="checkbox"/> Primary Nursery Area
<input type="checkbox"/> Publicly owned property	<input type="checkbox"/> NCDWR riparian buffer rule in effect
<input type="checkbox"/> Anadromous fish	<input type="checkbox"/> 303(d) List
<input type="checkbox"/> Documented presence of a federal and/or state listed protected species within the assessment area.	<input type="checkbox"/> Water Supply Watershed (<input type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/> V)
<input type="checkbox"/> Nutrient Sensitive Waters	<input type="checkbox"/> High Quality Waters/Outstanding Resource Waters
<input type="checkbox"/> CAMA Area of Environmental Concern (AEC)	<input type="checkbox"/> CAMA Area of Environmental Concern (AEC)
List species: _____	
<input type="checkbox"/> Designated Critical Habitat (list species): _____	
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? <input type="checkbox"/> Yes <input type="checkbox"/> No	

1. **Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)**
 - A Water throughout assessment reach.
 - B No flow, water in pools only.
 - C No water in assessment reach.

2. **Evidence of Flow Restriction – assessment reach metric**
 - A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is adversely affected by a flow restriction or fill to the point of obstructing flow or a channel choked with aquatic macrophytes or ponded water or impounded on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates).
 - B Not A

3. **Feature Pattern – assessment reach metric**
 - A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
 - B Not A.

4. **Feature Longitudinal Profile – assessment reach metric**
 - A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
 - B Not A

5. **Signs of Active Instability – assessment reach metric**
Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).
 - A < 10% of channel unstable
 - B 10 to 25% of channel unstable
 - C > 25% of channel unstable

6. **Streamside Area Interaction – streamside area metric**
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
<input type="radio"/> A	<input type="radio"/> A	Little or no evidence of conditions that adversely affect reference interaction
<input type="radio"/> B	<input type="radio"/> B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
<input type="radio"/> C	<input type="radio"/> C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] <u>or</u> too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) <u>or</u> floodplain/intertidal zone unnaturally absent <u>or</u> assessment reach is a man-made feature on an interstream divide

7. **Water Quality Stressors – assessment reach/intertidal zone metric**
Check all that apply.
 - A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
 - B Excessive sedimentation (burying of stream features or intertidal zone)

- C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
- D Odor (not including natural sulfide odors)
- E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in the "Notes/Sketch" section.
- F Livestock with access to stream or intertidal zone
- G Excessive algae in stream or intertidal zone
- H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc.)
- I Other: _____ (explain in "Notes/Sketch" section)
- J Little to no stressors

8. Recent Weather – watershed metric

For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.

- A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
- B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
- C No drought conditions

9. Large or Dangerous Stream – assessment reach metric

Yes No Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).

10. Natural In-stream Habitat Types – assessment reach metric

10a. Yes No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) (evaluate for size 4 Coastal Plain streams only, then skip to Metric 12)

10b. Check all that occur (occurs if > 5% coverage of assessment reach) (skip for Size 4 Coastal Plain streams)

- | | | |
|---|------------------------------------|---|
| <ul style="list-style-type: none"> <input type="checkbox"/> A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats) <input checked="" type="checkbox"/> B Multiple sticks and/or leaf packs and/or emergent vegetation <input type="checkbox"/> C Multiple snags and logs (including lap trees) <input checked="" type="checkbox"/> D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter <input type="checkbox"/> E Little or no habitat | Check for Tidal Marsh Streams only | <ul style="list-style-type: none"> <input type="checkbox"/> F 5% oysters or other natural hard bottoms <input type="checkbox"/> G Submerged aquatic vegetation <input type="checkbox"/> H Low-tide refugia (pools) <input type="checkbox"/> I Sand bottom <input type="checkbox"/> J 5% vertical bank along the marsh <input type="checkbox"/> K Little or no habitat |
|---|------------------------------------|---|

*****REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS*****

11. Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

11a. Yes No Is assessment reach in a natural sand-bed stream? (skip for Coastal Plain streams)

11b. Bedform evaluated. Check the appropriate box(es).

- A Riffle-run section (evaluate 11c)
- B Pool-glide section (evaluate 11d)
- C Natural bedform absent (skip to Metric 12, Aquatic Life)

11c. In riffles sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. Check at least one box in each row (skip for Size 4 Coastal Plain Streams and Tidal Marsh Streams). Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Bedrock/saprolite
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Boulder (256 – 4096 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cobble (64 – 256 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gravel (2 – 64 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sand (.062 – 2 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Silt/clay (< 0.062 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Detritus
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Artificial (rip-rap, concrete, etc.)

11d. Yes No Are pools filled with sediment? (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

12. Aquatic Life – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

12a. Yes No Was an in-stream aquatic life assessment performed as described in the User Manual?

If No, select one of the following reasons and skip to Metric 13. No Water Other: _____

12b. Yes No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

- 1 >1 Numbers over columns refer to "individuals" for size 1 and 2 streams and "taxa" for size 3 and 4 streams.
- Adult frogs
 - Aquatic reptiles
 - Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
 - Beetles (including water pennies)
 - Caddisfly larvae (Trichoptera [T])
 - Asian clam (*Corbicula*)
 - Crustacean (isopod/amphipod/crayfish/shrimp)
 - Damselfly and dragonfly larvae
 - Dipterans (true flies)
 - Mayfly larvae (Ephemeroptera [E])
 - Megaloptera (alderfly, fishfly, dobsonfly larvae)
 - Midges/mosquito larvae
 - Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
 - Mussels/Clams (not *Corbicula*)
 - Other fish
 - Salamanders/tadpoles
 - Snails
 - Stonefly larvae (Plecoptera [P])
 - Tipulid larvae

Worms/leeches

13. **Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)**
Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Little or no alteration to water storage capacity over a majority of the streamside area
<input type="checkbox"/> B	<input type="checkbox"/> B	Moderate alteration to water storage capacity over a majority of the streamside area
<input type="checkbox"/> C	<input type="checkbox"/> C	Severe alteration to water storage capacity over a majority of the streamside area (examples include: ditches, fill, soil, compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. **Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)**
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Majority of streamside area with depressions able to pond water \geq 6 inches deep
<input type="checkbox"/> B	<input type="checkbox"/> B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
<input type="checkbox"/> C	<input type="checkbox"/> C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. **Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)**

Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB	RB	
<input type="checkbox"/> Y	<input type="checkbox"/> Y	Are wetlands present in the streamside area?
<input type="checkbox"/> N	<input type="checkbox"/> N	

16. **Baseflow Contributors – assessment reach metric (skip for size 4 streams and Tidal Marsh Streams)**

Check all contributors within the assessment reach or within view of and draining to the assessment reach.

A Streams and/or springs (jurisdictional discharges)
 B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
 C Obstruction that passes some flow during low-flow periods within assessment area (beaver dam, bottom-release dam)
 D Evidence of bank seepage or sweating (iron oxidizing bacteria in water indicates seepage)
 E Stream bed or bank soil reduced (dig through deposited sediment if present)
 F None of the above

17. **Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)**

Check all that apply.

A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
 B Obstruction not passing flow during low flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
 C Urban stream (\geq 24% impervious surface for watershed)
 D Evidence that the stream-side area has been modified resulting in accelerated drainage into the assessment reach
 E Assessment reach relocated to valley edge
 F None of the above

18. **Shading – assessment reach metric (skip for Tidal Marsh Streams)**

Consider aspect. Consider "leaf-on" condition.

A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
 B Degraded (example: scattered trees)
 C Stream shading is gone or largely absent

19. **Buffer Width – streamside area metric (skip for Tidal Marsh Streams)**

Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated		Wooded		
LB	RB	LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	\geq 100-feet wide <u>or</u> extends to the edge of the watershed
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	From 50 to < 100-feet wide
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	From 30 to < 50-feet wide
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	From 10 to < 30-feet wide
<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	< 10-feet wide <u>or</u> no trees

20. **Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)**

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Mature forest
<input type="checkbox"/> B	<input type="checkbox"/> B	Non-mature woody vegetation <u>or</u> modified vegetation structure
<input type="checkbox"/> C	<input type="checkbox"/> C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
<input type="checkbox"/> D	<input type="checkbox"/> D	Maintained shrubs
<input type="checkbox"/> E	<input type="checkbox"/> E	Little or no vegetation

21. **Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)**

Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).

If none of the following stressors occurs on either bank, check here and skip to Metric 22:

Abuts		< 30 feet		30-50 feet		
LB	RB	LB	RB	LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	Row crops
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	Maintained turf
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	Pasture (no livestock)/commercial horticulture
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	Pasture (active livestock use)

22. **Stem Density – streamside area metric (skip for Tidal Marsh Streams)**

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Medium to high stem density
<input type="checkbox"/> B	<input type="checkbox"/> B	Low stem density
<input type="checkbox"/> C	<input type="checkbox"/> C	No wooded riparian buffer <u>or</u> predominantly herbaceous species <u>or</u> bare ground

23. **Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)**

Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10-feet wide.

LB RB

- A A The total length of buffer breaks is < 25 percent.
B B The total length of buffer breaks is between 25 and 50 percent.
C C The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – First 100 feet of streamside area metric (skip for Tidal Marsh Streams)

Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB RB

- A A Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
B B Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
C C Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)

25a. Yes No Was a conductivity measurement recorded?

If No, select one of the following reasons.

No Water

Other: _____

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).

A <46

B 46 to < 67

C 67 to < 79

D 79 to < 230

E ≥ 230

Notes/Sketch:

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name Catfish Pond
 Stream Category Pa1

Date of Evaluation 4/13/18
 Assessor Name/Organization C.Lanza

Notes of Field Assessment Form (Y/N) NO
 Presence of regulatory considerations (Y/N) NO
 Additional stream information/supplementary measurements included (Y/N) _____
 NC SAM feature type (perennial, intermittent, Tidal Marsh Stream) Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	LOW	
(2) Baseflow	MEDIUM	
(2) Flood Flow	LOW	
(3) Streamside Area Attenuation	MEDIUM	
(4) Floodplain Access	MEDIUM	
(4) Wooded Riparian Buffer	MEDIUM	
(4) Microtopography	LOW	
(3) Stream Stability	LOW	
(4) Channel Stability	LOW	
(4) Sediment Transport	LOW	
(4) Stream Geomorphology	MEDIUM	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	LOW	
(2) Baseflow	MEDIUM	
(2) Streamside Area Vegetation	MEDIUM	
(3) Upland Pollutant Filtration	LOW	
(3) Thermoregulation	HIGH	
(2) Indicators of Stressors	YES	
(2) Aquatic Life Tolerance	LOW	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	LOW	
(2) In-stream Habitat	LOW	
(3) Baseflow	MEDIUM	
(3) Substrate	LOW	
(3) Stream Stability	LOW	
(3) In-stream Habitat	MEDIUM	
(2) Stream-side Habitat	HIGH	
(3) Stream-side Habitat	HIGH	
(3) Thermoregulation	HIGH	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	LOW	

NC SAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 2.1

USACE AID #: _____ NCDWR #: _____

INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if any supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.

NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).

PROJECT / SITE INFORMATION:

1. Project name (if any): Catfish Pond 2. Date of evaluation: 4/13/18
3. Applicant/owner name: Wildlands Eng 4. Assessor name/organization: C. Lanza
5. County: Durham 6. Nearest named water body: _____
7. River Basin: Neuse on USGS 7.5-minute quad: Mountain Creek
8. Site coordinates (decimal degrees, at lower end of assessment reach): _____

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): Catfish R4 10. Length of assessment reach evaluated (feet): _____
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 3 ft Unable to assess channel depth.
12. Channel width at top of bank (feet): 13 ft 13. Is assessment reach a swamp stream? Yes No
14. Feature type: Perennial flow Intermittent flow Tidal Marsh Stream

STREAM RATING INFORMATION:

15. NC SAM Zone: Mountains (M) Piedmont (P) Inner Coastal Plain (I) Outer Coastal Plain (O)

16. Estimated geomorphic valley shape (skip for Tidal Marsh Stream): a (more sinuous stream, flatter valley slope) b (less sinuous stream, steeper valley slope)
17. Watershed size: (skip for Tidal Marsh Stream) Size 1 (< 0.1 mi²) Size 2 (0.1 to < 0.5 mi²) Size 3 (0.5 to < 5 mi²) Size 4 (≥ 5 mi²)

ADDITIONAL INFORMATION:

18. Were regulatory considerations evaluated? Yes No If Yes, check all that apply to the assessment area.
 Section 10 water Classified Trout Waters Water Supply Watershed (I II III IV V)
 Essential Fish Habitat Primary Nursery Area High Quality Waters/Outstanding Resource Waters
 Publicly owned property NCDWR riparian buffer rule in effect Nutrient Sensitive Waters
 Anadromous fish 303(d) List CAMA Area of Environmental Concern (AEC)
 Documented presence of a federal and/or state listed protected species within the assessment area.
List species: _____
 Designated Critical Habitat (list species): _____
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? Yes No

1. **Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)**
- A Water throughout assessment reach.
 - B No flow, water in pools only.
 - C No water in assessment reach.
2. **Evidence of Flow Restriction – assessment reach metric**
- A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is adversely affected by a flow restriction or fill to the point of obstructing flow or a channel choked with aquatic macrophytes or ponded water or impounded on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates).
 - B Not A
3. **Feature Pattern – assessment reach metric**
- A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
 - B Not A.
4. **Feature Longitudinal Profile – assessment reach metric**
- A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
 - B Not A
5. **Signs of Active Instability – assessment reach metric**
Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).
- A < 10% of channel unstable
 - B 10 to 25% of channel unstable
 - C > 25% of channel unstable
6. **Streamside Area Interaction – streamside area metric**
Consider for the Left Bank (LB) and the Right Bank (RB).
- | | | |
|------------------------------------|------------------------------------|---|
| LB | RB | |
| <input checked="" type="radio"/> A | <input checked="" type="radio"/> A | Little or no evidence of conditions that adversely affect reference interaction |
| <input type="radio"/> B | <input type="radio"/> B | Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching]) |
| <input type="radio"/> C | <input type="radio"/> C | Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] <u>or</u> too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) <u>or</u> floodplain/intertidal zone unnaturally absent <u>or</u> assessment reach is a man-made feature on an interstream divide |
7. **Water Quality Stressors – assessment reach/intertidal zone metric**
Check all that apply.
- A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
 - B Excessive sedimentation (burying of stream features or intertidal zone)

- C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
- D Odor (not including natural sulfide odors)
- E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in the "Notes/Sketch" section.
- F Livestock with access to stream or intertidal zone
- G Excessive algae in stream or intertidal zone
- H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc.)
- I Other: _____ (explain in "Notes/Sketch" section)
- J Little to no stressors

8. Recent Weather – watershed metric

For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.

- A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
- B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
- C No drought conditions

9 Large or Dangerous Stream – assessment reach metric

Yes No Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).

10. Natural In-stream Habitat Types – assessment reach metric

10a. Yes No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) (evaluate for size 4 Coastal Plain streams only, then skip to Metric 12)

10b. Check all that occur (occurs if > 5% coverage of assessment reach) (skip for Size 4 Coastal Plain streams)

- | | | |
|--|------------------------------------|---|
| <ul style="list-style-type: none"> <input checked="" type="checkbox"/> A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats) <input checked="" type="checkbox"/> B Multiple sticks and/or leaf packs and/or emergent vegetation <input checked="" type="checkbox"/> C Multiple snags and logs (including lap trees) <input type="checkbox"/> D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter <input type="checkbox"/> E Little or no habitat | Check for Tidal Marsh Streams only | <ul style="list-style-type: none"> <input type="checkbox"/> F 5% oysters or other natural hard bottoms <input type="checkbox"/> G Submerged aquatic vegetation <input type="checkbox"/> H Low-tide refugia (pools) <input type="checkbox"/> I Sand bottom <input type="checkbox"/> J 5% vertical bank along the marsh <input type="checkbox"/> K Little or no habitat |
|--|------------------------------------|---|

*****REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS*****

11. Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

11a. Yes No Is assessment reach in a natural sand-bed stream? (skip for Coastal Plain streams)

11b. Bedform evaluated. Check the appropriate box(es).

- A Riffle-run section (evaluate 11c)
- B Pool-glide section (evaluate 11d)
- C Natural bedform absent (skip to Metric 12, Aquatic Life)

11c. In riffles sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. Check at least one box in each row (skip for Size 4 Coastal Plain Streams and Tidal Marsh Streams). Not Present (NP) = absent. Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Bedrock/saprolite
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Boulder (256 – 4096 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cobble (64 – 256 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gravel (2 – 64 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sand (.062 – 2 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Silt/clay (< 0.062 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Detritus
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Artificial (rip-rap, concrete, etc.)

11d. Yes No Are pools filled with sediment? (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

12. Aquatic Life – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

12a. Yes No Was an in-stream aquatic life assessment performed as described in the User Manual?

If No, select one of the following reasons and skip to Metric 13. No Water Other: _____

12b. Yes No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

- 1 >1 Numbers over columns refer to "individuals" for size 1 and 2 streams and "taxa" for size 3 and 4 streams.
- Adult frogs
 - Aquatic reptiles
 - Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
 - Beetles (including water pennies)
 - Caddisfly larvae (Trichoptera [T])
 - Asian clam (*Corbicula*)
 - Crustacean (isopod/amphipod/crayfish/shrimp)
 - Damselfly and dragonfly larvae
 - Dipterans (true flies)
 - Mayfly larvae (Ephemeroptera [E])
 - Megaloptera (alderfly, fishfly, dobsonfly larvae)
 - Midge/mosquito larvae
 - Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
 - Mussels/Clams (not *Corbicula*)
 - Other fish
 - Salamanders/tadpoles
 - Snails
 - Stonefly larvae (Plecoptera [P])
 - Tipulid larvae

Worms/leeches

13. **Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)**
Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB		RB		
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	Little or no alteration to water storage capacity over a majority of the streamside area
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	Moderate alteration to water storage capacity over a majority of the streamside area
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	Severe alteration to water storage capacity over a majority of the streamside area (examples include: ditches, fill, soil, compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. **Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)**
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB		RB		
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	Majority of streamside area with depressions able to pond water \geq 6 inches deep
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. **Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)**

Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB		RB		
<input type="checkbox"/> Y	<input type="checkbox"/> Y	<input type="checkbox"/> Y	<input type="checkbox"/> Y	Are wetlands present in the streamside area?
<input type="checkbox"/> N	<input type="checkbox"/> N	<input type="checkbox"/> N	<input type="checkbox"/> N	

16. **Baseflow Contributors – assessment reach metric (skip for size 4 streams and Tidal Marsh Streams)**

Check all contributors within the assessment reach or within view of and draining to the assessment reach.

- A Streams and/or springs (jurisdictional discharges)
- B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
- C Obstruction that passes some flow during low-flow periods within assessment area (beaver dam, bottom-release dam)
- D Evidence of bank seepage or sweating (iron oxidizing bacteria in water indicates seepage)
- E Stream bed or bank soil reduced (dig through deposited sediment if present)
- F None of the above

17. **Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)**

Check all that apply.

- A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
- B Obstruction not passing flow during low flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
- C Urban stream (\geq 24% impervious surface for watershed)
- D Evidence that the stream-side area has been modified resulting in accelerated drainage into the assessment reach
- E Assessment reach relocated to valley edge
- F None of the above

18. **Shading – assessment reach metric (skip for Tidal Marsh Streams)**

Consider aspect. Consider "leaf-on" condition.

- A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
- B Degraded (example: scattered trees)
- C Stream shading is gone or largely absent

19. **Buffer Width – streamside area metric (skip for Tidal Marsh Streams)**

Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated		Wooded		
LB	RB	LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	\geq 100-feet wide <u>or</u> extends to the edge of the watershed
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	From 50 to < 100-feet wide
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	From 30 to < 50-feet wide
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	From 10 to < 30-feet wide
<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	< 10-feet wide <u>or</u> no trees

20. **Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)**

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB		RB		
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	Mature forest
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	Non-mature woody vegetation <u>or</u> modified vegetation structure
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	Maintained shrubs
<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	Little or no vegetation

21. **Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)**

Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).

If none of the following stressors occurs on either bank, check here and skip to Metric 22:

Abuts		< 30 feet		30-50 feet		
LB	RB	LB	RB	LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	Row crops
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	Maintained turf
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	Pasture (no livestock)/commercial horticulture
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	Pasture (active livestock use)

22. **Stem Density – streamside area metric (skip for Tidal Marsh Streams)**

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB		RB		
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	Medium to high stem density
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	Low stem density
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	No wooded riparian buffer <u>or</u> predominantly herbaceous species <u>or</u> bare ground

23. **Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)**

Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10-feet wide.

LB RB

- A A The total length of buffer breaks is < 25 percent.
 B B The total length of buffer breaks is between 25 and 50 percent.
 C C The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – First 100 feet of streamside area metric (skip for Tidal Marsh Streams)

Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB RB

- A A Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
 B B Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
 C C Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)

25a. Yes No Was a conductivity measurement recorded?

If No, select one of the following reasons.

No Water

Other: _____

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).

A <46

B 46 to < 67

C 67 to < 79

D 79 to < 230

E ≥ 230

Notes/Sketch:

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name Catfish Pond
 Stream Category Pa1

Date of Evaluation 4/13/18
 Assessor Name/Organization C.Lanza

Notes of Field Assessment Form (Y/N) NO
 Presence of regulatory considerations (Y/N) NO
 Additional stream information/supplementary measurements included (Y/N) _____
 NC SAM feature type (perennial, intermittent, Tidal Marsh Stream) Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	HIGH	
(2) Baseflow	HIGH	
(2) Flood Flow	HIGH	
(3) Streamside Area Attenuation	HIGH	
(4) Floodplain Access	HIGH	
(4) Wooded Riparian Buffer	HIGH	
(4) Microtopography	MEDIUM	
(3) Stream Stability	HIGH	
(4) Channel Stability	HIGH	
(4) Sediment Transport	HIGH	
(4) Stream Geomorphology	HIGH	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	MEDIUM	
(2) Baseflow	HIGH	
(2) Streamside Area Vegetation	MEDIUM	
(3) Upland Pollutant Filtration	LOW	
(3) Thermoregulation	HIGH	
(2) Indicators of Stressors	YES	
(2) Aquatic Life Tolerance	HIGH	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	HIGH	
(2) In-stream Habitat	HIGH	
(3) Baseflow	HIGH	
(3) Substrate	HIGH	
(3) Stream Stability	HIGH	
(3) In-stream Habitat	HIGH	
(2) Stream-side Habitat	HIGH	
(3) Stream-side Habitat	HIGH	
(3) Thermoregulation	HIGH	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	HIGH	

NC SAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 2.1

USACE AID #:	NCDWR #:
<p>INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if any supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.</p> <p>NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).</p>	
PROJECT / SITE INFORMATION:	
1. Project name (if any): <u>Catfish Pond</u>	2. Date of evaluation: <u>4/13/18</u>
3. Applicant/owner name: <u>Wildlands Eng</u>	4. Assessor name/organization: <u>C.Lanza</u>
5. County: <u>Durham</u>	6. Nearest named water body
7. River Basin: <u>Neuse</u>	on USGS 7.5-minute quad: <u>Mountain Creek</u>
8. Site coordinates (decimal degrees, at lower end of assessment reach): _____	
STREAM INFORMATION: (depth and width can be approximations)	
9. Site number (show on attached map): <u>Catfish R6</u>	10. Length of assessment reach evaluated (feet): _____
11. Channel depth from bed (in riffle, if present) to top of bank (feet): <u>3.5</u>	<input type="checkbox"/> Unable to assess channel depth.
12. Channel width at top of bank (feet): <u>23</u>	13. Is assessment reach a swamp stream? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
14. Feature type: <input checked="" type="checkbox"/> Perennial flow <input type="checkbox"/> Intermittent flow <input type="checkbox"/> Tidal Marsh Stream	
STREAM RATING INFORMATION:	
15. NC SAM Zone: <input type="checkbox"/> Mountains (M) <input checked="" type="checkbox"/> Piedmont (P) <input type="checkbox"/> Inner Coastal Plain (I) <input type="checkbox"/> Outer Coastal Plain (O)	
16. Estimated geomorphic valley shape (skip for Tidal Marsh Stream):	
<input checked="" type="checkbox"/> a (more sinuous stream, flatter valley slope)	<input type="checkbox"/> b (less sinuous stream, steeper valley slope)
17. Watershed size: (skip for Tidal Marsh Stream)	
<input type="checkbox"/> Size 1 (< 0.1 mi ²)	<input checked="" type="checkbox"/> Size 2 (0.1 to < 0.5 mi ²)
<input type="checkbox"/> Size 3 (0.5 to < 5 mi ²)	<input type="checkbox"/> Size 4 (≥ 5 mi ²)
ADDITIONAL INFORMATION:	
18. Were regulatory considerations evaluated? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes, check all that apply to the assessment area.	
<input type="checkbox"/> Section 10 water	<input type="checkbox"/> Classified Trout Waters
<input type="checkbox"/> Essential Fish Habitat	<input type="checkbox"/> Primary Nursery Area
<input type="checkbox"/> Publicly owned property	<input type="checkbox"/> NCDWR riparian buffer rule in effect
<input type="checkbox"/> Anadromous fish	<input type="checkbox"/> 303(d) List
<input type="checkbox"/> Documented presence of a federal and/or state listed protected species within the assessment area.	<input type="checkbox"/> Water Supply Watershed (<input type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/> V)
<input type="checkbox"/> Nutrient Sensitive Waters	<input type="checkbox"/> High Quality Waters/Outstanding Resource Waters
<input type="checkbox"/> CAMA Area of Environmental Concern (AEC)	<input type="checkbox"/> CAMA Area of Environmental Concern (AEC)
List species: _____	
<input type="checkbox"/> Designated Critical Habitat (list species): _____	
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? <input type="checkbox"/> Yes <input type="checkbox"/> No	

1. **Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)**
 - A Water throughout assessment reach.
 - B No flow, water in pools only.
 - C No water in assessment reach.

2. **Evidence of Flow Restriction – assessment reach metric**
 - A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is adversely affected by a flow restriction or fill to the point of obstructing flow or a channel choked with aquatic macrophytes or ponded water or impounded on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates).
 - B Not A

3. **Feature Pattern – assessment reach metric**
 - A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
 - B Not A.

4. **Feature Longitudinal Profile – assessment reach metric**
 - A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
 - B Not A

5. **Signs of Active Instability – assessment reach metric**
Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).
 - A < 10% of channel unstable
 - B 10 to 25% of channel unstable
 - C > 25% of channel unstable

6. **Streamside Area Interaction – streamside area metric**
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
<input checked="" type="radio"/> A	<input checked="" type="radio"/> A	Little or no evidence of conditions that adversely affect reference interaction
<input type="radio"/> B	<input type="radio"/> B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
<input type="radio"/> C	<input type="radio"/> C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] <u>or</u> too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) <u>or</u> floodplain/intertidal zone unnaturally absent <u>or</u> assessment reach is a man-made feature on an interstream divide

7. **Water Quality Stressors – assessment reach/intertidal zone metric**
Check all that apply.
 - A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
 - B Excessive sedimentation (burying of stream features or intertidal zone)

- C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
- D Odor (not including natural sulfide odors)
- E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in the "Notes/Sketch" section.
- F Livestock with access to stream or intertidal zone
- G Excessive algae in stream or intertidal zone
- H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc.)
- I Other: _____ (explain in "Notes/Sketch" section)
- J Little to no stressors

8. Recent Weather – watershed metric

For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.

- A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
- B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
- C No drought conditions

9 Large or Dangerous Stream – assessment reach metric

Yes No Is stream is too large or dangerous to assess? **If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).**

10. Natural In-stream Habitat Types – assessment reach metric

10a. Yes No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**

- | | | |
|---|------------------------------------|---|
| <ul style="list-style-type: none"> <input type="checkbox"/> A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats) <input checked="" type="checkbox"/> B Multiple sticks and/or leaf packs and/or emergent vegetation <input checked="" type="checkbox"/> C Multiple snags and logs (including lap trees) <input type="checkbox"/> D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter <input type="checkbox"/> E Little or no habitat | Check for Tidal Marsh Streams only | <ul style="list-style-type: none"> <input type="checkbox"/> F 5% oysters or other natural hard bottoms <input type="checkbox"/> G Submerged aquatic vegetation <input type="checkbox"/> H Low-tide refugia (pools) <input type="checkbox"/> I Sand bottom <input type="checkbox"/> J 5% vertical bank along the marsh <input type="checkbox"/> K Little or no habitat |
|---|------------------------------------|---|

*****REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS*****

11. Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

11a. Yes No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**

- A Riffle-run section (evaluate 11c)
- B Pool-glide section (evaluate 11d)
- C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffles sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain Streams and Tidal Marsh Streams).** Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Bedrock/saprolite
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Boulder (256 – 4096 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cobble (64 – 256 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gravel (2 – 64 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sand (.062 – 2 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Silt/clay (< 0.062 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Detritus
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Artificial (rip-rap, concrete, etc.)

11d. Yes No Are pools filled with sediment? **(skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**

12. Aquatic Life – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

12a. Yes No Was an in-stream aquatic life assessment performed as described in the User Manual?

If No, select one of the following reasons and skip to Metric 13. No Water Other: _____

12b. Yes No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

- 1 >1 Numbers over columns refer to "individuals" for size 1 and 2 streams and "taxa" for size 3 and 4 streams.
- Adult frogs
 - Aquatic reptiles
 - Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
 - Beetles (including water pennies)
 - Caddisfly larvae (Trichoptera [T])
 - Asian clam (*Corbicula*)
 - Crustacean (isopod/amphipod/crayfish/shrimp)
 - Damselfly and dragonfly larvae
 - Dipterans (true flies)
 - Mayfly larvae (Ephemeroptera [E])
 - Megaloptera (alderfly, fishfly, dobsonfly larvae)
 - Midges/mosquito larvae
 - Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
 - Mussels/Clams (not *Corbicula*)
 - Other fish
 - Salamanders/tadpoles
 - Snails
 - Stonefly larvae (Plecoptera [P])
 - Tipulid larvae

Worms/leeches

13. **Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)**
Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Little or no alteration to water storage capacity over a majority of the streamside area
<input type="checkbox"/> B	<input type="checkbox"/> B	Moderate alteration to water storage capacity over a majority of the streamside area
<input type="checkbox"/> C	<input type="checkbox"/> C	Severe alteration to water storage capacity over a majority of the streamside area (examples include: ditches, fill, soil, compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. **Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)**
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Majority of streamside area with depressions able to pond water \geq 6 inches deep
<input type="checkbox"/> B	<input type="checkbox"/> B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
<input type="checkbox"/> C	<input type="checkbox"/> C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. **Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)**

Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB	RB	
<input type="checkbox"/> Y	<input type="checkbox"/> Y	Are wetlands present in the streamside area?
<input type="checkbox"/> N	<input type="checkbox"/> N	

16. **Baseflow Contributors – assessment reach metric (skip for size 4 streams and Tidal Marsh Streams)**

Check all contributors within the assessment reach or within view of and draining to the assessment reach.

A Streams and/or springs (jurisdictional discharges)
 B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
 C Obstruction that passes some flow during low-flow periods within assessment area (beaver dam, bottom-release dam)
 D Evidence of bank seepage or sweating (iron oxidizing bacteria in water indicates seepage)
 E Stream bed or bank soil reduced (dig through deposited sediment if present)
 F None of the above

17. **Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)**

Check all that apply.

A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
 B Obstruction not passing flow during low flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
 C Urban stream (\geq 24% impervious surface for watershed)
 D Evidence that the stream-side area has been modified resulting in accelerated drainage into the assessment reach
 E Assessment reach relocated to valley edge
 F None of the above

18. **Shading – assessment reach metric (skip for Tidal Marsh Streams)**

Consider aspect. Consider "leaf-on" condition.

A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
 B Degraded (example: scattered trees)
 C Stream shading is gone or largely absent

19. **Buffer Width – streamside area metric (skip for Tidal Marsh Streams)**

Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated		Wooded		
LB	RB	LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	\geq 100-feet wide <u>or</u> extends to the edge of the watershed
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	From 50 to < 100-feet wide
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	From 30 to < 50-feet wide
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	From 10 to < 30-feet wide
<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	< 10-feet wide <u>or</u> no trees

20. **Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)**

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Mature forest
<input type="checkbox"/> B	<input type="checkbox"/> B	Non-mature woody vegetation <u>or</u> modified vegetation structure
<input type="checkbox"/> C	<input type="checkbox"/> C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
<input type="checkbox"/> D	<input type="checkbox"/> D	Maintained shrubs
<input type="checkbox"/> E	<input type="checkbox"/> E	Little or no vegetation

21. **Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)**

Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).

If none of the following stressors occurs on either bank, check here and skip to Metric 22:

Abuts		< 30 feet		30-50 feet		
LB	RB	LB	RB	LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	Row crops
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	Maintained turf
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	Pasture (no livestock)/commercial horticulture
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	Pasture (active livestock use)

22. **Stem Density – streamside area metric (skip for Tidal Marsh Streams)**

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Medium to high stem density
<input type="checkbox"/> B	<input type="checkbox"/> B	Low stem density
<input type="checkbox"/> C	<input type="checkbox"/> C	No wooded riparian buffer <u>or</u> predominantly herbaceous species <u>or</u> bare ground

23. **Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)**

Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10-feet wide.

LB RB

- A A The total length of buffer breaks is < 25 percent.
B B The total length of buffer breaks is between 25 and 50 percent.
C C The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – First 100 feet of streamside area metric (skip for Tidal Marsh Streams)

Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB RB

- A A Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
B B Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
C C Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)

25a. Yes No Was a conductivity measurement recorded?

If No, select one of the following reasons.

No Water

Other: _____

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).

A <46

B 46 to < 67

C 67 to < 79

D 79 to < 230

E ≥ 230

Notes/Sketch:

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name Catfish Pond
 Stream Category Pa2

Date of Evaluation 4/13/18
 Assessor Name/Organization C.Lanza

Notes of Field Assessment Form (Y/N) NO
 Presence of regulatory considerations (Y/N) NO
 Additional stream information/supplementary measurements included (Y/N) _____
 NC SAM feature type (perennial, intermittent, Tidal Marsh Stream) Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	HIGH	
(2) Baseflow	HIGH	
(2) Flood Flow	HIGH	
(3) Streamside Area Attenuation	HIGH	
(4) Floodplain Access	HIGH	
(4) Wooded Riparian Buffer	MEDIUM	
(4) Microtopography	LOW	
(3) Stream Stability	MEDIUM	
(4) Channel Stability	MEDIUM	
(4) Sediment Transport	HIGH	
(4) Stream Geomorphology	MEDIUM	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	LOW	
(2) Baseflow	HIGH	
(2) Streamside Area Vegetation	MEDIUM	
(3) Upland Pollutant Filtration	LOW	
(3) Thermoregulation	HIGH	
(2) Indicators of Stressors	YES	
(2) Aquatic Life Tolerance	MEDIUM	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	HIGH	
(2) In-stream Habitat	HIGH	
(3) Baseflow	HIGH	
(3) Substrate	HIGH	
(3) Stream Stability	MEDIUM	
(3) In-stream Habitat	HIGH	
(2) Stream-side Habitat	HIGH	
(3) Stream-side Habitat	HIGH	
(3) Thermoregulation	HIGH	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	HIGH	

NC SAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 2.1

USACE AID #:	NCDWR #:
INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if any supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.	
NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).	
PROJECT / SITE INFORMATION:	
1. Project name (if any): <u>Catfish Pond</u>	2. Date of evaluation: <u>4/13/18</u>
3. Applicant/owner name: <u>Wildlands Eng.</u>	4. Assessor name/organization: <u>C.Lanza</u>
5. County: <u>Durham</u>	6. Nearest named water body
7. River Basin: <u>Neuse</u>	on USGS 7.5-minute quad: <u>Mountain Creek</u>
8. Site coordinates (decimal degrees, at lower end of assessment reach):	
STREAM INFORMATION: (depth and width can be approximations)	
9. Site number (show on attached map): <u>Mountain Crib</u>	10. Length of assessment reach evaluated (feet):
11. Channel depth from bed (in riffle, if present) to top of bank (feet): <u>1</u>	<input type="checkbox"/> Unable to assess channel depth.
12. Channel width at top of bank (feet): <u>4</u>	13. Is assessment reach a swamp stream? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
14. Feature type: <input type="checkbox"/> Perennial flow <input checked="" type="checkbox"/> Intermittent flow <input type="checkbox"/> Tidal Marsh Stream	
STREAM RATING INFORMATION:	
15. NC SAM Zone: <input type="checkbox"/> Mountains (M) <input checked="" type="checkbox"/> Piedmont (P) <input type="checkbox"/> Inner Coastal Plain (I) <input type="checkbox"/> Outer Coastal Plain (O)	
16. Estimated geomorphic valley shape (skip for Tidal Marsh Stream): <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <input checked="" type="checkbox"/> a (more sinuous stream, flatter valley slope) </div> <div style="text-align: center;"> <input type="checkbox"/> b (less sinuous stream, steeper valley slope) </div> </div>	
17. Watershed size: (skip for Tidal Marsh Stream) <input checked="" type="checkbox"/> Size 1 (< 0.1 mi ²) <input type="checkbox"/> Size 2 (0.1 to < 0.5 mi ²) <input type="checkbox"/> Size 3 (0.5 to < 5 mi ²) <input type="checkbox"/> Size 4 (≥ 5 mi ²)	
ADDITIONAL INFORMATION:	
18. Were regulatory considerations evaluated? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes, check all that apply to the assessment area.	
<input type="checkbox"/> Section 10 water <input type="checkbox"/> Classified Trout Waters <input type="checkbox"/> Water Supply Watershed (<input type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/> V) <input type="checkbox"/> Essential Fish Habitat <input type="checkbox"/> Primary Nursery Area <input type="checkbox"/> High Quality Waters/Outstanding Resource Waters <input type="checkbox"/> Publicly owned property <input type="checkbox"/> NCDWR riparian buffer rule in effect <input type="checkbox"/> Nutrient Sensitive Waters <input type="checkbox"/> Anadromous fish <input type="checkbox"/> 303(d) List <input type="checkbox"/> CAMA Area of Environmental Concern (AEC) <input type="checkbox"/> Documented presence of a federal and/or state listed protected species within the assessment area. List species: _____ <input type="checkbox"/> Designated Critical Habitat (list species): _____	
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? <input type="checkbox"/> Yes <input type="checkbox"/> No	

1. **Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)**
 - A Water throughout assessment reach.
 - B No flow, water in pools only.
 - C No water in assessment reach.

2. **Evidence of Flow Restriction – assessment reach metric**
 - A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is adversely affected by a flow restriction or fill to the point of obstructing flow or a channel choked with aquatic macrophytes or ponded water or impounded on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates).
 - B Not A

3. **Feature Pattern – assessment reach metric**
 - A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
 - B Not A.

4. **Feature Longitudinal Profile – assessment reach metric**
 - A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
 - B Not A

5. **Signs of Active Instability – assessment reach metric**
Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).
 - A < 10% of channel unstable
 - B 10 to 25% of channel unstable
 - C > 25% of channel unstable

6. **Streamside Area Interaction – streamside area metric**
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Little or no evidence of conditions that adversely affect reference interaction
<input type="checkbox"/> B	<input type="checkbox"/> B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
<input type="checkbox"/> C	<input type="checkbox"/> C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] <u>or</u> too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) <u>or</u> floodplain/intertidal zone unnaturally absent <u>or</u> assessment reach is a man-made feature on an interstream divide

7. **Water Quality Stressors – assessment reach/intertidal zone metric**
Check all that apply.
 - A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
 - B Excessive sedimentation (burying of stream features or intertidal zone)

- C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
- D Odor (not including natural sulfide odors)
- E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in the "Notes/Sketch" section.
- F Livestock with access to stream or intertidal zone
- G Excessive algae in stream or intertidal zone
- H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc.)
- I Other: _____ (explain in "Notes/Sketch" section)
- J Little to no stressors

8. Recent Weather – watershed metric

For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.

- A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
- B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
- C No drought conditions

9 Large or Dangerous Stream – assessment reach metric

Yes No Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).

10. Natural In-stream Habitat Types – assessment reach metric

10a. Yes No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) (evaluate for size 4 Coastal Plain streams only, then skip to Metric 12)

10b. Check all that occur (occurs if > 5% coverage of assessment reach) (skip for Size 4 Coastal Plain streams)

- | | | |
|--|------------------------------------|---|
| <ul style="list-style-type: none"> <input checked="" type="checkbox"/> A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats) <input checked="" type="checkbox"/> B Multiple sticks and/or leaf packs and/or emergent vegetation <input checked="" type="checkbox"/> C Multiple snags and logs (including lap trees) <input type="checkbox"/> D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter <input type="checkbox"/> E Little or no habitat | Check for Tidal Marsh Streams only | <ul style="list-style-type: none"> <input type="checkbox"/> F 5% oysters or other natural hard bottoms <input type="checkbox"/> G Submerged aquatic vegetation <input type="checkbox"/> H Low-tide refugia (pools) <input type="checkbox"/> I Sand bottom <input type="checkbox"/> J 5% vertical bank along the marsh <input type="checkbox"/> K Little or no habitat |
|--|------------------------------------|---|

*****REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS*****

11. Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

11a. Yes No Is assessment reach in a natural sand-bed stream? (skip for Coastal Plain streams)

11b. Bedform evaluated. Check the appropriate box(es).

- A Riffle-run section (evaluate 11c)
- B Pool-glide section (evaluate 11d)
- C Natural bedform absent (skip to Metric 12, Aquatic Life)

11c. In riffles sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. Check at least one box in each row (skip for Size 4 Coastal Plain Streams and Tidal Marsh Streams). Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Bedrock/saprolite
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Boulder (256 – 4096 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cobble (64 – 256 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gravel (2 – 64 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sand (.062 – 2 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Silt/clay (< 0.062 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Detritus
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Artificial (rip-rap, concrete, etc.)

11d. Yes No Are pools filled with sediment? (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

12. Aquatic Life – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

12a. Yes No Was an in-stream aquatic life assessment performed as described in the User Manual?

If No, select one of the following reasons and skip to Metric 13. No Water Other: _____

12b. Yes No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

- 1 >1 Numbers over columns refer to "individuals" for size 1 and 2 streams and "taxa" for size 3 and 4 streams.
- Adult frogs
 - Aquatic reptiles
 - Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
 - Beetles (including water pennies)
 - Caddisfly larvae (Trichoptera [T])
 - Asian clam (*Corbicula*)
 - Crustacean (isopod/amphipod/crayfish/shrimp)
 - Damselfly and dragonfly larvae
 - Dipterans (true flies)
 - Mayfly larvae (Ephemeroptera [E])
 - Megaloptera (alderfly, fishfly, dobsonfly larvae)
 - Midges/mosquito larvae
 - Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
 - Mussels/Clams (not *Corbicula*)
 - Other fish
 - Salamanders/tadpoles
 - Snails
 - Stonefly larvae (Plecoptera [P])
 - Tipulid larvae

Worms/leeches

13. **Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)**
Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Little or no alteration to water storage capacity over a majority of the streamside area
<input type="checkbox"/> B	<input type="checkbox"/> B	Moderate alteration to water storage capacity over a majority of the streamside area
<input type="checkbox"/> C	<input type="checkbox"/> C	Severe alteration to water storage capacity over a majority of the streamside area (examples include: ditches, fill, soil, compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. **Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)**
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Majority of streamside area with depressions able to pond water \geq 6 inches deep
<input type="checkbox"/> B	<input type="checkbox"/> B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
<input type="checkbox"/> C	<input type="checkbox"/> C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. **Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)**

Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB	RB	
<input type="checkbox"/> Y	<input type="checkbox"/> Y	Are wetlands present in the streamside area?
<input type="checkbox"/> N	<input type="checkbox"/> N	

16. **Baseflow Contributors – assessment reach metric (skip for size 4 streams and Tidal Marsh Streams)**

Check all contributors within the assessment reach or within view of and draining to the assessment reach.

A Streams and/or springs (jurisdictional discharges)
 B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
 C Obstruction that passes some flow during low-flow periods within assessment area (beaver dam, bottom-release dam)
 D Evidence of bank seepage or sweating (iron oxidizing bacteria in water indicates seepage)
 E Stream bed or bank soil reduced (dig through deposited sediment if present)
 F None of the above

17. **Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)**

Check all that apply.

A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
 B Obstruction not passing flow during low flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
 C Urban stream (\geq 24% impervious surface for watershed)
 D Evidence that the stream-side area has been modified resulting in accelerated drainage into the assessment reach
 E Assessment reach relocated to valley edge
 F None of the above

18. **Shading – assessment reach metric (skip for Tidal Marsh Streams)**

Consider aspect. Consider "leaf-on" condition.

A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
 B Degraded (example: scattered trees)
 C Stream shading is gone or largely absent

19. **Buffer Width – streamside area metric (skip for Tidal Marsh Streams)**

Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated		Wooded		
LB	RB	LB	RB	
<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	\geq 100-foot wide <u>or</u> extends to the edge of the watershed
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	From 50 to < 100-foot wide
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	From 30 to < 50-foot wide
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	From 10 to < 30-foot wide
<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	< 10-foot wide <u>or</u> no trees

20. **Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)**

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Mature forest
<input type="checkbox"/> B	<input type="checkbox"/> B	Non-mature woody vegetation <u>or</u> modified vegetation structure
<input type="checkbox"/> C	<input type="checkbox"/> C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
<input type="checkbox"/> D	<input type="checkbox"/> D	Maintained shrubs
<input type="checkbox"/> E	<input type="checkbox"/> E	Little or no vegetation

21. **Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)**

Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).

If none of the following stressors occurs on either bank, check here and skip to Metric 22:

Abuts		< 30 feet		30-50 feet		
LB	RB	LB	RB	LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	Row crops
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	Maintained turf
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	Pasture (no livestock)/commercial horticulture
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	Pasture (active livestock use)

22. **Stem Density – streamside area metric (skip for Tidal Marsh Streams)**

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Medium to high stem density
<input type="checkbox"/> B	<input type="checkbox"/> B	Low stem density
<input type="checkbox"/> C	<input type="checkbox"/> C	No wooded riparian buffer <u>or</u> predominantly herbaceous species <u>or</u> bare ground

23. **Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)**

Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10-feet wide.

LB RB

- A A The total length of buffer breaks is < 25 percent.
B B The total length of buffer breaks is between 25 and 50 percent.
C C The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – First 100 feet of streamside area metric (skip for Tidal Marsh Streams)

Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB RB

- A A Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
B B Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
C C Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)

25a. Yes No Was a conductivity measurement recorded?

If No, select one of the following reasons.

No Water

Other: _____

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).

A <46

B 46 to < 67

C 67 to < 79

D 79 to < 230

E ≥ 230

Notes/Sketch:

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name Catfish Pond
 Stream Category Pa1

Date of Evaluation 4/13/18
 Assessor Name/Organization C.Lanza

Notes of Field Assessment Form (Y/N) NO
 Presence of regulatory considerations (Y/N) NO
 Additional stream information/supplementary measurements included (Y/N) _____
 NC SAM feature type (perennial, intermittent, Tidal Marsh Stream) Intermittent

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	MEDIUM	MEDIUM
(2) Baseflow	MEDIUM	MEDIUM
(2) Flood Flow	MEDIUM	MEDIUM
(3) Streamside Area Attenuation	MEDIUM	MEDIUM
(4) Floodplain Access	MEDIUM	MEDIUM
(4) Wooded Riparian Buffer	MEDIUM	MEDIUM
(4) Microtopography	MEDIUM	MEDIUM
(3) Stream Stability	MEDIUM	MEDIUM
(4) Channel Stability	MEDIUM	MEDIUM
(4) Sediment Transport	MEDIUM	MEDIUM
(4) Stream Geomorphology	HIGH	HIGH
(2) Stream/Intertidal Zone Interaction	NA	NA
(2) Longitudinal Tidal Flow	NA	NA
(2) Tidal Marsh Stream Stability	NA	NA
(3) Tidal Marsh Channel Stability	NA	NA
(3) Tidal Marsh Stream Geomorphology	NA	NA
(1) Water Quality	MEDIUM	MEDIUM
(2) Baseflow	MEDIUM	MEDIUM
(2) Streamside Area Vegetation	MEDIUM	MEDIUM
(3) Upland Pollutant Filtration	LOW	LOW
(3) Thermoregulation	HIGH	HIGH
(2) Indicators of Stressors	YES	YES
(2) Aquatic Life Tolerance	HIGH	NA
(2) Intertidal Zone Filtration	NA	NA
(1) Habitat		HIGH
(2) In-stream Habitat		HIGH
(3) Baseflow	MEDIUM	MEDIUM
(3) Substrate		
(3) Stream Stability	MEDIUM	MEDIUM
(3) In-stream Habitat	HIGH	HIGH
(2) Stream-side Habitat	HIGH	HIGH
(3) Stream-side Habitat	HIGH	HIGH
(3) Thermoregulation	HIGH	HIGH
(2) Tidal Marsh In-stream Habitat	NA	NA
(3) Flow Restriction	NA	NA
(3) Tidal Marsh Stream Stability	NA	NA
(4) Tidal Marsh Channel Stability	NA	NA
(4) Tidal Marsh Stream Geomorphology	NA	NA
(3) Tidal Marsh In-stream Habitat	NA	NA
(2) Intertidal Zone Habitat	NA	NA
Overall		HIGH

NC SAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 2.1

USACE AID #:	NCDWR #:
<p>INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if any supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.</p> <p>NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).</p>	
PROJECT / SITE INFORMATION:	
1. Project name (if any): <u>Catfish Pond</u>	2. Date of evaluation: <u>4/13/18</u>
3. Applicant/owner name: <u>Wildlands Eng</u>	4. Assessor name/organization: <u>C.Lanza</u>
5. County: <u>Durham</u>	6. Nearest named water body
7. River Basin: <u>Neuse</u>	on USGS 7.5-minute quad: <u>Mountain Creek</u>
8. Site coordinates (decimal degrees, at lower end of assessment reach): _____	
STREAM INFORMATION: (depth and width can be approximations)	
9. Site number (show on attached map): <u>UT1 R1</u>	10. Length of assessment reach evaluated (feet): _____
11. Channel depth from bed (in riffle, if present) to top of bank (feet): <u>1.5-2.5</u>	<input type="checkbox"/> Unable to assess channel depth.
12. Channel width at top of bank (feet): <u>10-15</u>	13. Is assessment reach a swamp stream? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
14. Feature type: <input checked="" type="checkbox"/> Perennial flow <input type="checkbox"/> Intermittent flow <input type="checkbox"/> Tidal Marsh Stream	
STREAM RATING INFORMATION:	
15. NC SAM Zone: <input type="checkbox"/> Mountains (M) <input checked="" type="checkbox"/> Piedmont (P) <input type="checkbox"/> Inner Coastal Plain (I) <input type="checkbox"/> Outer Coastal Plain (O)	
16. Estimated geomorphic valley shape (skip for Tidal Marsh Stream):	
<input checked="" type="checkbox"/> a (more sinuous stream, flatter valley slope)	<input type="checkbox"/> b (less sinuous stream, steeper valley slope)
17. Watershed size: (skip for Tidal Marsh Stream)	
<input checked="" type="checkbox"/> Size 1 (< 0.1 mi ²)	<input type="checkbox"/> Size 2 (0.1 to < 0.5 mi ²)
<input type="checkbox"/> Size 3 (0.5 to < 5 mi ²)	<input type="checkbox"/> Size 4 (≥ 5 mi ²)
ADDITIONAL INFORMATION:	
18. Were regulatory considerations evaluated? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes, check all that apply to the assessment area.	
<input type="checkbox"/> Section 10 water	<input type="checkbox"/> Classified Trout Waters
<input type="checkbox"/> Essential Fish Habitat	<input type="checkbox"/> Primary Nursery Area
<input type="checkbox"/> Publicly owned property	<input type="checkbox"/> NCDWR riparian buffer rule in effect
<input type="checkbox"/> Anadromous fish	<input type="checkbox"/> 303(d) List
<input type="checkbox"/> Documented presence of a federal and/or state listed protected species within the assessment area.	<input type="checkbox"/> Water Supply Watershed (<input type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/> V)
<input type="checkbox"/> Nutrient Sensitive Waters	<input type="checkbox"/> High Quality Waters/Outstanding Resource Waters
<input type="checkbox"/> CAMA Area of Environmental Concern (AEC)	<input type="checkbox"/> CAMA Area of Environmental Concern (AEC)
List species: _____	
<input type="checkbox"/> Designated Critical Habitat (list species): _____	
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? <input type="checkbox"/> Yes <input type="checkbox"/> No	

1. **Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)**
 - A Water throughout assessment reach.
 - B No flow, water in pools only.
 - C No water in assessment reach.

2. **Evidence of Flow Restriction – assessment reach metric**
 - A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is adversely affected by a flow restriction or fill to the point of obstructing flow or a channel choked with aquatic macrophytes or ponded water or impounded on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates).
 - B Not A

3. **Feature Pattern – assessment reach metric**
 - A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
 - B Not A.

4. **Feature Longitudinal Profile – assessment reach metric**
 - A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
 - B Not A

5. **Signs of Active Instability – assessment reach metric**
Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).
 - A < 10% of channel unstable
 - B 10 to 25% of channel unstable
 - C > 25% of channel unstable

6. **Streamside Area Interaction – streamside area metric**
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
<input checked="" type="radio"/> A	<input checked="" type="radio"/> A	Little or no evidence of conditions that adversely affect reference interaction
<input type="radio"/> B	<input type="radio"/> B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
<input type="radio"/> C	<input type="radio"/> C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] <u>or</u> too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) <u>or</u> floodplain/intertidal zone unnaturally absent <u>or</u> assessment reach is a man-made feature on an interstream divide

7. **Water Quality Stressors – assessment reach/intertidal zone metric**
Check all that apply.
 - A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
 - B Excessive sedimentation (burying of stream features or intertidal zone)

- C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
- D Odor (not including natural sulfide odors)
- E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in the "Notes/Sketch" section.
- F Livestock with access to stream or intertidal zone
- G Excessive algae in stream or intertidal zone
- H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc.)
- I Other: _____ (explain in "Notes/Sketch" section)
- J Little to no stressors

8. Recent Weather – watershed metric

For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.

- A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
- B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
- C No drought conditions

9 Large or Dangerous Stream – assessment reach metric

Yes No Is stream is too large or dangerous to assess? **If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).**

10. Natural In-stream Habitat Types – assessment reach metric

10a. Yes No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**

- | | | |
|---|------------------------------------|---|
| <ul style="list-style-type: none"> <input type="checkbox"/> A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats) <input checked="" type="checkbox"/> B Multiple sticks and/or leaf packs and/or emergent vegetation <input type="checkbox"/> C Multiple snags and logs (including lap trees) <input checked="" type="checkbox"/> D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter <input type="checkbox"/> E Little or no habitat | Check for Tidal Marsh Streams only | <ul style="list-style-type: none"> <input type="checkbox"/> F 5% oysters or other natural hard bottoms <input type="checkbox"/> G Submerged aquatic vegetation <input type="checkbox"/> H Low-tide refugia (pools) <input type="checkbox"/> I Sand bottom <input type="checkbox"/> J 5% vertical bank along the marsh <input type="checkbox"/> K Little or no habitat |
|---|------------------------------------|---|

*****REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS*****

11. Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

11a. Yes No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**

- A Riffle-run section (evaluate 11c)
- B Pool-glide section (evaluate 11d)
- C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffles sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain Streams and Tidal Marsh Streams).** Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Bedrock/saprolite
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Boulder (256 – 4096 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cobble (64 – 256 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gravel (2 – 64 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sand (.062 – 2 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Silt/clay (< 0.062 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Detritus
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Artificial (rip-rap, concrete, etc.)

11d. Yes No Are pools filled with sediment? **(skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**

12. Aquatic Life – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

12a. Yes No Was an in-stream aquatic life assessment performed as described in the User Manual?

If No, select one of the following reasons and skip to Metric 13. No Water Other: _____

12b. Yes No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

- 1 >1 Numbers over columns refer to "individuals" for size 1 and 2 streams and "taxa" for size 3 and 4 streams.
- Adult frogs
 - Aquatic reptiles
 - Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
 - Beetles (including water pennies)
 - Caddisfly larvae (Trichoptera [T])
 - Asian clam (*Corbicula*)
 - Crustacean (isopod/amphipod/crayfish/shrimp)
 - Damselfly and dragonfly larvae
 - Dipterans (true flies)
 - Mayfly larvae (Ephemeroptera [E])
 - Megaloptera (alderfly, fishfly, dobsonfly larvae)
 - Midges/mosquito larvae
 - Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
 - Mussels/Clams (not *Corbicula*)
 - Other fish
 - Salamanders/tadpoles
 - Snails
 - Stonefly larvae (Plecoptera [P])
 - Tipulid larvae

Worms/leeches

13. **Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)**
Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB		RB		
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	Little or no alteration to water storage capacity over a majority of the streamside area
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	Moderate alteration to water storage capacity over a majority of the streamside area
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	Severe alteration to water storage capacity over a majority of the streamside area (examples include: ditches, fill, soil, compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. **Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)**
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB		RB		
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	Majority of streamside area with depressions able to pond water \geq 6 inches deep
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. **Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)**

Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB		RB		
<input type="checkbox"/> Y	<input type="checkbox"/> Y	<input type="checkbox"/> Y	<input type="checkbox"/> Y	Are wetlands present in the streamside area?
<input type="checkbox"/> N	<input type="checkbox"/> N	<input type="checkbox"/> N	<input type="checkbox"/> N	

16. **Baseflow Contributors – assessment reach metric (skip for size 4 streams and Tidal Marsh Streams)**

Check all contributors within the assessment reach or within view of and draining to the assessment reach.

A Streams and/or springs (jurisdictional discharges)
 B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
 C Obstruction that passes some flow during low-flow periods within assessment area (beaver dam, bottom-release dam)
 D Evidence of bank seepage or sweating (iron oxidizing bacteria in water indicates seepage)
 E Stream bed or bank soil reduced (dig through deposited sediment if present)
 F None of the above

17. **Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)**

Check all that apply.

A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
 B Obstruction not passing flow during low flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
 C Urban stream (\geq 24% impervious surface for watershed)
 D Evidence that the stream-side area has been modified resulting in accelerated drainage into the assessment reach
 E Assessment reach relocated to valley edge
 F None of the above

18. **Shading – assessment reach metric (skip for Tidal Marsh Streams)**

Consider aspect. Consider "leaf-on" condition.

A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
 B Degraded (example: scattered trees)
 C Stream shading is gone or largely absent

19. **Buffer Width – streamside area metric (skip for Tidal Marsh Streams)**

Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated		Wooded		
LB	RB	LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	\geq 100-foot wide <u>or</u> extends to the edge of the watershed
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	From 50 to < 100-foot wide
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	From 30 to < 50-foot wide
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	From 10 to < 30-foot wide
<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	< 10-foot wide <u>or</u> no trees

20. **Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)**

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB		RB		
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	Mature forest
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	Non-mature woody vegetation <u>or</u> modified vegetation structure
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	Maintained shrubs
<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	Little or no vegetation

21. **Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)**

Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).

If none of the following stressors occurs on either bank, check here and skip to Metric 22:

Abuts		< 30 feet		30-50 feet		
LB	RB	LB	RB	LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	Row crops
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	Maintained turf
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	Pasture (no livestock)/commercial horticulture
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	Pasture (active livestock use)

22. **Stem Density – streamside area metric (skip for Tidal Marsh Streams)**

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB		RB		
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	Medium to high stem density
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	Low stem density
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	No wooded riparian buffer <u>or</u> predominantly herbaceous species <u>or</u> bare ground

23. **Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)**

Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10-feet wide.

LB RB

- A A The total length of buffer breaks is < 25 percent.
B B The total length of buffer breaks is between 25 and 50 percent.
C C The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – First 100 feet of streamside area metric (skip for Tidal Marsh Streams)

Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB RB

- A A Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
B B Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
C C Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)

25a. Yes No Was a conductivity measurement recorded?

If No, select one of the following reasons.

No Water

Other: _____

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).

A <46

B 46 to < 67

C 67 to < 79

D 79 to < 230

E ≥ 230

Notes/Sketch:

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name Catfish Pond
 Stream Category Pa1

Date of Evaluation 4/13/18
 Assessor Name/Organization C.Lanza

Notes of Field Assessment Form (Y/N) NO
 Presence of regulatory considerations (Y/N) NO
 Additional stream information/supplementary measurements included (Y/N) _____
 NC SAM feature type (perennial, intermittent, Tidal Marsh Stream) Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	LOW	
(2) Baseflow	MEDIUM	
(2) Flood Flow	LOW	
(3) Streamside Area Attenuation	LOW	
(4) Floodplain Access	MEDIUM	
(4) Wooded Riparian Buffer	LOW	
(4) Microtopography	LOW	
(3) Stream Stability	LOW	
(4) Channel Stability	LOW	
(4) Sediment Transport	LOW	
(4) Stream Geomorphology	MEDIUM	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	LOW	
(2) Baseflow	MEDIUM	
(2) Streamside Area Vegetation	MEDIUM	
(3) Upland Pollutant Filtration	LOW	
(3) Thermoregulation	HIGH	
(2) Indicators of Stressors	YES	
(2) Aquatic Life Tolerance	MEDIUM	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	LOW	
(2) In-stream Habitat	LOW	
(3) Baseflow	MEDIUM	
(3) Substrate	LOW	
(3) Stream Stability	LOW	
(3) In-stream Habitat	MEDIUM	
(2) Stream-side Habitat	MEDIUM	
(3) Stream-side Habitat	LOW	
(3) Thermoregulation	HIGH	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	LOW	

NC SAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 2.1

USACE AID #:	NCDWR #:
<p>INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if any supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.</p> <p>NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).</p>	
PROJECT / SITE INFORMATION:	
1. Project name (if any): <u>Catfish Pond</u>	2. Date of evaluation: <u>4/13/18</u>
3. Applicant/owner name: <u>Wildlands Eng</u>	4. Assessor name/organization: <u>C.Lanza</u>
5. County: <u>Durham</u>	6. Nearest named water body
7. River Basin: <u>Neuse</u>	on USGS 7.5-minute quad: <u>Mountain Creek</u>
8. Site coordinates (decimal degrees, at lower end of assessment reach): _____	
STREAM INFORMATION: (depth and width can be approximations)	
9. Site number (show on attached map): <u>UT1 R2</u>	10. Length of assessment reach evaluated (feet): _____
11. Channel depth from bed (in riffle, if present) to top of bank (feet): <u>.25</u> <input type="checkbox"/> Unable to assess channel depth.	
12. Channel width at top of bank (feet): <u>10</u>	
13. Is assessment reach a swamp stream? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
14. Feature type: <input checked="" type="checkbox"/> Perennial flow <input type="checkbox"/> Intermittent flow <input type="checkbox"/> Tidal Marsh Stream	
STREAM RATING INFORMATION:	
15. NC SAM Zone: <input type="checkbox"/> Mountains (M) <input checked="" type="checkbox"/> Piedmont (P) <input type="checkbox"/> Inner Coastal Plain (I) <input type="checkbox"/> Outer Coastal Plain (O)	
16. Estimated geomorphic valley shape (skip for Tidal Marsh Stream): <input checked="" type="checkbox"/> a (more sinuous stream, flatter valley slope) <input type="checkbox"/> b (less sinuous stream, steeper valley slope)	
17. Watershed size: (skip for Tidal Marsh Stream) <input checked="" type="checkbox"/> Size 1 (< 0.1 mi ²) <input type="checkbox"/> Size 2 (0.1 to < 0.5 mi ²) <input type="checkbox"/> Size 3 (0.5 to < 5 mi ²) <input type="checkbox"/> Size 4 (≥ 5 mi ²)	
ADDITIONAL INFORMATION:	
18. Were regulatory considerations evaluated? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes, check all that apply to the assessment area.	
<input type="checkbox"/> Section 10 water	<input type="checkbox"/> Classified Trout Waters
<input type="checkbox"/> Essential Fish Habitat	<input type="checkbox"/> Primary Nursery Area
<input type="checkbox"/> Publicly owned property	<input type="checkbox"/> NCDWR riparian buffer rule in effect
<input type="checkbox"/> Anadromous fish	<input type="checkbox"/> 303(d) List
<input type="checkbox"/> Documented presence of a federal and/or state listed protected species within the assessment area.	<input type="checkbox"/> Water Supply Watershed (<input type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/> V)
<input type="checkbox"/> Nutrient Sensitive Waters	<input type="checkbox"/> High Quality Waters/Outstanding Resource Waters
<input type="checkbox"/> CAMA Area of Environmental Concern (AEC)	<input type="checkbox"/> CAMA Area of Environmental Concern (AEC)
List species: _____	
<input type="checkbox"/> Designated Critical Habitat (list species): _____	
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? <input type="checkbox"/> Yes <input type="checkbox"/> No	

1. **Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)**
 - A Water throughout assessment reach.
 - B No flow, water in pools only.
 - C No water in assessment reach.

2. **Evidence of Flow Restriction – assessment reach metric**
 - A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is adversely affected by a flow restriction or fill to the point of obstructing flow or a channel choked with aquatic macrophytes or ponded water or impounded on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates).
 - B Not A

3. **Feature Pattern – assessment reach metric**
 - A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
 - B Not A.

4. **Feature Longitudinal Profile – assessment reach metric**
 - A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
 - B Not A

5. **Signs of Active Instability – assessment reach metric**
Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).
 - A < 10% of channel unstable
 - B 10 to 25% of channel unstable
 - C > 25% of channel unstable

6. **Streamside Area Interaction – streamside area metric**
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
<input type="radio"/> A	<input type="radio"/> A	Little or no evidence of conditions that adversely affect reference interaction
<input type="radio"/> B	<input type="radio"/> B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
<input checked="" type="radio"/> C	<input checked="" type="radio"/> C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] <u>or</u> too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) <u>or</u> floodplain/intertidal zone unnaturally absent <u>or</u> assessment reach is a man-made feature on an interstream divide

7. **Water Quality Stressors – assessment reach/intertidal zone metric**
Check all that apply.
 - A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
 - B Excessive sedimentation (burying of stream features or intertidal zone)

- C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
- D Odor (not including natural sulfide odors)
- E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in the "Notes/Sketch" section.
- F Livestock with access to stream or intertidal zone
- G Excessive algae in stream or intertidal zone
- H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc.)
- I Other: _____ (explain in "Notes/Sketch" section)
- J Little to no stressors

8. Recent Weather – watershed metric

For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.

- A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
- B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
- C No drought conditions

9 Large or Dangerous Stream – assessment reach metric

Yes No Is stream is too large or dangerous to assess? **If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).**

10. Natural In-stream Habitat Types – assessment reach metric

10a. Yes No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**

- | | | |
|--|------------------------------------|---|
| <ul style="list-style-type: none"> <input type="checkbox"/> A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats) <input type="checkbox"/> B Multiple sticks and/or leaf packs and/or emergent vegetation <input type="checkbox"/> C Multiple snags and logs (including lap trees) <input type="checkbox"/> D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter <input checked="" type="checkbox"/> E Little or no habitat | Check for Tidal Marsh Streams only | <ul style="list-style-type: none"> <input type="checkbox"/> F 5% oysters or other natural hard bottoms <input type="checkbox"/> G Submerged aquatic vegetation <input type="checkbox"/> H Low-tide refugia (pools) <input type="checkbox"/> I Sand bottom <input type="checkbox"/> J 5% vertical bank along the marsh <input type="checkbox"/> K Little or no habitat |
|--|------------------------------------|---|

*****REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS*****

11. Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

11a. Yes No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**

- A Riffle-run section (evaluate 11c)
- B Pool-glide section (evaluate 11d)
- C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffles sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain Streams and Tidal Marsh Streams).** Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Bedrock/saprolite
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Boulder (256 – 4096 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cobble (64 – 256 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gravel (2 – 64 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sand (.062 – 2 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Silt/clay (< 0.062 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Detritus
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Artificial (rip-rap, concrete, etc.)

11d. Yes No Are pools filled with sediment? **(skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**

12. Aquatic Life – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

12a. Yes No Was an in-stream aquatic life assessment performed as described in the User Manual?

If No, select one of the following reasons and skip to Metric 13. No Water Other: _____

12b. Yes No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

- 1 >1 Numbers over columns refer to "individuals" for size 1 and 2 streams and "taxa" for size 3 and 4 streams.
- Adult frogs
 - Aquatic reptiles
 - Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
 - Beetles (including water pennies)
 - Caddisfly larvae (Trichoptera [T])
 - Asian clam (*Corbicula*)
 - Crustacean (isopod/amphipod/crayfish/shrimp)
 - Damselfly and dragonfly larvae
 - Dipterans (true flies)
 - Mayfly larvae (Ephemeroptera [E])
 - Megaloptera (alderfly, fishfly, dobsonfly larvae)
 - Midges/mosquito larvae
 - Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
 - Mussels/Clams (not *Corbicula*)
 - Other fish
 - Salamanders/tadpoles
 - Snails
 - Stonefly larvae (Plecoptera [P])
 - Tipulid larvae

Worms/leeches

13. **Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)**
Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Little or no alteration to water storage capacity over a majority of the streamside area
<input type="checkbox"/> B	<input type="checkbox"/> B	Moderate alteration to water storage capacity over a majority of the streamside area
<input type="checkbox"/> C	<input type="checkbox"/> C	Severe alteration to water storage capacity over a majority of the streamside area (examples include: ditches, fill, soil, compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. **Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)**
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Majority of streamside area with depressions able to pond water \geq 6 inches deep
<input type="checkbox"/> B	<input type="checkbox"/> B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
<input type="checkbox"/> C	<input type="checkbox"/> C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. **Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)**

Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB	RB	
<input type="checkbox"/> Y	<input type="checkbox"/> Y	Are wetlands present in the streamside area?
<input type="checkbox"/> N	<input type="checkbox"/> N	

16. **Baseflow Contributors – assessment reach metric (skip for size 4 streams and Tidal Marsh Streams)**

Check all contributors within the assessment reach or within view of and draining to the assessment reach.

A Streams and/or springs (jurisdictional discharges)
 B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
 C Obstruction that passes some flow during low-flow periods within assessment area (beaver dam, bottom-release dam)
 D Evidence of bank seepage or sweating (iron oxidizing bacteria in water indicates seepage)
 E Stream bed or bank soil reduced (dig through deposited sediment if present)
 F None of the above

17. **Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)**

Check all that apply.

A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
 B Obstruction not passing flow during low flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
 C Urban stream (\geq 24% impervious surface for watershed)
 D Evidence that the stream-side area has been modified resulting in accelerated drainage into the assessment reach
 E Assessment reach relocated to valley edge
 F None of the above

18. **Shading – assessment reach metric (skip for Tidal Marsh Streams)**

Consider aspect. Consider "leaf-on" condition.

A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
 B Degraded (example: scattered trees)
 C Stream shading is gone or largely absent

19. **Buffer Width – streamside area metric (skip for Tidal Marsh Streams)**

Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated		Wooded		
LB	RB	LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	\geq 100-feet wide <u>or</u> extends to the edge of the watershed
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	From 50 to < 100-feet wide
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	From 30 to < 50-feet wide
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	From 10 to < 30-feet wide
<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	< 10-feet wide <u>or</u> no trees

20. **Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)**

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Mature forest
<input type="checkbox"/> B	<input type="checkbox"/> B	Non-mature woody vegetation <u>or</u> modified vegetation structure
<input type="checkbox"/> C	<input type="checkbox"/> C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
<input type="checkbox"/> D	<input type="checkbox"/> D	Maintained shrubs
<input type="checkbox"/> E	<input type="checkbox"/> E	Little or no vegetation

21. **Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)**

Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).

If none of the following stressors occurs on either bank, check here and skip to Metric 22:

Abuts		< 30 feet		30-50 feet		
LB	RB	LB	RB	LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	Row crops
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	Maintained turf
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	Pasture (no livestock)/commercial horticulture
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	Pasture (active livestock use)

22. **Stem Density – streamside area metric (skip for Tidal Marsh Streams)**

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Medium to high stem density
<input type="checkbox"/> B	<input type="checkbox"/> B	Low stem density
<input type="checkbox"/> C	<input type="checkbox"/> C	No wooded riparian buffer <u>or</u> predominantly herbaceous species <u>or</u> bare ground

23. **Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)**

Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10-feet wide.

LB RB

- A A The total length of buffer breaks is < 25 percent.
B B The total length of buffer breaks is between 25 and 50 percent.
C C The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – First 100 feet of streamside area metric (skip for Tidal Marsh Streams)

Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB RB

- A A Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
B B Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
C C Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)

25a. Yes No Was a conductivity measurement recorded?

If No, select one of the following reasons.

No Water

Other: _____

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).

A <46

B 46 to < 67

C 67 to < 79

D 79 to < 230

E ≥ 230

Notes/Sketch: _____

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name Catfish Pond
 Stream Category Pa1

Date of Evaluation 4/13/18
 Assessor Name/Organization C.Lanza

Notes of Field Assessment Form (Y/N) NO
 Presence of regulatory considerations (Y/N) NO
 Additional stream information/supplementary measurements included (Y/N) _____
 NC SAM feature type (perennial, intermittent, Tidal Marsh Stream) Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	LOW	
(2) Baseflow	MEDIUM	
(2) Flood Flow	LOW	
(3) Streamside Area Attenuation	LOW	
(4) Floodplain Access	LOW	
(4) Wooded Riparian Buffer	LOW	
(4) Microtopography	LOW	
(3) Stream Stability	LOW	
(4) Channel Stability	LOW	
(4) Sediment Transport	LOW	
(4) Stream Geomorphology	MEDIUM	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	LOW	
(2) Baseflow	MEDIUM	
(2) Streamside Area Vegetation	LOW	
(3) Upland Pollutant Filtration	LOW	
(3) Thermoregulation	LOW	
(2) Indicators of Stressors	YES	
(2) Aquatic Life Tolerance	MEDIUM	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	LOW	
(2) In-stream Habitat	LOW	
(3) Baseflow	MEDIUM	
(3) Substrate	LOW	
(3) Stream Stability	LOW	
(3) In-stream Habitat	LOW	
(2) Stream-side Habitat	LOW	
(3) Stream-side Habitat	LOW	
(3) Thermoregulation	LOW	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	LOW	

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USACE AID #:	NCDWR #:	
<p>INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if any supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.</p> <p>NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).</p>		
PROJECT / SITE INFORMATION:		
1. Project name (if any): <u>Catfish Pond</u>	2. Date of evaluation: <u>4/13/18</u>	
3. Applicant/owner name: <u>Wildlands Eng.</u>	4. Assessor name/organization: <u>C.Lanza</u>	
5. County: <u>Durham</u>	6. Nearest named water body	
7. River Basin: <u>Neuse</u>	on USGS 7.5-minute quad: <u>Mountain Creek</u>	
8. Site coordinates (decimal degrees, at lower end of assessment reach): _____		
STREAM INFORMATION: (depth and width can be approximations)		
9. Site number (show on attached map): <u>UT1 R3</u>	10. Length of assessment reach evaluated (feet): _____	
11. Channel depth from bed (in riffle, if present) to top of bank (feet): <u>4</u>	<input type="checkbox"/> Unable to assess channel depth.	
12. Channel width at top of bank (feet): <u>16</u>	13. Is assessment reach a swamp stream? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
14. Feature type: <input checked="" type="checkbox"/> Perennial flow <input type="checkbox"/> Intermittent flow <input type="checkbox"/> Tidal Marsh Stream		
STREAM RATING INFORMATION:		
15. NC SAM Zone: <input type="checkbox"/> Mountains (M) <input checked="" type="checkbox"/> Piedmont (P) <input type="checkbox"/> Inner Coastal Plain (I) <input type="checkbox"/> Outer Coastal Plain (O)		
16. Estimated geomorphic valley shape (skip for Tidal Marsh Stream): <input checked="" type="checkbox"/> a (more sinuous stream, flatter valley slope) <input type="checkbox"/> b (less sinuous stream, steeper valley slope)		
17. Watershed size: (skip for Tidal Marsh Stream) <input type="checkbox"/> Size 1 (< 0.1 mi ²) <input checked="" type="checkbox"/> Size 2 (0.1 to < 0.5 mi ²) <input type="checkbox"/> Size 3 (0.5 to < 5 mi ²) <input type="checkbox"/> Size 4 (≥ 5 mi ²)		
ADDITIONAL INFORMATION:		
18. Were regulatory considerations evaluated? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes, check all that apply to the assessment area.		
<input type="checkbox"/> Section 10 water	<input type="checkbox"/> Classified Trout Waters	<input type="checkbox"/> Water Supply Watershed (<input type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/> V)
<input type="checkbox"/> Essential Fish Habitat	<input type="checkbox"/> Primary Nursery Area	<input type="checkbox"/> High Quality Waters/Outstanding Resource Waters
<input type="checkbox"/> Publicly owned property	<input type="checkbox"/> NCDWR riparian buffer rule in effect	<input type="checkbox"/> Nutrient Sensitive Waters
<input type="checkbox"/> Anadromous fish	<input type="checkbox"/> 303(d) List	<input type="checkbox"/> CAMA Area of Environmental Concern (AEC)
<input type="checkbox"/> Documented presence of a federal and/or state listed protected species within the assessment area.		
List species: _____		
<input type="checkbox"/> Designated Critical Habitat (list species): _____		
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? <input type="checkbox"/> Yes <input type="checkbox"/> No		

1. **Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)**
 - A Water throughout assessment reach.
 - B No flow, water in pools only.
 - C No water in assessment reach.

2. **Evidence of Flow Restriction – assessment reach metric**
 - A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is adversely affected by a flow restriction or fill to the point of obstructing flow or a channel choked with aquatic macrophytes or ponded water or impounded on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates).
 - B Not A

3. **Feature Pattern – assessment reach metric**
 - A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
 - B Not A.

4. **Feature Longitudinal Profile – assessment reach metric**
 - A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
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Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).
 - A < 10% of channel unstable
 - B 10 to 25% of channel unstable
 - C > 25% of channel unstable

6. **Streamside Area Interaction – streamside area metric**
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
<input type="radio"/> A	<input type="radio"/> A	Little or no evidence of conditions that adversely affect reference interaction
<input type="radio"/> B	<input type="radio"/> B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
<input type="radio"/> C	<input type="radio"/> C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] or too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) or floodplain/intertidal zone unnaturally absent or assessment reach is a man-made feature on an interstream divide

7. **Water Quality Stressors – assessment reach/intertidal zone metric**
Check all that apply.
 - A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
 - B Excessive sedimentation (burying of stream features or intertidal zone)

- C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
- D Odor (not including natural sulfide odors)
- E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in the "Notes/Sketch" section.
- F Livestock with access to stream or intertidal zone
- G Excessive algae in stream or intertidal zone
- H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc.)
- I Other: _____ (explain in "Notes/Sketch" section)
- J Little to no stressors

8. Recent Weather – watershed metric

For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.

- A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
- B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
- C No drought conditions

9 Large or Dangerous Stream – assessment reach metric

Yes No Is stream is too large or dangerous to assess? **If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).**

10. Natural In-stream Habitat Types – assessment reach metric

10a. Yes No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**

- | | | |
|---|------------------------------------|---|
| <ul style="list-style-type: none"> <input type="checkbox"/> A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats) <input checked="" type="checkbox"/> B Multiple sticks and/or leaf packs and/or emergent vegetation <input checked="" type="checkbox"/> C Multiple snags and logs (including lap trees) <input type="checkbox"/> D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter <input type="checkbox"/> E Little or no habitat | Check for Tidal Marsh Streams only | <ul style="list-style-type: none"> <input type="checkbox"/> F 5% oysters or other natural hard bottoms <input type="checkbox"/> G Submerged aquatic vegetation <input type="checkbox"/> H Low-tide refugia (pools) <input type="checkbox"/> I Sand bottom <input type="checkbox"/> J 5% vertical bank along the marsh <input type="checkbox"/> K Little or no habitat |
|---|------------------------------------|---|

*****REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS*****

11. Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

11a. Yes No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**

- A Riffle-run section (evaluate 11c)
- B Pool-glide section (evaluate 11d)
- C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffles sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain Streams and Tidal Marsh Streams).** Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Bedrock/saprolite
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Boulder (256 – 4096 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cobble (64 – 256 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gravel (2 – 64 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sand (.062 – 2 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Silt/clay (< 0.062 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Detritus
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Artificial (rip-rap, concrete, etc.)

11d. Yes No Are pools filled with sediment? **(skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**

12. Aquatic Life – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

12a. Yes No Was an in-stream aquatic life assessment performed as described in the User Manual?

If No, select one of the following reasons and skip to Metric 13. No Water Other: _____

12b. Yes No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

- 1 >1 Numbers over columns refer to "individuals" for size 1 and 2 streams and "taxa" for size 3 and 4 streams.
- Adult frogs
 - Aquatic reptiles
 - Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
 - Beetles (including water pennies)
 - Caddisfly larvae (Trichoptera [T])
 - Asian clam (*Corbicula*)
 - Crustacean (isopod/amphipod/crayfish/shrimp)
 - Damselfly and dragonfly larvae
 - Dipterans (true flies)
 - Mayfly larvae (Ephemeroptera [E])
 - Megaloptera (alderfly, fishfly, dobsonfly larvae)
 - Midges/mosquito larvae
 - Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
 - Mussels/Clams (not *Corbicula*)
 - Other fish
 - Salamanders/tadpoles
 - Snails
 - Stonefly larvae (Plecoptera [P])
 - Tipulid larvae

Worms/leeches

13. Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)

Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

- | LB | RB | |
|----------------------------|----------------------------|---|
| <input type="checkbox"/> A | <input type="checkbox"/> A | Little or no alteration to water storage capacity over a majority of the streamside area |
| <input type="checkbox"/> B | <input type="checkbox"/> B | Moderate alteration to water storage capacity over a majority of the streamside area |
| <input type="checkbox"/> C | <input type="checkbox"/> C | Severe alteration to water storage capacity over a majority of the streamside area (examples include: ditches, fill, soil, compaction, livestock disturbance, buildings, man-made levees, drainage pipes) |

14. Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

- | LB | RB | |
|----------------------------|----------------------------|--|
| <input type="checkbox"/> A | <input type="checkbox"/> A | Majority of streamside area with depressions able to pond water \geq 6 inches deep |
| <input type="checkbox"/> B | <input type="checkbox"/> B | Majority of streamside area with depressions able to pond water 3 to 6 inches deep |
| <input type="checkbox"/> C | <input type="checkbox"/> C | Majority of streamside area with depressions able to pond water < 3 inches deep |

15. Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)

Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

- | LB | RB | |
|----------------------------|----------------------------|--|
| <input type="checkbox"/> Y | <input type="checkbox"/> Y | Are wetlands present in the streamside area? |
| <input type="checkbox"/> N | <input type="checkbox"/> N | |

16. Baseflow Contributors – assessment reach metric (skip for size 4 streams and Tidal Marsh Streams)

Check all contributors within the assessment reach or within view of and draining to the assessment reach.

- A Streams and/or springs (jurisdictional discharges)
- B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
- C Obstruction that passes some flow during low-flow periods within assessment area (beaver dam, bottom-release dam)
- D Evidence of bank seepage or sweating (iron oxidizing bacteria in water indicates seepage)
- E Stream bed or bank soil reduced (dig through deposited sediment if present)
- F None of the above

17. Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)

Check all that apply.

- A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
- B Obstruction not passing flow during low flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
- C Urban stream (\geq 24% impervious surface for watershed)
- D Evidence that the stream-side area has been modified resulting in accelerated drainage into the assessment reach
- E Assessment reach relocated to valley edge
- F None of the above

18. Shading – assessment reach metric (skip for Tidal Marsh Streams)

Consider aspect. Consider "leaf-on" condition.

- A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
- B Degraded (example: scattered trees)
- C Stream shading is gone or largely absent

19. Buffer Width – streamside area metric (skip for Tidal Marsh Streams)

Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

- | Vegetated | | Wooded | | |
|----------------------------|----------------------------|----------------------------|----------------------------|---|
| LB | RB | LB | RB | |
| <input type="checkbox"/> A | <input type="checkbox"/> A | <input type="checkbox"/> A | <input type="checkbox"/> A | \geq 100-feet wide <u>or</u> extends to the edge of the watershed |
| <input type="checkbox"/> B | <input type="checkbox"/> B | <input type="checkbox"/> B | <input type="checkbox"/> B | From 50 to < 100-feet wide |
| <input type="checkbox"/> C | <input type="checkbox"/> C | <input type="checkbox"/> C | <input type="checkbox"/> C | From 30 to < 50-feet wide |
| <input type="checkbox"/> D | <input type="checkbox"/> D | <input type="checkbox"/> D | <input type="checkbox"/> D | From 10 to < 30-feet wide |
| <input type="checkbox"/> E | <input type="checkbox"/> E | <input type="checkbox"/> E | <input type="checkbox"/> E | < 10-feet wide <u>or</u> no trees |

20. Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

- | LB | RB | |
|----------------------------|----------------------------|---|
| <input type="checkbox"/> A | <input type="checkbox"/> A | Mature forest |
| <input type="checkbox"/> B | <input type="checkbox"/> B | Non-mature woody vegetation <u>or</u> modified vegetation structure |
| <input type="checkbox"/> C | <input type="checkbox"/> C | Herbaceous vegetation with or without a strip of trees < 10 feet wide |
| <input type="checkbox"/> D | <input type="checkbox"/> D | Maintained shrubs |
| <input type="checkbox"/> E | <input type="checkbox"/> E | Little or no vegetation |

21. Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)

Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).

If none of the following stressors occurs on either bank, check here and skip to Metric 22:

- | Abuts | | < 30 feet | | 30-50 feet | | |
|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|--|
| LB | RB | LB | RB | LB | RB | |
| <input type="checkbox"/> A | <input type="checkbox"/> A | <input type="checkbox"/> A | <input type="checkbox"/> A | <input type="checkbox"/> A | <input type="checkbox"/> A | Row crops |
| <input type="checkbox"/> B | <input type="checkbox"/> B | <input type="checkbox"/> B | <input type="checkbox"/> B | <input type="checkbox"/> B | <input type="checkbox"/> B | Maintained turf |
| <input type="checkbox"/> C | <input type="checkbox"/> C | <input type="checkbox"/> C | <input type="checkbox"/> C | <input type="checkbox"/> C | <input type="checkbox"/> C | Pasture (no livestock)/commercial horticulture |
| <input type="checkbox"/> D | <input type="checkbox"/> D | <input type="checkbox"/> D | <input type="checkbox"/> D | <input type="checkbox"/> D | <input type="checkbox"/> D | Pasture (active livestock use) |

22. Stem Density – streamside area metric (skip for Tidal Marsh Streams)

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

- | LB | RB | |
|----------------------------|----------------------------|--|
| <input type="checkbox"/> A | <input type="checkbox"/> A | Medium to high stem density |
| <input type="checkbox"/> B | <input type="checkbox"/> B | Low stem density |
| <input type="checkbox"/> C | <input type="checkbox"/> C | No wooded riparian buffer <u>or</u> predominantly herbaceous species <u>or</u> bare ground |

23. Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)

Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10-feet wide.

LB RB

- A A The total length of buffer breaks is < 25 percent.
B B The total length of buffer breaks is between 25 and 50 percent.
C C The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – First 100 feet of streamside area metric (skip for Tidal Marsh Streams)

Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB RB

- A A Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
B B Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
C C Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)

25a. Yes No Was a conductivity measurement recorded?

If No, select one of the following reasons.

No Water

Other: _____

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).

A <46

B 46 to < 67

C 67 to < 79

D 79 to < 230

E ≥ 230

Notes/Sketch:

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name Catfish Pond
 Stream Category Pa2

Date of Evaluation 4/13/18
 Assessor Name/Organization C.Lanza

Notes of Field Assessment Form (Y/N) NO
 Presence of regulatory considerations (Y/N) NO
 Additional stream information/supplementary measurements included (Y/N) _____
 NC SAM feature type (perennial, intermittent, Tidal Marsh Stream) Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	LOW	
(2) Baseflow	MEDIUM	
(2) Flood Flow	LOW	
(3) Streamside Area Attenuation	LOW	
(4) Floodplain Access	MEDIUM	
(4) Wooded Riparian Buffer	LOW	
(4) Microtopography	LOW	
(3) Stream Stability	MEDIUM	
(4) Channel Stability	MEDIUM	
(4) Sediment Transport	MEDIUM	
(4) Stream Geomorphology	HIGH	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	LOW	
(2) Baseflow	MEDIUM	
(2) Streamside Area Vegetation	MEDIUM	
(3) Upland Pollutant Filtration	LOW	
(3) Thermoregulation	HIGH	
(2) Indicators of Stressors	YES	
(2) Aquatic Life Tolerance	LOW	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	MEDIUM	
(2) In-stream Habitat	MEDIUM	
(3) Baseflow	MEDIUM	
(3) Substrate	MEDIUM	
(3) Stream Stability	MEDIUM	
(3) In-stream Habitat	MEDIUM	
(2) Stream-side Habitat	MEDIUM	
(3) Stream-side Habitat	LOW	
(3) Thermoregulation	HIGH	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	LOW	

NC SAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 2.1

USACE AID #:	NCDWR #:
<p>INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if any supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.</p> <p>NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).</p>	
PROJECT / SITE INFORMATION:	
1. Project name (if any): <u>Catfish Pond</u>	2. Date of evaluation: <u>4/13/18</u>
3. Applicant/owner name: <u>Wildlands Eng</u>	4. Assessor name/organization: <u>C.Lanza</u>
5. County: <u>Durham</u>	6. Nearest named water body
7. River Basin: <u>Neuse</u>	on USGS 7.5-minute quad: <u>Mountain Creek</u>
8. Site coordinates (decimal degrees, at lower end of assessment reach): _____	
STREAM INFORMATION: (depth and width can be approximations)	
9. Site number (show on attached map): <u>UT1 R2</u>	10. Length of assessment reach evaluated (feet): _____
11. Channel depth from bed (in riffle, if present) to top of bank (feet): <u>.25</u>	<input type="checkbox"/> Unable to assess channel depth.
12. Channel width at top of bank (feet): <u>3</u>	13. Is assessment reach a swamp stream? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
14. Feature type: <input type="checkbox"/> Perennial flow <input checked="" type="checkbox"/> Intermittent flow <input type="checkbox"/> Tidal Marsh Stream	
STREAM RATING INFORMATION:	
15. NC SAM Zone: <input type="checkbox"/> Mountains (M) <input checked="" type="checkbox"/> Piedmont (P) <input type="checkbox"/> Inner Coastal Plain (I) <input type="checkbox"/> Outer Coastal Plain (O)	
16. Estimated geomorphic valley shape (skip for Tidal Marsh Stream):	
<input checked="" type="checkbox"/> a (more sinuous stream, flatter valley slope)	<input type="checkbox"/> b (less sinuous stream, steeper valley slope)
17. Watershed size: (skip for Tidal Marsh Stream)	
<input checked="" type="checkbox"/> Size 1 (< 0.1 mi ²)	<input type="checkbox"/> Size 2 (0.1 to < 0.5 mi ²)
<input type="checkbox"/> Size 3 (0.5 to < 5 mi ²)	<input type="checkbox"/> Size 4 (≥ 5 mi ²)
ADDITIONAL INFORMATION:	
18. Were regulatory considerations evaluated? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes, check all that apply to the assessment area.	
<input type="checkbox"/> Section 10 water	<input type="checkbox"/> Classified Trout Waters
<input type="checkbox"/> Essential Fish Habitat	<input type="checkbox"/> Primary Nursery Area
<input type="checkbox"/> Publicly owned property	<input type="checkbox"/> NCDWR riparian buffer rule in effect
<input type="checkbox"/> Anadromous fish	<input type="checkbox"/> 303(d) List
<input type="checkbox"/> Documented presence of a federal and/or state listed protected species within the assessment area.	<input type="checkbox"/> Water Supply Watershed (<input type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/> V)
<input type="checkbox"/> Nutrient Sensitive Waters	<input type="checkbox"/> High Quality Waters/Outstanding Resource Waters
<input type="checkbox"/> CAMA Area of Environmental Concern (AEC)	<input type="checkbox"/> Nutrient Sensitive Waters
List species: _____	
<input type="checkbox"/> Designated Critical Habitat (list species): _____	
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? <input type="checkbox"/> Yes <input type="checkbox"/> No	

1. **Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)**
 - A Water throughout assessment reach.
 - B No flow, water in pools only.
 - C No water in assessment reach.

2. **Evidence of Flow Restriction – assessment reach metric**
 - A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is adversely affected by a flow restriction or fill to the point of obstructing flow or a channel choked with aquatic macrophytes or ponded water or impounded on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates).
 - B Not A

3. **Feature Pattern – assessment reach metric**
 - A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
 - B Not A.

4. **Feature Longitudinal Profile – assessment reach metric**
 - A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
 - B Not A

5. **Signs of Active Instability – assessment reach metric**
Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).
 - A < 10% of channel unstable
 - B 10 to 25% of channel unstable
 - C > 25% of channel unstable

6. **Streamside Area Interaction – streamside area metric**
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> A	Little or no evidence of conditions that adversely affect reference interaction
<input type="checkbox"/> B	<input type="checkbox"/> B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
<input type="checkbox"/> C	<input type="checkbox"/> C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] <u>or</u> too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) <u>or</u> floodplain/intertidal zone unnaturally absent <u>or</u> assessment reach is a man-made feature on an interstream divide

7. **Water Quality Stressors – assessment reach/intertidal zone metric**
Check all that apply.
 - A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
 - B Excessive sedimentation (burying of stream features or intertidal zone)

- C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
- D Odor (not including natural sulfide odors)
- E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in the "Notes/Sketch" section.
- F Livestock with access to stream or intertidal zone
- G Excessive algae in stream or intertidal zone
- H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc.)
- I Other: _____ (explain in "Notes/Sketch" section)
- J Little to no stressors

8. Recent Weather – watershed metric

For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.

- A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
- B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
- C No drought conditions

9 Large or Dangerous Stream – assessment reach metric

Yes No Is stream is too large or dangerous to assess? **If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).**

10. Natural In-stream Habitat Types – assessment reach metric

10a. Yes No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**

- | | | |
|---|------------------------------------|---|
| <ul style="list-style-type: none"> <input checked="" type="checkbox"/> A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats) <input checked="" type="checkbox"/> B Multiple sticks and/or leaf packs and/or emergent vegetation <input type="checkbox"/> C Multiple snags and logs (including lap trees) <input type="checkbox"/> D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter <input type="checkbox"/> E Little or no habitat | Check for Tidal Marsh Streams only | <ul style="list-style-type: none"> <input type="checkbox"/> F 5% oysters or other natural hard bottoms <input type="checkbox"/> G Submerged aquatic vegetation <input type="checkbox"/> H Low-tide refugia (pools) <input type="checkbox"/> I Sand bottom <input type="checkbox"/> J 5% vertical bank along the marsh <input type="checkbox"/> K Little or no habitat |
|---|------------------------------------|---|

*****REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS*****

11. Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

11a. Yes No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**

- A Riffle-run section (evaluate 11c)
- B Pool-glide section (evaluate 11d)
- C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffles sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain Streams and Tidal Marsh Streams).** Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Bedrock/saprolite
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Boulder (256 – 4096 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cobble (64 – 256 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gravel (2 – 64 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sand (.062 – 2 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Silt/clay (< 0.062 mm)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Detritus
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Artificial (rip-rap, concrete, etc.)

11d. Yes No Are pools filled with sediment? **(skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**

12. Aquatic Life – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

12a. Yes No Was an in-stream aquatic life assessment performed as described in the User Manual?

If No, select one of the following reasons and skip to Metric 13. No Water Other: _____

12b. Yes No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

- 1 >1 Numbers over columns refer to "individuals" for size 1 and 2 streams and "taxa" for size 3 and 4 streams.
- Adult frogs
 - Aquatic reptiles
 - Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
 - Beetles (including water pennies)
 - Caddisfly larvae (Trichoptera [T])
 - Asian clam (*Corbicula*)
 - Crustacean (isopod/amphipod/crayfish/shrimp)
 - Damselfly and dragonfly larvae
 - Dipterans (true flies)
 - Mayfly larvae (Ephemeroptera [E])
 - Megaloptera (alderfly, fishfly, dobsonfly larvae)
 - Midges/mosquito larvae
 - Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
 - Mussels/Clams (not *Corbicula*)
 - Other fish
 - Salamanders/tadpoles
 - Snails
 - Stonefly larvae (Plecoptera [P])
 - Tipulid larvae

Worms/leeches

13. **Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)**
Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Little or no alteration to water storage capacity over a majority of the streamside area
<input type="checkbox"/> B	<input type="checkbox"/> B	Moderate alteration to water storage capacity over a majority of the streamside area
<input type="checkbox"/> C	<input type="checkbox"/> C	Severe alteration to water storage capacity over a majority of the streamside area (examples include: ditches, fill, soil, compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. **Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)**
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Majority of streamside area with depressions able to pond water \geq 6 inches deep
<input type="checkbox"/> B	<input type="checkbox"/> B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
<input type="checkbox"/> C	<input type="checkbox"/> C	Majority of streamside area with depressions able to pond water $<$ 3 inches deep

15. **Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)**

Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB	RB	
<input type="checkbox"/> Y	<input type="checkbox"/> Y	Are wetlands present in the streamside area?
<input type="checkbox"/> N	<input type="checkbox"/> N	

16. **Baseflow Contributors – assessment reach metric (skip for size 4 streams and Tidal Marsh Streams)**

Check all contributors within the assessment reach or within view of and draining to the assessment reach.

A Streams and/or springs (jurisdictional discharges)
 B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
 C Obstruction that passes some flow during low-flow periods within assessment area (beaver dam, bottom-release dam)
 D Evidence of bank seepage or sweating (iron oxidizing bacteria in water indicates seepage)
 E Stream bed or bank soil reduced (dig through deposited sediment if present)
 F None of the above

17. **Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)**

Check all that apply.

A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
 B Obstruction not passing flow during low flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
 C Urban stream (\geq 24% impervious surface for watershed)
 D Evidence that the stream-side area has been modified resulting in accelerated drainage into the assessment reach
 E Assessment reach relocated to valley edge
 F None of the above

18. **Shading – assessment reach metric (skip for Tidal Marsh Streams)**

Consider aspect. Consider "leaf-on" condition.

A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
 B Degraded (example: scattered trees)
 C Stream shading is gone or largely absent

19. **Buffer Width – streamside area metric (skip for Tidal Marsh Streams)**

Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated		Wooded		
LB	RB	LB	RB	
<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	\geq 100-foot wide <u>or</u> extends to the edge of the watershed
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	From 50 to $<$ 100-foot wide
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	From 30 to $<$ 50-foot wide
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	From 10 to $<$ 30-foot wide
<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	$<$ 10-foot wide <u>or</u> no trees

20. **Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)**

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Mature forest
<input type="checkbox"/> B	<input type="checkbox"/> B	Non-mature woody vegetation <u>or</u> modified vegetation structure
<input type="checkbox"/> C	<input type="checkbox"/> C	Herbaceous vegetation with or without a strip of trees $<$ 10 feet wide
<input type="checkbox"/> D	<input type="checkbox"/> D	Maintained shrubs
<input type="checkbox"/> E	<input type="checkbox"/> E	Little or no vegetation

21. **Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)**

Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream ($<$ 30 feet), or is between 30 to 50 feet of stream (30-50 feet).

If none of the following stressors occurs on either bank, check here and skip to Metric 22:

Abuts		$<$ 30 feet		30-50 feet		
LB	RB	LB	RB	LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	Row crops
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B	Maintained turf
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	Pasture (no livestock)/commercial horticulture
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	Pasture (active livestock use)

22. **Stem Density – streamside area metric (skip for Tidal Marsh Streams)**

Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	Medium to high stem density
<input type="checkbox"/> B	<input type="checkbox"/> B	Low stem density
<input type="checkbox"/> C	<input type="checkbox"/> C	No wooded riparian buffer <u>or</u> predominantly herbaceous species <u>or</u> bare ground

23. **Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)**

Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10-feet wide.

LB RB

- A A The total length of buffer breaks is < 25 percent.
B B The total length of buffer breaks is between 25 and 50 percent.
C C The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – First 100 feet of streamside area metric (skip for Tidal Marsh Streams)

Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB RB

- A A Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
B B Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
C C Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)

25a. Yes No Was a conductivity measurement recorded?

If No, select one of the following reasons.

No Water

Other: _____

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).

A <46

B 46 to < 67

C 67 to < 79

D 79 to < 230

E ≥ 230

Notes/Sketch:

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name Catfish Pond
 Stream Category Pa1

Date of Evaluation 4/13/18
 Assessor Name/Organization C.Lanza

Notes of Field Assessment Form (Y/N) NO
 Presence of regulatory considerations (Y/N) NO
 Additional stream information/supplementary measurements included (Y/N) _____
 NC SAM feature type (perennial, intermittent, Tidal Marsh Stream) Intermittent

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	HIGH	HIGH
(2) Baseflow	MEDIUM	MEDIUM
(2) Flood Flow	HIGH	HIGH
(3) Streamside Area Attenuation	HIGH	HIGH
(4) Floodplain Access	HIGH	HIGH
(4) Wooded Riparian Buffer	HIGH	HIGH
(4) Microtopography	MEDIUM	MEDIUM
(3) Stream Stability	HIGH	HIGH
(4) Channel Stability	HIGH	HIGH
(4) Sediment Transport	MEDIUM	MEDIUM
(4) Stream Geomorphology	HIGH	HIGH
(2) Stream/Intertidal Zone Interaction	NA	NA
(2) Longitudinal Tidal Flow	NA	NA
(2) Tidal Marsh Stream Stability	NA	NA
(3) Tidal Marsh Channel Stability	NA	NA
(3) Tidal Marsh Stream Geomorphology	NA	NA
(1) Water Quality	LOW	LOW
(2) Baseflow	MEDIUM	MEDIUM
(2) Streamside Area Vegetation	MEDIUM	MEDIUM
(3) Upland Pollutant Filtration	LOW	LOW
(3) Thermoregulation	HIGH	HIGH
(2) Indicators of Stressors	YES	YES
(2) Aquatic Life Tolerance	MEDIUM	NA
(2) Intertidal Zone Filtration	NA	NA
(1) Habitat	HIGH	HIGH
(2) In-stream Habitat	MEDIUM	HIGH
(3) Baseflow	MEDIUM	MEDIUM
(3) Substrate	MEDIUM	MEDIUM
(3) Stream Stability	HIGH	HIGH
(3) In-stream Habitat	MEDIUM	HIGH
(2) Stream-side Habitat	HIGH	HIGH
(3) Stream-side Habitat	HIGH	HIGH
(3) Thermoregulation	HIGH	HIGH
(2) Tidal Marsh In-stream Habitat	NA	NA
(3) Flow Restriction	NA	NA
(3) Tidal Marsh Stream Stability	NA	NA
(4) Tidal Marsh Channel Stability	NA	NA
(4) Tidal Marsh Stream Geomorphology	NA	NA
(3) Tidal Marsh In-stream Habitat	NA	NA
(2) Intertidal Zone Habitat	NA	NA
Overall	HIGH	HIGH

Appendix 6

Approved FHWA Categorical Exclusion Form

Categorical Exclusion Form for Ecosystem Enhancement Program Projects Version 1.4

Note: Only Appendix A should to be submitted (along with any supporting documentation) as the environmental document.

Part 1: General Project Information	
Project Name:	Catfish Pond Mitigation Site
County Name:	Durham County
EEP Number:	100039
Project Sponsor:	Wildlands Engineering, Inc.
Project Contact Name:	Carolyn Lanza
Project Contact Address:	312 W. Millbrook, Suite 225, Raleigh, NC 27609
Project Contact E-mail:	clanza@wildlandseng.com
EEP Project Manager:	Jeff Schaffer
Project Description	
<p>The Catfish Pond Mitigation Site is a stream mitigation project located approximately 12 miles north of the City of Durham and approximately 3 miles east of the Orange/Durham County border. The project includes Catfish Creek, three unnamed tributaries and the removal of an impoundment for a total of 7,383 linear feet of stream. Agriculture, specifically livestock, has been the main use of the land. The project will provide stream mitigation units to the Division of Mitigation Services in the Neuse River Basin (03020201).</p>	
For Official Use Only	
Reviewed By:	
<p style="font-size: 1.2em; margin: 0;"><u>4/19/2018</u></p> <p>Date</p>	<p>EEP Project Manager</p>
Conditional Approved By:	
<p>Date</p>	<p>For Division Administrator FHWA</p>
<input type="checkbox"/> Check this box if there are outstanding issues	
Final Approval By:	
<p style="font-size: 1.2em; margin: 0;"><u>4-19-18</u></p> <p>Date</p>	<p>For Division Administrator FHWA</p>

Part 2: All Projects Regulation/Question		Response
Coastal Zone Management Act (CZMA)		
1. Is the project located in a CAMA county?		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2. Does the project involve ground-disturbing activities within a CAMA Area of Environmental Concern (AEC)?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
3. Has a CAMA permit been secured?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
4. Has NCDPCM agreed that the project is consistent with the NC Coastal Management Program?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)		
1. Is this a "full-delivery" project?		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
2. Has the zoning/land use of the subject property and adjacent properties ever been designated as commercial or industrial?		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
3. As a result of a limited Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
4. As a result of a Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
5. As a result of a Phase II Site Assessment, are there known or potential hazardous waste sites within the project area?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
6. Is there an approved hazardous mitigation plan?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
National Historic Preservation Act (Section 106)		
1. Are there properties listed on, or eligible for listing on, the National Register of Historic Places in the project area?		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2. Does the project affect such properties and does the SHPO/THPO concur?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
3. If the effects are adverse, have they been resolved?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)		
1. Is this a "full-delivery" project?		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
2. Does the project require the acquisition of real estate?		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
3. Was the property acquisition completed prior to the intent to use federal funds?		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
4. Has the owner of the property been informed: * prior to making an offer that the agency does not have condemnation authority; and * what the fair market value is believed to be?		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A

Part 3: Ground-Disturbing Activities Regulation/Question		Response
American Indian Religious Freedom Act (AIRFA)		
1. Is the project located in a county claimed as "territory" by the Eastern Band of Cherokee Indians?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
2. Is the site of religious importance to American Indians?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
3. Is the project listed on, or eligible for listing on, the National Register of Historic Places?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
4. Have the effects of the project on this site been considered?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Antiquities Act (AA)		
1. Is the project located on Federal lands?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
2. Will there be loss or destruction of historic or prehistoric ruins, monuments or objects of antiquity?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
3. Will a permit from the appropriate Federal agency be required?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
4. Has a permit been obtained?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Archaeological Resources Protection Act (ARPA)		
1. Is the project located on federal or Indian lands (reservation)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
2. Will there be a loss or destruction of archaeological resources?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
3. Will a permit from the appropriate Federal agency be required?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
4. Has a permit been obtained?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Endangered Species Act (ESA)		
1. Are federal Threatened and Endangered species and/or Designated Critical Habitat listed for the county?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
2. Is Designated Critical Habitat or suitable habitat present for listed species?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
3. Are T&E species present or is the project being conducted in Designated Critical Habitat?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	
4. Is the project "likely to adversely affect" the species and/or "likely to adversely modify" Designated Critical Habitat?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
5. Does the USFWS/NOAA-Fisheries concur in the effects determination?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
6. Has the USFWS/NOAA-Fisheries rendered a "jeopardy" determination?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	

Executive Order 13007 (Indian Sacred Sites)	
1. Is the project located on Federal lands that are within a county claimed as "territory" by the EBCI?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2. Has the EBCI indicated that Indian sacred sites may be impacted by the proposed project?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
3. Have accommodations been made for access to and ceremonial use of Indian sacred sites?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Farmland Protection Policy Act (FPPA)	
1. Will real estate be acquired?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
2. Has NRCS determined that the project contains prime, unique, statewide or locally important farmland?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
3. Has the completed Form AD-1006 been submitted to NRCS?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Fish and Wildlife Coordination Act (FWCA)	
1. Will the project impound, divert, channel deepen, or otherwise control/modify any water body?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
2. Have the USFWS and the NCWRC been consulted?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Land and Water Conservation Fund Act (Section 6(f))	
1. Will the project require the conversion of such property to a use other than public, outdoor recreation?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2. Has the NPS approved of the conversion?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Magnuson-Stevens Fishery Conservation and Management Act (Essential Fish Habitat)	
1. Is the project located in an estuarine system?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2. Is suitable habitat present for EFH-protected species?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
3. Is sufficient design information available to make a determination of the effect of the project on EFH?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
4. Will the project adversely affect EFH?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
5. Has consultation with NOAA-Fisheries occurred?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Migratory Bird Treaty Act (MBTA)	
1. Does the USFWS have any recommendations with the project relative to the MBTA?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2. Have the USFWS recommendations been incorporated?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Wilderness Act	
1. Is the project in a Wilderness area?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2. Has a special use permit and/or easement been obtained from the maintaining federal agency?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A

Catfish Pond Mitigation Site
Categorical Exclusion
SUMMARY

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) provides a Federal “Superfund” to clean up uncontrolled or abandoned hazardous-waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment.

As the Catfish Pond Mitigation Site is a full-delivery project; an EDR Radius Map Report with Geocheck was ordered for the site through Environmental Data Resources, Inc on January 29, 2018. Neither the target property nor the adjacent properties were listed in any of the Federal, State, or Tribal environmental databases searched by the EDR. The assessment revealed no evidence of any “recognized environmental conditions” in connection with the target property. The Executive Summary of the EDR report is included in the Appendix. The full report is available if needed.

National Historic Preservation Act (Section 106)

The National Historic Preservation Act declares a national policy of historic preservation to protect, rehabilitate, restore, and reuse districts, sites, buildings, structures, and objects significant in American architecture, history, archaeology, and culture, and Section 106 mandates that federal agencies take into account the effect of an undertaking on a property that is included in, or is eligible for inclusion in, the National Register of Historic Places.

Wildlands Engineering, Inc. (Wildlands) requested review and comment from the State Historic Preservation Office (SHPO) with respect to any archeological and architectural resources related to the Catfish Pond Mitigation Site on February 9, 2018. SHPO responded on March 5, 2018 and stated they were aware of “no historic resources which would be affected by the project” and would have no further comment. All correspondence related to Section 106 is included in the Appendix.

Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)

These acts, collectively known as the Uniform Act, provide for uniform and equitable treatment of persons displaced from their homes, businesses, non-profit associations, or farms by federal and federally-assisted programs, and establish uniform and equitable land acquisition policies.

Catfish Pond Mitigation Site is a full-delivery project that includes land acquisition. Notification of the fair market value of the project property and the lack of condemnation authority by Wildlands was included in the signed Option Agreement for the project property. A copy of the relevant section of the Option Agreement is included in the Appendix.

Endangered Species Act (ESA)

Section 7 of the ESA requires federal agencies, in consultation with and with the assistance of the Secretary of the Interior or of Commerce, as appropriate, to ensure that actions they authorize, fund or carry out are not likely to jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of critical habitat for these species.

The Durham County listed endangered species includes the smooth coneflower (*Echinacea laevigata*) and Michaux’s sumac (*Rhus michauxii*).

A pedestrian survey conducted on April 13, 2018, indicated that the Site provides suitable habitat for the smooth coneflower and Michaux’s sumac but no species were identified on the site. Therefore, due to the absence of the listed species on the site, the project has been determined by Wildlands to have “no effect” on the smooth coneflower and Michaux’s sumac.

Wildlands requested review and comment from the United States Fish and Wildlife Service (USFWS) on February 9, 2018 in respect to the Catfish Pond Mitigation Site and its potential impacts on threatened



or endangered species. USFWS responded on March 2, 2018 stating “that the proposed action is not likely to adversely affect any federally-listed endangered or threatened species...” All documents submitted to the USFWS are included in the Appendix.

Farmland Protection Policy Act (FPPA)

The FPPA requires that, before taking or approving any federal action that would result in conversion of farmland, the agency must examine the effects of the action using the criteria set forth in the FPPA, and, if there are adverse effects, must consider alternatives to lessen them.

The Catfish Pond Mitigation Site includes the conversion of prime farmland. As such, Form AD-1006 has been completed and submitted to the Natural Resources Conservation Service (NRCS). The completed form and correspondence documenting its submittal is included in the Appendix.

Fish and Wildlife Coordination Act (FWCA)

The FWCA requires consultation with the USFWS and the appropriate state wildlife agency on projects that alter or modify a water body. Reports and recommendations prepared by these agencies document project effects on wildlife and identify measures that may be adopted to prevent loss or damage to wildlife resources.

The Catfish Pond Mitigation Site includes stream restoration. Wildlands requested comment on the project from both the USFWS and the North Carolina Wildlife Resources Commission (NCWRC) on February 9, 2018. NCWRC responded on March 21, 2018 with comments about the possible presence of rare and aquatic species in the project area. There are records for the federal species of concern and state-endangered yellow lampmussel (*Lampsilis cariosa*) near the project site. There are also historic records for the federal species of concern and state-significantly rare, Roanoke bass (*Ambloplites cavifrons*) and federal species of concern and state-special concern, Neuse River waterdog (*Necturus lewisi*) in the project vicinity. A pedestrian survey conducted by Wildlands on April 13, 2018, indicated that the Site provides suitable habitat for the yellow lampmussel and Roanoke bass, but not the Neuse River waterdog. No species were identified on the site. Per the request of NCWRC, communication with Dr. Tyler Black, NCWRC Eastern Region Aquatic Wildlife Diversity Research Coordinator, has been established regarding the stream restoration project. USFWS responded on March 2, 2018 and had no objections to the project. All correspondence with the two agencies is included in the Appendix.

Migratory Bird Treaty Act (MBTA)

The MBTA makes it unlawful for anyone to kill, capture, collect, possess, buy, sell, trade, ship, import, or export any migratory bird. The indirect killing of birds by destroying their nests and eggs is covered by the MBTA, so construction in nesting areas during nesting seasons can constitute a taking.

Wildlands requested comment on the Catfish Pond Mitigation Site from the USFWS regarding migratory birds on February 9, 2018. The USFWS responded on March 2, 2018 but had no comment regarding migratory birds. All correspondence with USFWS is included in the Appendix.



Catfish Pond Mitigation Site
Categorical Exclusion
APPENDIX

N Roxboro Rd
N Roxboro Rd
Bahama, NC 27503

Inquiry Number: 5170975.2s
January 29, 2018

The EDR Radius Map™ Report with GeoCheck®



6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

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Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-13), the ASTM Standard Practice for Environmental Site Assessments for Forestland or Rural Property (E 2247-16), the ASTM Standard Practice for Limited Environmental Due Diligence: Transaction Screen Process (E 1528-14) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

N ROXBORO RD
BAHAMA, NC 27503

COORDINATES

Latitude (North): 36.1625620 - 36° 9' 45.22"
Longitude (West): 78.9100680 - 78° 54' 36.24"
Universal Transverse Mercator: Zone 17
UTM X (Meters): 687990.5
UTM Y (Meters): 4003802.0
Elevation: 439 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map: 5945265 ROUGEMONT, NC
Version Date: 2013

AERIAL PHOTOGRAPHY IN THIS REPORT

Portions of Photo from: 20140619
Source: USDA

MAPPED SITES SUMMARY

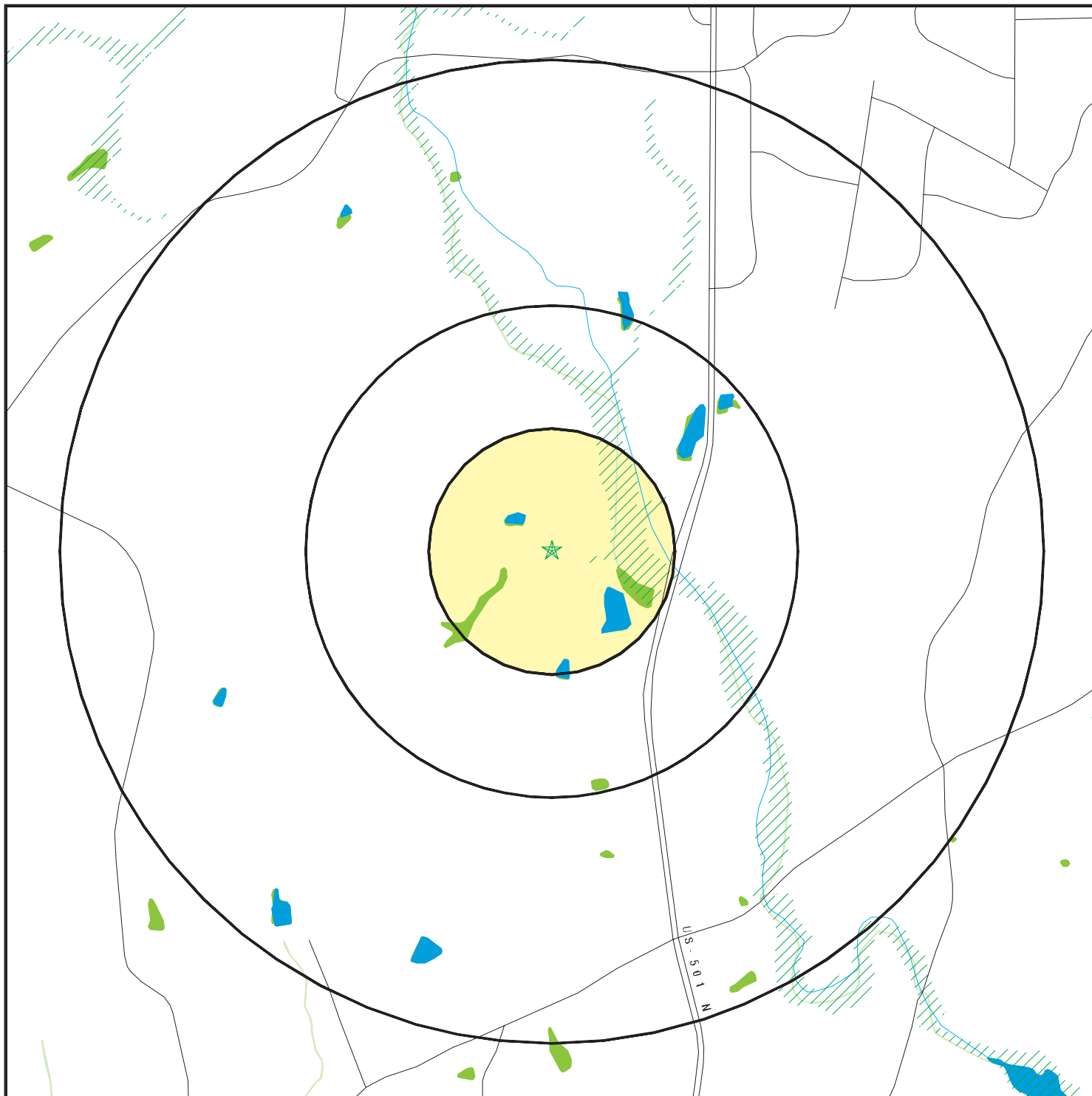
Target Property Address:
N ROXBORO RD
BAHAMA, NC 27503

Click on Map ID to see full detail.

MAP ID	SITE NAME	ADDRESS	DATABASE ACRONYMS	RELATIVE ELEVATION	DIST (ft. & mi.) DIRECTION
--------	-----------	---------	-------------------	--------------------	----------------------------

NO MAPPED SITES FOUND

OVERVIEW MAP - 5170975.2S



- ★ Target Property
- ▲ Sites at elevations higher than or equal to the target property
- ◆ Sites at elevations lower than the target property
- ⚙ Manufactured Gas Plants
- ☒ National Priority List Sites
- ☒ Dept. Defense Sites

- ☒ Indian Reservations BIA
- ☒ 100-year flood zone
- ☒ 500-year flood zone
- ☒ National Wetland Inventory
- ☒ State Wetlands
- ☒ Upgradient Area
- ☒ Hazardous Substance Disposal Sites

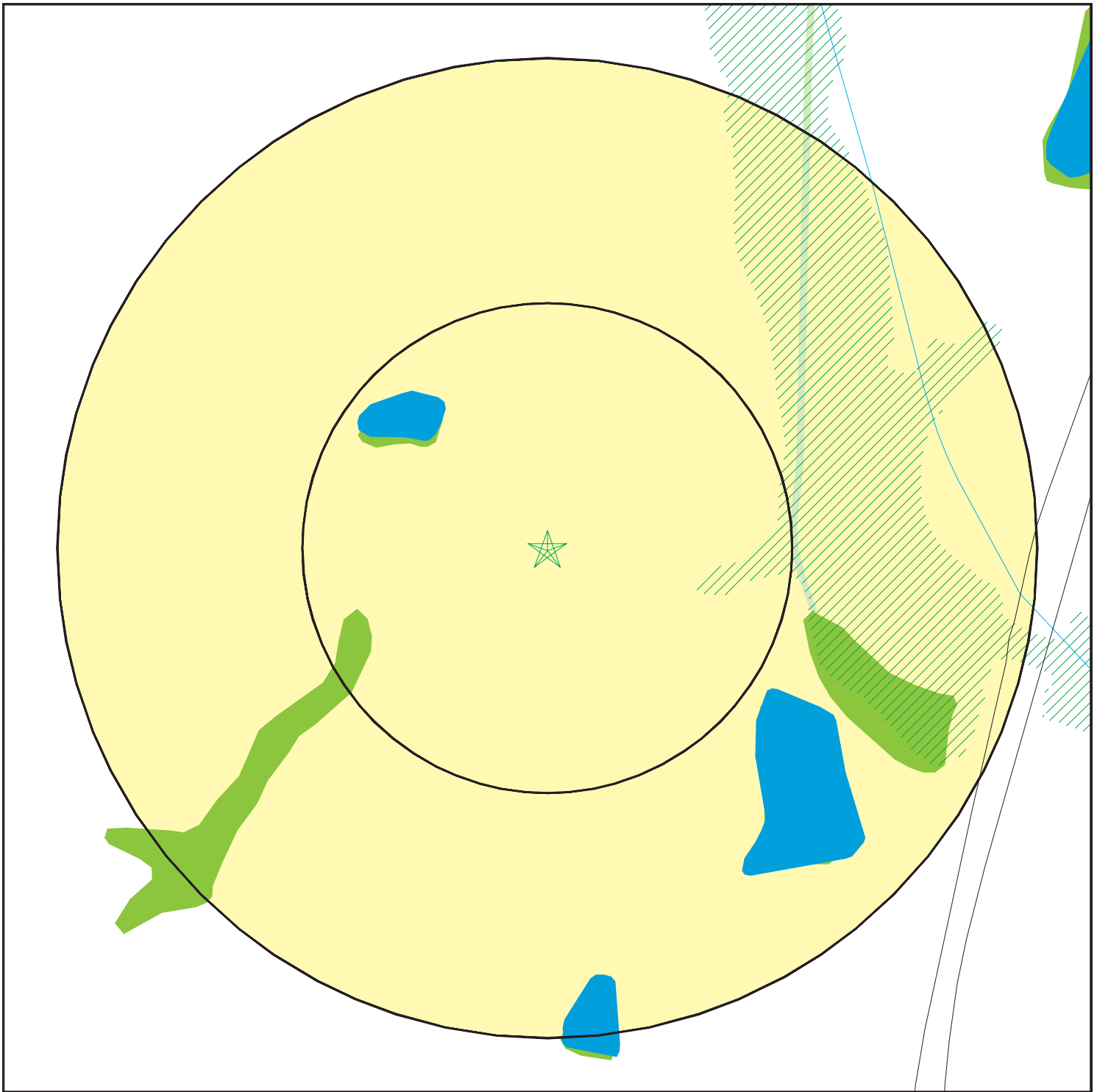


This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: N Roxboro Rd
 ADDRESS: N Roxboro Rd
 Bahama NC 27503
 LAT/LONG: 36.162562 / 78.910068

CLIENT: Wildlands Eng, Inc.
 CONTACT: Carolyn Lanza
 INQUIRY #: 5170975.2s
 DATE: January 29, 2018 2:29 pm

DETAIL MAP - 5170975.2S



- ★ Target Property
- ▲ Sites at elevations higher than or equal to the target property
- ◆ Sites at elevations lower than the target property
- ⚙ Manufactured Gas Plants
- ⚡ Sensitive Receptors
- ☒ National Priority List Sites
- ☒ Dept. Defense Sites



- ☒ Indian Reservations BIA
- ▨ 100-year flood zone
- ▨ 500-year flood zone
- National Wetland Inventory
- State Wetlands
- ☒ Hazardous Substance Disposal Sites



This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: N Roxboro Rd
 ADDRESS: N Roxboro Rd
 Bahama NC 27503
 LAT/LONG: 36.162562 / 78.910068

CLIENT: Wildlands Eng, Inc.
 CONTACT: Carolyn Lanza
 INQUIRY #: 5170975.2s
 DATE: January 29, 2018 2:31 pm

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
STANDARD ENVIRONMENTAL RECORDS								
<i>Federal NPL site list</i>								
NPL	1.000		0	0	0	0	NR	0
Proposed NPL	1.000		0	0	0	0	NR	0
NPL LIENS	TP		NR	NR	NR	NR	NR	0
<i>Federal Delisted NPL site list</i>								
Delisted NPL	1.000		0	0	0	0	NR	0
<i>Federal CERCLIS list</i>								
FEDERAL FACILITY	0.500		0	0	0	NR	NR	0
SEMS	0.500		0	0	0	NR	NR	0
<i>Federal CERCLIS NFRAP site list</i>								
SEMS-ARCHIVE	0.500		0	0	0	NR	NR	0
<i>Federal RCRA CORRACTS facilities list</i>								
CORRACTS	1.000		0	0	0	0	NR	0
<i>Federal RCRA non-CORRACTS TSD facilities list</i>								
RCRA-TSDF	0.500		0	0	0	NR	NR	0
<i>Federal RCRA generators list</i>								
RCRA-LQG	0.250		0	0	NR	NR	NR	0
RCRA-SQG	0.250		0	0	NR	NR	NR	0
RCRA-CESQG	0.250		0	0	NR	NR	NR	0
<i>Federal institutional controls / engineering controls registries</i>								
LUCIS	0.500		0	0	0	NR	NR	0
US ENG CONTROLS	0.500		0	0	0	NR	NR	0
US INST CONTROL	0.500		0	0	0	NR	NR	0
<i>Federal ERNS list</i>								
ERNS	TP		NR	NR	NR	NR	NR	0
<i>State- and tribal - equivalent NPL</i>								
NC HSDS	1.000		0	0	0	0	NR	0
<i>State- and tribal - equivalent CERCLIS</i>								
SHWS	1.000		0	0	0	0	NR	0
<i>State and tribal landfill and/or solid waste disposal site lists</i>								
SWF/LF	0.500		0	0	0	NR	NR	0
OLI	0.500		0	0	0	NR	NR	0
<i>State and tribal leaking storage tank lists</i>								
LAST	0.500		0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
LUST	0.500		0	0	0	NR	NR	0
INDIAN LUST	0.500		0	0	0	NR	NR	0
LUST TRUST	0.500		0	0	0	NR	NR	0
State and tribal registered storage tank lists								
FEMA UST	0.250		0	0	NR	NR	NR	0
UST	0.250		0	0	NR	NR	NR	0
AST	0.250		0	0	NR	NR	NR	0
INDIAN UST	0.250		0	0	NR	NR	NR	0
State and tribal institutional control / engineering control registries								
INST CONTROL	0.500		0	0	0	NR	NR	0
State and tribal voluntary cleanup sites								
VCP	0.500		0	0	0	NR	NR	0
INDIAN VCP	0.500		0	0	0	NR	NR	0
State and tribal Brownfields sites								
BROWNFIELDS	0.500		0	0	0	NR	NR	0
<u>ADDITIONAL ENVIRONMENTAL RECORDS</u>								
Local Brownfield lists								
US BROWNFIELDS	0.500		0	0	0	NR	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
SWRCY	0.500		0	0	0	NR	NR	0
HIST LF	0.500		0	0	0	NR	NR	0
INDIAN ODI	0.500		0	0	0	NR	NR	0
ODI	0.500		0	0	0	NR	NR	0
DEBRIS REGION 9	0.500		0	0	0	NR	NR	0
IHS OPEN DUMPS	0.500		0	0	0	NR	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US HIST CDL	TP		NR	NR	NR	NR	NR	0
US CDL	TP		NR	NR	NR	NR	NR	0
Local Land Records								
LIENS 2	TP		NR	NR	NR	NR	NR	0
Records of Emergency Release Reports								
HMIRS	TP		NR	NR	NR	NR	NR	0
SPILLS	TP		NR	NR	NR	NR	NR	0
IMD	0.500		0	0	0	NR	NR	0
SPILLS 90	TP		NR	NR	NR	NR	NR	0
SPILLS 80	TP		NR	NR	NR	NR	NR	0
Other Ascertainable Records								
RCRA NonGen / NLR	0.250		0	0	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
FUDS	1.000		0	0	0	0	NR	0
DOD	1.000		0	0	0	0	NR	0
SCRD DRYCLEANERS	0.500		0	0	0	NR	NR	0
US FIN ASSUR	TP		NR	NR	NR	NR	NR	0
EPA WATCH LIST	TP		NR	NR	NR	NR	NR	0
2020 COR ACTION	0.250		0	0	NR	NR	NR	0
TSCA	TP		NR	NR	NR	NR	NR	0
TRIS	TP		NR	NR	NR	NR	NR	0
SSTS	TP		NR	NR	NR	NR	NR	0
ROD	1.000		0	0	0	0	NR	0
RMP	TP		NR	NR	NR	NR	NR	0
RAATS	TP		NR	NR	NR	NR	NR	0
PRP	TP		NR	NR	NR	NR	NR	0
PADS	TP		NR	NR	NR	NR	NR	0
ICIS	TP		NR	NR	NR	NR	NR	0
FTTS	TP		NR	NR	NR	NR	NR	0
MLTS	TP		NR	NR	NR	NR	NR	0
COAL ASH DOE	TP		NR	NR	NR	NR	NR	0
COAL ASH EPA	0.500		0	0	0	NR	NR	0
PCB TRANSFORMER	TP		NR	NR	NR	NR	NR	0
RADINFO	TP		NR	NR	NR	NR	NR	0
HIST FTTS	TP		NR	NR	NR	NR	NR	0
DOT OPS	TP		NR	NR	NR	NR	NR	0
CONSENT	1.000		0	0	0	0	NR	0
INDIAN RESERV	1.000		0	0	0	0	NR	0
FUSRAP	1.000		0	0	0	0	NR	0
UMTRA	0.500		0	0	0	NR	NR	0
LEAD SMELTERS	TP		NR	NR	NR	NR	NR	0
US AIRS	TP		NR	NR	NR	NR	NR	0
US MINES	0.250		0	0	NR	NR	NR	0
ABANDONED MINES	0.250		0	0	NR	NR	NR	0
FINDS	TP		NR	NR	NR	NR	NR	0
UXO	1.000		0	0	0	0	NR	0
DOCKET HWC	TP		NR	NR	NR	NR	NR	0
ECHO	TP		NR	NR	NR	NR	NR	0
FUELS PROGRAM	0.250		0	0	NR	NR	NR	0
COAL ASH	0.500		0	0	0	NR	NR	0
DRYCLEANERS	0.250		0	0	NR	NR	NR	0
Financial Assurance	TP		NR	NR	NR	NR	NR	0
NPDES	TP		NR	NR	NR	NR	NR	0
UIC	TP		NR	NR	NR	NR	NR	0

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP	1.000		0	0	0	0	NR	0
EDR Hist Auto	0.125		0	NR	NR	NR	NR	0
EDR Hist Cleaner	0.125		0	NR	NR	NR	NR	0

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

RGA HWS	TP		NR	NR	NR	NR	NR	0
---------	----	--	----	----	----	----	----	---

MAP FINDINGS SUMMARY

<u>Database</u>	<u>Search Distance (Miles)</u>	<u>Target Property</u>	<u>< 1/8</u>	<u>1/8 - 1/4</u>	<u>1/4 - 1/2</u>	<u>1/2 - 1</u>	<u>> 1</u>	<u>Total Plotted</u>
RGA LF	TP		NR	NR	NR	NR	NR	0
RGA LUST	TP		NR	NR	NR	NR	NR	0
- Totals --		0	0	0	0	0	0	0

NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

Map ID
Direction
Distance
Elevation

MAP FINDINGS

Site

Database(s)

EDR ID Number
EPA ID Number

NO SITES FOUND

Count: 0 records.

ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
------	--------	-----------	--------------	-----	-------------

NO SITES FOUND



February 9, 2018

Renee Gledhill-Earley
State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617

Subject: Catfish Pond Mitigation Site
Durham County, North Carolina

Dear Ms. Gledhill-Earley,

Wildlands Engineering, Inc. requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with the Catfish Pond Mitigation Site. A Site Map and USGS Topographic Map with approximate project areas are enclosed. The topographic figure was prepared from the Rougemont, NC USGS 7.5-minute topographic quadrangle.

The Catfish Pond Mitigation Site is being developed to provide in-kind mitigation for unavoidable stream channel impacts. Several sections of channel have been identified as significantly degraded. The project will include stream restoration on Catfish Creek and several unnamed tributaries all which drain to Mountain Creek and the removal of Catfish Pond. The site has historically been disturbed due to livestock use. Based on a review of historical aerials, Catfish Pond was installed sometime between 1940 and 1955. There are no existing structures within the project area. Furthermore, no archeological artifacts have been observed or noted during preliminary surveys of the site for restoration purposes.

We ask that you review this site based on the attached information to determine the presence of any historic properties.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the project.

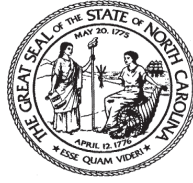
Sincerely,

A handwritten signature in cursive script that reads "Carolyn Lanza".

Carolyn Lanza
Environmental Scientist

Attachment:

Figure 1 Site Map
Figure 2 USGS Topographic Map



North Carolina Department of Natural and Cultural Resources
State Historic Preservation Office

Ramona M. Bartos, Administrator

Governor Roy Cooper
Secretary Susi H. Hamilton

Office of Archives and History
Deputy Secretary Kevin Cherry

March 5, 2018

Carolyn Lanza
Wildlands Engineering
1430 South Mint Street, Suite 104
Charlotte, NC 28203

Re: Catfish Pond Mitigation Site, Durham County, ER 18-0328

Dear Ms. Lanza:

Thank you for your letter of February 9, 2018, concerning the above project.

We have conducted a review of the project and are aware of no historic resources which would be affected by the project. Therefore, we have no comment on the project as proposed.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579 or environmental.review@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

A handwritten signature in blue ink that reads "Renee Gledhill-Earley".

for Ramona M. Bartos

TO OPTIONEE: Wildlands Engineering, Inc.
1430 S. Mint Street, Suite 104
Charlotte, North Carolina 28203
Attention: Robert W. Bugg
e-mail: rbugg@wildlandseng.com

TO OPTIONOR: Gary Penny
2917 Tavistock Drive
Durham, NC 27712
e-mail: gpspoonman@aol.com

Notice of change of address shall be given by written notice in the manner described in this paragraph.

3.3 **Assignment.** Optionee has the right to assign this agreement without the consent of Optionor to any entity wholly or substantially owned by Wildlands Engineering, Inc. No assignment shall be effective unless the assignee has delivered to Optionor a written assumption of Optionee's obligations under this agreement. Optionor hereby releases Optionee from any obligations under this agreement arising after the effective date of any assignment of this agreement by Optionee.

3.4 **Value of Conservation Easement; No Power of Eminent Domain.** In accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Optionee hereby notifies Optionor that: (i) Optionee believes that the fair market value of the Conservation Easement is an amount equal to the Purchase Price; and (ii) Optionee does not have the power of eminent domain.

3.5 **Modification; Waiver.** No amendment of this agreement will be effective unless it is in writing and signed by the parties. No waiver of satisfaction of a condition or failure to comply with an obligation under this agreement will be effective unless it is in writing and signed by the party granting the waiver, and no such waiver will constitute a waiver of satisfaction of any other condition or failure to comply with any other obligation.

3.6 **Attorneys' Fees.** If either party commences an action against the other to interpret or enforce any of the terms of this agreement or because of the breach by the other party of any of the terms of this agreement, the losing party shall pay to the prevailing party reasonable attorneys' fees, expenses, court costs, litigation costs and any other expenses incurred in connection with the prosecution or defense of such action, whether or not the action is prosecuted to a final judgment.

3.7 **Memorandum of Option Agreement.** Concurrently with the signing of this agreement, Optionee and Optionor agree to sign a Memorandum of Option which will be recorded against the Property in the Register of Deeds of the County stated in paragraph A within five days after the Effective Date.

3.8 **Landowner Authorization.** Concurrently with the signing of this agreement, Optionor agrees to sign the NCDMS Landowner Authorization Form in the form of exhibit C.

3.9 **Entire Agreement.** Each party acknowledges they are not relying on any statements made by the other party, other than in this agreement, regarding the subject matter of this agreement. Neither party will have a basis for bringing any claim for fraud in connection with any such statements.



February 9, 2018

Emily Wells
US Fish and Wildlife Service
P.O. Box 33726
Raleigh, North Carolina 27636-3726

Subject: Catfish Pond Mitigation Site
Durham County, North Carolina

Dear Ms. Wells,

Wildlands Engineering, Inc. requests review and comment on any possible issues that might emerge with respect to endangered species, migratory birds, or other trust resources associated with the proposed Catfish Pond Mitigation Site. A USGS Topographic Map and an Overview Site Map showing the approximate project area are enclosed. The topographic figure was prepared from the Rougemont, NC USGS 7.5-minute topographic quadrangle.

The Catfish Pond Mitigation Site is being developed to provide in-kind mitigation for unavoidable stream channel impacts. Several sections of channel have been identified as significantly degraded. The project will include stream restoration on Catfish Creek and several unnamed tributaries all which drain to Mountain Creek and the removal of Catfish Pond. The site has historically been disturbed due to livestock use. Based on a review of historical aerials, Catfish Pond was installed sometime between 1940 and 1955.

According to your website (<https://www.fws.gov/raleigh/species/cntylist/durham.html>) the threatened or endangered species for Durham County are: the Michaux's sumac (*Rhus michauxii*) and the smooth coneflower (*Echinacea laevigata*). If we have not heard from you in 30 days, we will assume that you do not have any comments regarding associated laws and that you do not have any information relevant to this project at the current time.

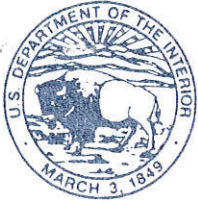
We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning this project.

Sincerely,

A handwritten signature in cursive script that reads "Carolyn Lanza".

Carolyn Lanza
Environmental Scientist

Attachment:
Figure 1 Site Map
Figure 2 USGS Topographic Map



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Raleigh ES Field Office

Post Office Box 33726

Raleigh, North Carolina 27636-3726

March 2, 2018

Carolyn Lanza
Wildlands Engineering, Inc.
1430 South Mint Street, Suite 104
Charlotte, NC 28203

Re: Catfish Pond Mitigation Site – Durham County, NC

Dear Ms. Lanza:

This letter is to inform you that the Service has established an on-line project planning and consultation process which assists developers and consultants in determining whether a federally-listed species or designated critical habitat may be affected by a proposed project. For future projects, please visit the Raleigh Field Office's project planning website at <https://www.fws.gov/raleigh/pp.html>. If you are only searching for a list of species that may be present in the project's Action Area, then you may use the Service's Information, Planning, and Consultation System (IPaC) website to determine if any listed, proposed, or candidate species may be present in the Action Area and generate a species list. The IPaC website may be viewed at <https://ecos.fws.gov/ipac/>. The IPaC web site contains a complete and frequently updated list of all endangered and threatened species protected by the provisions of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.)(Act), a list of federal species of concern¹ that are known to occur in each county in North Carolina, and other resources.

Section 7 of the Act requires that all federal agencies (or their designated non-federal representative), in consultation with the Service, insure that any action federally authorized, funded, or carried out by such agencies is not likely to jeopardize the continued existence of any federally-listed endangered or threatened species. A biological assessment or evaluation may be prepared to fulfill that requirement and in determining whether additional consultation with the Service is necessary. In addition to the federally-protected species list, information on the species' life histories and habitats and information on completing a biological assessment or

¹ The term "federal species of concern" refers to those species which the Service believes might be in need of concentrated conservation actions. Federal species of concern receive no legal protection and their designation does not necessarily imply that the species will eventually be proposed for listing as a federally endangered or threatened species. However, we recommend that all practicable measures be taken to avoid or minimize adverse impacts to federal species of concern.

evaluation and can be found on our web page at <http://www.fws.gov/raleigh>. Please check the web site often for updated information or changes.

If your project contains suitable habitat for any of the federally-listed species known to be present within the county where your project occurs, the proposed action has the potential to adversely affect those species. As such, we recommend that surveys be conducted to determine the species' presence or absence within the project area. The use of North Carolina Natural Heritage program data should not be substituted for actual field surveys.

If you determine that the proposed action may affect (i.e., likely to adversely affect or not likely to adversely affect) a federally-protected species, you should notify this office with your determination, the results of your surveys, survey methodologies, and an analysis of the effects of the action on listed species, including consideration of direct, indirect, and cumulative effects, before conducting any activities that might affect the species. If you determine that the proposed action will have no effect (i.e., no beneficial or adverse, direct or indirect effect) on federally listed species, then you are not required to contact our office for concurrence (unless an Environmental Impact Statement is prepared). However, you should maintain a complete record of the assessment, including steps leading to your determination of effect, the qualified personnel conducting the assessment, habitat conditions, site photographs, and any other related articles.

With regard to the above-referenced project, we offer the following remarks. Our comments are submitted pursuant to, and in accordance with, provisions of the Endangered Species Act.

Based on the information provided and other information available, it appears that the proposed action is not likely to adversely affect any federally-listed endangered or threatened species, their formally designated critical habitat, or species currently proposed for listing under the Act at these sites. We believe that the requirements of section 7(a)(2) of the Act have been satisfied for your project. Please remember that obligations under section 7 consultation must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered; (2) this action is subsequently modified in a manner that was not considered in this review; or, (3) a new species is listed or critical habitat determined that may be affected by the identified action.

However, the Service is concerned about the potential impacts the proposed action might have on aquatic species. Aquatic resources are highly susceptible to sedimentation. Therefore, we recommend that all practicable measures be taken to avoid adverse impacts to aquatic species, including implementing directional boring methods and stringent sediment and erosion control measures. An erosion and sedimentation control plan should be submitted to and approved by the North Carolina Division of Land Resources, Land Quality Section prior to construction. Erosion and sedimentation controls should be installed and maintained between the construction site and any nearby down-gradient surface waters. In addition, we recommend maintaining natural, vegetated buffers on all streams and creeks adjacent to the project site.

The North Carolina Wildlife Resources Commission has developed a Guidance Memorandum (a copy can be found on our website at (<http://www.fws.gov/raleigh>) to address and mitigate secondary and cumulative impacts to aquatic and terrestrial wildlife resources and water quality.

We recommend that you consider this document in the development of your projects and in completing an initiation package for consultation (if necessary).

We hope you find our web page useful and informative and that following the process described above will reduce the time required, and eliminate the need, for general correspondence for species' lists. If you have any questions or comments, please contact Emily Wells of this office at (919) 856-4520 ext. 25.

Sincerely,


fw Pete Benjamin
Field Supervisor

FARMLAND CONVERSION IMPACT RATING

PART I (To be completed by Federal Agency)	Date Of Land Evaluation Request <i>2/13/18</i>
Name Of Project <i>Catfish Pond Mitigation Site</i>	Federal Agency Involved <i>NC Division of Mitigation Services</i>
Proposed Land Use <i>Stream Restoration</i>	County And State <i>Durham County, NC</i>

PART II (To be completed by NRCS)		Date Request Received By NRCS <i>3/13/18</i>	
Does the site contain prime, unique, statewide or local important farmland? <i>(If no, the FPPA does not apply -- do not complete additional parts of this form).</i>		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
		Acres Irrigated <i>none</i>	Average Farm Size <i>108 acres</i>
Major Crop(s) <i>CORN</i>	Farmable Land In Govt. Jurisdiction Acres: <i>132,267</i> % <i>69</i>	Amount Of Farmland As Defined in FPPA Acres: <i>118,720 acres</i> % <i>62</i>	
Name Of Land Evaluation System Used <i>Durham County, NC LESA</i>	Name Of Local Site Assessment System <i>N/A</i>	Date Land Evaluation Returned By NRCS <i>March 26, 2018 by eMail</i>	

PART III (To be completed by Federal Agency)		Alternative Site Rating			
		Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	18.3				
B. Total Acres To Be Converted Indirectly					
C. Total Acres In Site	18.3	0.0	0.0	0.0	

PART IV (To be completed by NRCS) Land Evaluation Information					
A. Total Acres Prime And Unique Farmland	10.6				
B. Total Acres Statewide And Local Important Farmland	56.9				
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	0.1				
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	67.6				

PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value Of Farmland To Be Converted <i>(Scale of 0 to 100 Points)</i>	51	0	0	0
---	----	---	---	---

PART VI (To be completed by Federal Agency) Site Assessment Criteria <i>(These criteria are explained in 7 CFR 658.5(b))</i>	Maximum Points				
1. Area In Nonurban Use	15	15			
2. Perimeter In Nonurban Use	10	10			
3. Percent Of Site Being Farmed	20	20			
4. Protection Provided By State And Local Government	20	20			
5. Distance From Urban Builtup Area	15	10			
6. Distance To Urban Support Services	15	0			
7. Size Of Present Farm Unit Compared To Average	10	5			
8. Creation Of Nonfarmable Farmland	10	10			
9. Availability Of Farm Support Services	5	0			
10. On-Farm Investments	20	0			
11. Effects Of Conversion On Farm Support Services	10				
12. Compatibility With Existing Agricultural Use	10				
TOTAL SITE ASSESSMENT POINTS	160	90	0	0	0

PART VII (To be completed by Federal Agency)					
Relative Value Of Farmland <i>(From Part V)</i>	100	51	0	0	0
Total Site Assessment <i>(From Part VI above or a local site assessment)</i>	160	90	0	0	0
TOTAL POINTS (Total of above 2 lines)	260	141	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes <input type="checkbox"/> No <input type="checkbox"/>
----------------	-------------------	---

Reason For Selection:

From: [Carolyn Lanza](#)
To: [Cortes, Milton - NRCS, Raleigh, NC](#)
Subject: RE: Request for AD1006 Form - Catfish Pond Mitigation Site - Durham County, NC
Date: Tuesday, April 3, 2018 5:11:00 PM
Attachments: [Soils Map Catfish Pond.pdf](#)
[image001.png](#)
[AD1006 Catfish Pond \(003\).pdf](#)

Milton,

I realized in the soils map submitted the acres were incorrect leading to believe the site was larger than it will be. The pervious map had the unclipped acres left over from the total parcel. The total land converted will be 18.26 acres. The attached soils map has the updated numbers.

The completed AD1006 form is also attached.

Thank you for your help.

Carolyn Lanza | *Environmental Scientist*
O: 919.851.9986 x113 **M:** 313.969.7318

Wildlands Engineering, Inc.

312 West Millbrook Road, Suite 225
Raleigh, NC 27609

From: Cortes, Milton - NRCS, Raleigh, NC <Milton.Cortes@nc.usda.gov>
Sent: Monday, March 26, 2018 3:24 PM
To: Carolyn Lanza <clanza@wildlandseng.com>
Subject: RE: Request for AD1006 Form - Catfish Pond Mitigation Site - Durham County, NC
Importance: High

Carolyn:

Please find attached the Farmland Conversion Impact Rating for the NCDENR Division of Mitigation Services (DMS) stream restoration project (Catfish Pond Mitigation Site) located in Durham County. Note that the total acreage were updated according to the map submitted.

Let us know if we can be of further assistance

Cordially;

Milton Cortes
Assistant State Soil Scientist
USDA Natural Resources Conservation Service
4407 Bland Rd, Suite 117
Raleigh, NC 27609
Phone: 919-873-2171

milton.cortes@nc.usda.gov



From: Carolyn Lanza [<mailto:clanza@wildlandseng.com>]
Sent: Tuesday, February 13, 2018 4:31 PM
To: Cortes, Milton - NRCS, Raleigh, NC <Milton.Cortes@nc.usda.gov>
Subject: Request for AD1006 Form - Catfish Pond Mitigation Site - Durham County, NC

Milton,

I have a request for a completed AD-1006 form for a NCDENR Division of Mitigation Services (DMS) stream restoration project (Catfish Pond Mitigation Site) located in Durham County. Please find a Soils Map attached in addition to the AD-1006 form with Parts I and III filled out. The soil breakdown is included on the Soils Map.

Thank you for your assistance and please let me know if you need any additional information.

Carolyn Lanza, | *Environmental Scientist*
O: 919.851.9986 x113 **M:** 313.969.7318

Wildlands Engineering, Inc.

312 West Millbrook Road, Suite 225
Raleigh, NC 27609

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February 9, 2018

Shannon Deaton
North Carolina Wildlife Resource Commission
Division of Inland Fisheries
1721 Mail Service Center
Raleigh, NC 27699

Subject: Catfish Pond Mitigation Site
Durham County, North Carolina

Dear Ms. Deaton,

Wildlands Engineering, Inc. requests review and comment on any possible issues that might emerge with respect to fish and wildlife issues associated with the proposed Catfish Pond Mitigation Site. A USGS Topographic Map and an Overview Site Map showing the approximate project area are enclosed. The topographic figure was prepared from the Rougemont, NC USGS 7.5-minute topographic quadrangle.

The Catfish Pond Mitigation Site is being developed to provide in-kind mitigation for unavoidable stream channel impacts. Several sections of channel have been identified as significantly degraded. The project will include stream restoration on Catfish Creek and several unnamed tributaries all which drain to Mountain Creek and the removal of Catfish Pond. The site has historically been disturbed due to livestock use. Based on a review of historical aerials, Catfish Pond was installed sometime between 1940 and 1955.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning this project.

Sincerely,

A handwritten signature in cursive script that reads "Carolyn Lanza".

Carolyn Lanza
Environmental Scientist

Attachment:

Figure 1 Site Map
Figure 2 USGS Topographic Map



◊ North Carolina Wildlife Resources Commission ◊

Gordon Myers, Executive Director

March 21, 2018

Ms. Carolyn Lanza
Wildlands Engineering, Inc.
1430 South Mint Street, Suite 104
Charlotte, NC 28203

Subject: Request for Environmental Information for the Catfish Pond Mitigation Project, Durham County, North Carolina.

Dear Ms. Lanza,

Biologists with the North Carolina Wildlife Resources Commission (NCWRC) have reviewed the proposed project description. Comments are provided in accordance with certain provisions of the Clean Water Act of 1977 (as amended), Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667e) and North Carolina General Statutes (G.S. 113-131 et seq.).

Wildlands Engineering, Inc. has developed the Catfish Pond Mitigation Project to provide in-kind mitigation for unavoidable stream channel impacts. Several sections of channels have been identified as significantly degraded. In addition to the removal of Catfish Pond, this project will include stream restoration of Catfish Creek and several unnamed tributaries to Mountain Creek. There are records for the federal species of concern and state-endangered, yellow lampmussel (*Lampsilis cariosa*) near the project site. There are also historic records for the federal species of concern and state-significantly rare, Roanoke bass (*Ambloplites cavifrons*) and federal species of concern and state-special concern, Neuse River Waterdog (*Necturus lewisi*) in the project vicinity. The Natural Heritage Natural Area – Little River Gorge – is located along the Little River. The project area is located west of Roxboro Road, north of Patrick Road, north of Durham.

Stream restoration projects often improve water quality and aquatic habitat. Establishing native, forested buffers in riparian areas will help protect water quality, improve aquatic and terrestrial habitats and provide a travel corridor for wildlife species. Due to the possible presence of rare aquatic species in the project area, all work should be coordinated with Dr. Tyler Black, NCWRC Eastern Region Aquatic Wildlife Diversity Research Coordinator (tyler.black@ncwildlife.org, 336-290-0054), prior to project commencement.

The NCWRC recommends the use of biodegradable and wildlife-friendly sediment and erosion control devices. Silt fencing, fiber rolls and/or other products should have loose-weave netting that is made of natural fiber materials with movable joints between the vertical and horizontal twines. Silt fencing and similar products that have been reinforced with plastic or metal mesh should be avoided as they impede

Mailing Address: Habitat Conservation • 1721 Mail Service Center • Raleigh, NC 27699-1721
Telephone: (919) 707-0220 • **Fax:** (919) 707-0028

Page 2

March 21, 2018

Scoping – Catfish Pond Mitigation Project

the movement of terrestrial wildlife species. Excessive silt and sediment loads can have detrimental effects on aquatic resources including destruction of spawning habitat, suffocation of eggs and clogging of gills. Any invasive plant species that are found onsite should be removed.

Thank you for the opportunity to review and comment on this project. If I can be of further assistance, please contact me at (910) 409-7350 or gabriela.garrison@ncwildlife.org.

Sincerely,

A handwritten signature in blue ink that reads "Gabriela Garrison". The signature is written in a cursive, flowing style.

Gabriela Garrison
Eastern Piedmont Habitat Conservation Coordinator
Habitat Conservation Program

cc: Tyler Black, NCWRC

From: [Carolyn Lanza](#)
To: ["tyler.black@ncwildlife.org"](mailto:tyler.black@ncwildlife.org)
Subject: Catfish Pond Mitigation Project
Date: Friday, April 6, 2018 1:12:00 PM
Attachments: [NCWRC Scoping_Catfish Pond Mitigation Project_Durham County.pdf](#)

Hello Dr. Black,

I am reaching out to you in regards to potential rare, aquatic species on site at Catfish Pond Stream Mitigation Project in Durham County. There are records for federal species of concern and state-endangered, yellow lampmussel (*Lampsilis cariosa*) near the project site. There are also historic records for the federal species of concern and state-significantly rare, Roanoke bass (*Ambloplites cavifrons*) and federal species of concern and state-special concern, Neuse River Waterdog (*Necturus lewisi*) in the project vicinity. How would you like to be involved in the project going forward?

Thank you,

Carolyn Lanza | *Environmental Scientist*
O: 919.851.9986 x113 **M:** 313.969.7318

Wildlands Engineering, Inc.

312 West Millbrook Road, Suite 225
Raleigh, NC 27609

From: Garrison, Gabriela <gabriela.garrison@ncwildlife.org>
Sent: Wednesday, March 21, 2018 9:39 PM
To: Carolyn Lanza <clanza@wildlandseng.com>
Cc: Black, Tyler R <tyler.black@ncwildlife.org>
Subject: WRC Comments for 2 Mitigation Projects

Hello Ms. Lanza,

I have attached comments for two mitigation projects – Sassarixa Swamp and Catfish Pond in Johnston and Durham Counties, respectively. Of particular note, please contact Dr. Tyler Black (NCWRC) in reference to the Catfish Pond Mitigation Project due to the potential presence of rare, aquatic species onsite.

Let me know if you have any questions.

Thank you,
Gabriela

Gabriela Garrison
Eastern Piedmont Habitat Conservation Coordinator

NC Wildlife Resources Commission

Sandhills Depot, P.O. Box 149

Hoffman, NC 28347

Office and Cell: 910-409-7350

gabriela.garrison@ncwildlife.org

www.ncwildlife.org



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Catfish Pond Mitigation Site
Categorical Exclusion

FIGURES

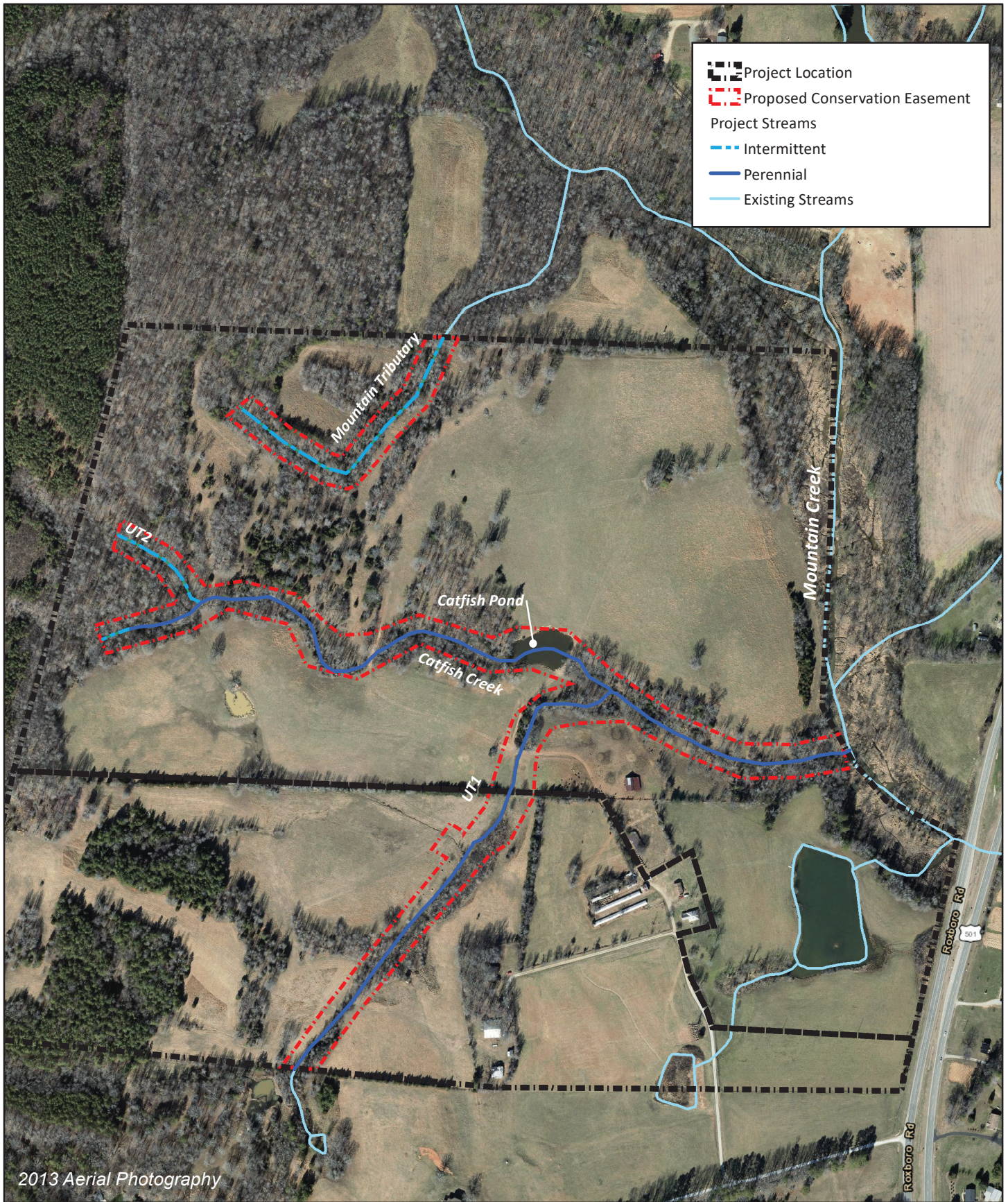
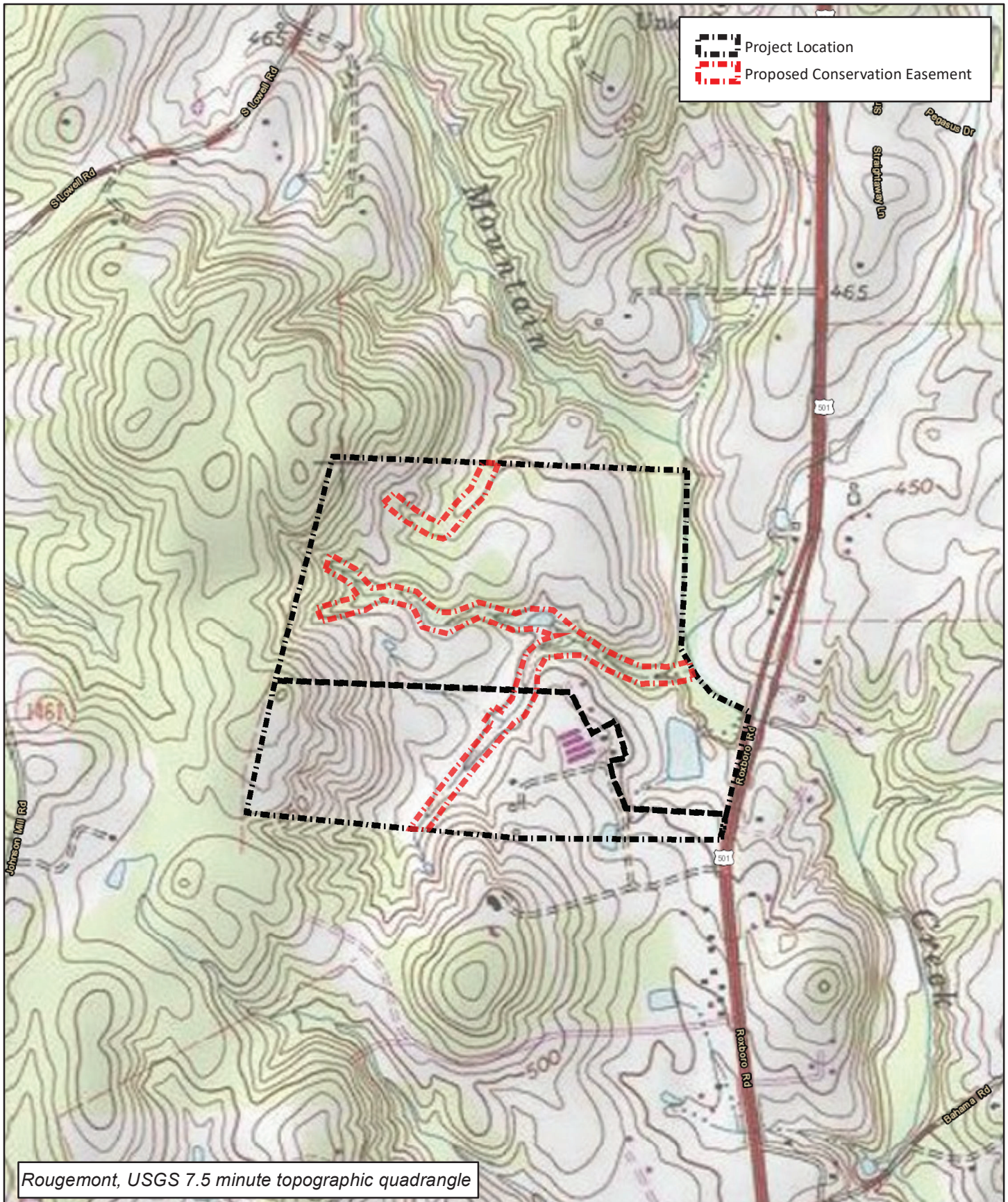




Figure 1 Site Map
 Catfish Pond Mitigation Site
 Neuse River Basin 03020201



 Project Location
 Proposed Conservation Easement

Rougemont, USGS 7.5 minute topographic quadrangle

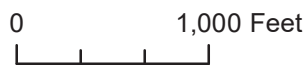


Figure 2 USGS Topographic Map
 Catfish Pond Mitigation Site
 Neuse River Basin 03020201

Appendix 7

Plan Sheets

Catfish Pond Mitigation Site

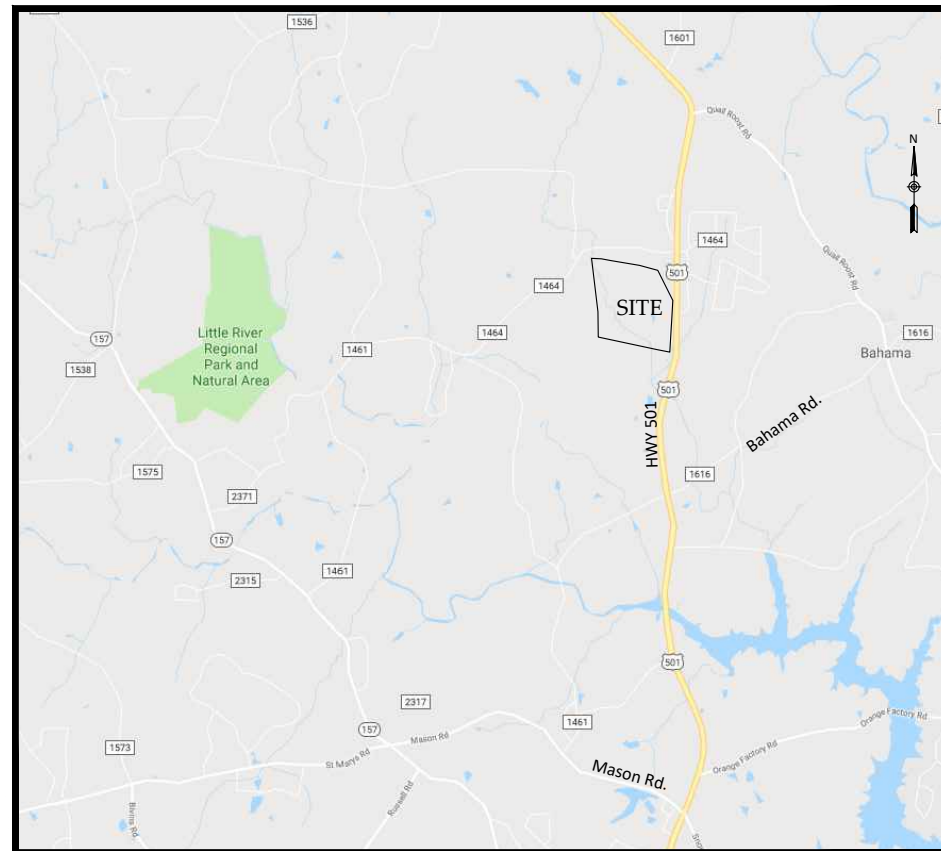
Durham County, North Carolina

for

NCDEQ

Division of Mitigation Services

Durham County, NC

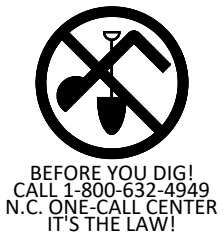


Vicinity Map
Not to Scale

Site Coordinates	
Latitude	Longitude
36.163342	-78.910461



Construction Drawings
July 17, 2019



Sheet Index

Title Sheet	0.1
General Notes and Legend	0.2
Project Overview	0.3
Typical Sections	1.1-1.4
Stream Plan and Profile	2.1-2.19
Grading Plan	3.1-3.7
Erosion and Sediment Control	4.0-4.8
Planting and Fencing Plan	5.0-5.7
Details	6.1-6.12

Project Directory

Engineering:
Wildlands Engineering, Inc
License No. F-0831
312 W. Millbrook Rd., Suite 225
Raleigh, NC 27609
Chris Roessler
919-851-9986

Surveying:
Kee Mapping & Surveying
Box P.O. 2566
Asheville, NC 28802
Phillip B. Kee, PLS
828-575-9021

Owner:
NCDEQ
Division of Mitigation Services
217 West Jones St. Suite 3000A
Raleigh, NC 27603
Jeff Schaffer
919-707-8976

DMS Project No. 100039

Neuse River Basin HUC 03020201

USACE Action ID: SAW-2018-00424

WILDLANDS
ENGINEERING
312 W. Millbrook Rd. Suite 225
Raleigh, NC 27609
Tel: 919.851.9986
Fax: 704.332.3306
Firm License No. F-0831



Catfish Pond Mitigation Site
Durham County, North Carolina

Cover

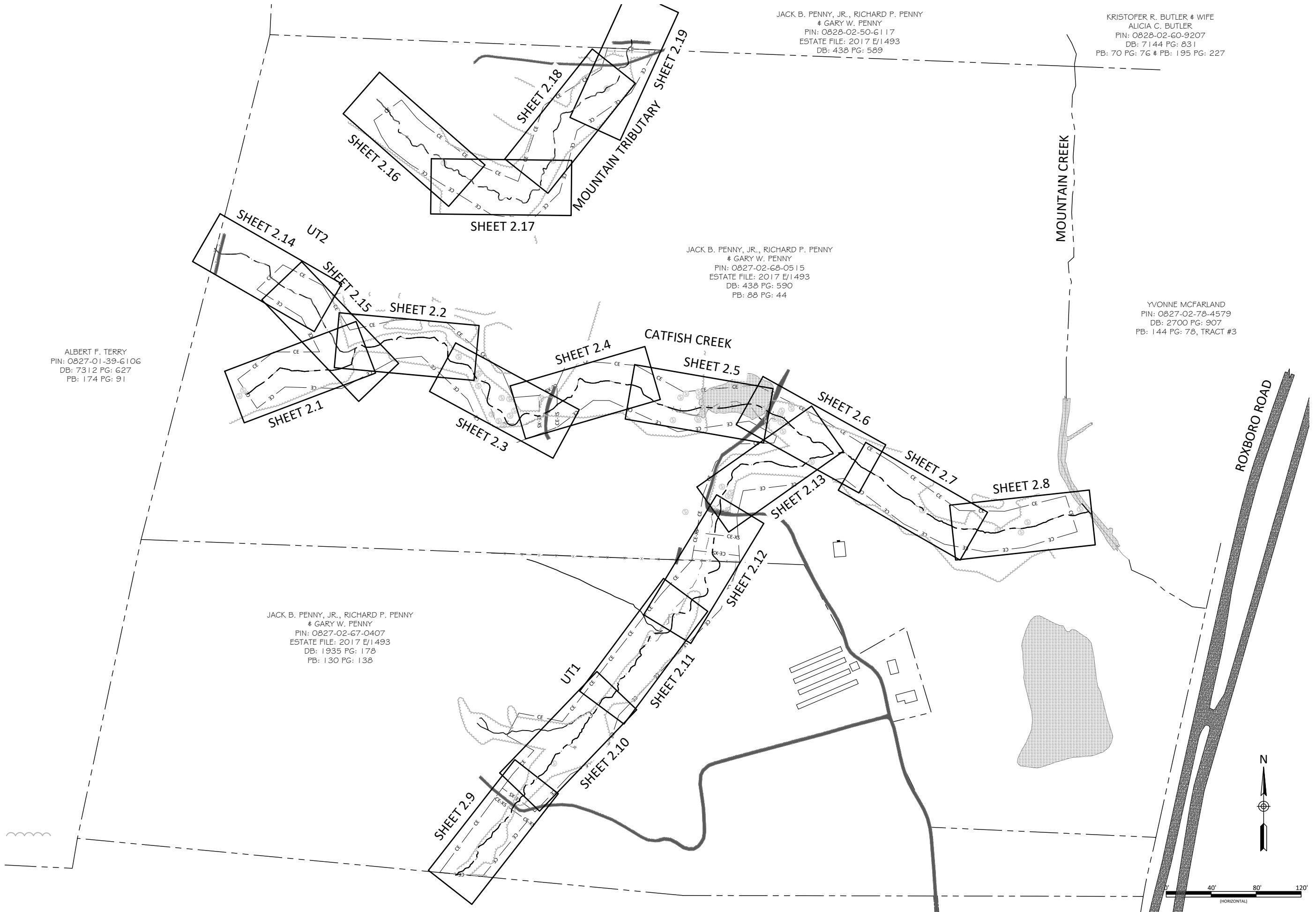
Revisions

Date: 07-16-2019
Job Number: 005-02168
Project Engineer: GLS
Drawn By: ABP
Checked By: CR

0.1

Sheet

July 23, 2019
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& GARY W. PENNY
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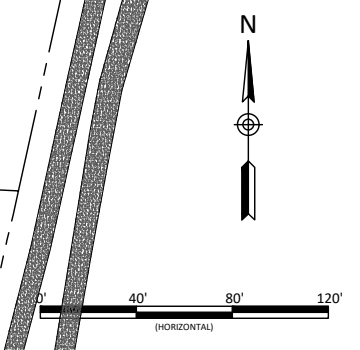
KRISTOFER R. BUTLER & WIFE
ALICIA C. BUTLER
PIN: 0828-02-60-9207
DB: 7144 PG: 831
PB: 70 PG: 76 & PB: 195 PG: 227

JACK B. PENNY, JR., RICHARD P. PENNY
& GARY W. PENNY
PIN: 0827-02-68-0515
ESTATE FILE: 2017 E/1493
DB: 438 PG: 590
PB: 88 PG: 44

YVONNE MCFARLAND
PIN: 0827-02-78-4579
DB: 2700 PG: 907
PB: 144 PG: 78, TRACT #3

ALBERT F. TERRY
PIN: 0827-01-39-6106
DB: 7312 PG: 627
PB: 174 PG: 91

JACK B. PENNY, JR., RICHARD P. PENNY
& GARY W. PENNY
PIN: 0827-02-67-0407
ESTATE FILE: 2017 E/1493
DB: 1935 PG: 178
PB: 130 PG: 138



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Catfish Pond Mitigation Site
Durham County, North Carolina
Project Overview

Revisions

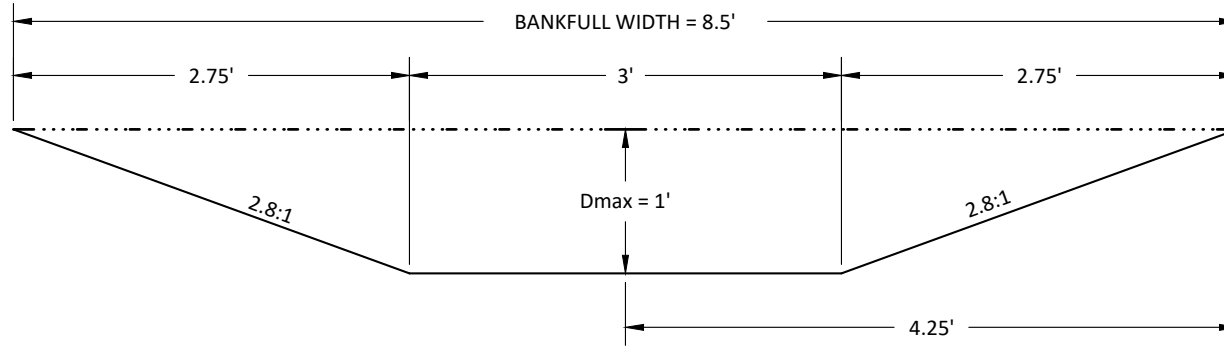
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Project Engineer: GLS
Drawn By: ABP
Checked By: CR

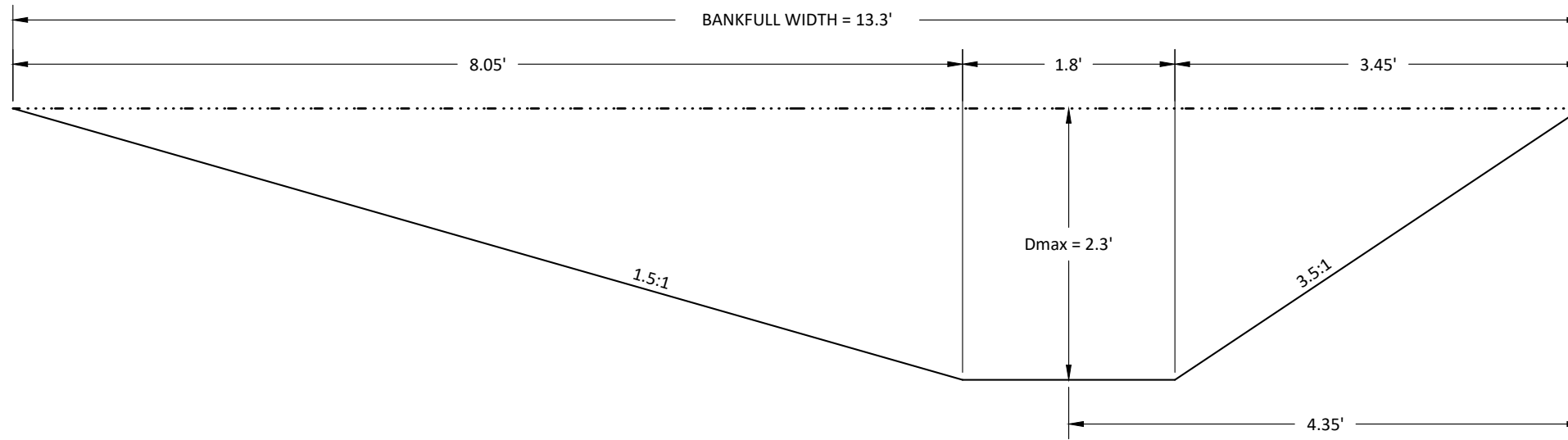
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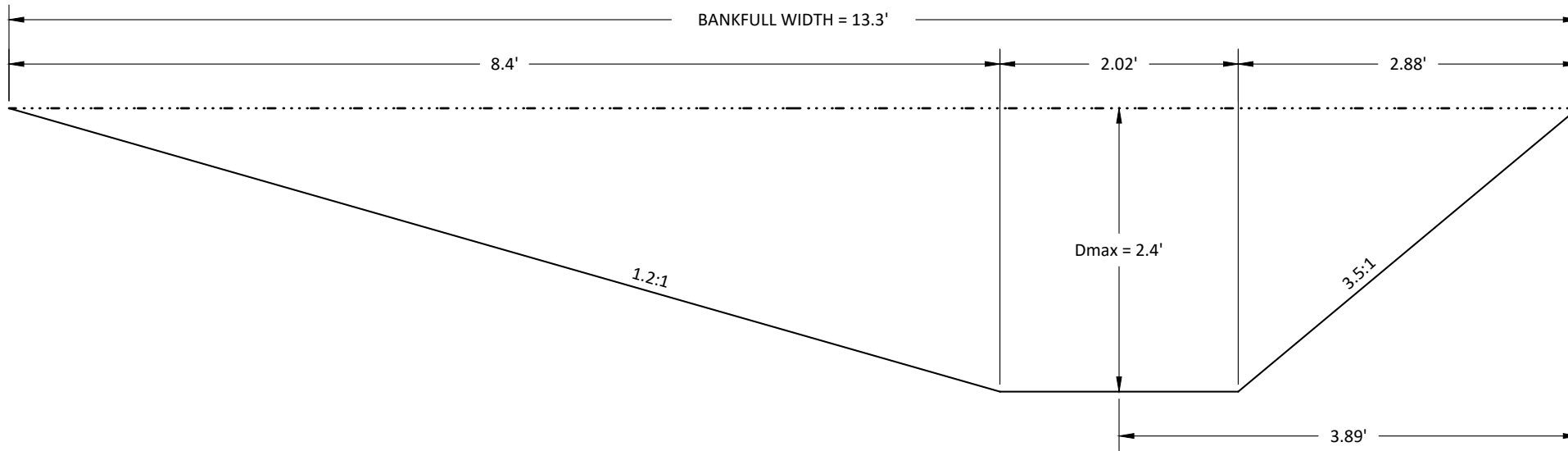
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Catfish Creek Reach 4 - Pool STA: 210+74 - 215+89



Catfish Creek Reach 4 - Pool With Structure STA: 210+74 - 215+89

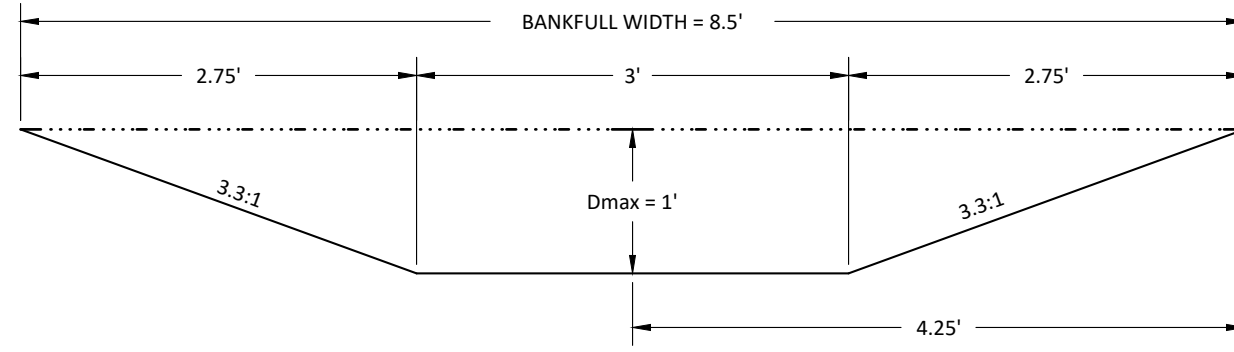


Catfish Pond Mitigation Site
Durham County, North Carolina
 Catfish Creek Reach 4
 Typical Sections

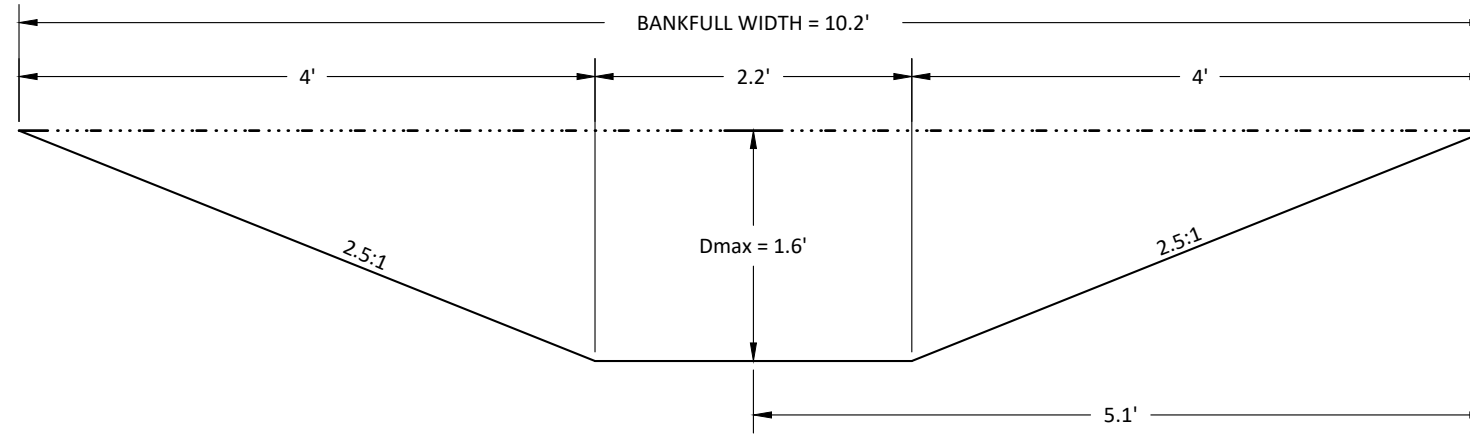
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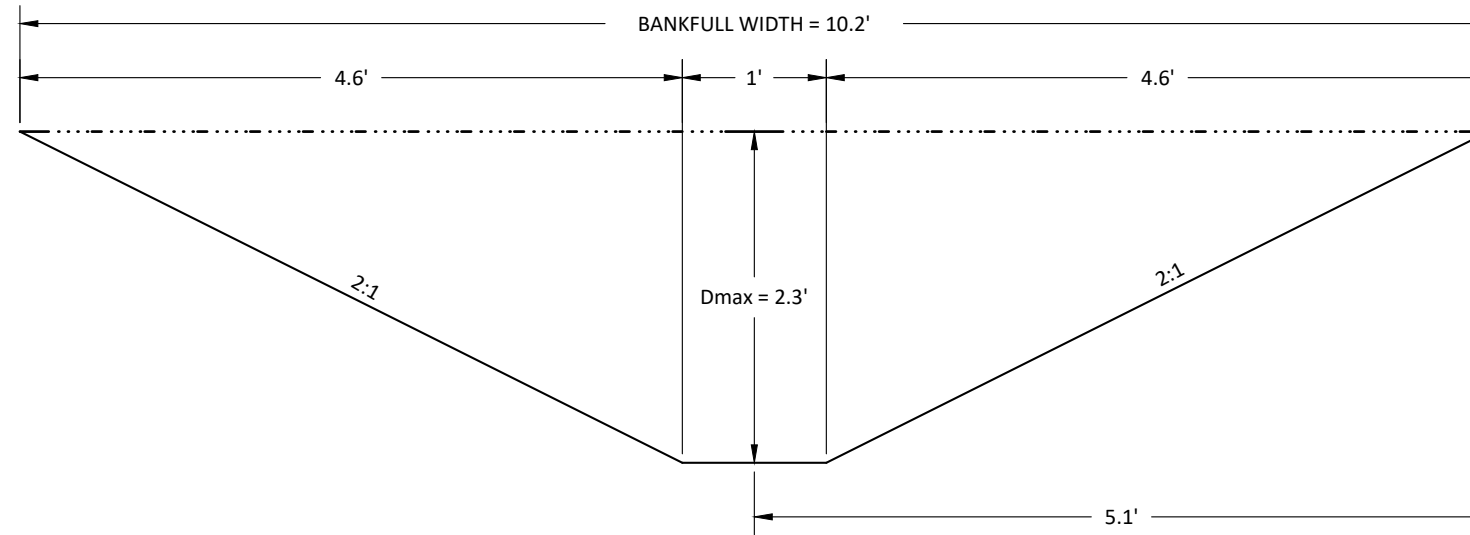
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Catfish Creek Reach 6 - Pool STA: 118+17 - 122+71



Catfish Creek Reach 6 - Pool With Structure STA: 118+17 - 122+71

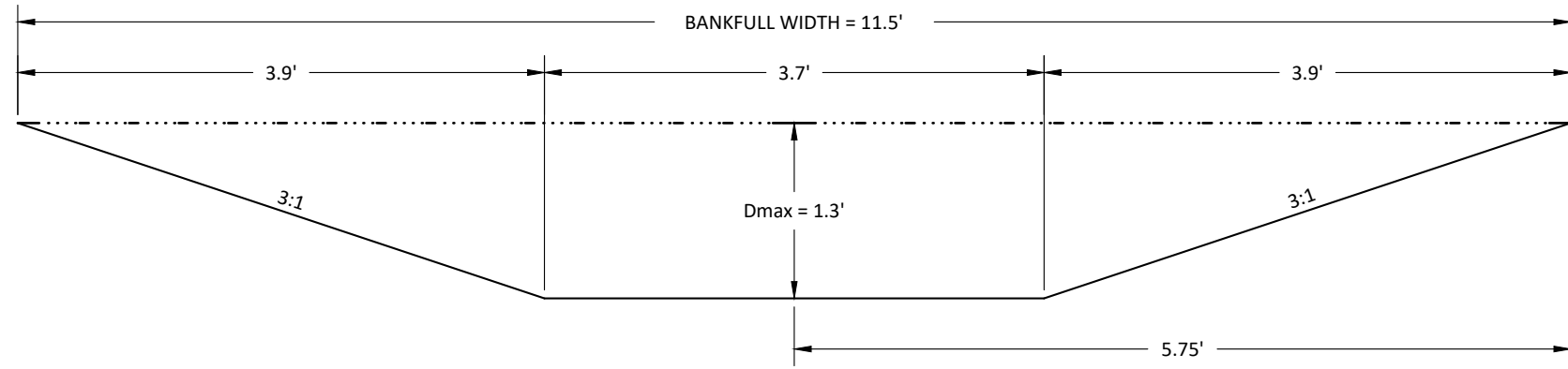


Catfish Pond Mitigation Site
 Durham County, North Carolina
 Catfish Creek Reach 6
 Typical Sections

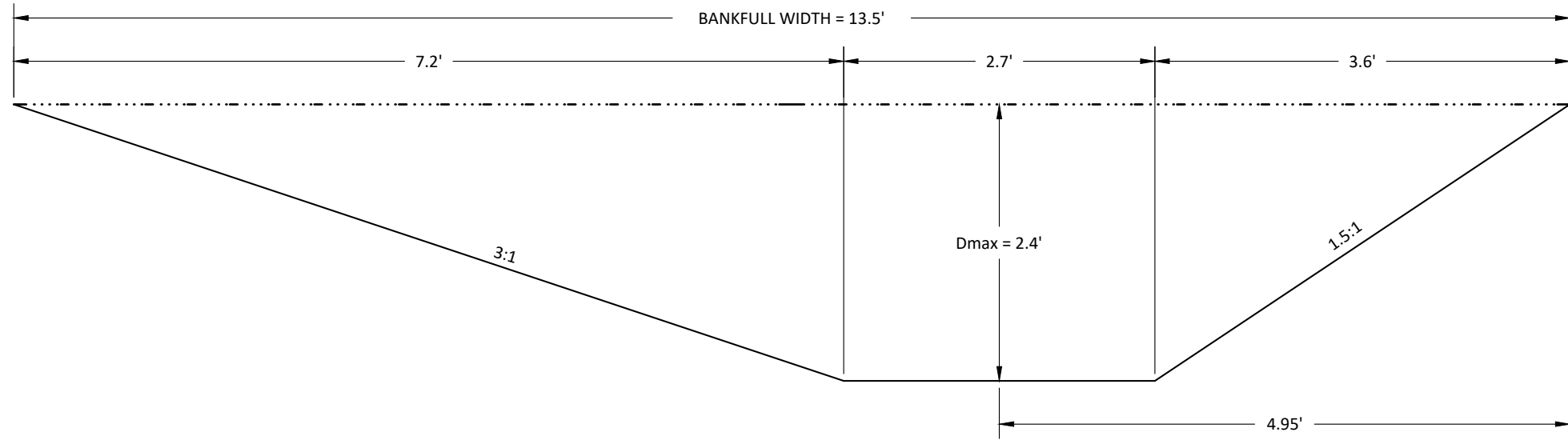
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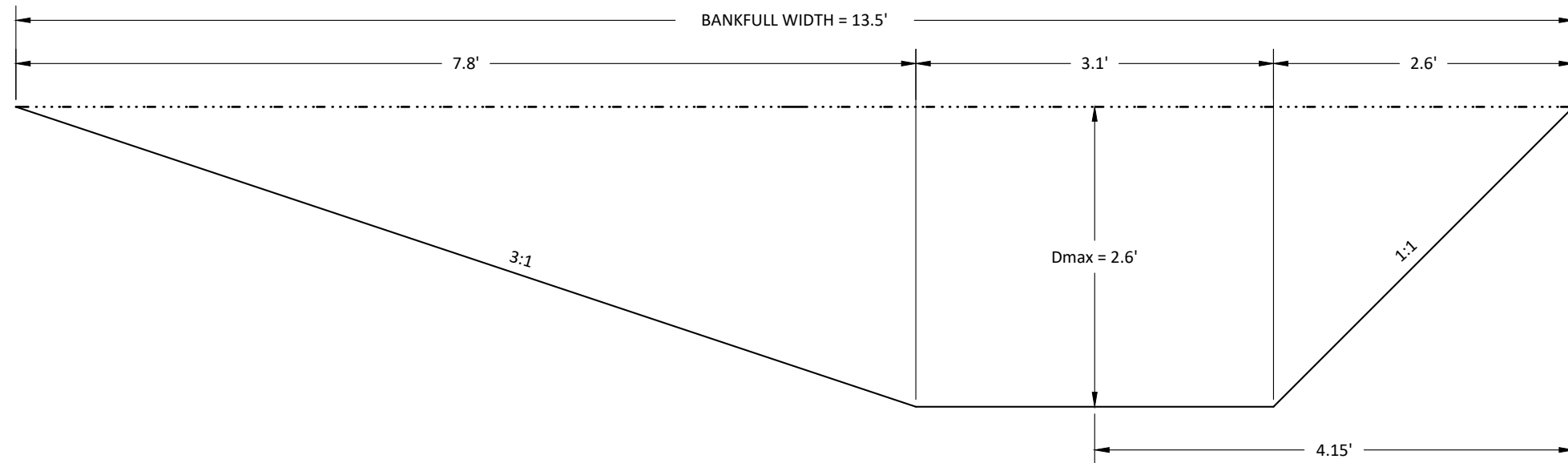
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UT1 Reach 2 - Pool
STA: 210+74 - 215+89



UT1 Reach 2 - Pool With Structure
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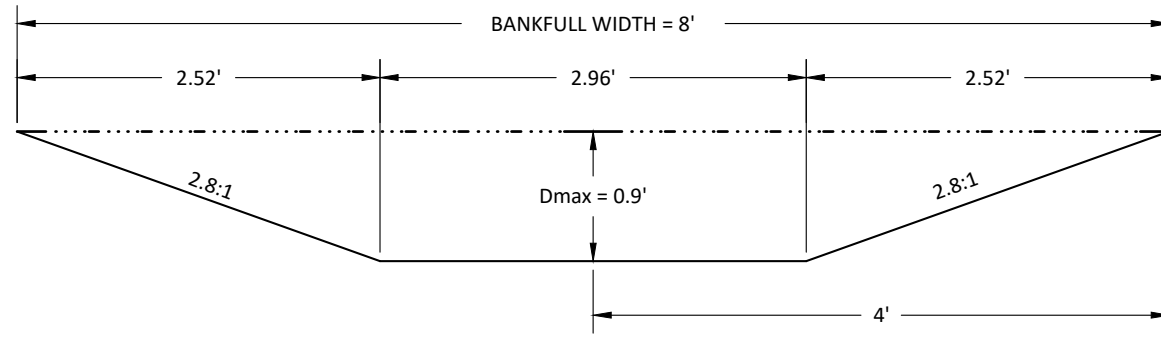


Catfish Pond Mitigation Site
Durham County, North Carolina
UT1 Reach 2
Typical Sections

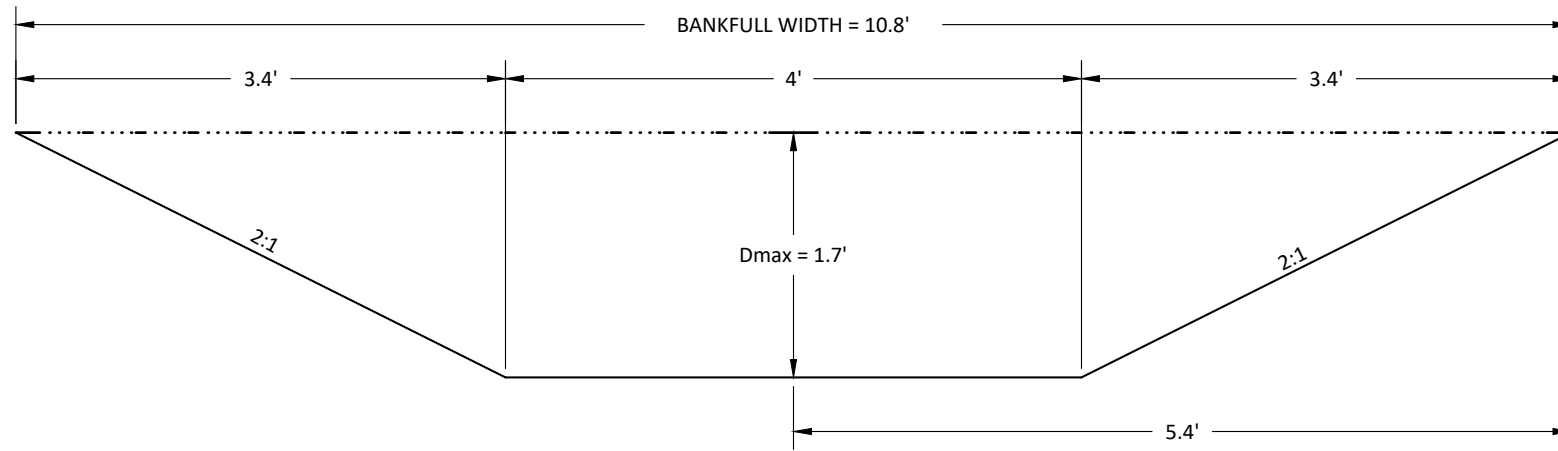
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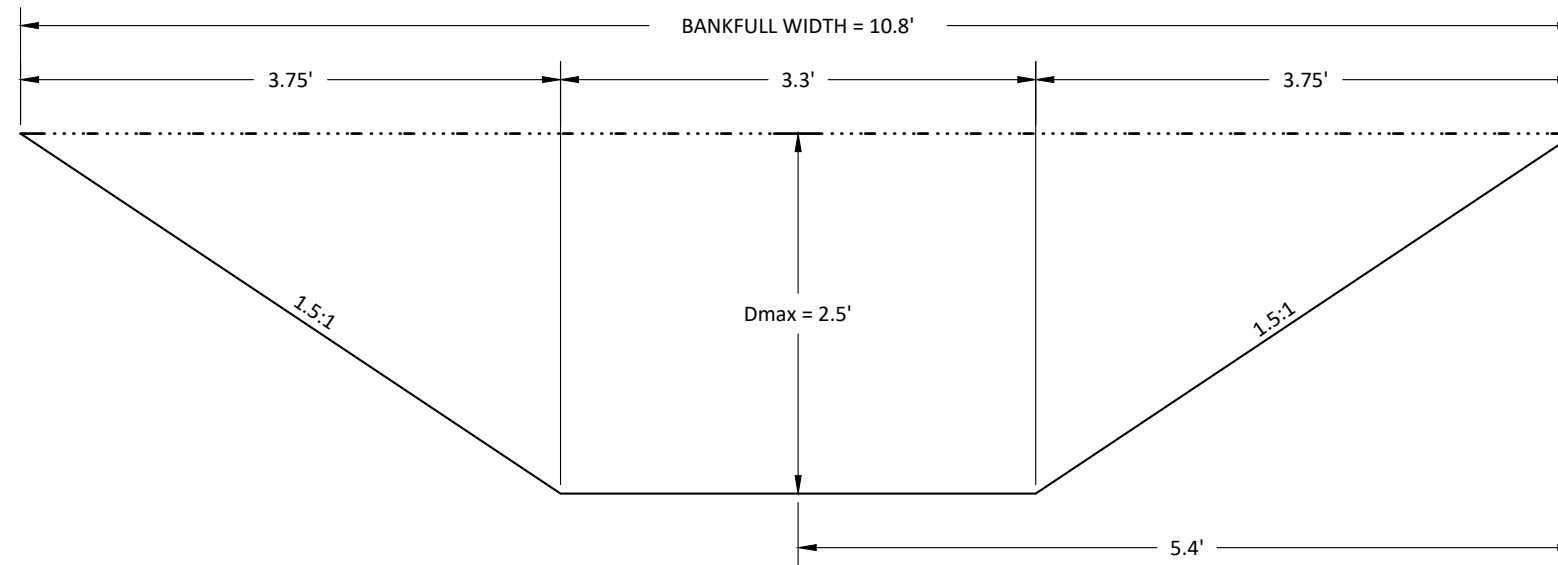
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UT1 Reach 3 - Pool
STA: 216+49 - 217+98



UT1 Reach 3 - Pool With Structure
STA: 216+49 - 217+98

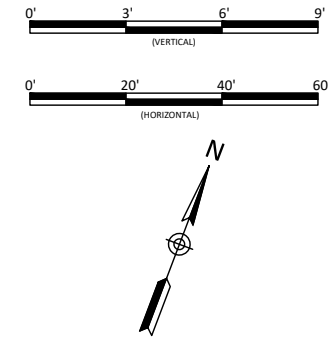
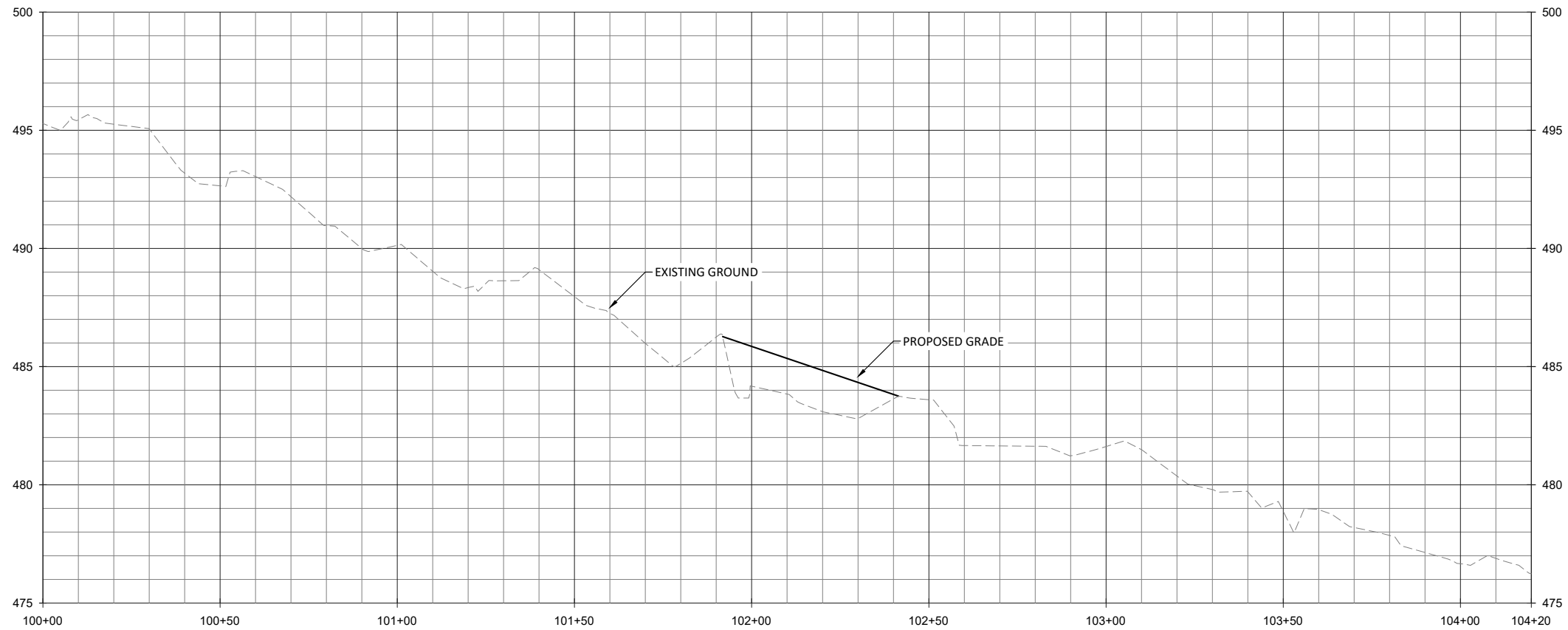


Catfish Pond Mitigation Site
 Durham County, North Carolina
 UT1 Reach 3
 Typical Sections

Revisions:

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 Drawn By: ABP
 Checked By: CR

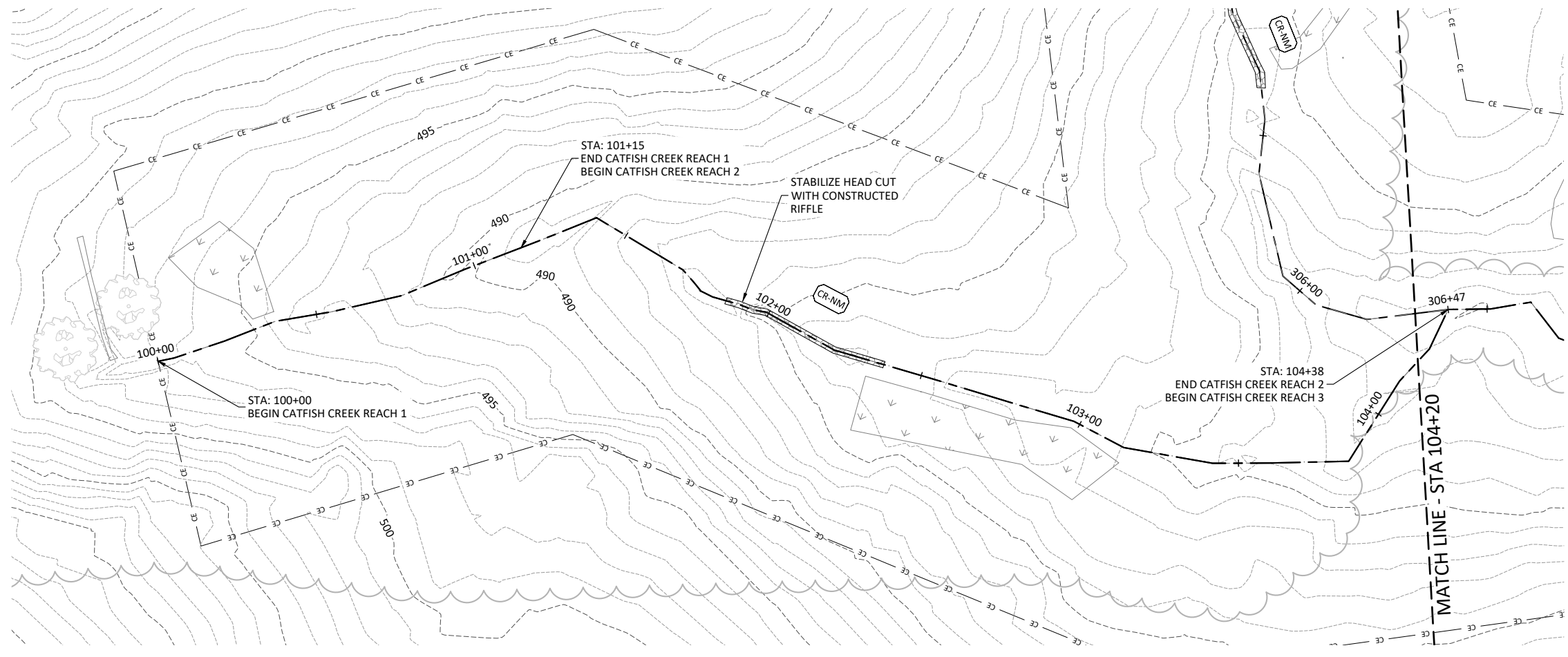
July 23, 2019



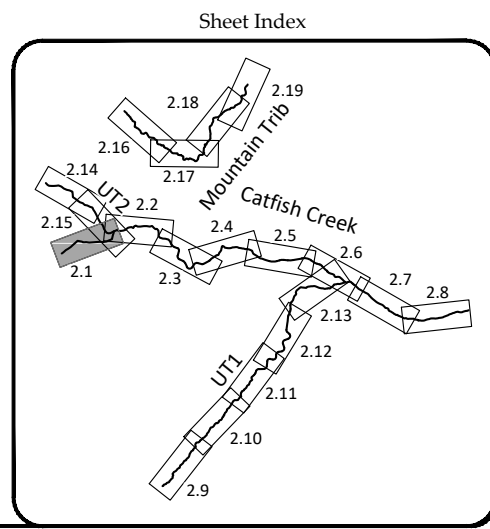
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Raleigh, NC 27609
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Fax: 704.332.3306
Firm License No. F-0831



Catfish Pond Mitigation Site
Durham County, North Carolina
Plan and Profile
Catfish Creek



- REACHWIDE TREATMENTS**
1. FENCE OUT CATTLE.
 2. TREAT INVASIVE SPECIES - REFER TO PLANTING PLAN SHEETS.
 3. SUPPLEMENT BUFFER PLANTING - REFER TO PLANTING PLAN SHEETS.
 4. SPOT REPAIR ON ERODED BANKS.



Revisions

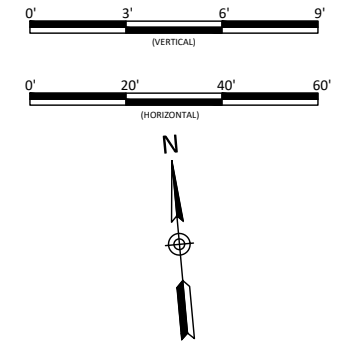
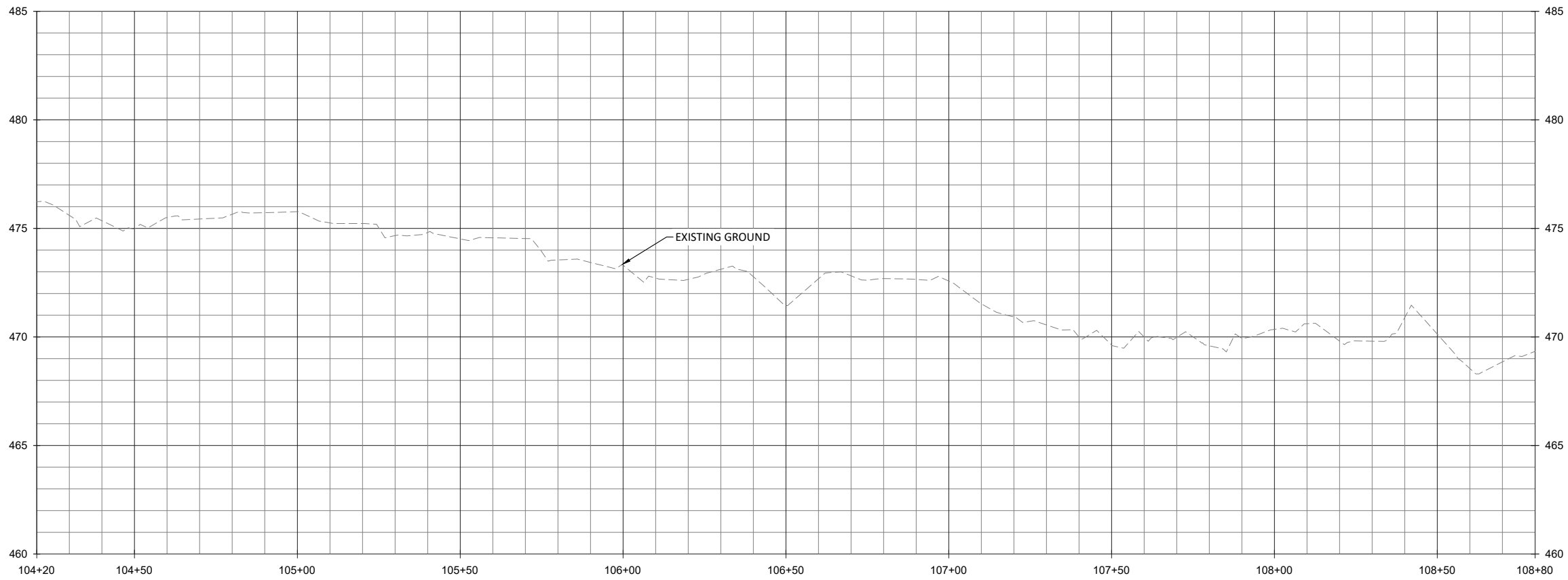
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Job Number: 005-02168
Project Engineer: GLS
Drawn By: ABP
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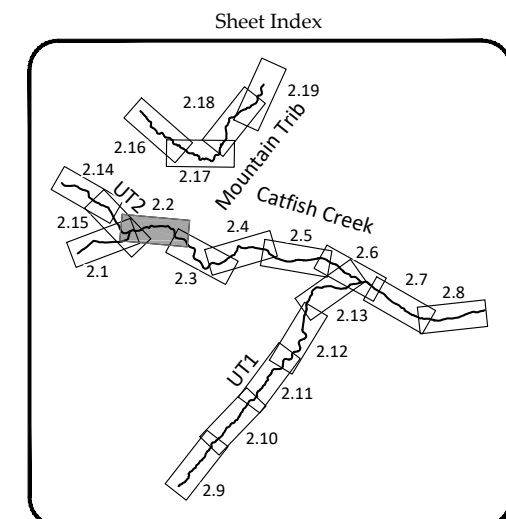
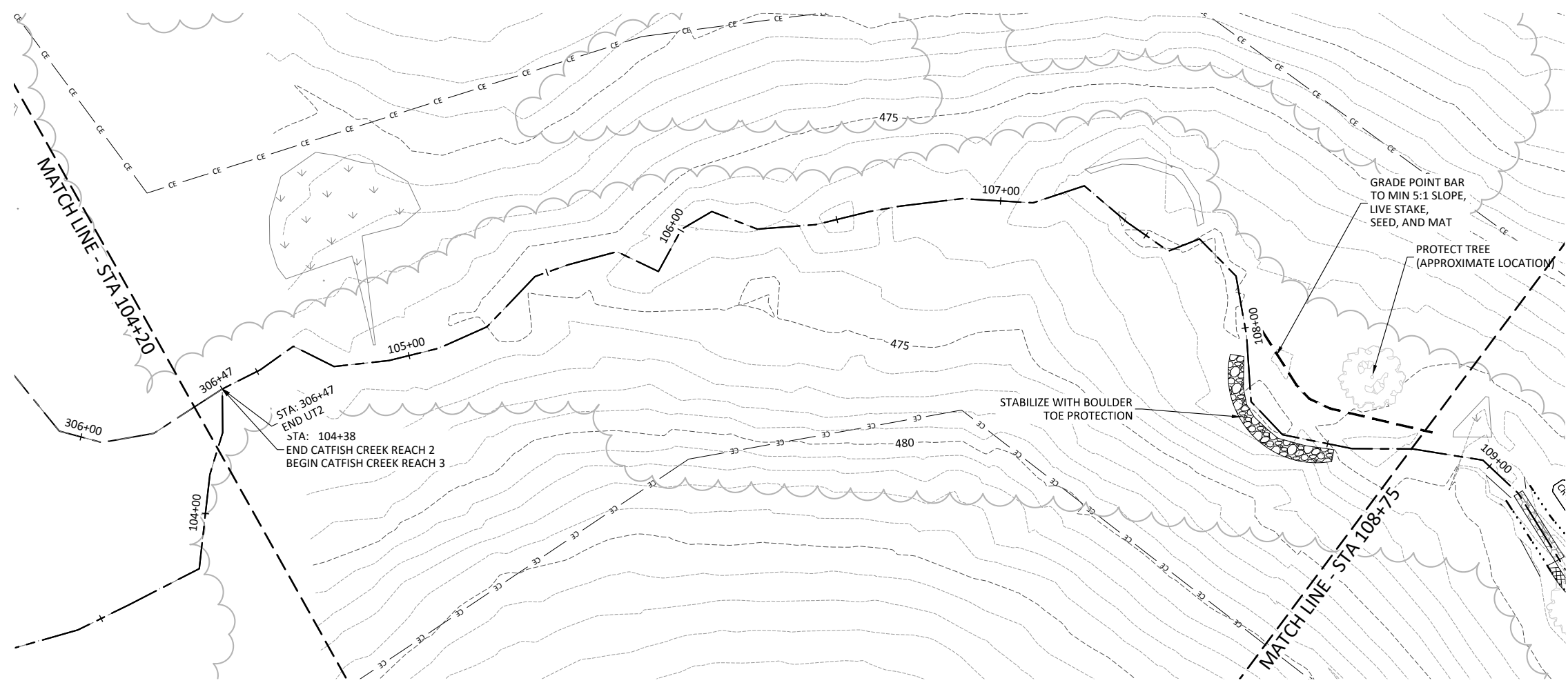


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Plan and Profile
Catfish Creek

- REACHWIDE TREATMENTS**
1. FENCE OUT CATTLE.
 2. TREAT INVASIVE SPECIES - REFER TO PLANTING PLAN SHEETS.
 3. SUPPLEMENT BUFFER PLANTING - REFER TO PLANTING PLAN SHEETS.
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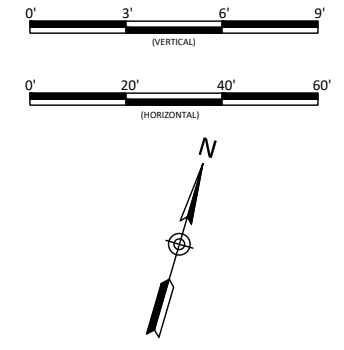
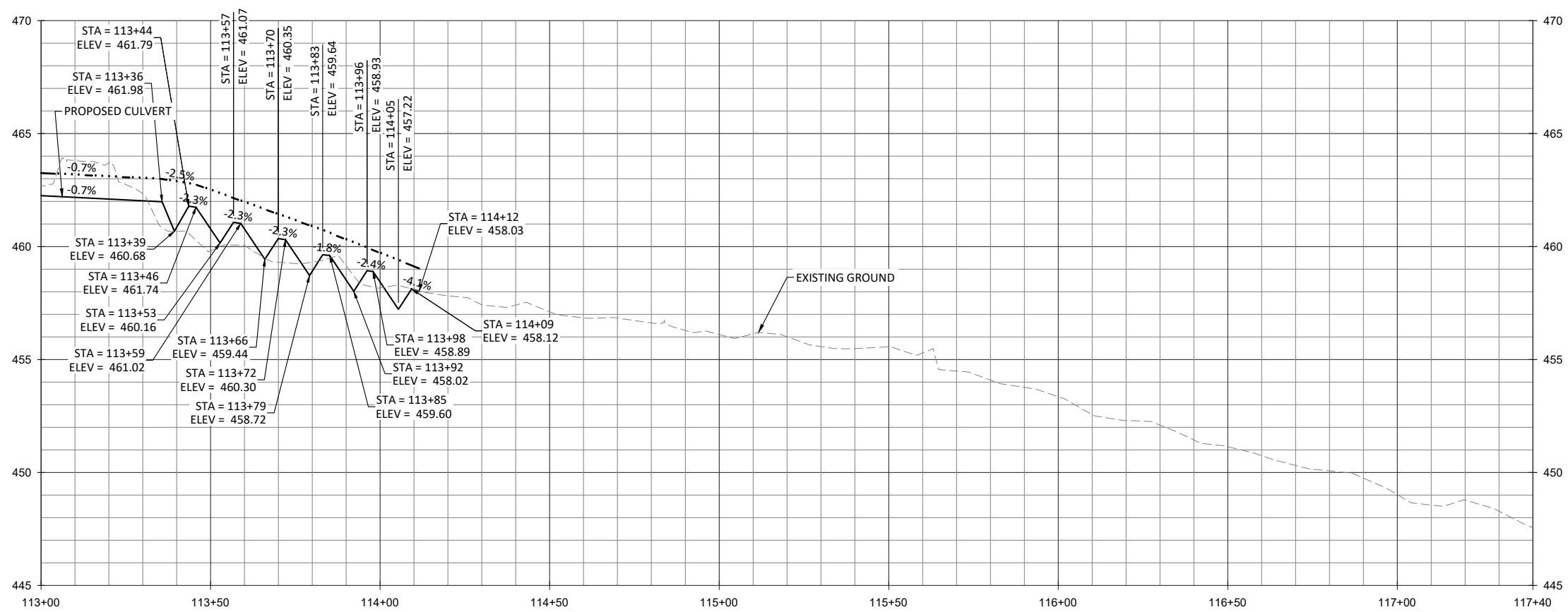
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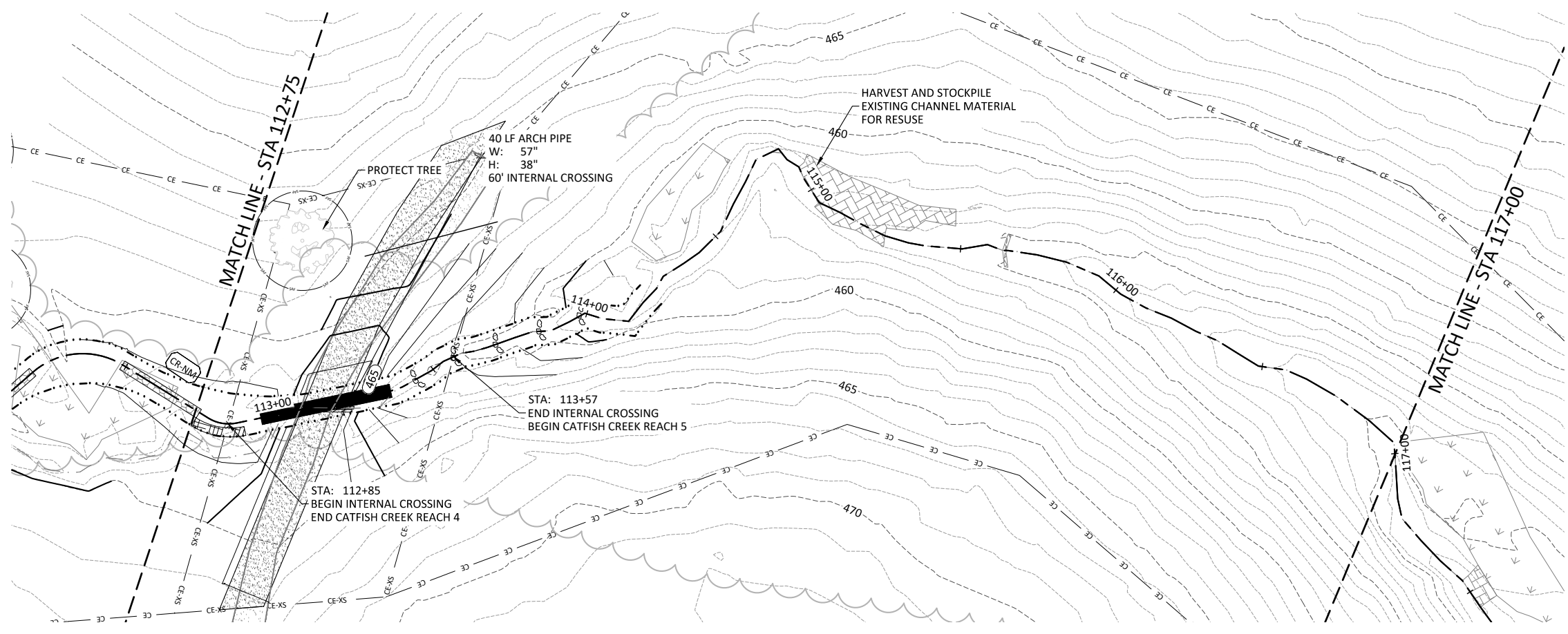
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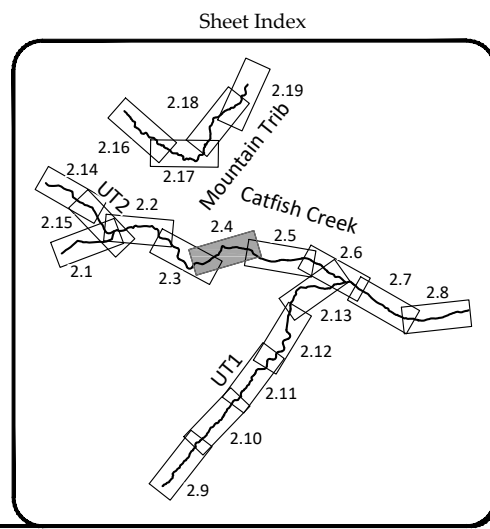
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- REACHWIDE TREATMENTS**
- CATFISH CREEK REACH 4**
1. RESTORATION
- CATFISH CREEK REACH 5**
1. FENCE OUT CATTLE.
 2. TREAT INVASIVE SPECIES - REFER TO PLANTING PLAN SHEETS.
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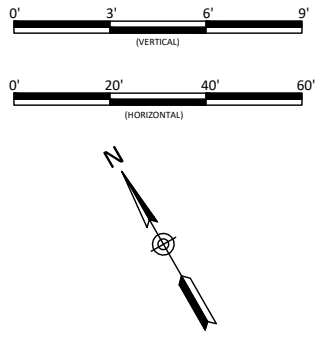
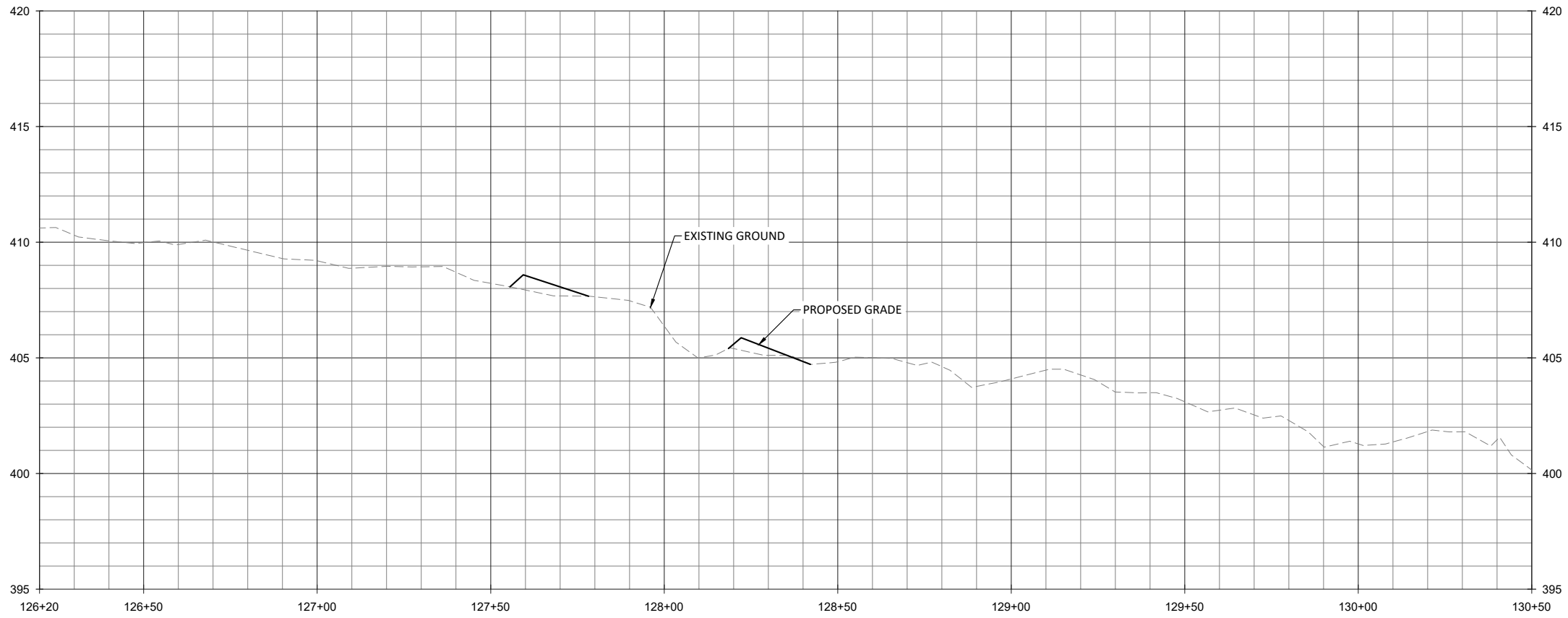
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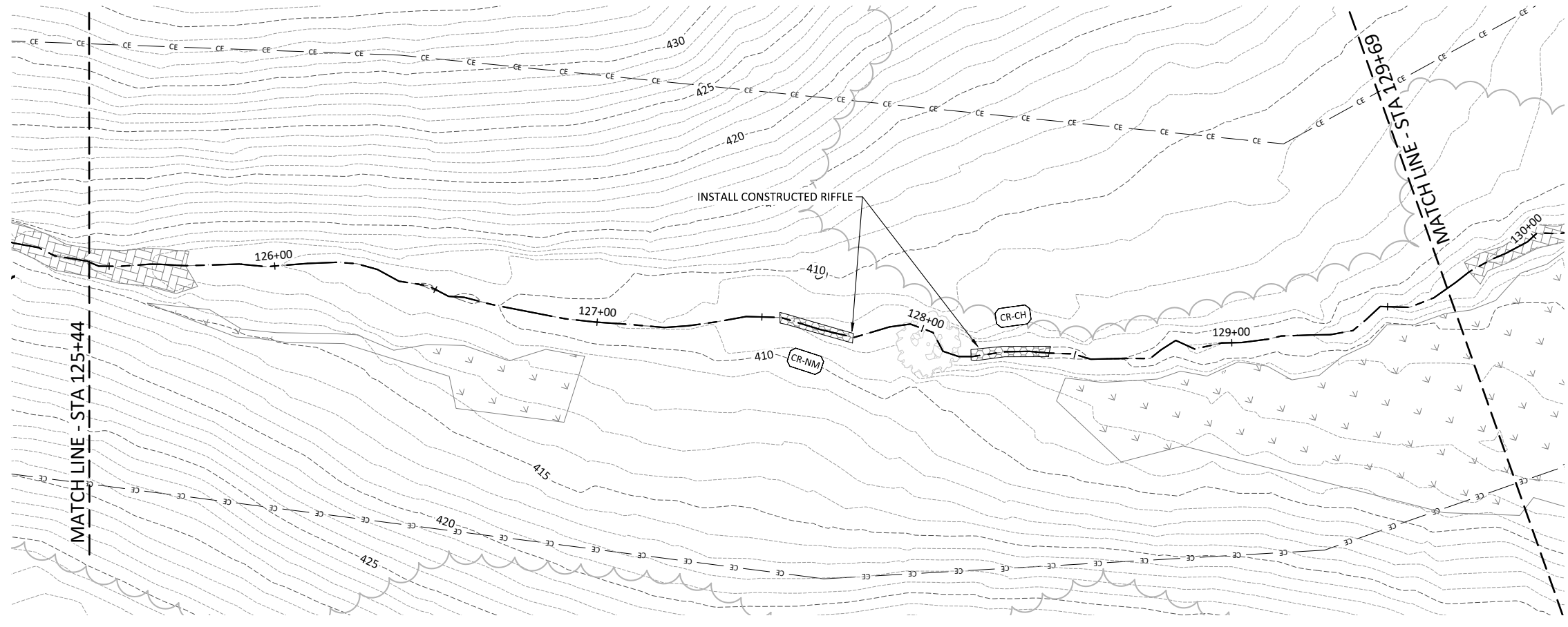
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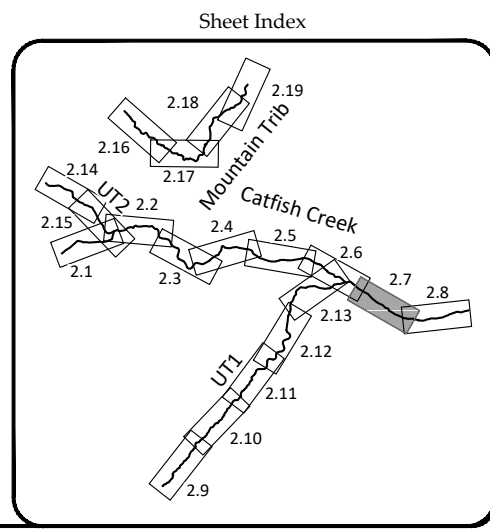
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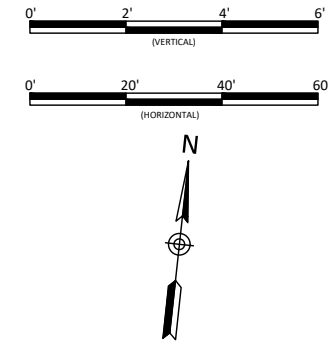
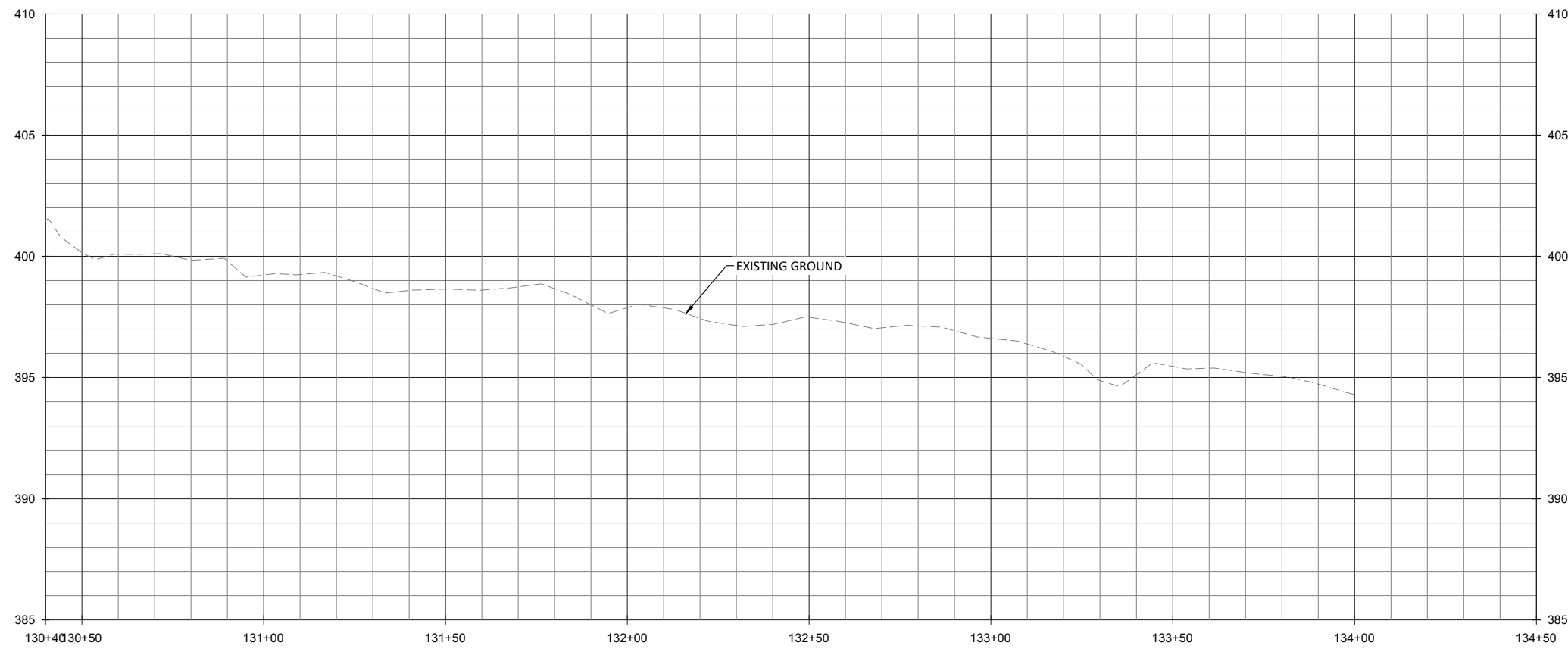
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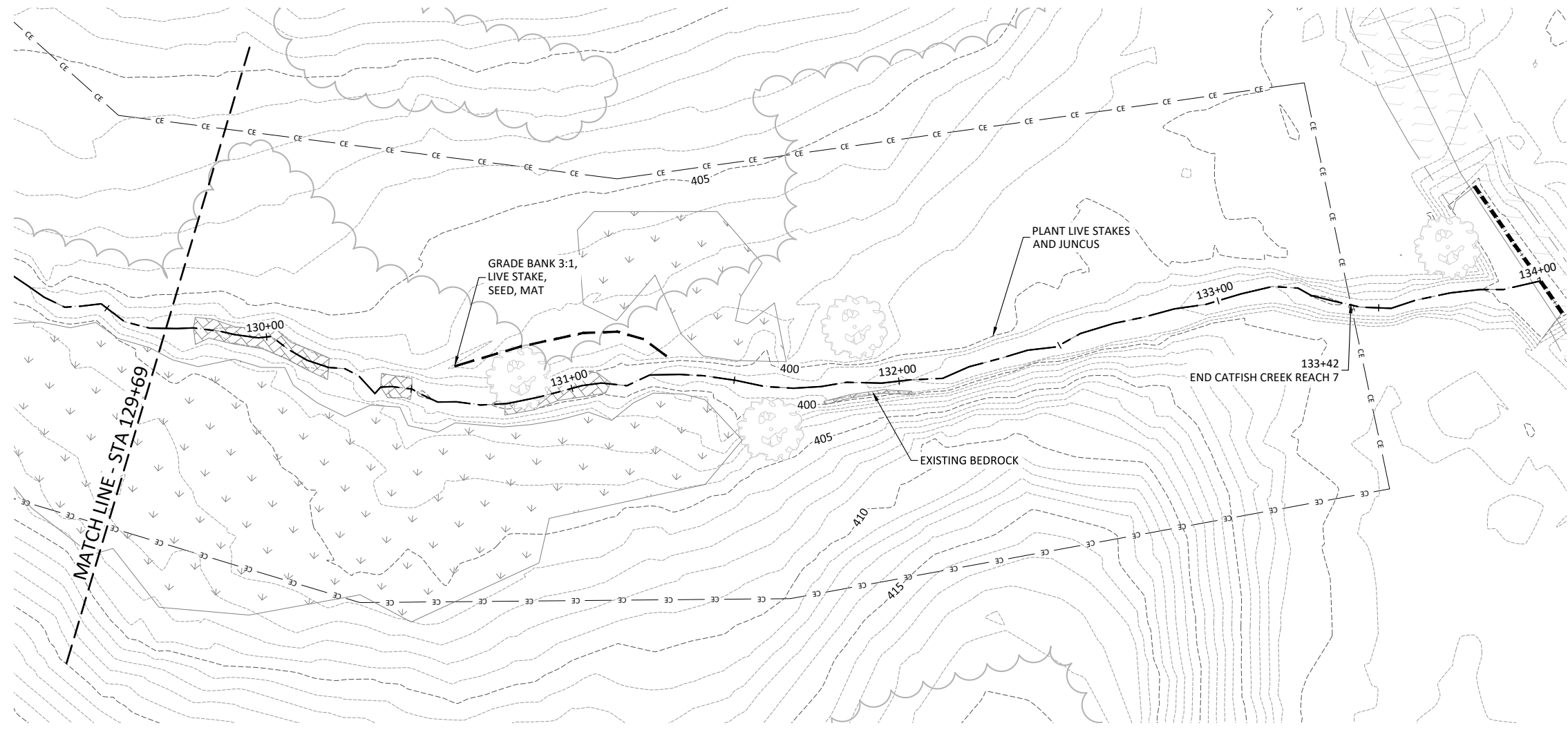
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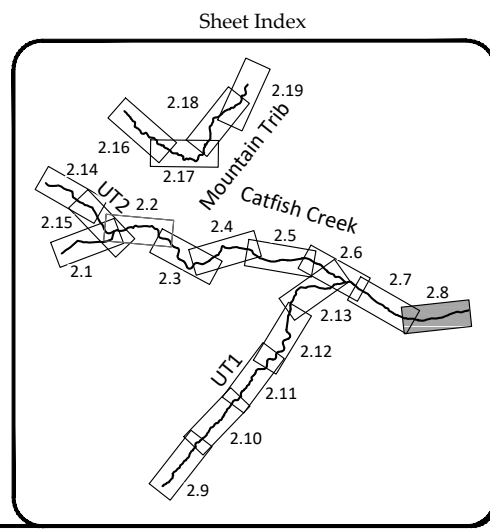
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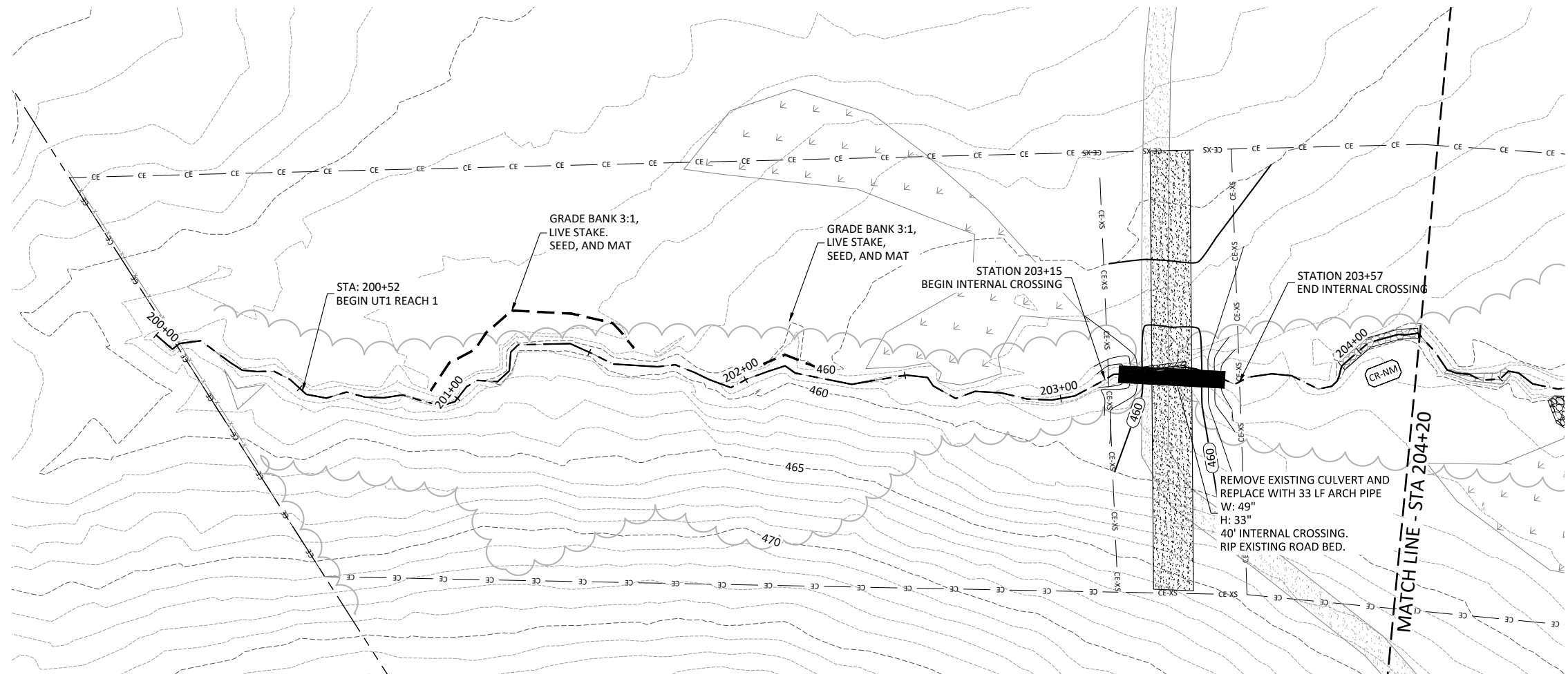
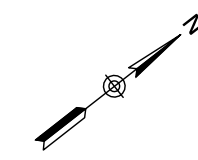
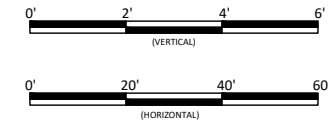
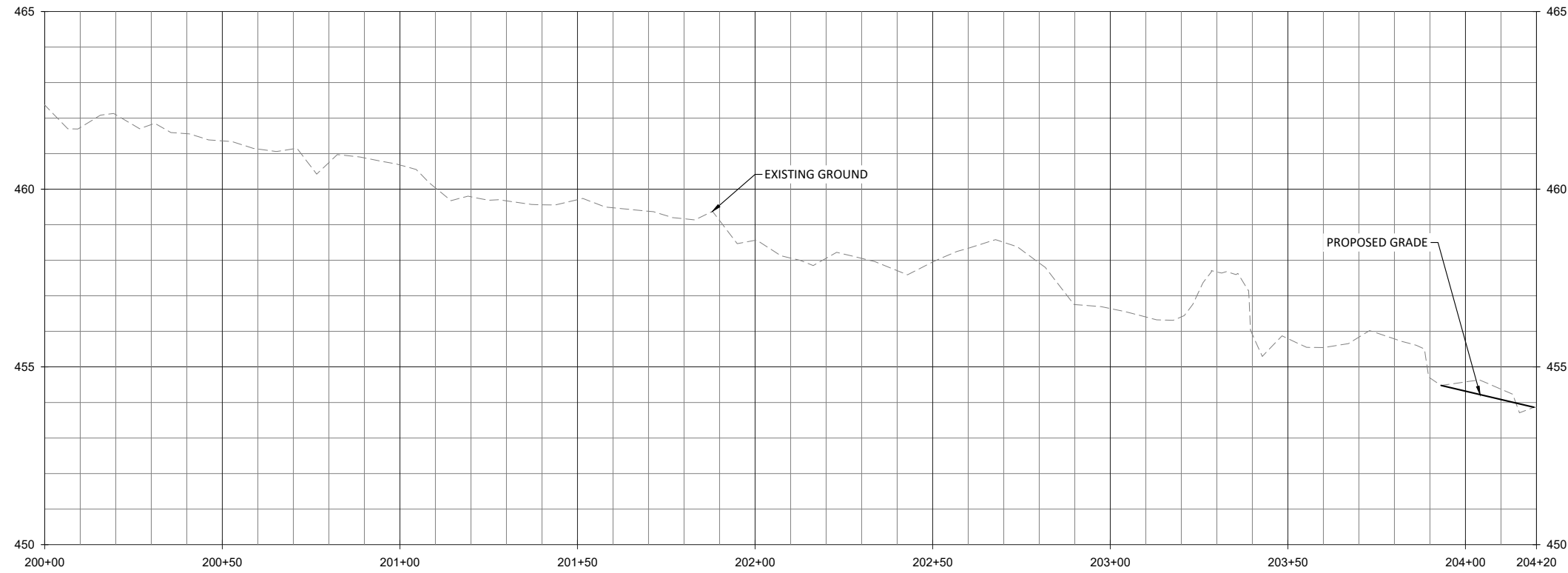
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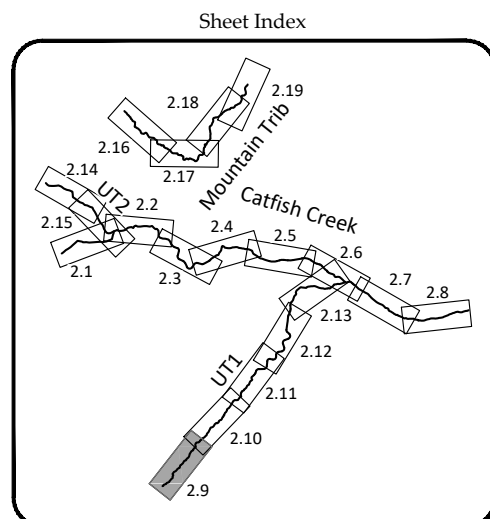
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- REACHWIDE TREATMENTS
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Plan and Profile
UT1

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Job Number: 005-02168
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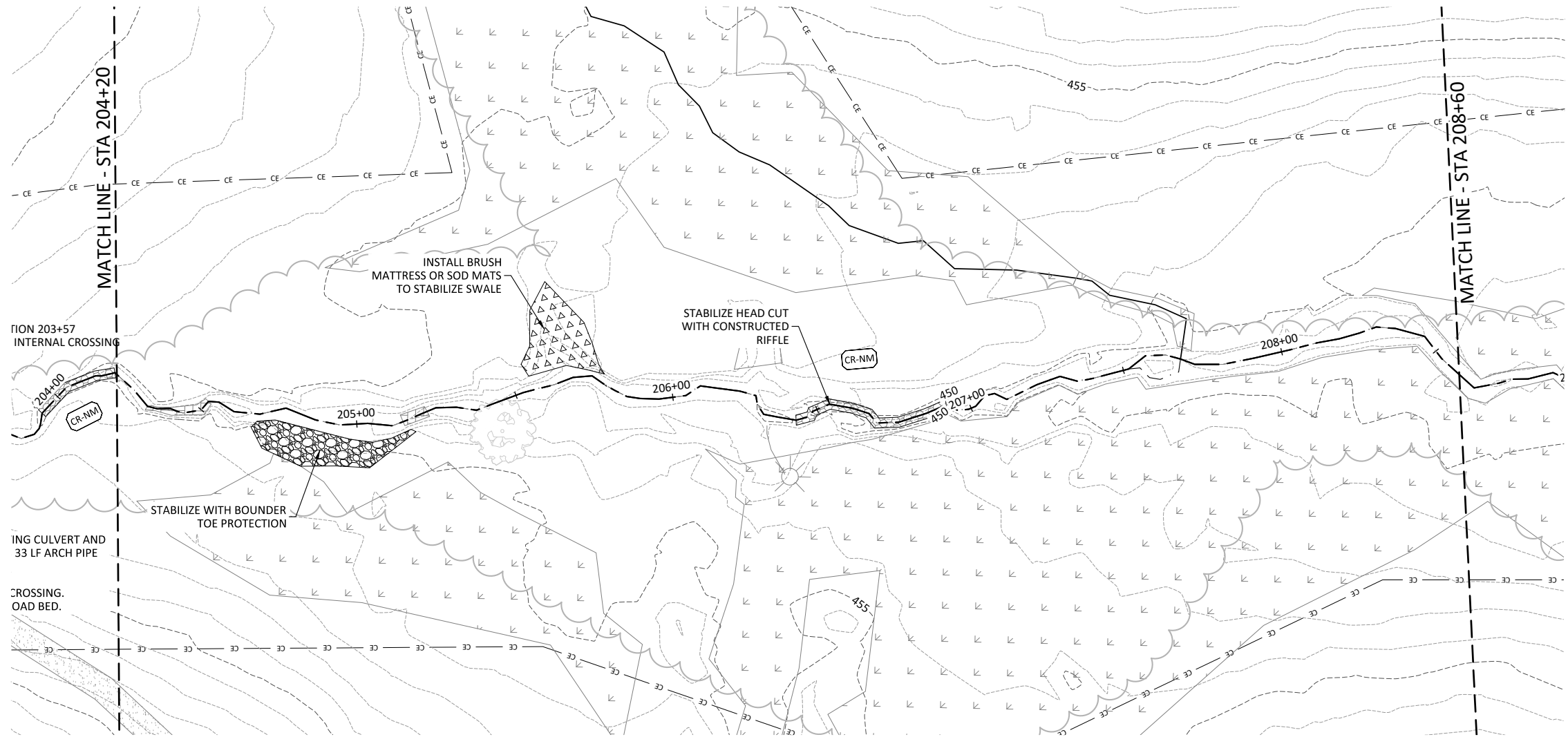
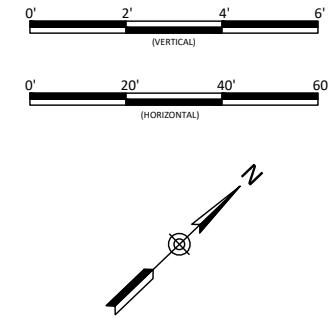
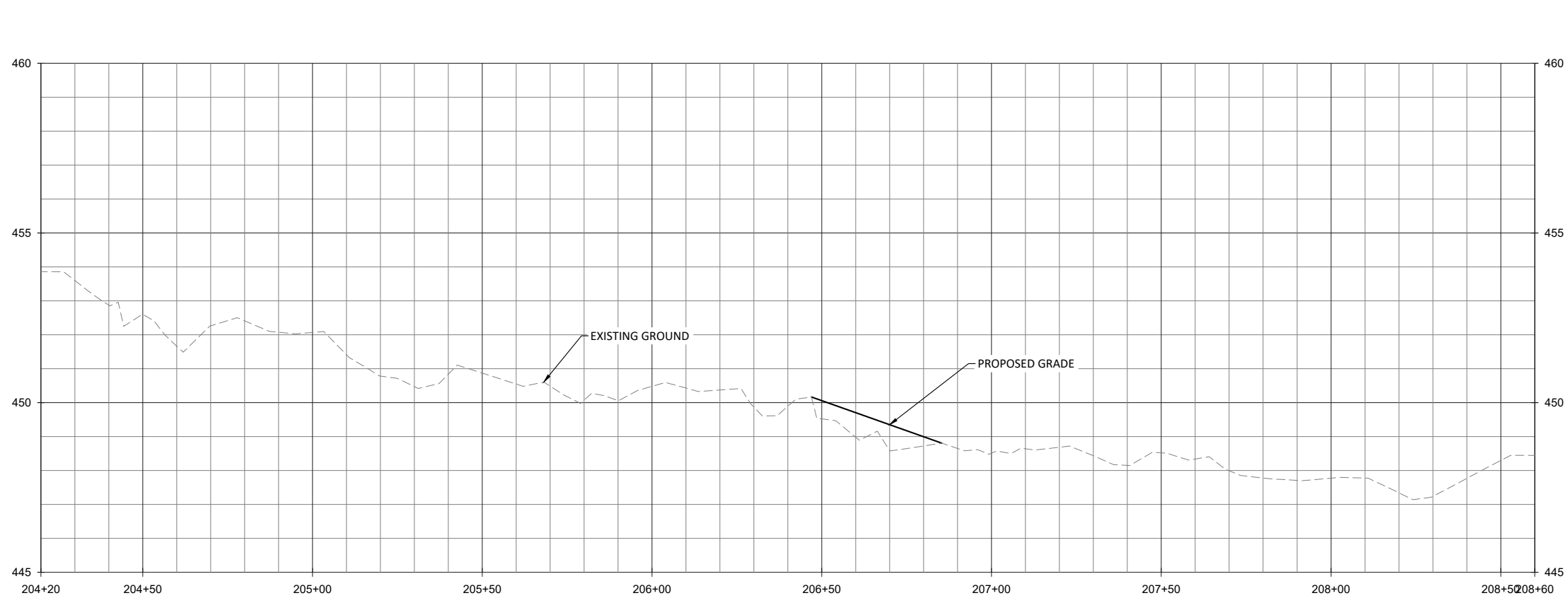
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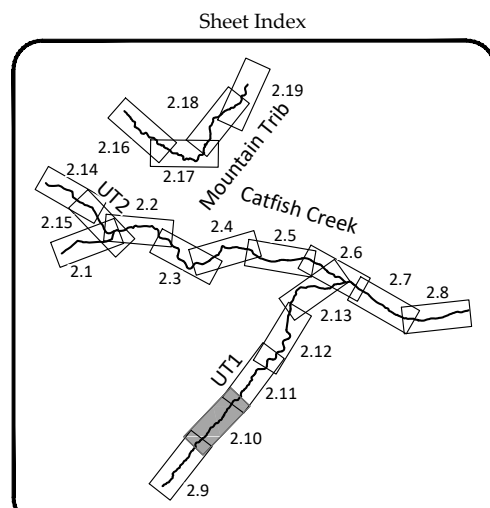


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- REACHWIDE TREATMENTS
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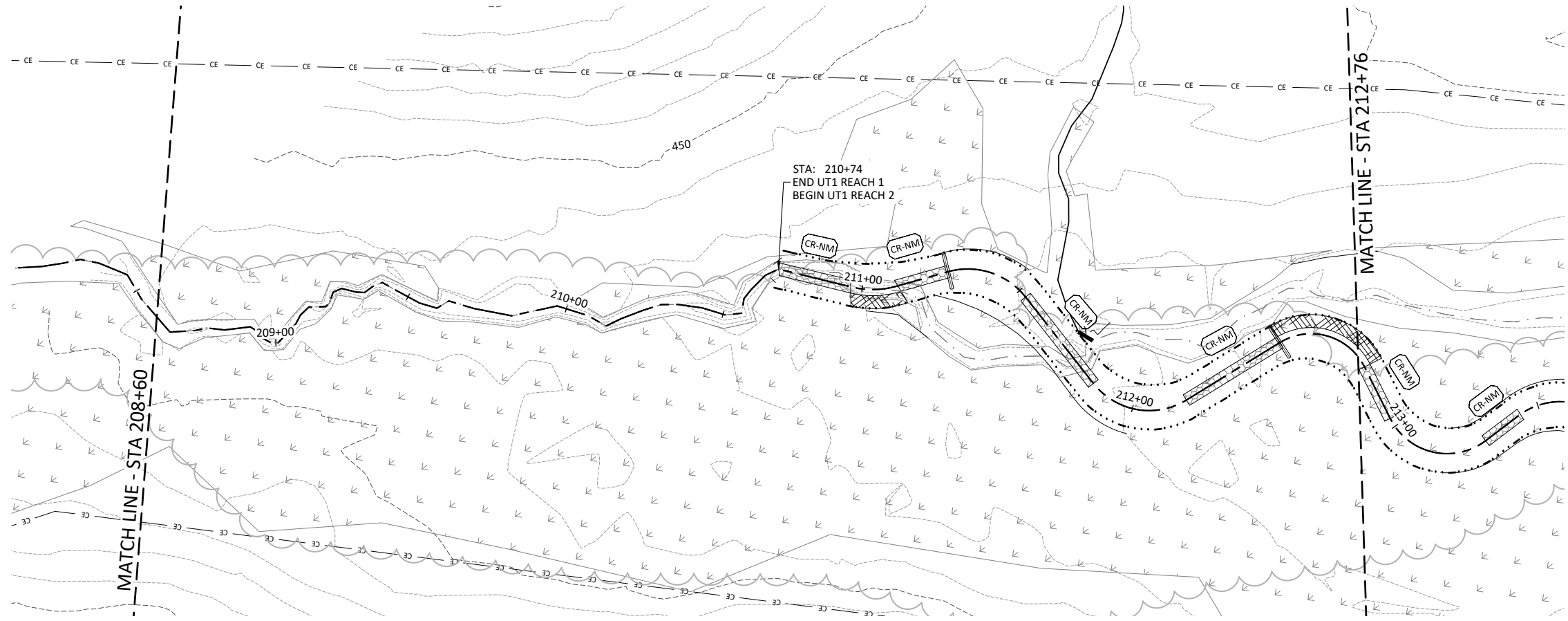
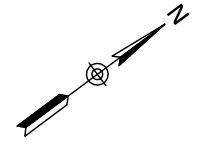
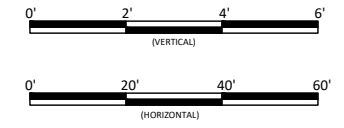
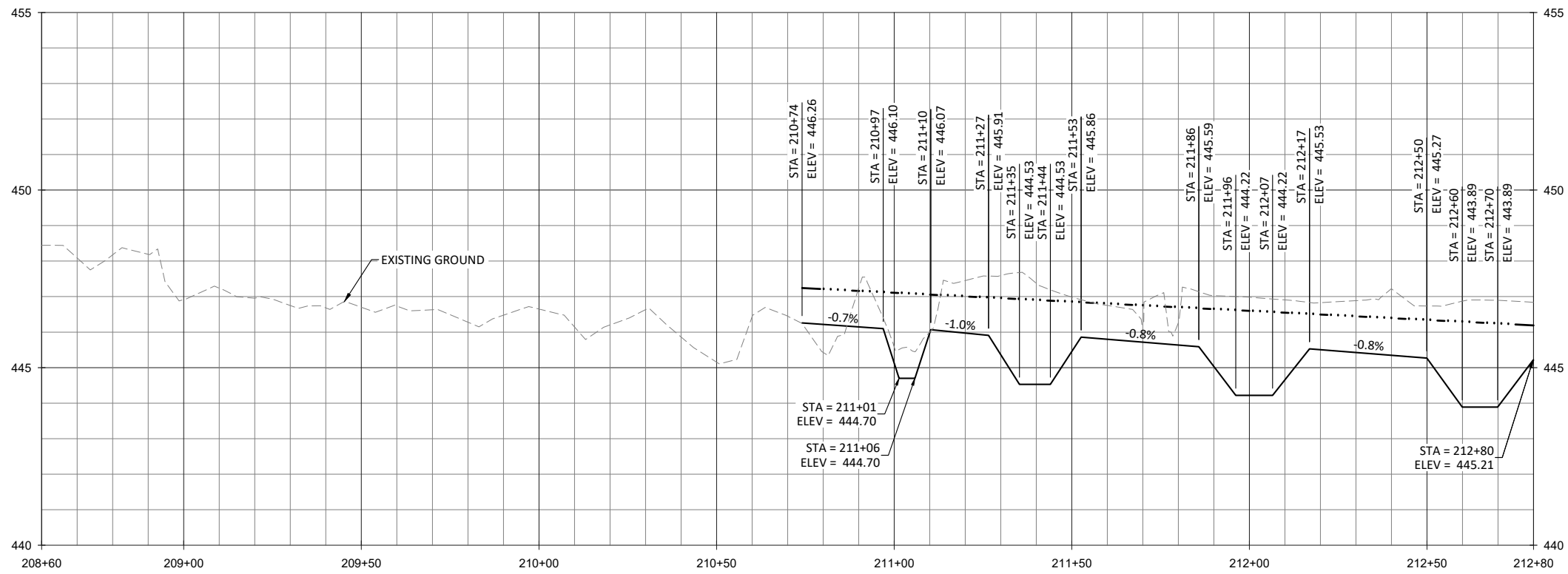
Plan and Profile
UT1

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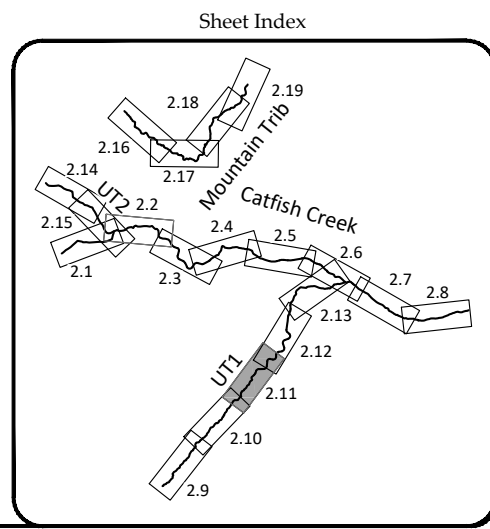
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Job Number: 005-02168
Project Engineer: GLS
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- REACHWIDE TREATMENTS
- UT1 REACH 1
1. FENCE OUT CATTLE.
 2. TREAT INVASIVE SPECIES - REFER TO PLANTING PLAN SHEETS.
 3. SUPPLEMENT BUFFER PLANTING - REFER TO PLANTING PLAN SHEETS.
 4. SPOT REPAIR ON ERODED BANKS.
- UT1 REACH 2
1. RESTORATION



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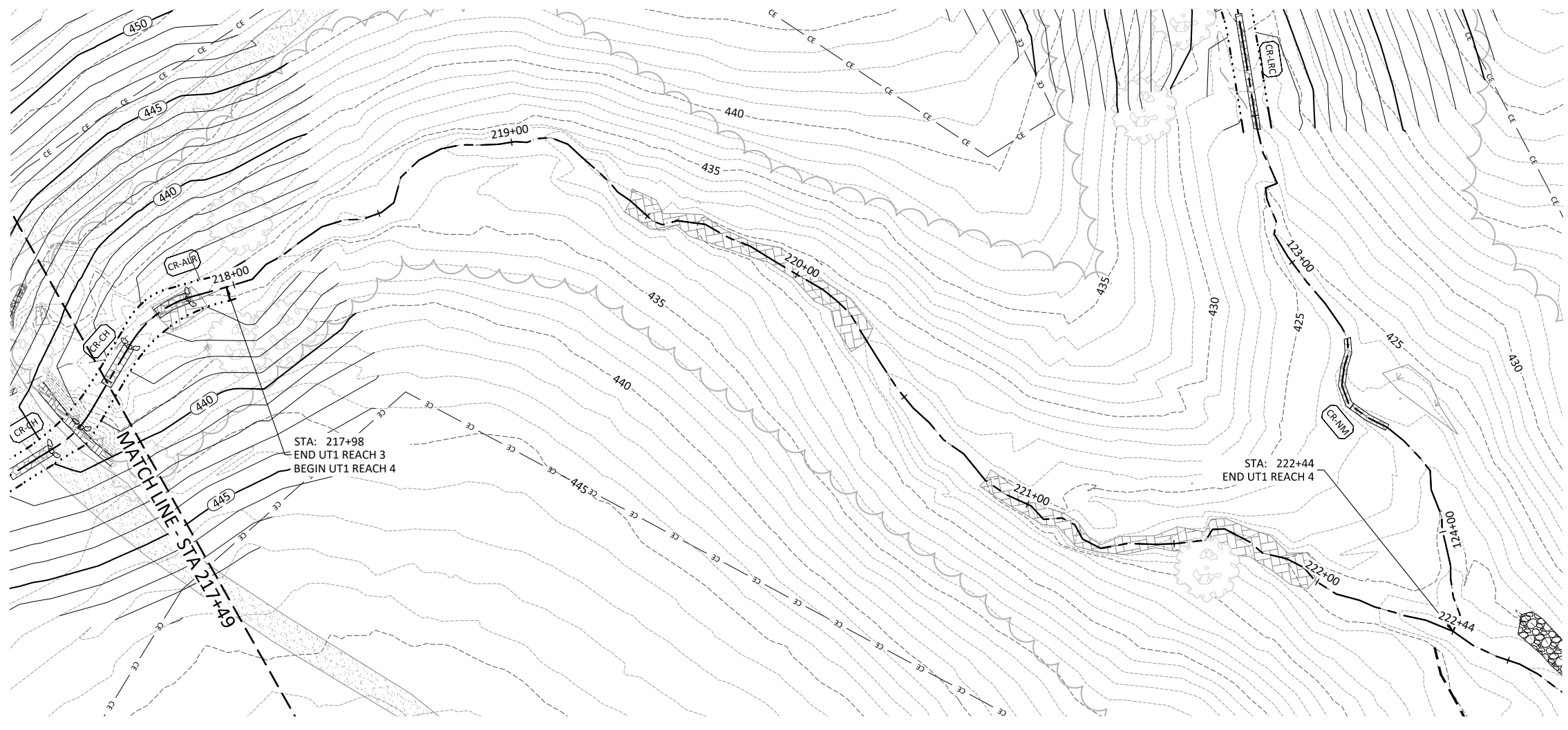
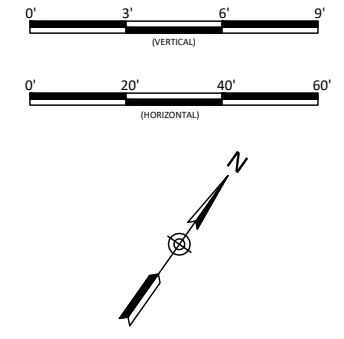
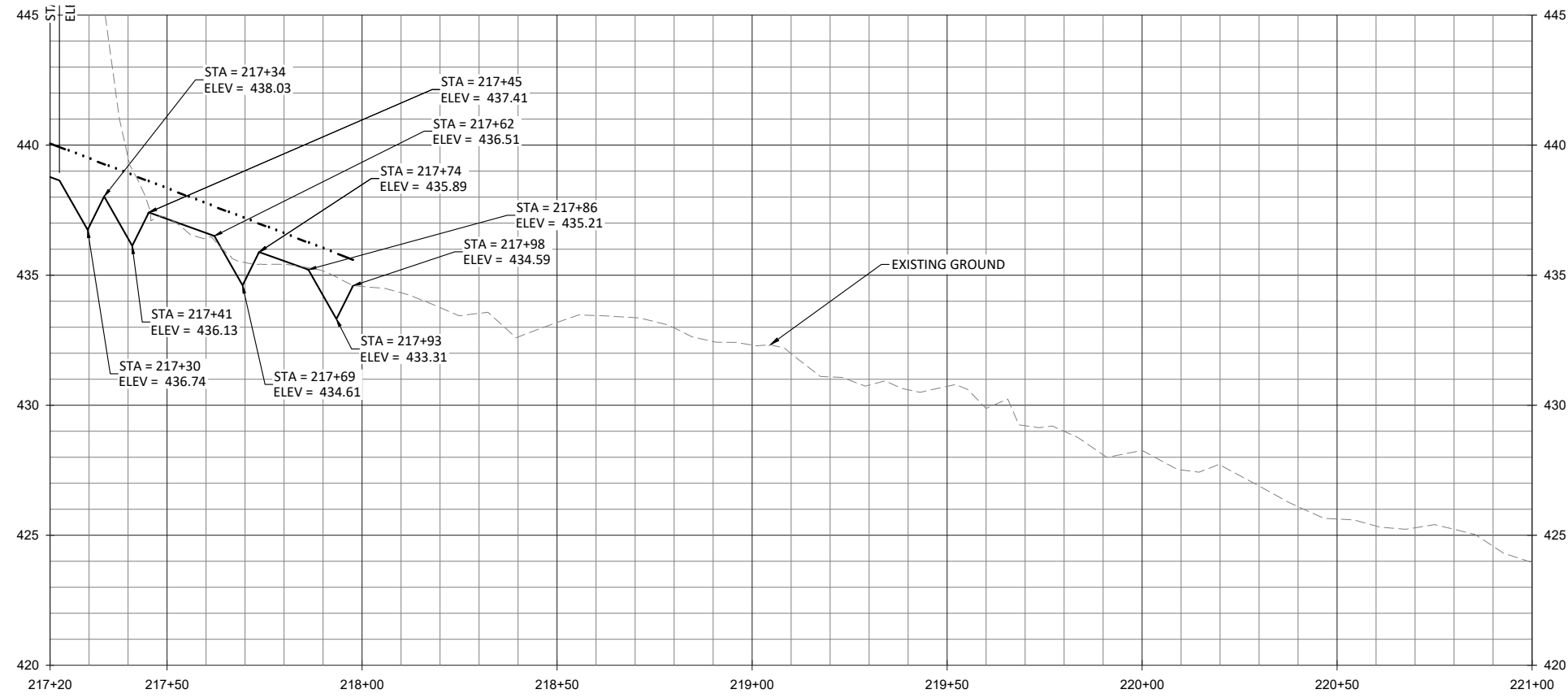
Catfish Pond Mitigation Site
Durham County, North Carolina
Plan and Profile
UT1

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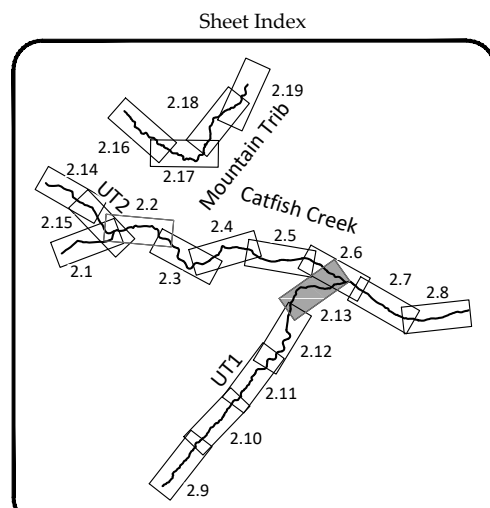
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- REACHWIDE TREATMENTS**
- UT1 REACH 3**
1. RESTORATION
- UT1 REACH 4**
1. FENCE OUT CATTLE.
 2. TREAT INVASIVE SPECIES - REFER TO PLANTING PLAN SHEETS.
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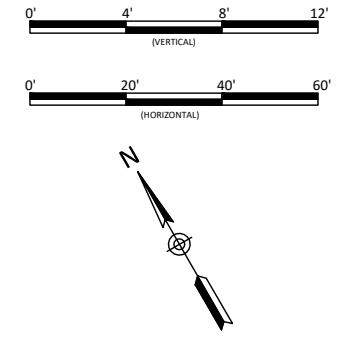
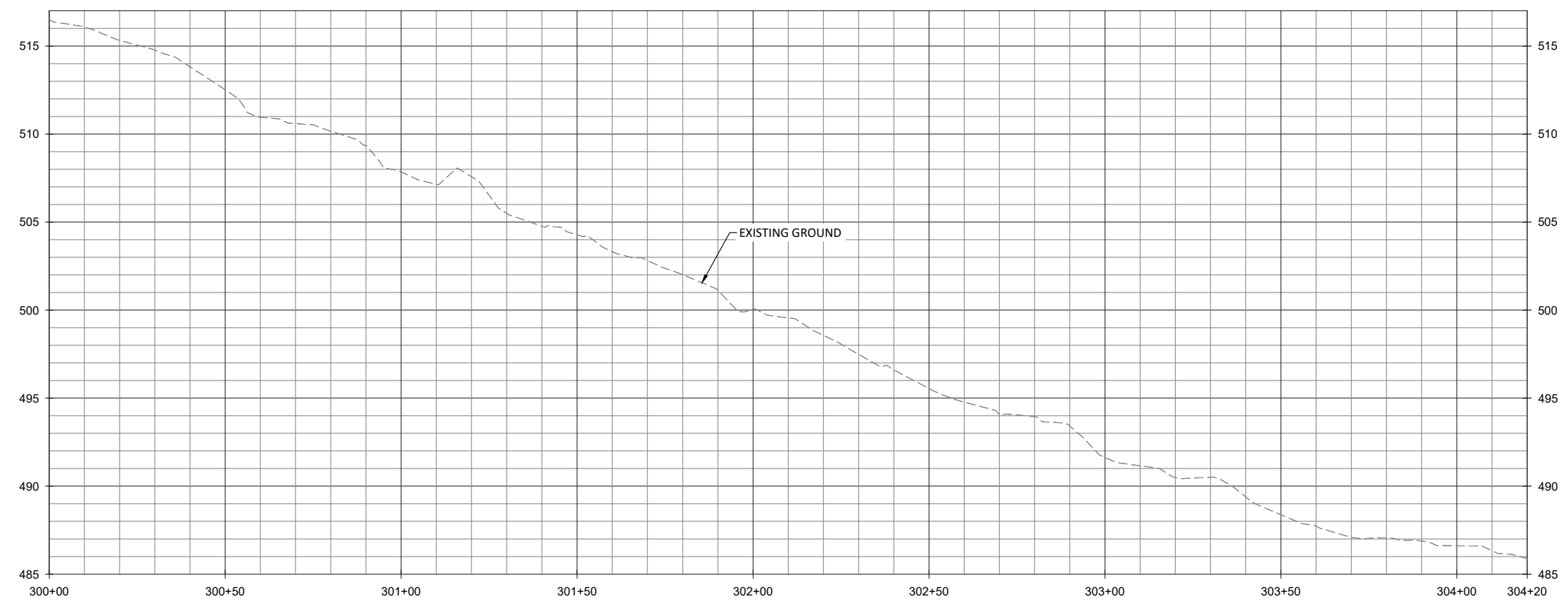
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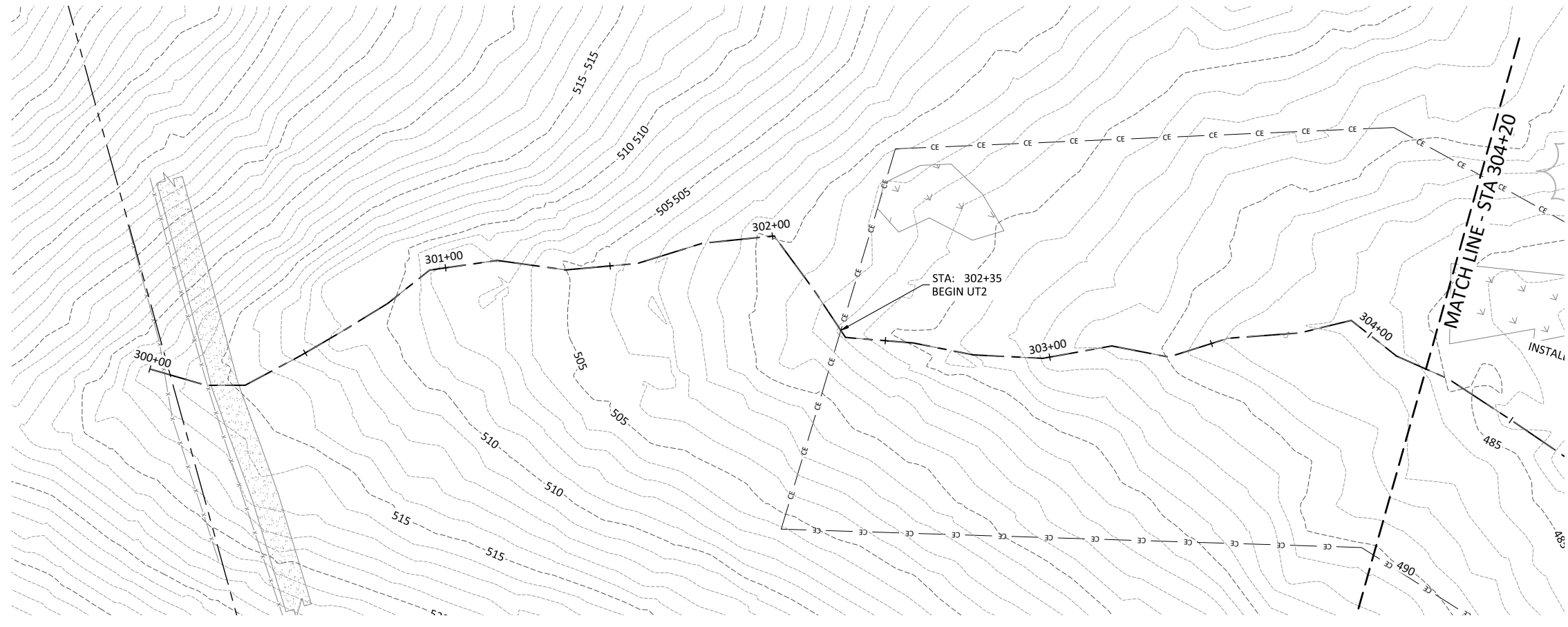
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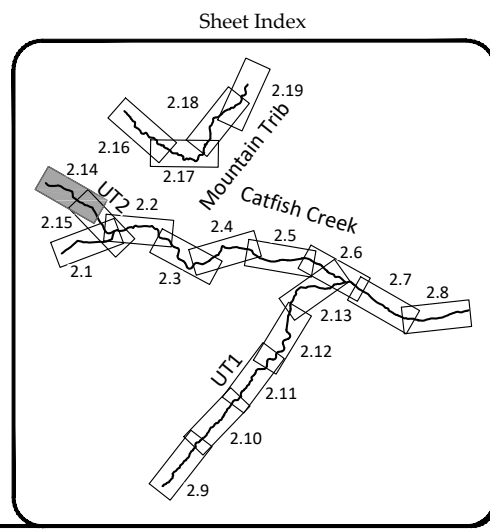
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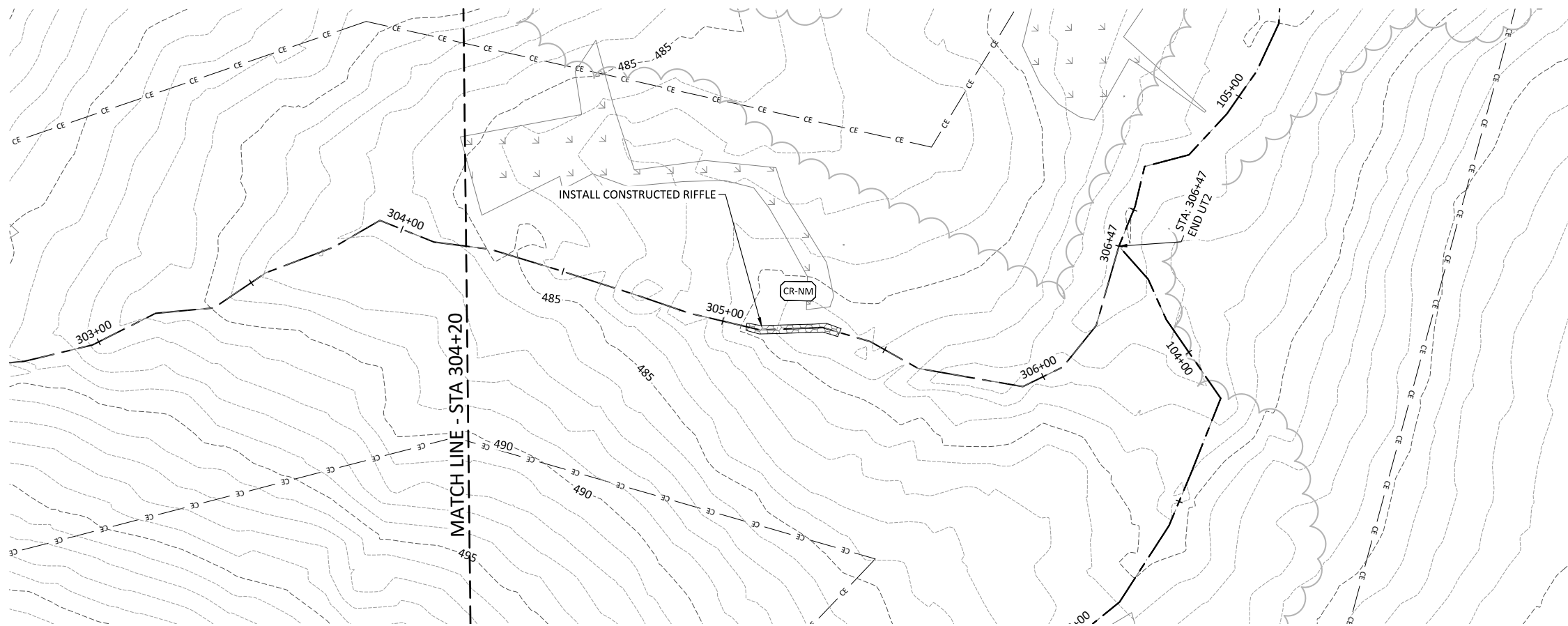
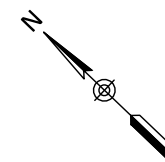
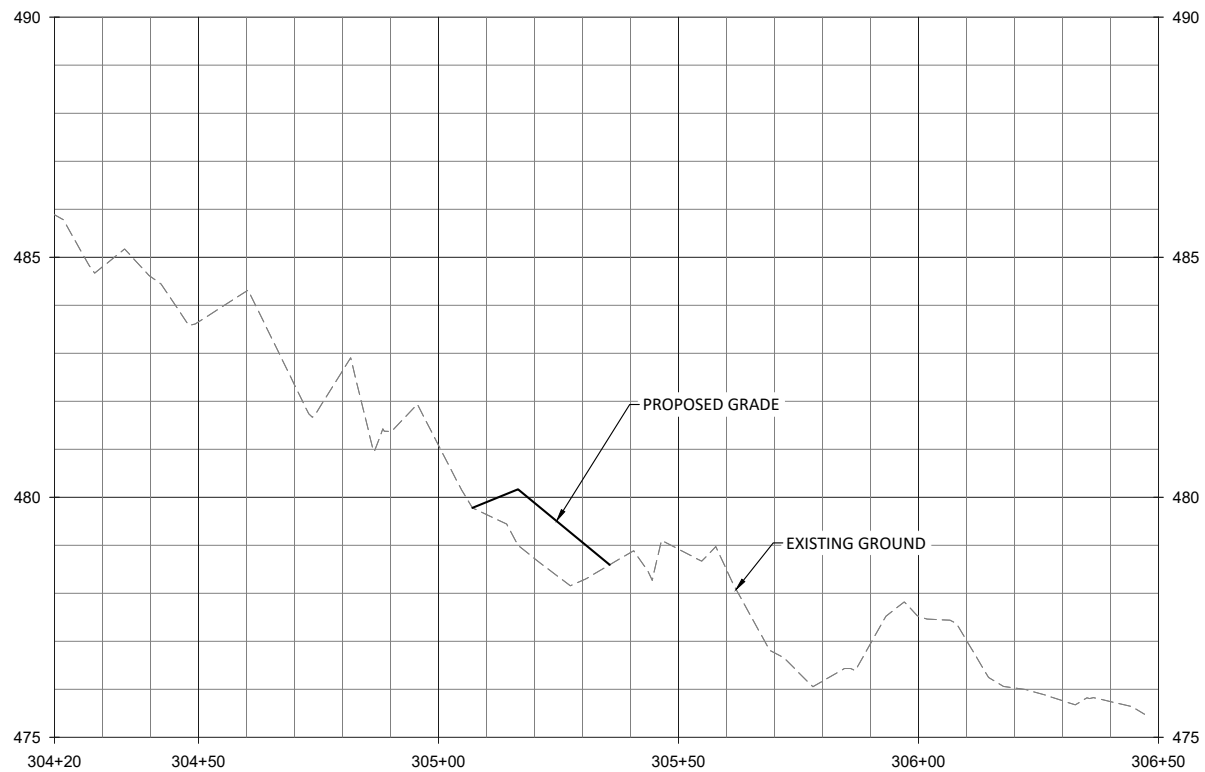
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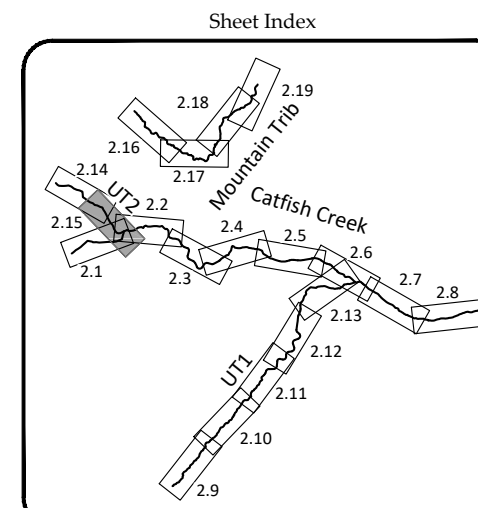
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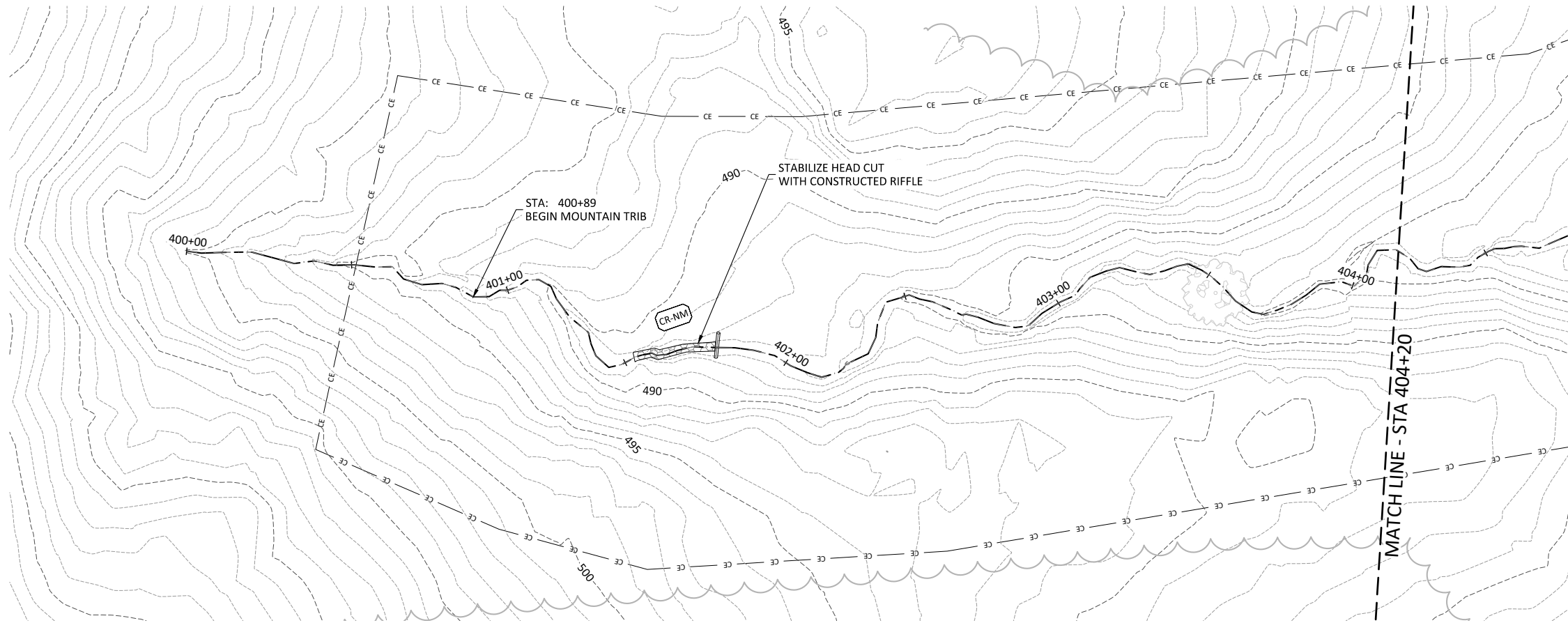
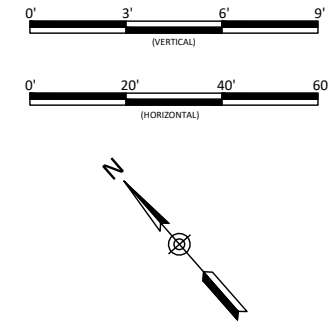
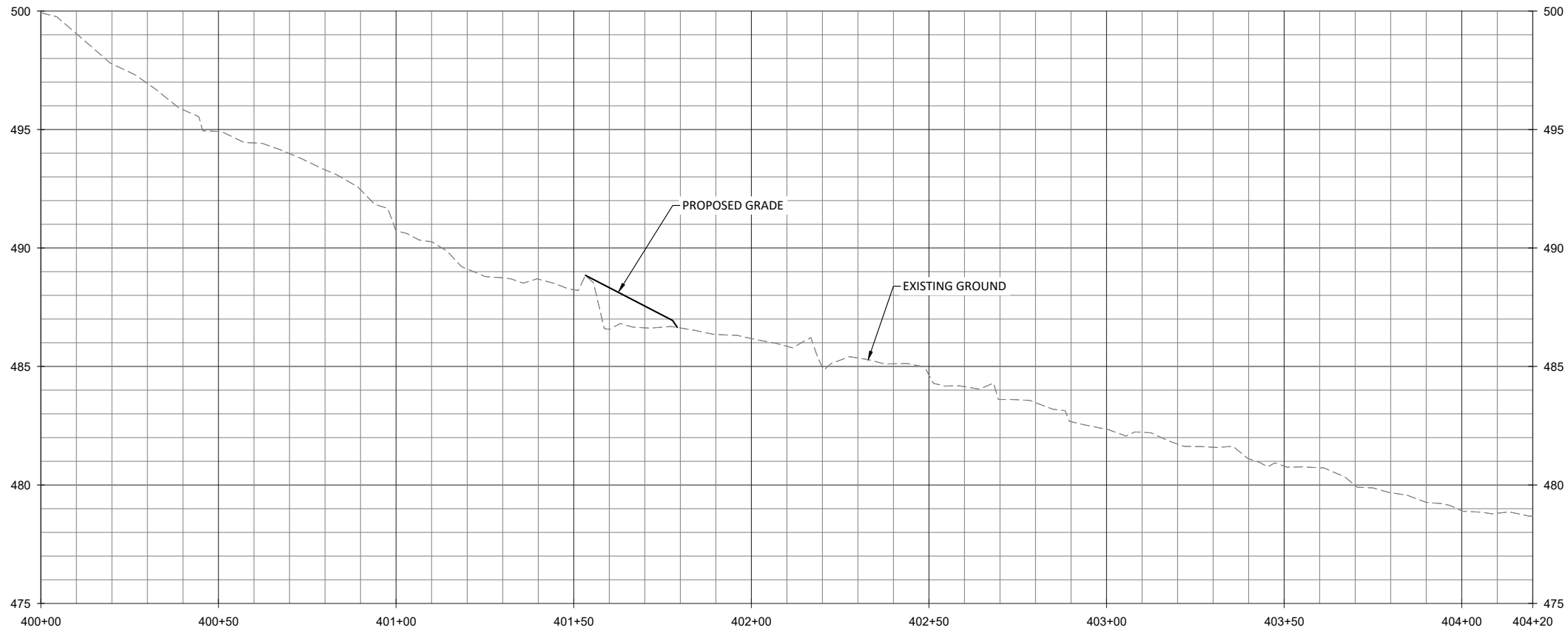
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 Durham County, North Carolina

Plan and Profile
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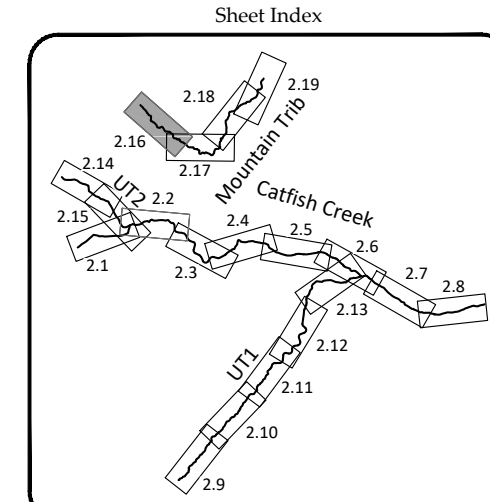


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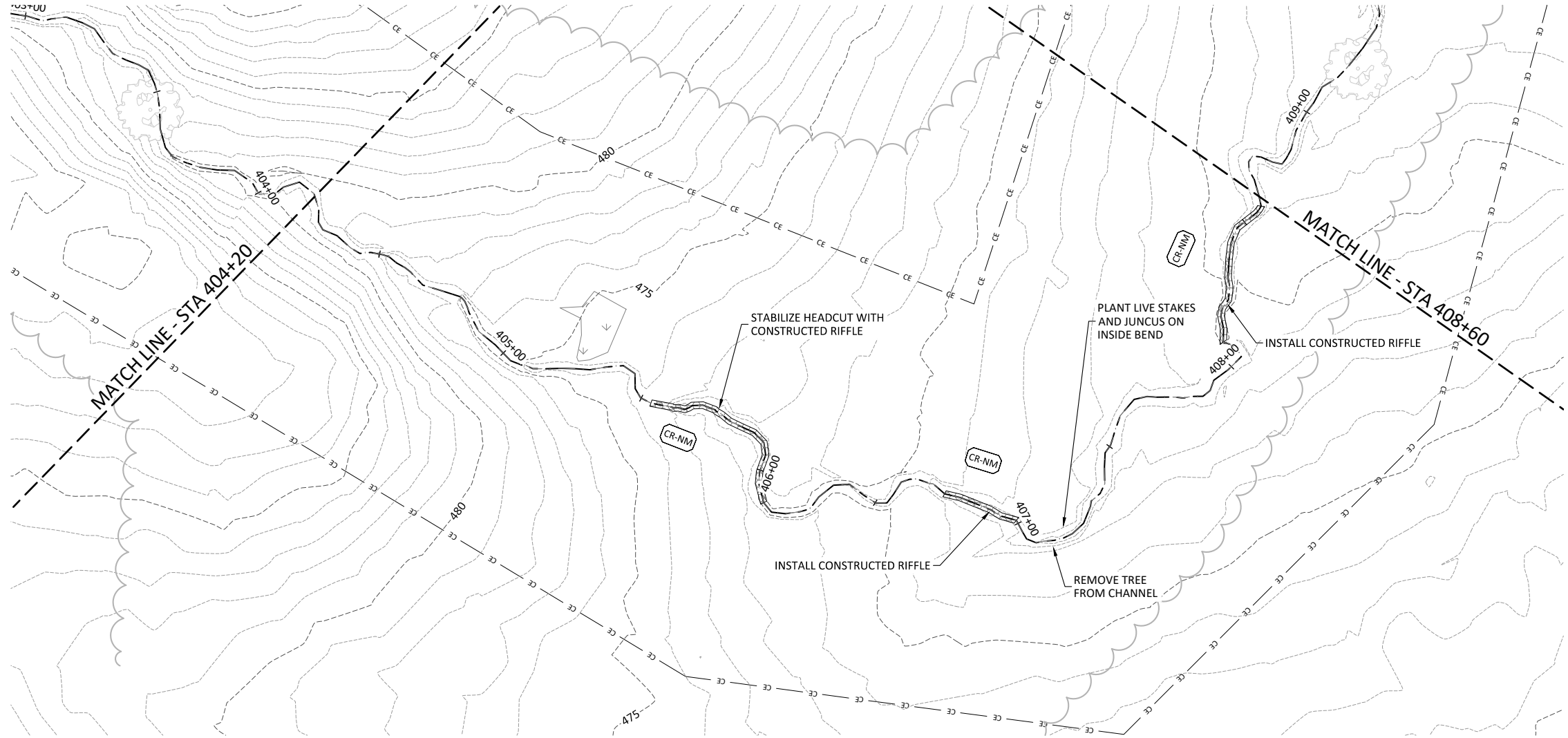
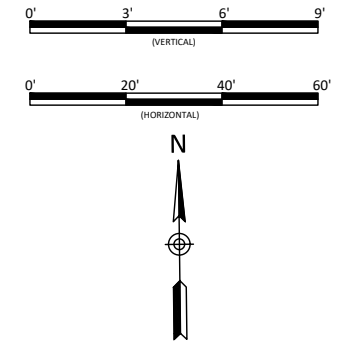
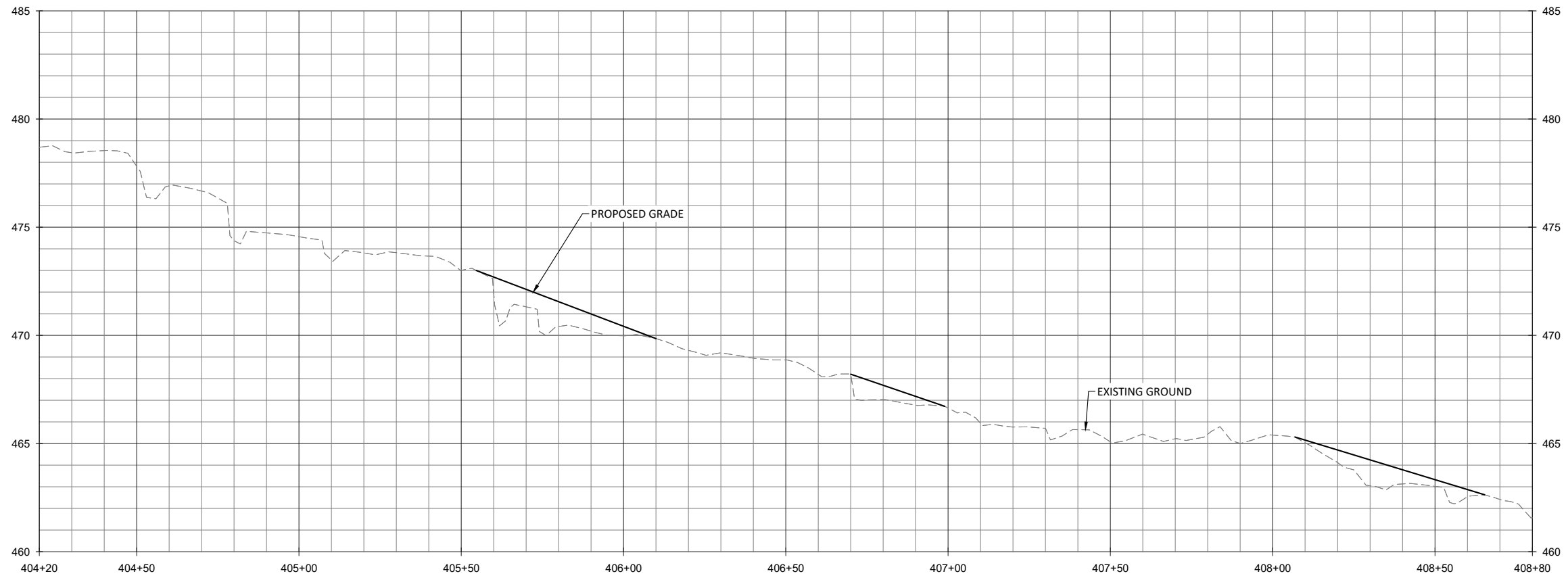
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 Plan and Profile
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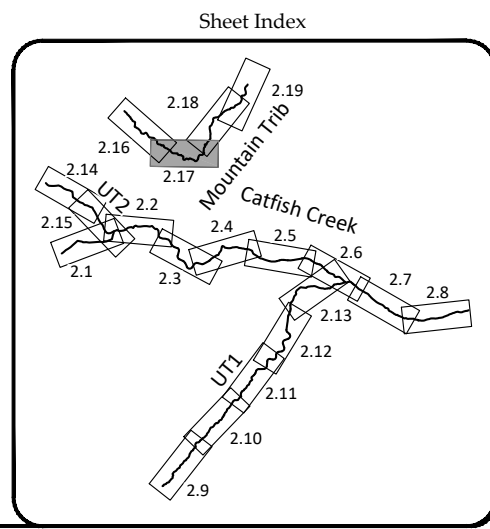
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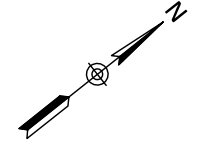
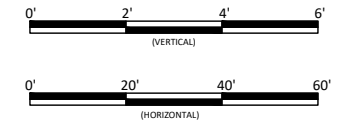
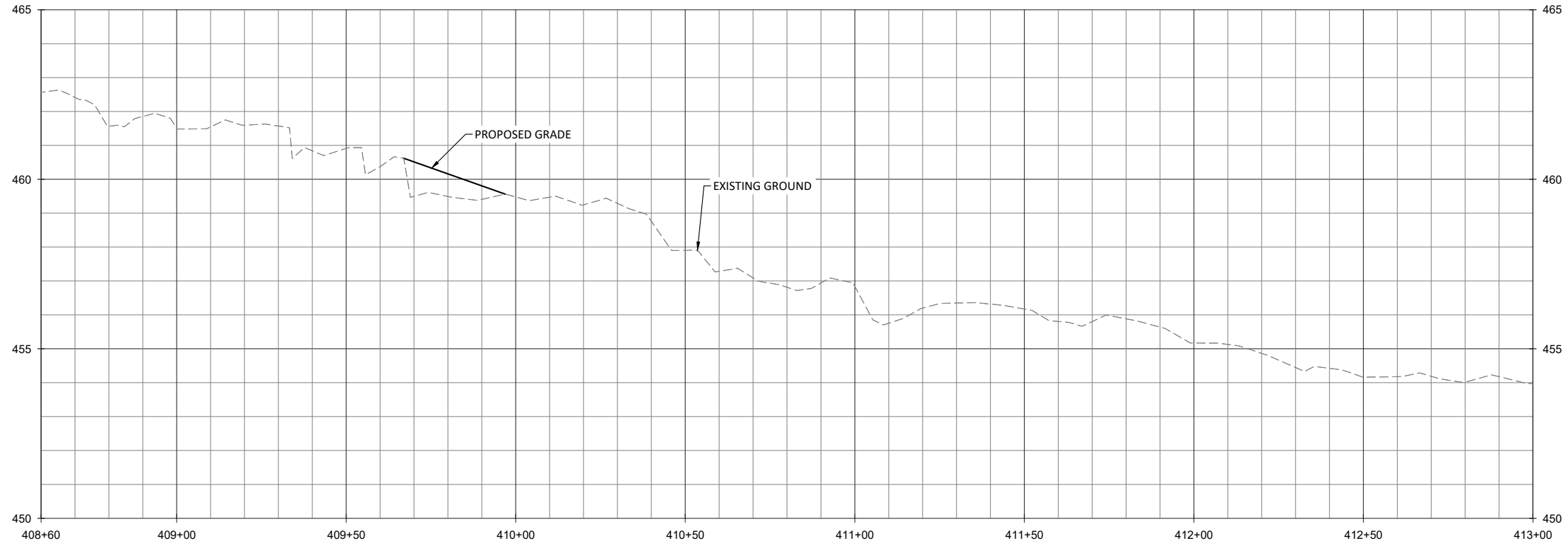
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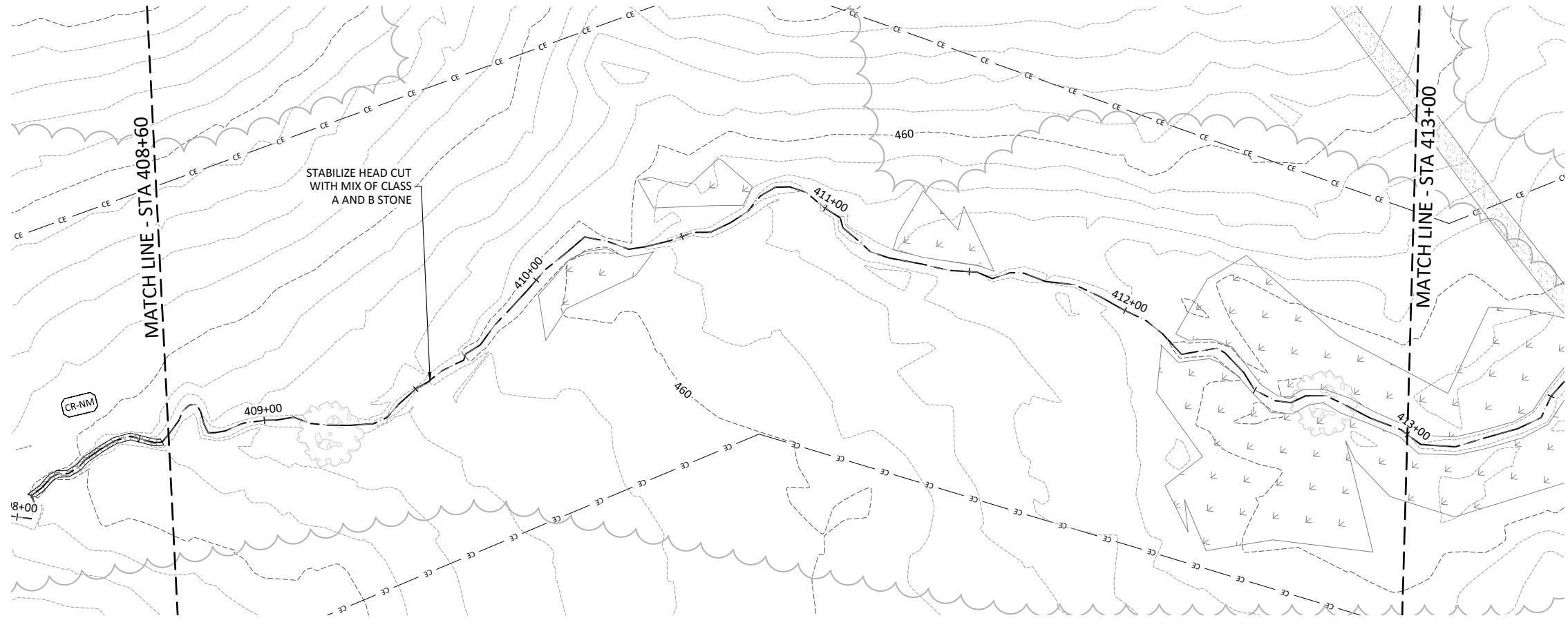
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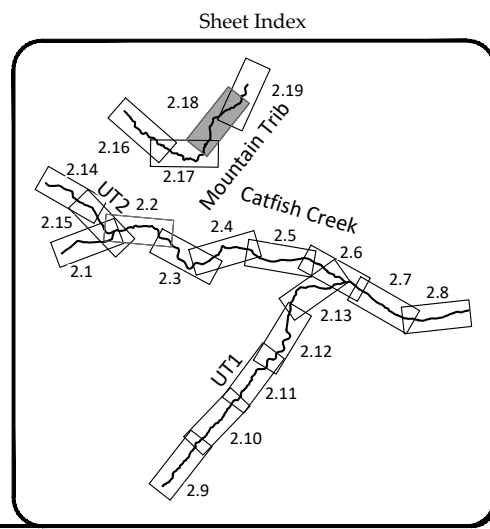
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 3. SUPPLEMENT BUFFER PLANTING - REFER TO PLANTING PLAN SHEETS.
 4. SPOT REPAIR ON ERODED BANKS.

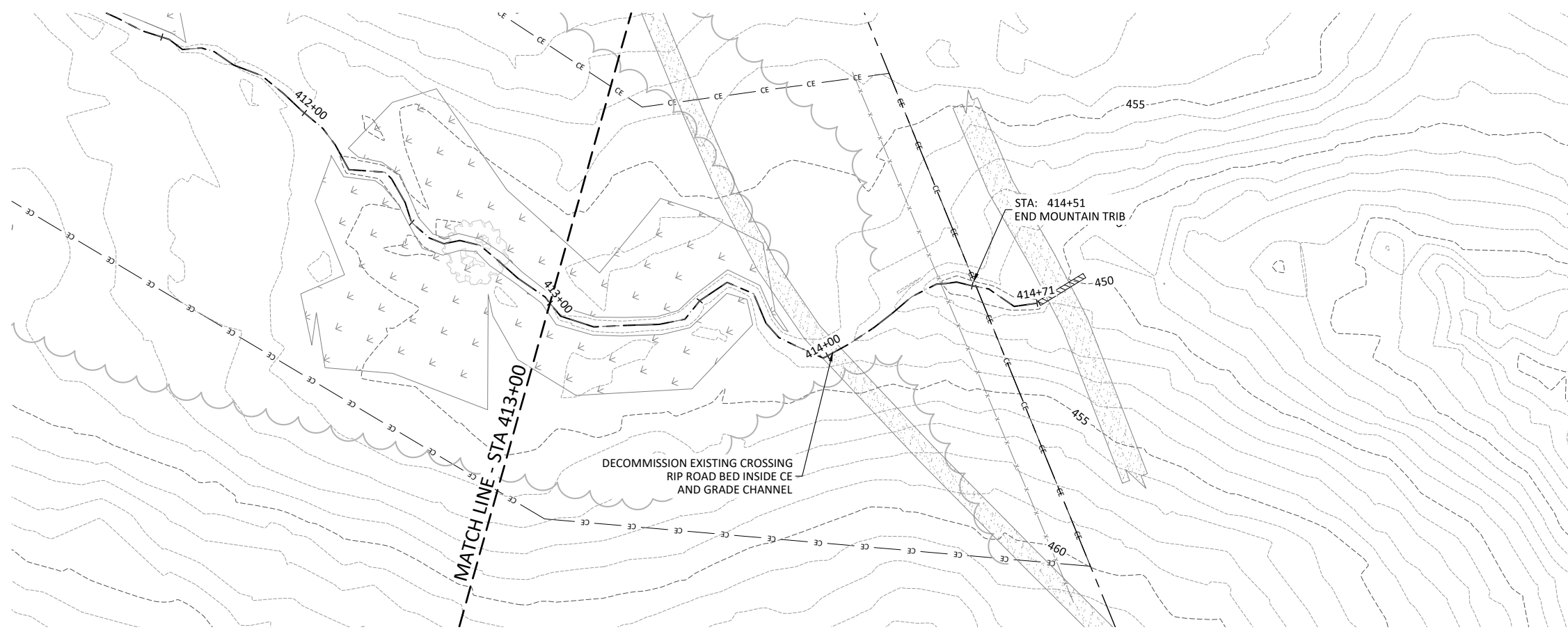
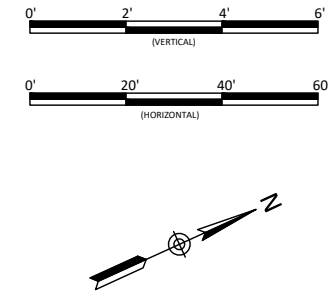
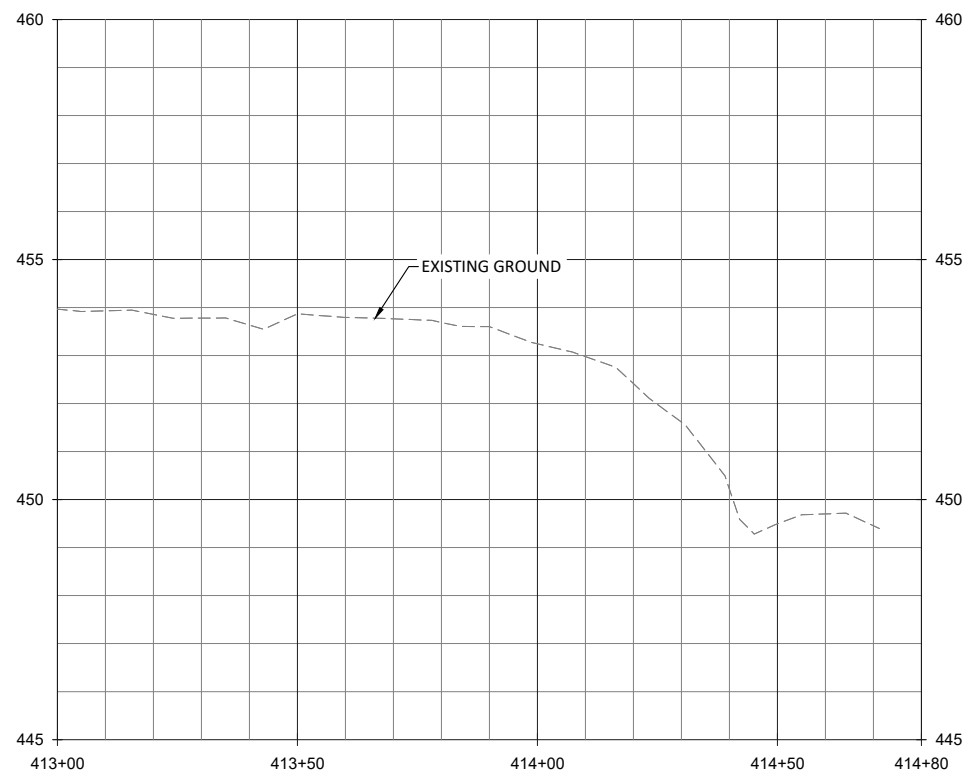


Catfish Pond Mitigation Site
Durham County, North Carolina
Plan and Profile
Mountain Trib

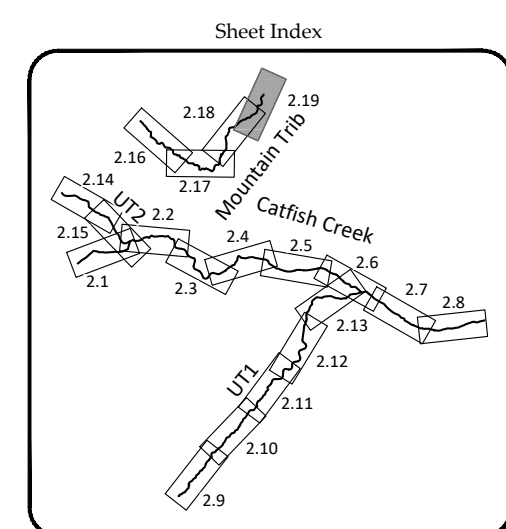
Revisions

Date: 07-16-2019
Job Number: 005-02168
Project Engineer: GLS
Drawn By: ABP
Checked By: CR
2.18
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- REACHWIDE TREATMENTS
1. FENCE OUT CATTLE.
 2. TREAT INVASIVE SPECIES - REFER TO PLANTING PLAN SHEETS.
 3. SUPPLEMENT BUFFER PLANTING - REFER TO PLANTING PLAN SHEETS.
 4. SPOT REPAIR ON ERODED BANKS.



Revisions

Date: 07-16-2019
 Job Number: 005-02168
 Project Engineer: GLS
 Drawn By: ABP
 Checked By: CR

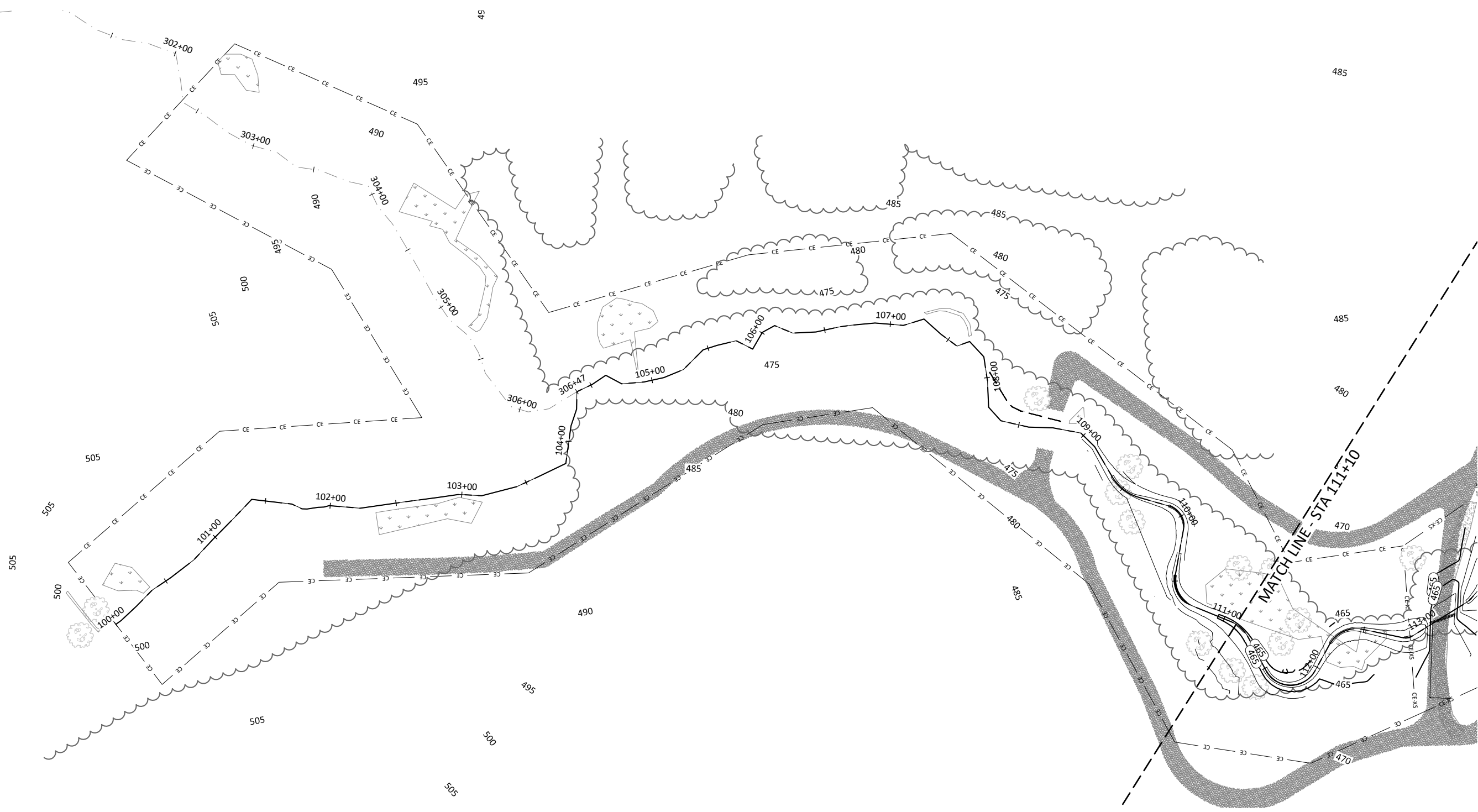
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Catfish Pond Mitigation Site
 Durham County, North Carolina
 Plan and Profile
 Mountain Trib

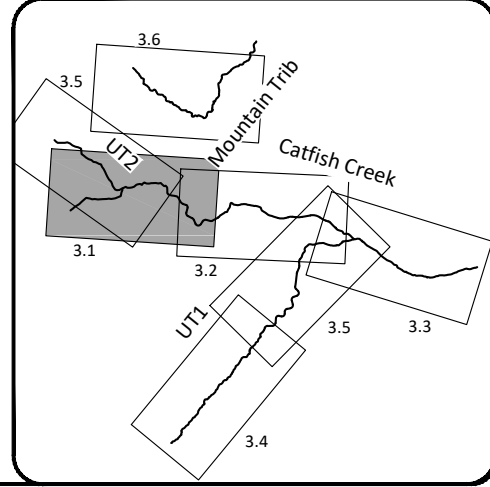


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Revisions

Date	Job Number	Project Engineer	Drawn By	Checked By
07-16-2019	005-02168	CLS	ABP	CR

3.1

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Catfish Pond Mitigation Site
Durham County, North Carolina

Catfish Creek
Grading Plan



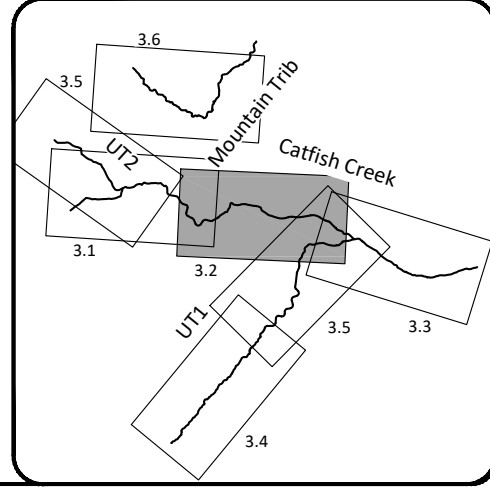
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Date:	07-16-2019
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Project Engineer:	CLS
Drawn By:	ABP
Checked By:	CR

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Catfish Pond Mitigation Site
Durham County, North Carolina

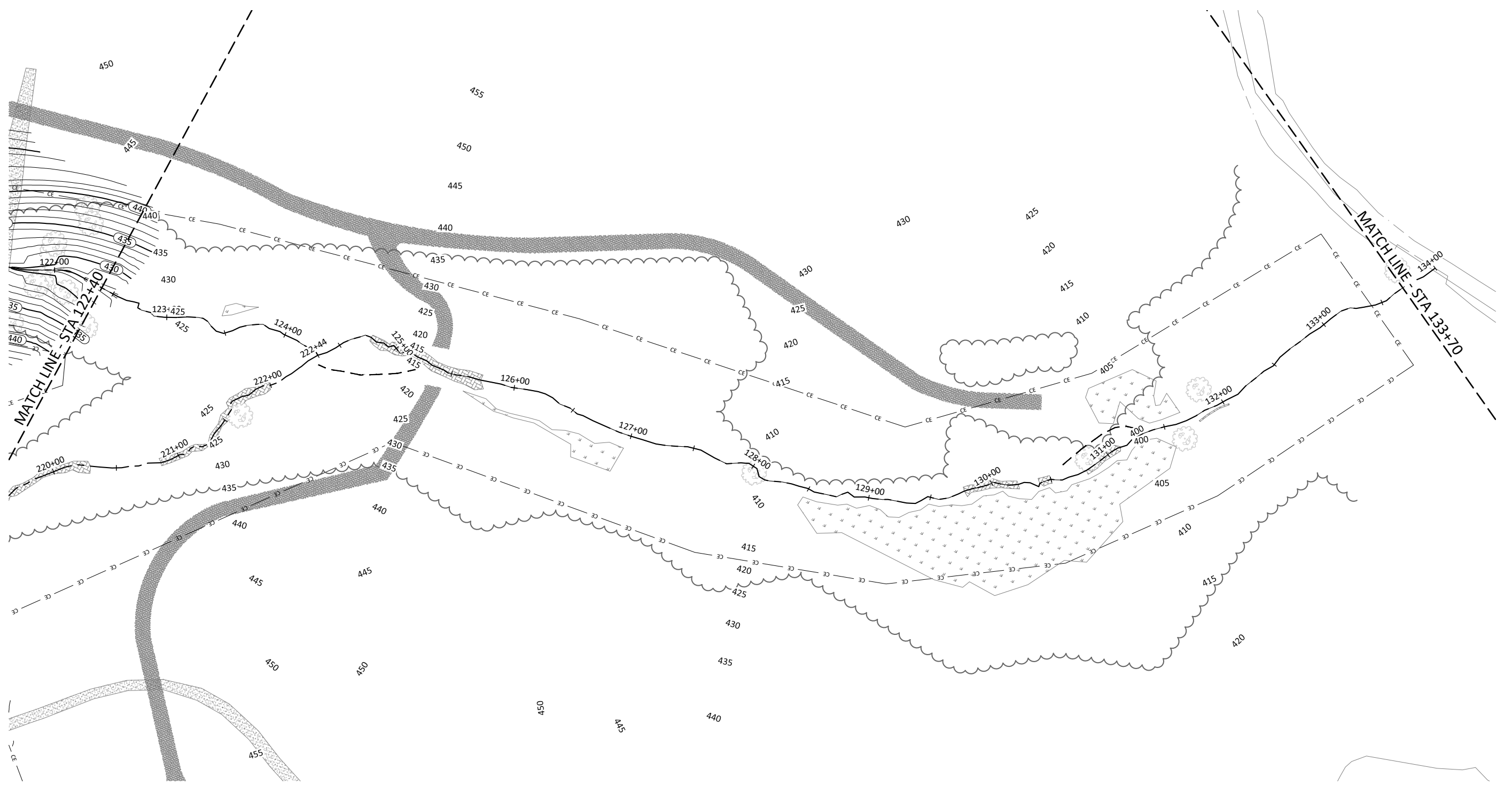
Catfish Creek
Grading Plan



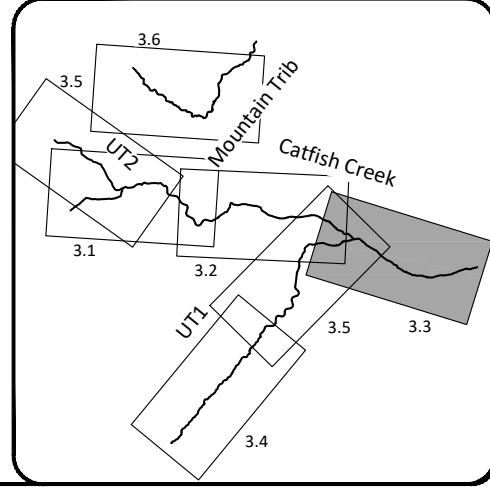
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Project Engineer:	CLS
Drawn By:	ABP
Checked By:	CR

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Sheet

Catfish Pond Mitigation Site
Durham County, North Carolina

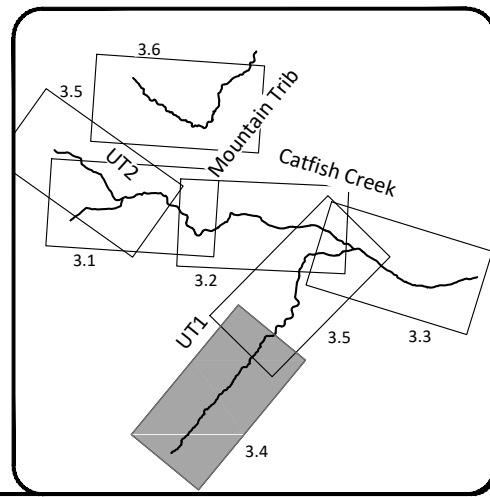
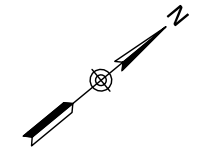
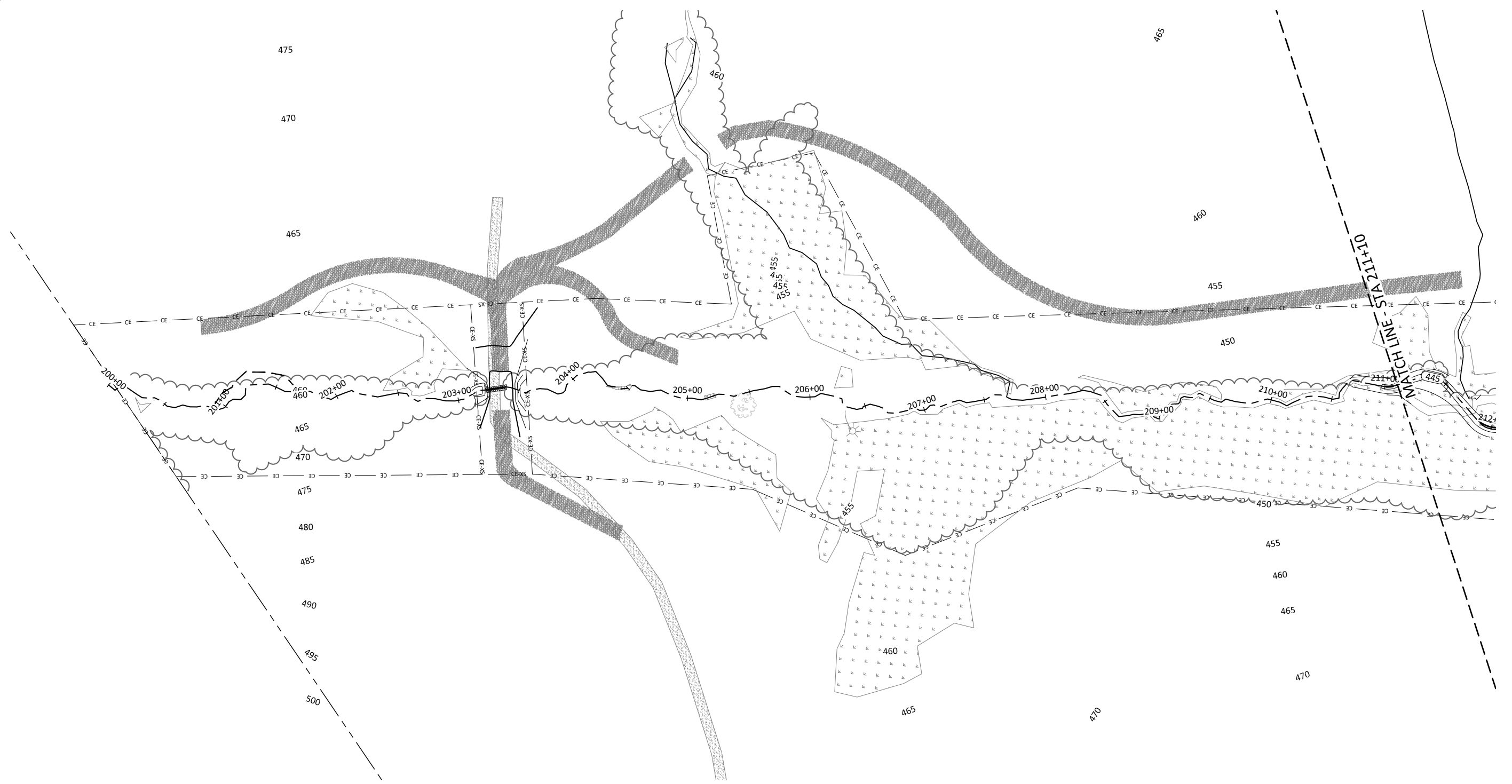
Catfish Creek
Grading Plan



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Date: 07-16-2019

Job Number: 005-02168

Project Engineer: GLS

Drawn By: ABP

Checked By: CR

Revisions

3.4

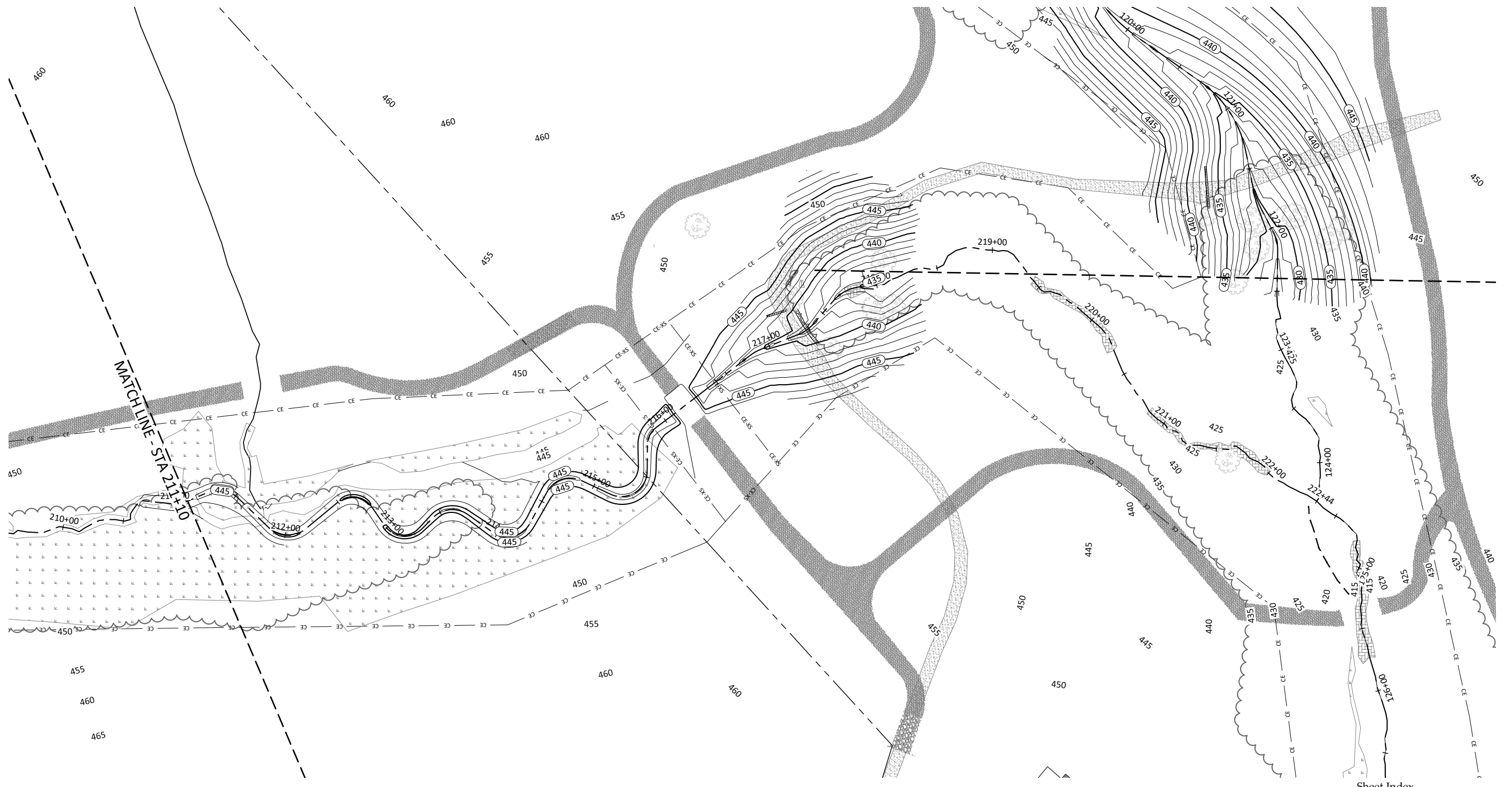
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Durham County, North Carolina

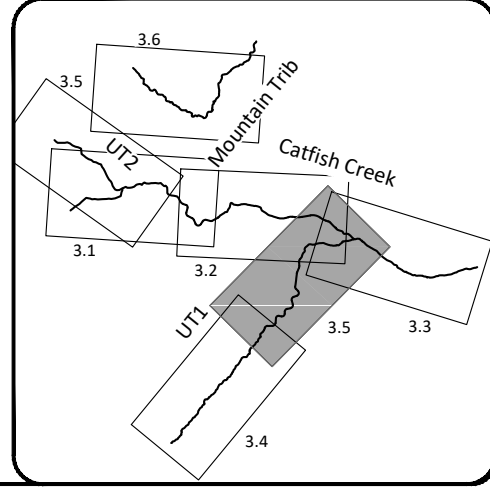
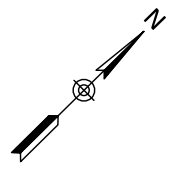
UT1
Grading Plan



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Catfish Pond Mitigation Site
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UT1
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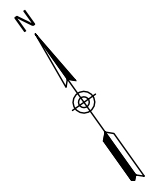
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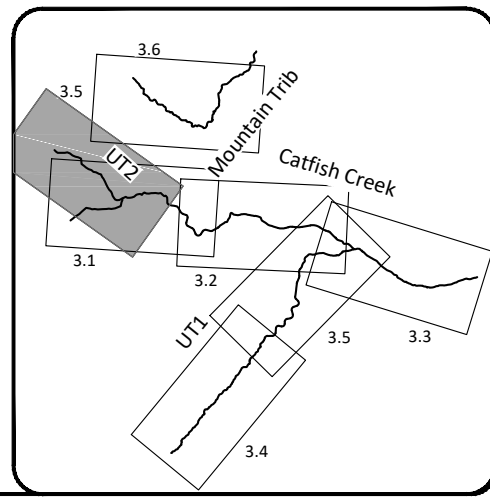
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Project Engineer:	GLS
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Checked By:	CR

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Catfish Pond Mitigation Site
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UT2
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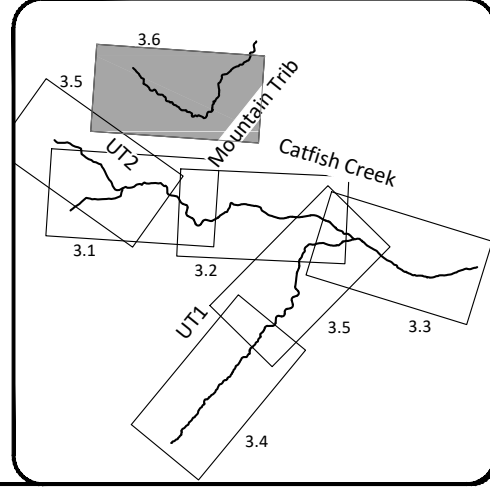
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Date:	07-16-2019
Job Number:	005-02168
Project Engineer:	GLS
Drawn By:	ABP
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3.7

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Catfish Pond Mitigation Site
Durham County, North Carolina

Mountain Trib
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ALBERT F. TERRY
 PIN: 0827-01-39-6106
 DB: 7312 PG: 627
 PB: 174 PG: 91

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 # GARY W. PENNY
 PIN: 0828-02-50-6117
 ESTATE FILE: 2017 E/1493
 DB: 438 PG: 589

JACK B. PENNY, JR., RICHARD P. PENNY
 # GARY W. PENNY
 PIN: 0827-02-68-0515
 ESTATE FILE: 2017 E/1493
 DB: 438 PG: 590
 PB: 88 PG: 44

JACK B. PENNY, JR., RICHARD P. PENNY
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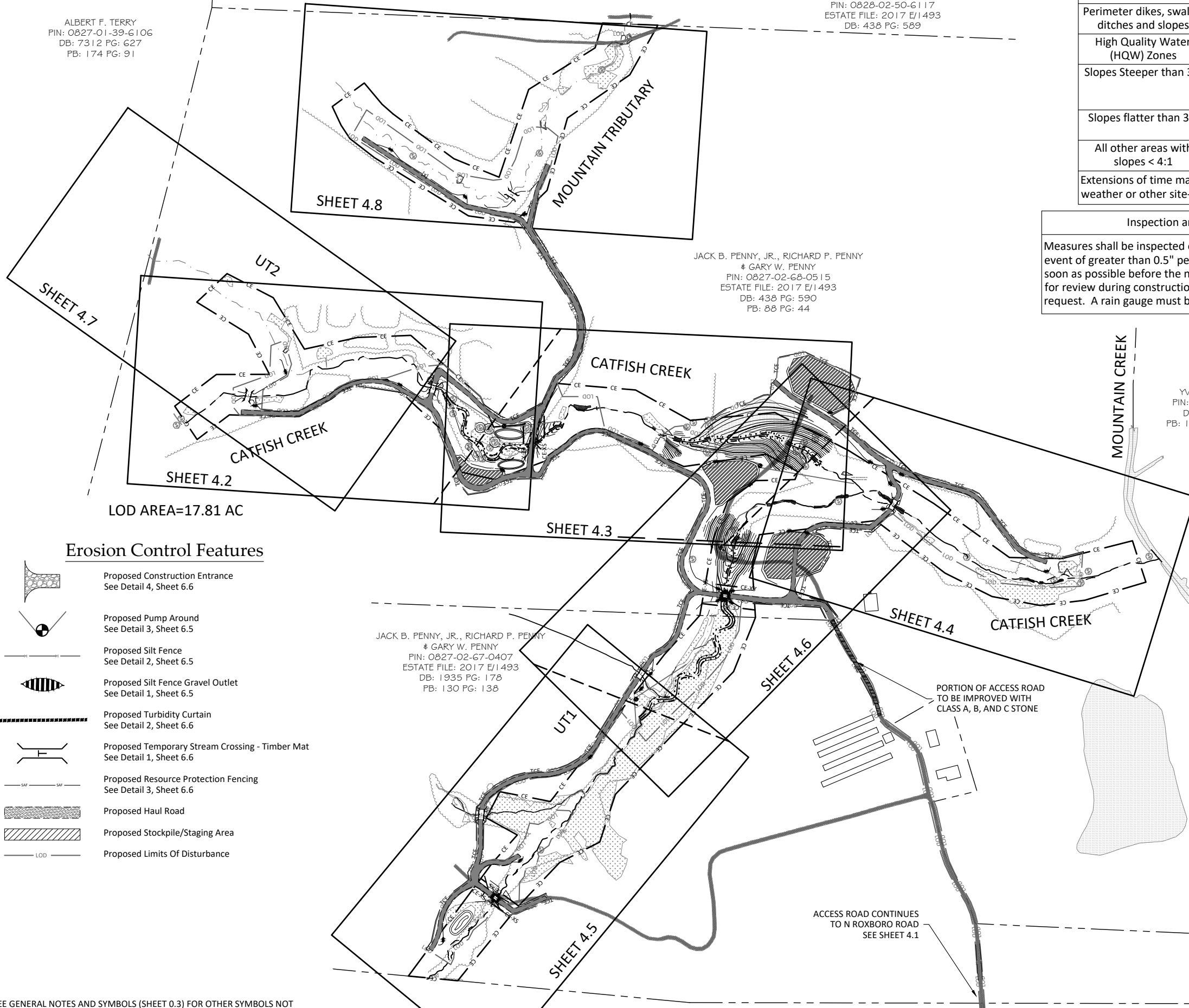
YVONNE MCFARLAND
 PIN: 0827-02-78-4579
 DB: 2700 PG: 907
 PB: 144 PG: 78, TRACT #3

Ground Stabilization Requirements per NCG01		
Site Area Description	Stabilization Time Frame	Stabilization Time Frame Exceptions
Perimeter dikes, swales, ditches and slopes	7 days	None
High Quality Water (HQW) Zones	7 days	None
Slopes Steeper than 3:1	7 days	If slopes are 10' or less in length and are not steeper than 2:1, 14 days are allowed
Slopes flatter than 3:1	14 days	7 days for slopes > than 50' in length
All other areas with slopes < 4:1	14 days	None (except for perimeters and HQW)











Extensions of time may be approved by the permitting authority based on weather or other site-specific conditions that make compliance impracticable.

Inspection and Record Keeping Requirements per NCG01

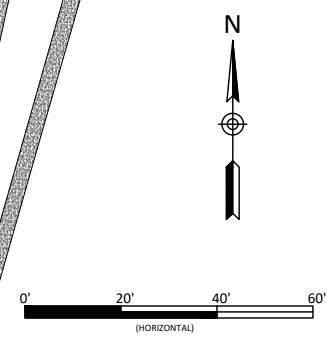
Measures shall be inspected once per 7 calendar days and within 24 hours of a rainfall event of greater than 0.5" per 24 hour period. Corrective actions shall be performed as soon as possible before the next storm event. Records must be kept on-site and available for review during construction and must be maintained for 3 years and be available upon request. A rain gauge must be installed at the site.



Erosion Control Features

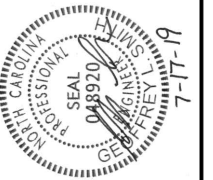
-  Proposed Construction Entrance
See Detail 4, Sheet 6.6
-  Proposed Pump Around
See Detail 3, Sheet 6.5
-  Proposed Silt Fence
See Detail 2, Sheet 6.5
-  Proposed Silt Fence Gravel Outlet
See Detail 1, Sheet 6.5
-  Proposed Turbidity Curtain
See Detail 2, Sheet 6.6
-  Proposed Temporary Stream Crossing - Timber Mat
See Detail 1, Sheet 6.6
-  Proposed Resource Protection Fencing
See Detail 3, Sheet 6.6
-  Proposed Haul Road
-  Proposed Stockpile/Staging Area
-  Proposed Limits Of Disturbance

SEE GENERAL NOTES AND SYMBOLS (SHEET 0.3) FOR OTHER SYMBOLS NOT IN THIS LEGEND



*Note A: The perimeter of the conservation easement will be fenced. A portion of this perimeter is located within a wooded area. The contractor will harvest select trees, but maintain stumps, along this portion of the CE boundary to facilitate construction of the fence. No grading will occur within these areas, and thus these areas are excluded from the limits of disturbance.

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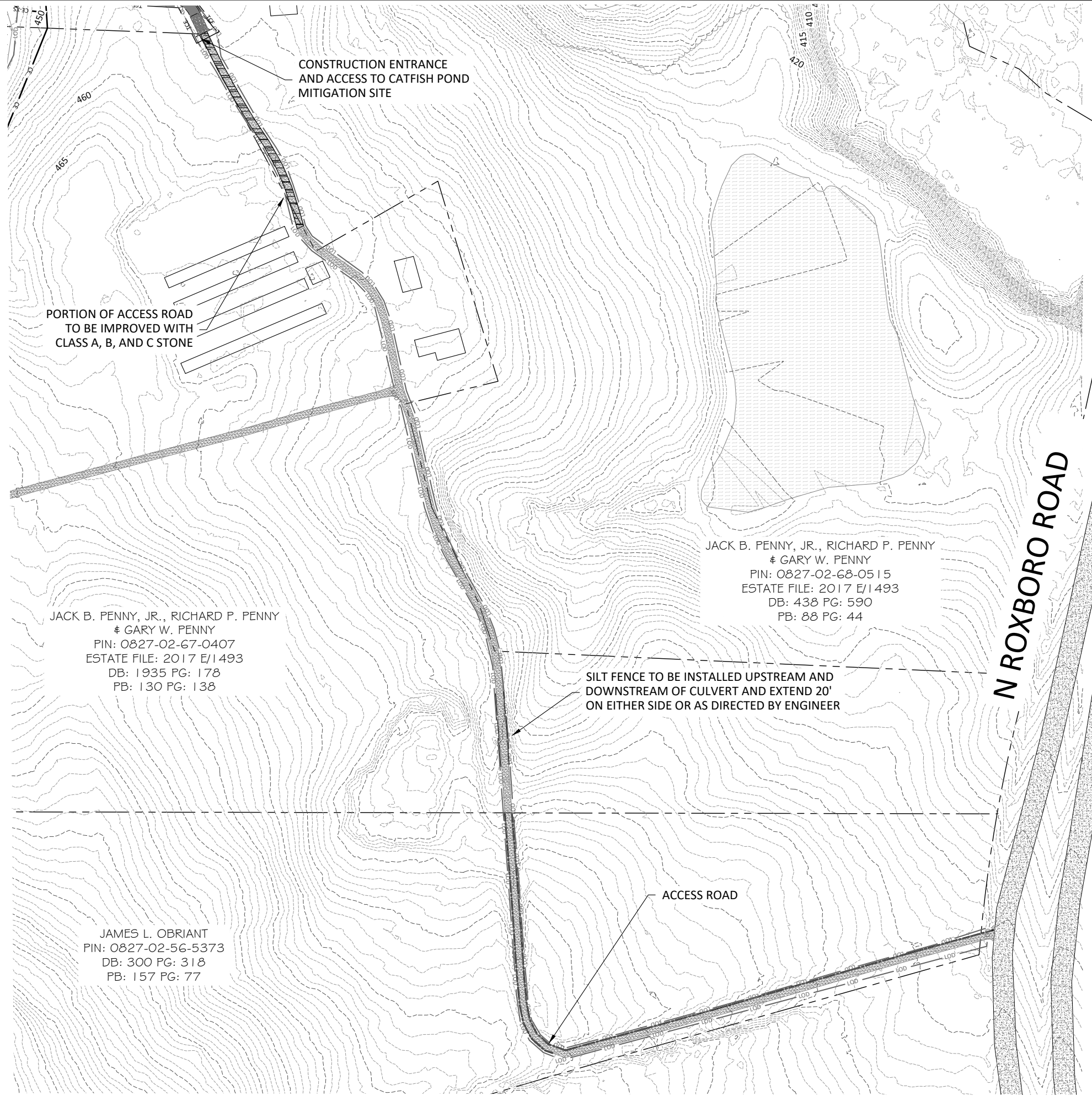
Catfish Pond Mitigation Site
 Durham County, North Carolina
 Erosion and Sediment Control Plan Overview
 Erosion and Sediment Control Plan

Revision	Description

Date: 07-16-2019
 Job Number: 005-02168
 Project Engineer: GWS
 Drawn By: ABP
 Checked By: CR
4.0
 Sheet

July 23, 2019

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Date:	07-16-2019
Job Number:	005-02168
Project Engineer:	GLS
Drawn By:	ABP
Checked By:	CR

Revisions

Catfish Pond Mitigation Site
Durham County, North Carolina
Access Road
Erosion and Sediment Control Plan

4.1

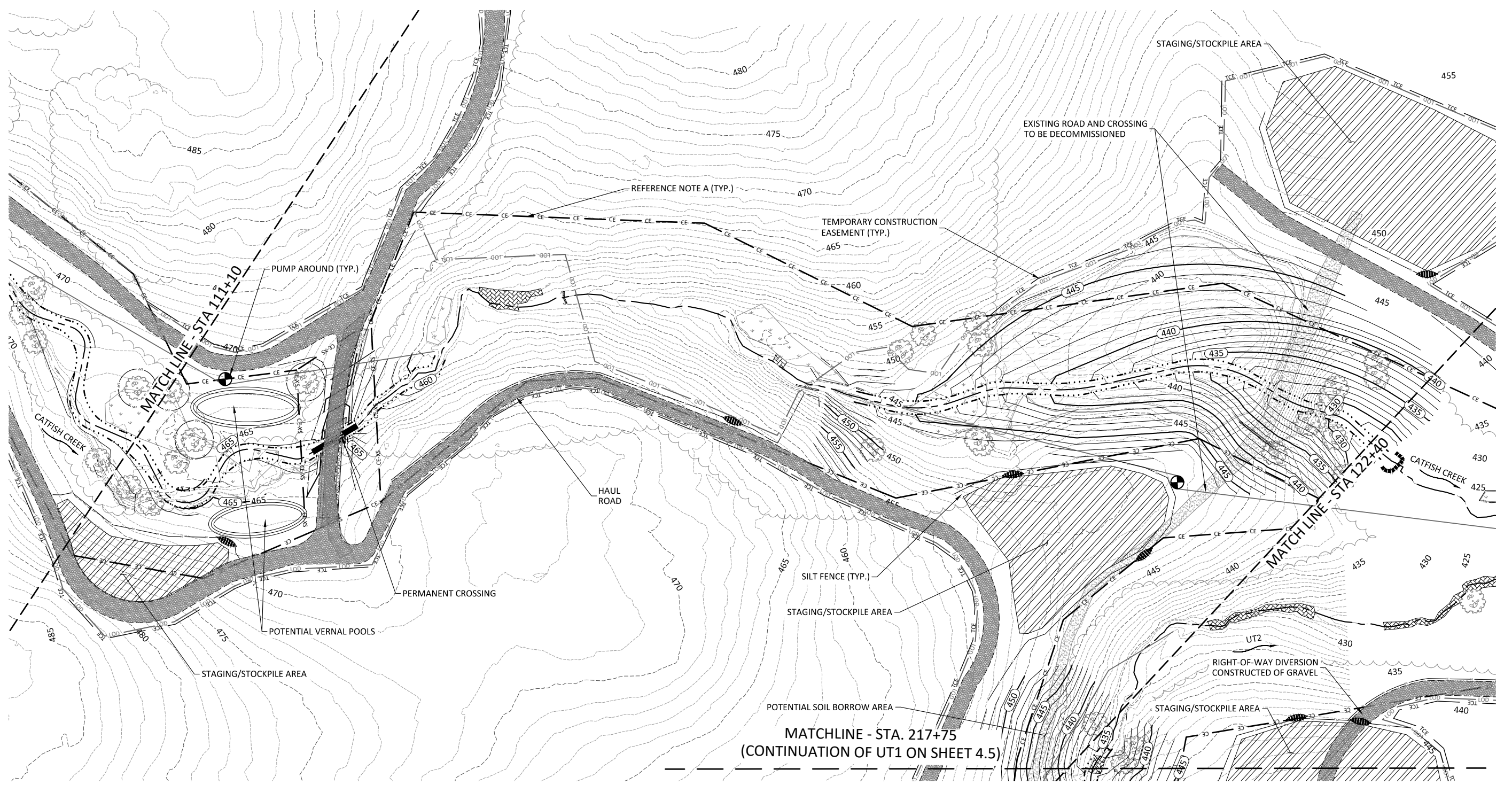
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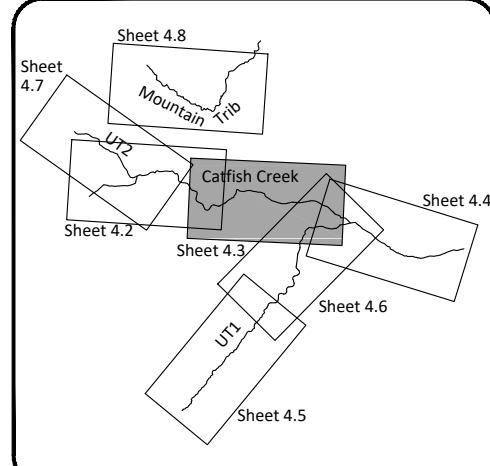
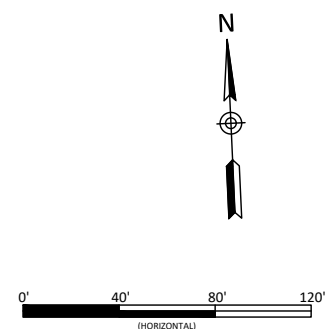
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July 23, 2019

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Date: 07-16-2019
 Job Number: 005-02168
 Project Engineer: GLS
 Drawn By: ABP
 Checked By: CR

Revisions

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4.3

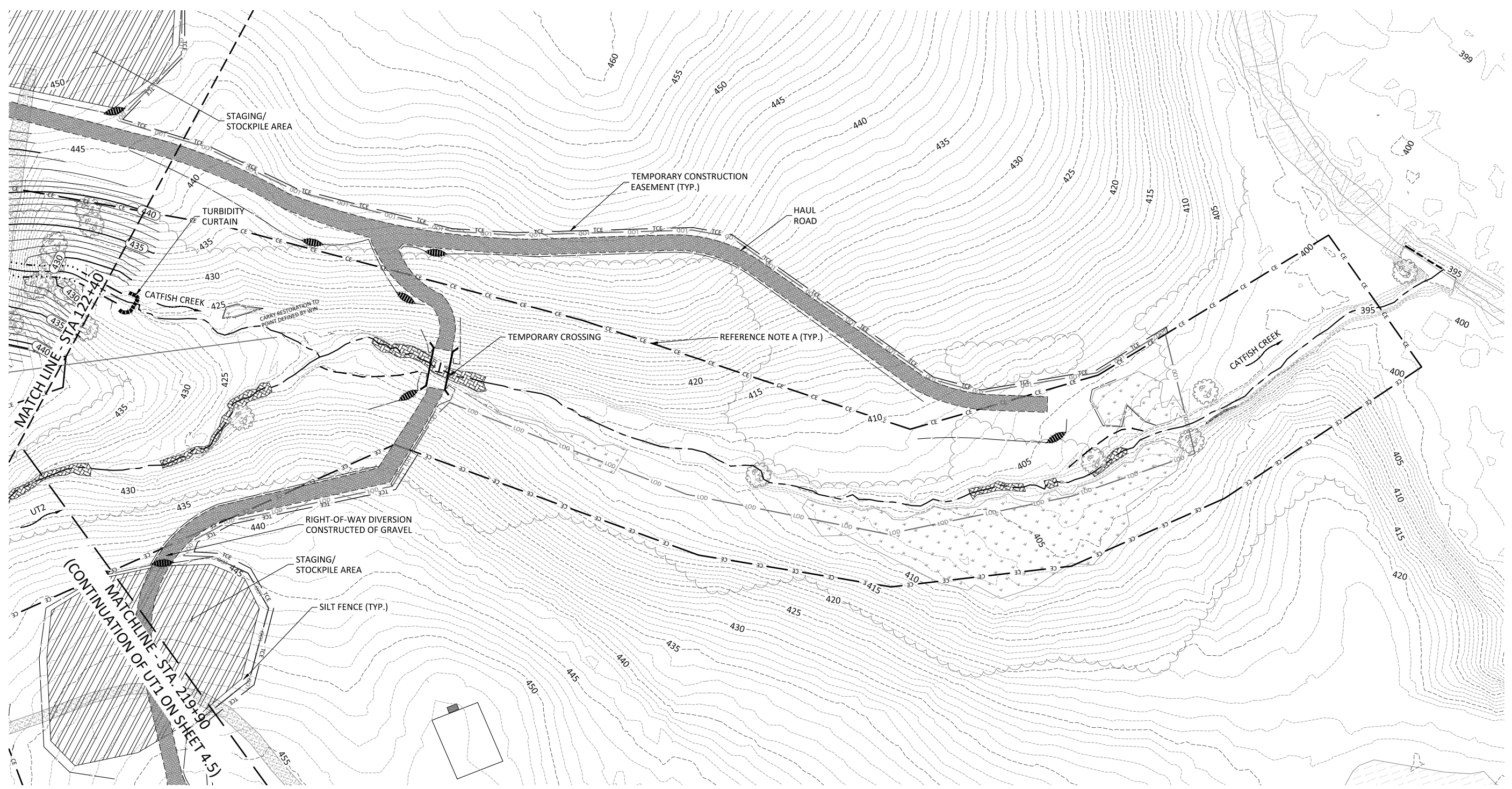
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Catfish Pond Mitigation Site
 Durham County, North Carolina
 Catfish Creek
 Erosion and Sediment Control Plan

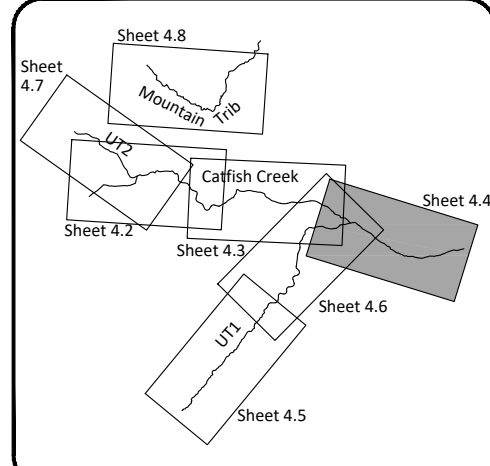
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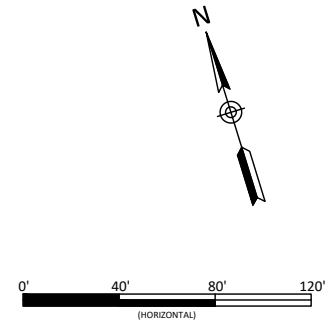
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 7-17-19



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*Note A: The perimeter of the conservation easement will be fenced. A portion of this perimeter is located within a wooded area. The contractor will harvest select trees, but maintain stumps, along this portion of the CE boundary to facilitate construction of the fence. No grading will occur within these areas, and thus these areas are excluded from the limits of disturbance.



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Catfish Pond Mitigation Site
Durham County, North Carolina
 Catfish Creek
 Erosion and Sediment Control Plan

Revisions

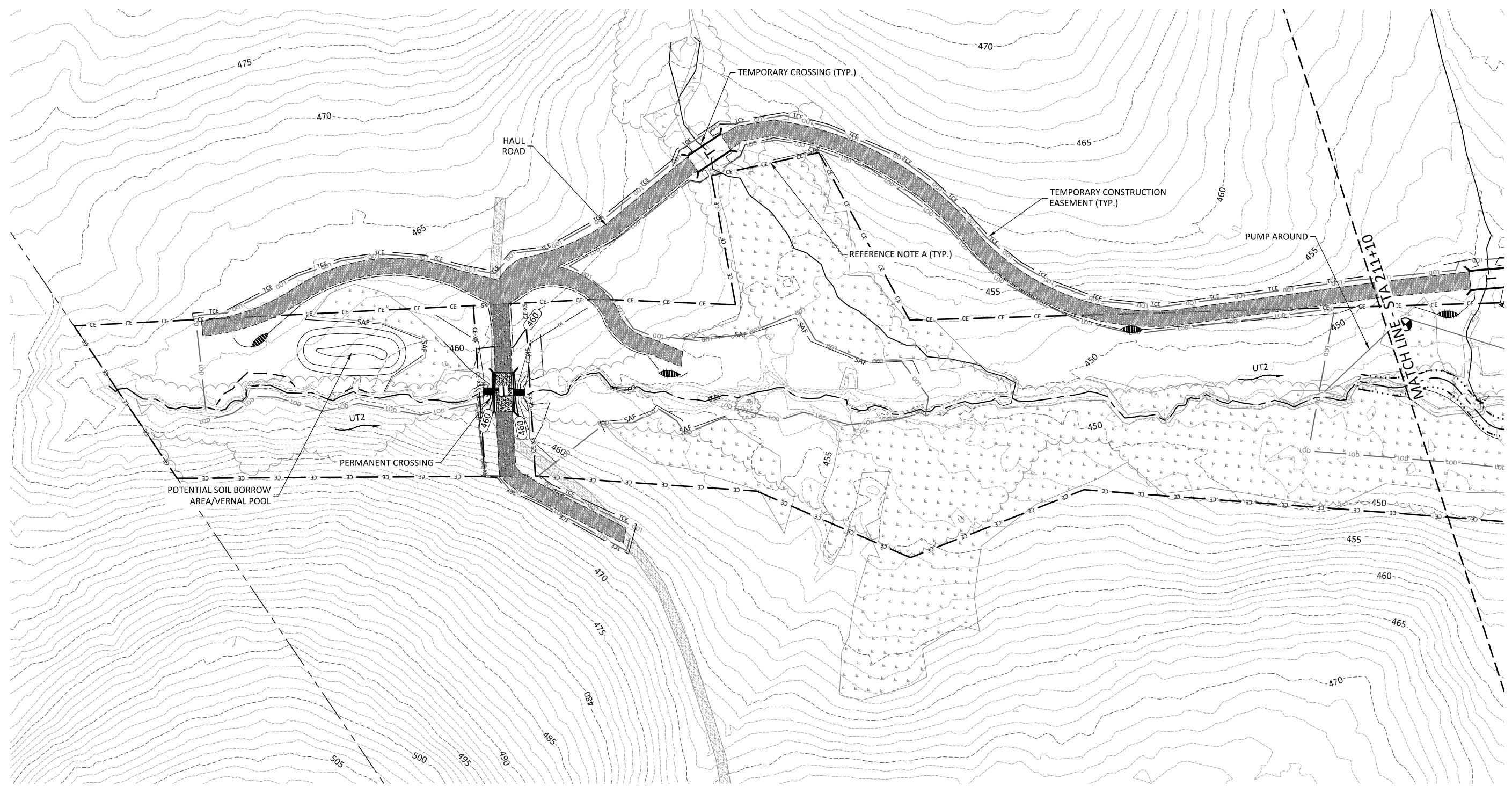
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 Project Engineer: GLS
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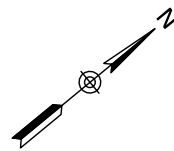
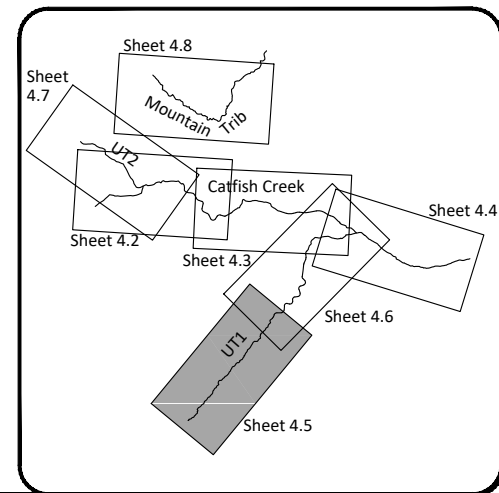
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July 23, 2019

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*Note A: The perimeter of the conservation easement will be fenced. A portion of this perimeter is located within a wooded area. The contractor will harvest select trees, but maintain stumps, along this portion of the CE boundary to facilitate construction of the fence. No grading will occur within these areas, and thus these areas are excluded from the limits of disturbance.



Catfish Pond Mitigation Site
Durham County, North Carolina

UT1

Erosion and Sediment Control Plan

Revisions

Date: 07-16-2019
Job Number: 005-02168
Project Engineer: GLS
Drawn By: ABP
Checked By: CR

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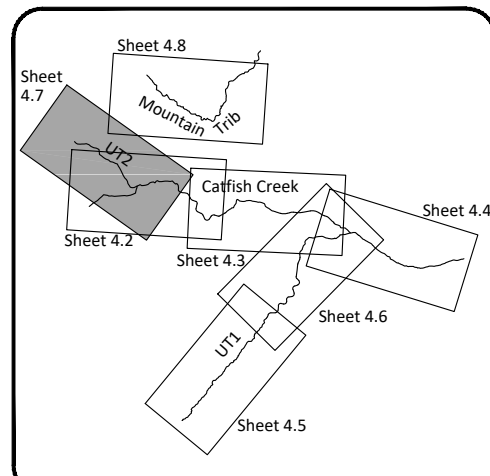
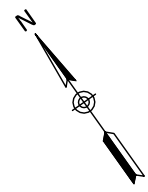
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MATCHLINE - STA 108+35
 (CONTINUATION OF CATFISH CREEK ON SHEET 4.3)

Sheet Index



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 Project Engineer: GLS
 Drawn By: ABP
 Checked By: CR

4.7

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Catfish Pond Mitigation Site
 Durham County, North Carolina

UT2
 Erosion and Sediment Control Plan

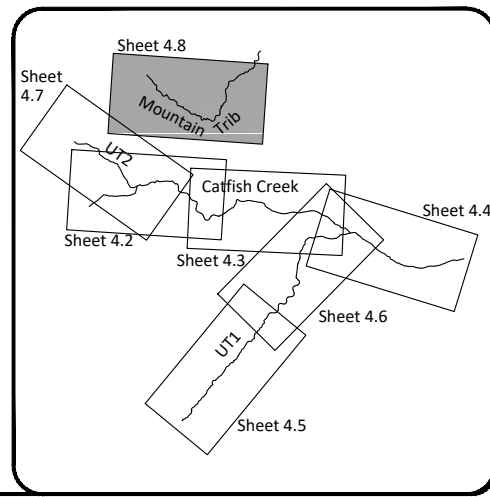


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Catfish Pond Mitigation Site
Durham County, North Carolina
Mountain Trib
Erosion and Sediment Control Plan

Revisions

No.	Description

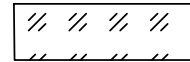
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Job Number: 005-02168
Project Engineer: GLS
Drawn By: ABP
Checked By: CR
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 07-16-2019

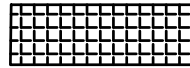
Zone 1* - Streambank Planting Zone

Streambank Planting Zone					
Live Stakes					
Species	Common Name	Indiv. Spacing	Min. Size	Stratum	% of Stems
<i>Sambucus canadensis</i>	Elderberry	3-6 ft.	0.5"-1.5" cal.	Shrub	15%
<i>Comus ammomum</i>	Silky Dogwood	3-6 ft.	0.5"-1.5" cal.	Shrub	45%
<i>Salix sericea</i>	Silky Willow	3-6 ft.	0.5"-1.5" cal.	Shrub	40%
					100%
Herbaceous Plugs					
<i>Juncus effusus</i>	Common Rush	4 ft.	1.0"- 2.0" plug	Herb	40%
<i>Scirpus cyperinus</i>	Woolgrass	4 ft.	1.0"- 2.0" plug	Herb	30%
<i>Carex lurida</i>	Lurid Sedge	4 ft.	1.0"- 2.0" plug	Herb	15%
<i>Carex alata</i>	Broadwing Sedge	4 ft.	1.0"- 2.0" plug	Herb	15%
					100%

Zone 2 - Buffer Planting Zone (Upland)



Zone 2 - Buffer Planting Zone (Wetland)



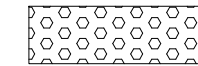
Zones 1* and 2

Permanent Riparian Seeding						
Pure Live Seed (20 lbs / acre)						
Approved Date	Species Name	Common Name	Stratum	Density (lbs/acre)	pH	Percentage
All Year	<i>Panicum rigidulum</i>	Redtop Panicgrass	Herb	1.6	5.0-7.5	8%
All Year	<i>Agrostis hyemalis</i>	Winter Bentgrass	Herb	1.8	5.0-7.5	9%
All Year	<i>Rudbeckia hirta</i>	Blackeyed Susan	Herb	1.0	6.0-7.0	5%
All Year	<i>Coreopsis lanceolata</i>	Lanceleaf Coreopsis	Herb	1.0	6.0-7.0	5%
All Year	<i>Carex vulpinoidea</i>	Fox Sedge	Herb	3.0	6.8-8.9	15%
All Year	<i>Panicum clandestinum</i>	Deertongue	Herb	3.0	4.0-7.5	15%
All Year	<i>Elymus virginicus</i>	Virginia Wild Rye	Herb	3.0	5.0-7.4	15%
All Year	<i>Bidens aristosa</i>	Bur-Marigold	Herb	1.4	5.0-7.0	7%
All Year	<i>Helianthus angustifolius</i>	Swamp Sunflower	Herb	0.6	4.0-7.0	3%
All Year	<i>Panicum virgatum</i>	Switchgrass	Herb	1.0	4.5-8.0	5%
All Year	<i>Poa palustris</i>	Fowl Bluegrass	Herb	1.0	4.9-7.5	5%
All Year	<i>Elymus riparius</i>	Riverbank Wildrye	Herb	0.6	4.5-7.2	3%
All Year	<i>Panicum dichotoiflorum</i>	Smooth Panicgrass	Herb	1.0	4.8-7.0	5%
						100%

*Zone 1 is from top of bank to top of bank but is not depicted on the plans.

Buffer Planting Zone							
Bare Root							
Species	Common Name	Max Spacing	Indiv. Spacing	Min. Caliper Size	Stratum	Zone	# of Stems
<i>Quercus phellos</i>	Willow Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	Throughout	10%
<i>Platanus occidentalis</i>	Sycamore	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	Throughout	20%
<i>Betula nigra</i>	River Birch	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	Throughout	15%
<i>Quercus michauxii</i>	Swamp Chestnut Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	Throughout	10%
<i>Populus deltoides</i>	Eastern Cottonwood	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	Throughout	12%
** <i>Quercus alba</i>	White Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	Zone 2 Upland Only	5%
** <i>Quercus lyrata</i>	Overcup Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	Zone 2 Wetland Only	5%
<i>Quercus shumardii</i>	Shumard Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	Throughout	10%
<i>Fraxinus pennsylvanica</i>	Green Ash	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	Throughout	10%
* <i>Viburnum nudum</i>	Possumhaw Viburnum	24 ft.	12-24 ft.	0.25"-1.0"	Understory	Throughout	1%
* <i>Amelanchier canadensis</i>	Shadbush Serviceberry	24 ft.	12-24 t.	0.25"-1.0"	Understory	Throughout	1%
* <i>Aesculus sylvatica</i>	Painted Buckeye	24 ft.	12-24 ft.	0.25"-1.0"	Understory	Throughout	1%
* These species should be used for supplemental planting in areas with existing canopy but limited understory							100%
** <i>Q. alba</i> should only be planted in true upland areas and <i>Q. lyrata</i> should only be planted in true wetland areas							

No Planting Zone (No planting within existing forested area)



Permanent Seeding Outside Easement					
Approved Date	Species Name	Common Name	Stratum	Density (lbs/acre)	Percentage
All Year	<i>Festuca arundinacea</i>	Tall Fescue	Herb	80	50%
All Year	<i>Festuca rubra</i>	Creeping Red Fescue	Herb	80	50%
					100%

Temporary Seeding				
Pure Live Seed				
Approved Date	Species Name	Common Name	Stratum	Density (lbs/acre)
Aug 15 - May 1	<i>Secale cereale</i>	Rye Grain	Herb	140
May 1 - Aug 15	<i>Setaria italica</i>	German Millet	Herb	50

Revisions

Date: 07-16-2019
 Job Number: 005-02168
 Project Engineer: GLS
 Drawn By: ABP
 Checked By: CR

5.0

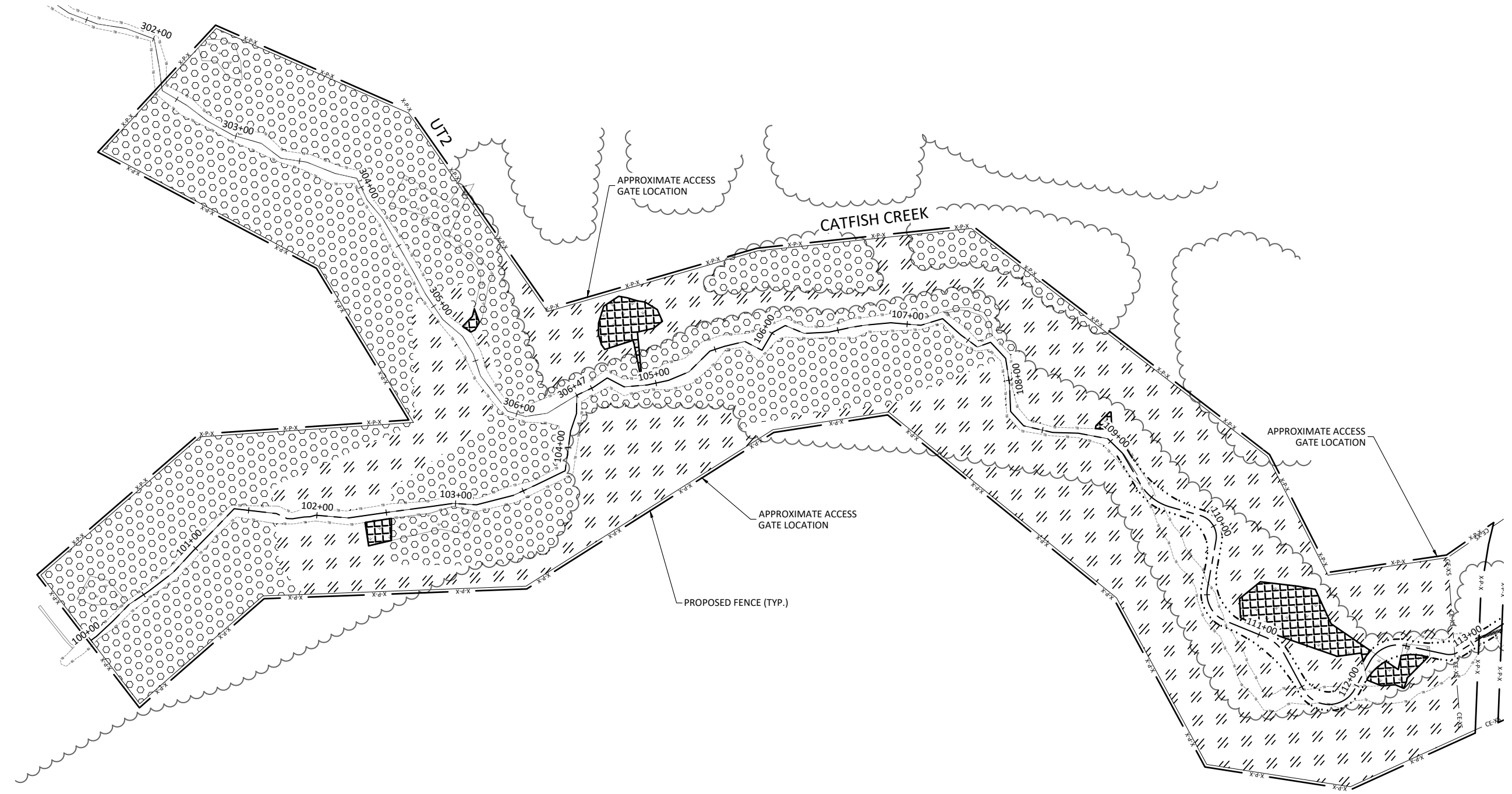
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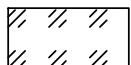


Catfish Pond Mitigation Site
 Durham County, North Carolina
 Planting Overview
 Planting and Fencing Plan

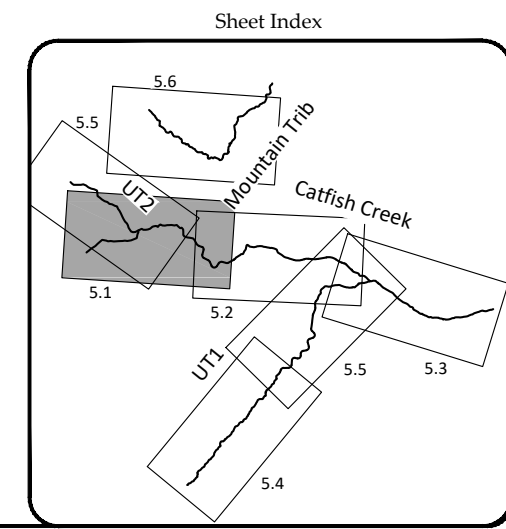
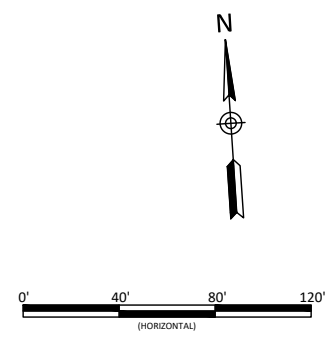


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-  Zone 2 - Buffer Planting Zone (Upland)
-  Zone 2 - Buffer Planting Zone (Wetland)
-  No Planting Zone (No planting within forested area)



Revisions	


Date:	07-16-2019
Job Number:	005-02168
Project Engineer:	CLS
Drawn By:	ABP
Checked By:	CR

5.1

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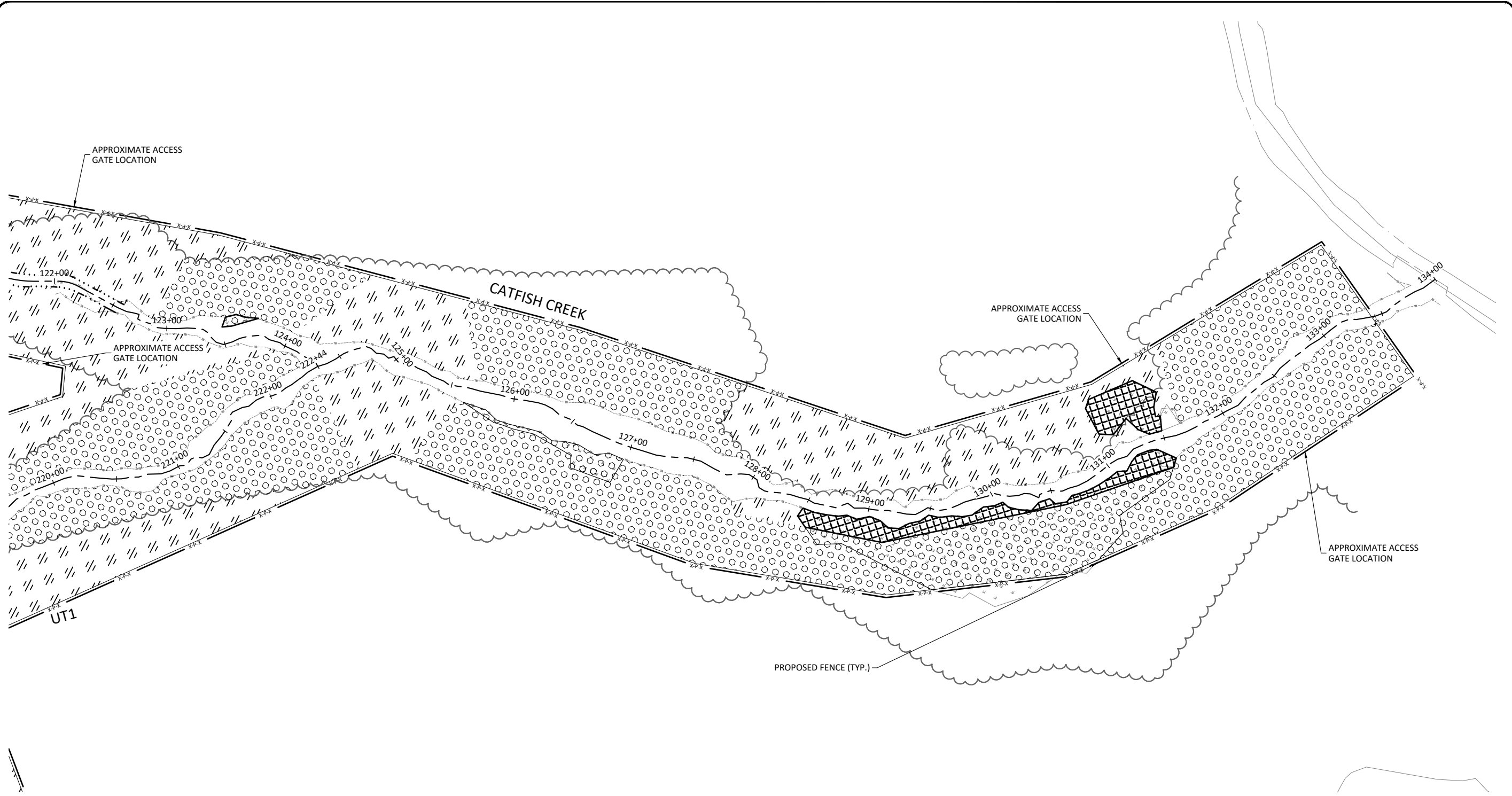
Catfish Pond Mitigation Site
Durham County, North Carolina

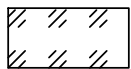
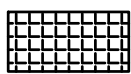
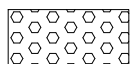
Catfish Creek
 Planting and Fencing Plan

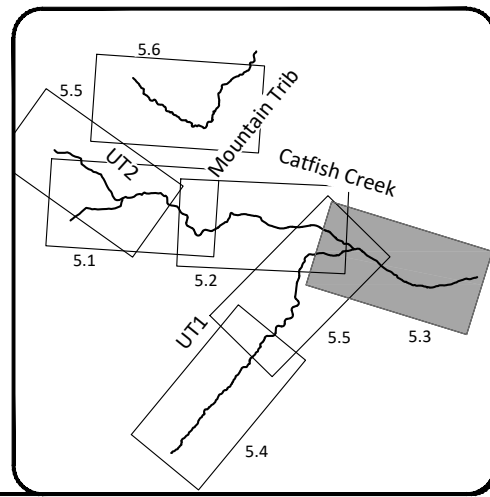
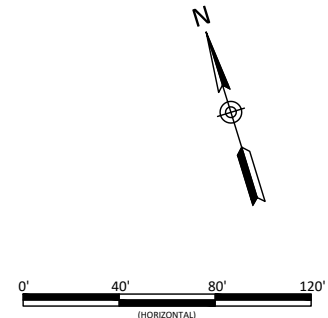



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-  Zone 2 - Buffer Planting Zone (Upland)
-  Zone 2 - Buffer Planting Zone (Wetland)
-  No Planting Zone (No planting within forested area)





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 SEAL
 048920
 GREGORY A. H.
 7-17-19

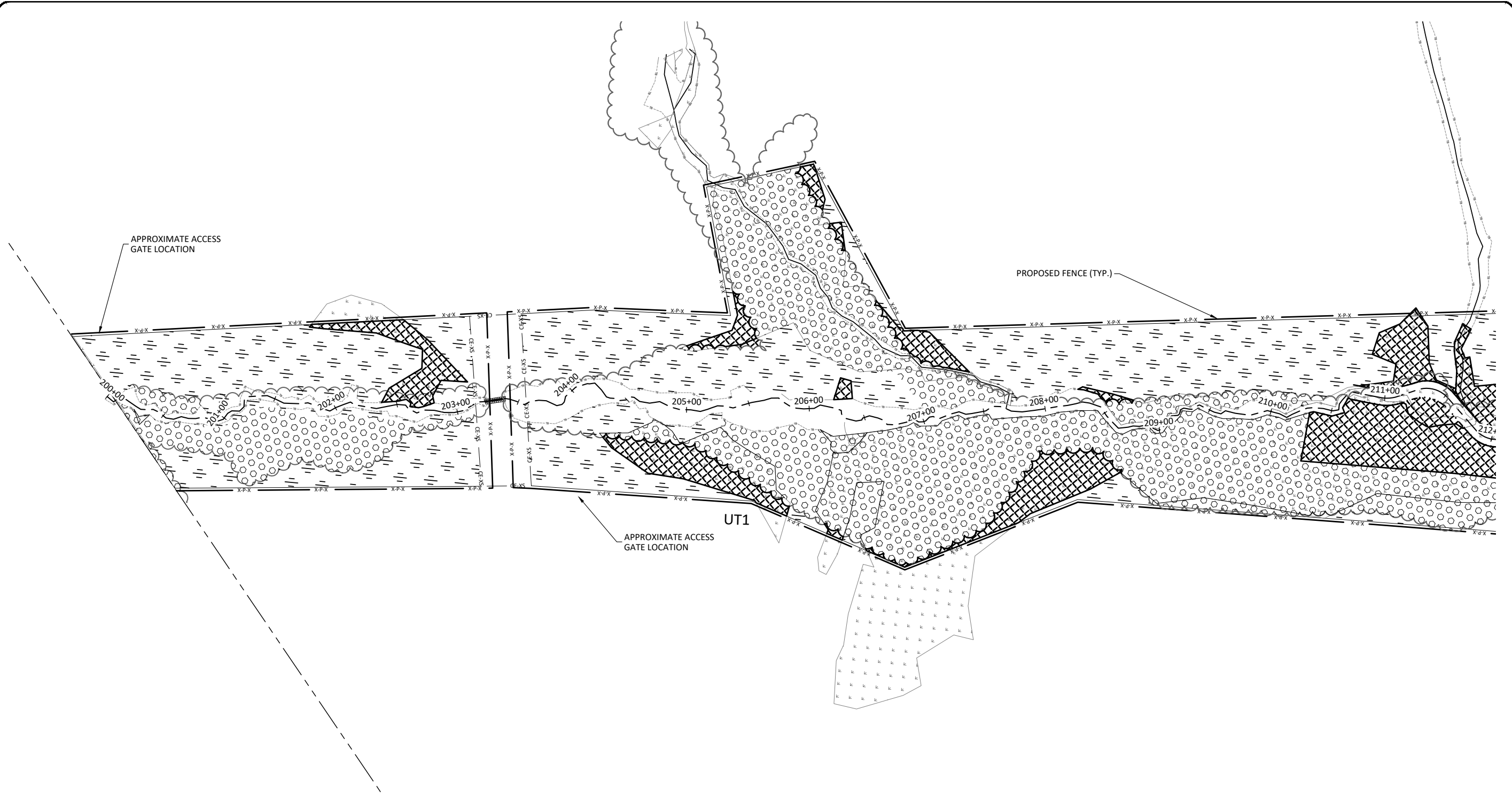
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Durham County, North Carolina
Catfish Creek
Planting and Fencing Plan

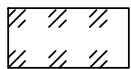
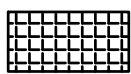
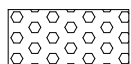
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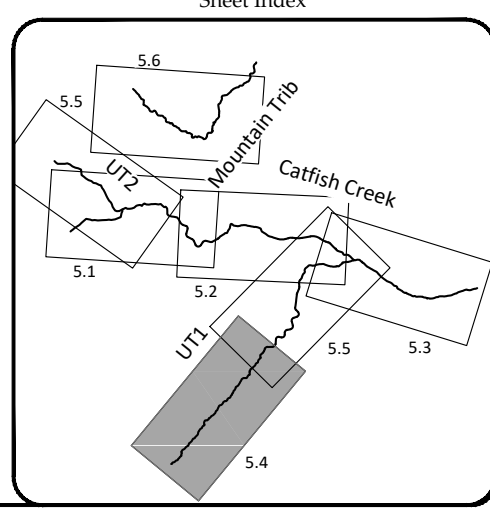
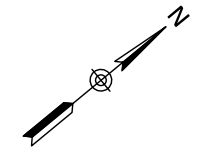
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Job Number:	005-02168
Project Engineer:	CLS
Drawn By:	ABP
Checked By:	CR


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Sheet




-  Zone 2 - Buffer Planting Zone (Upland)
-  Zone 2 - Buffer Planting Zone (Wetland)
-  No Planting Zone (No planting within forested area)





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7-17-19

Catfish Pond Mitigation Site
Durham County, North Carolina

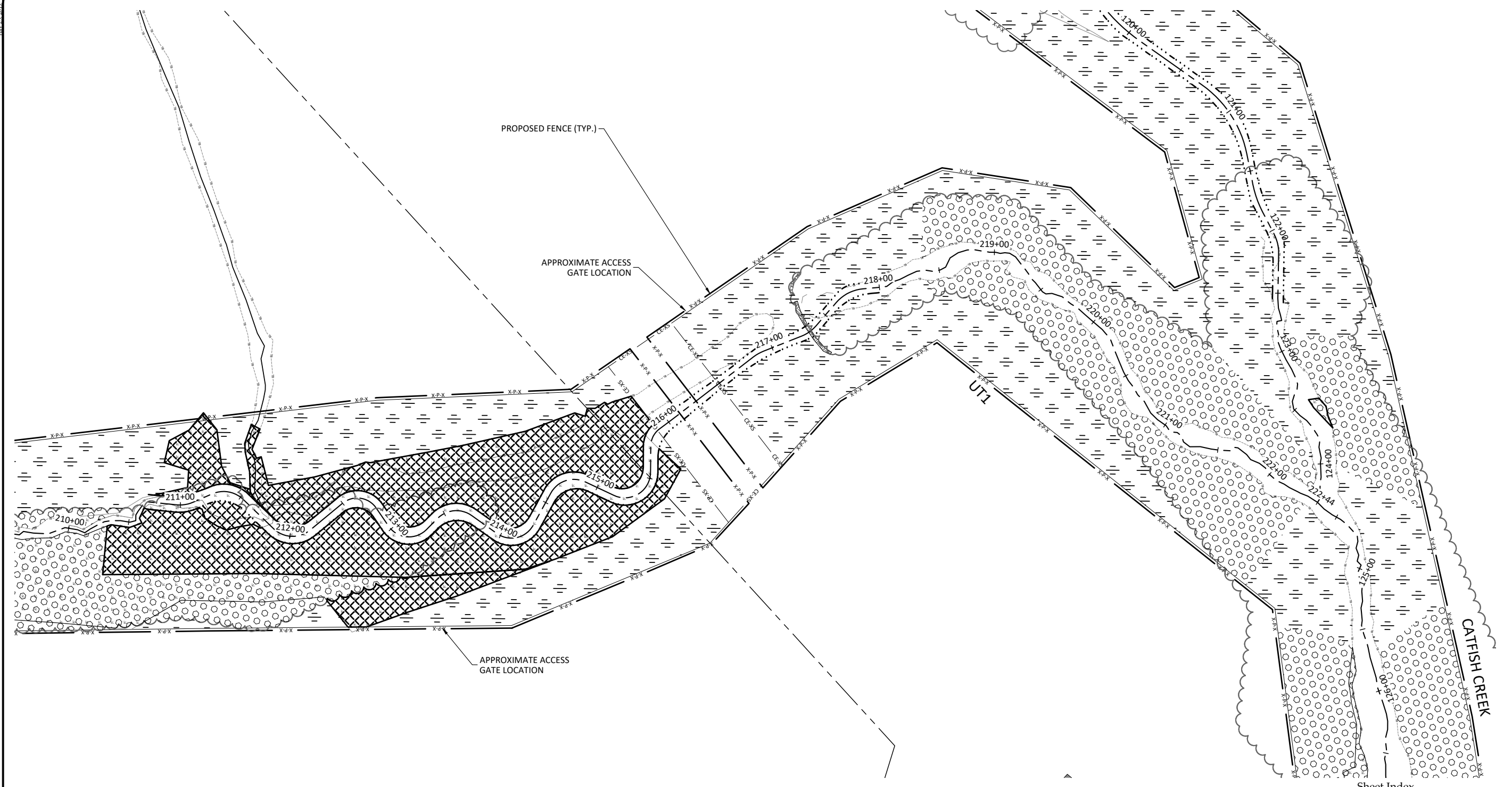
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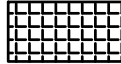

Date	Job Number	Project Engineer	Drawn By	Checked By	Revisions
07-16-2019	005-02168	GLS	ABP	CR	

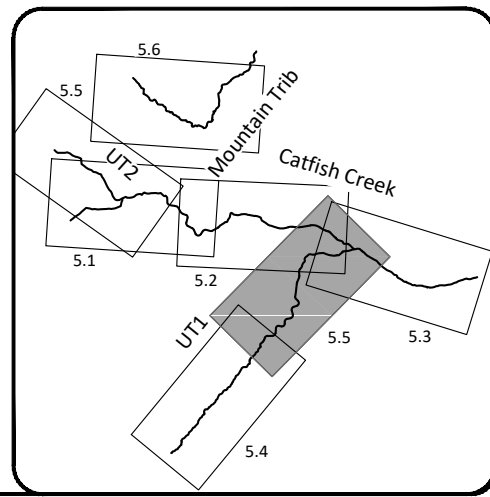
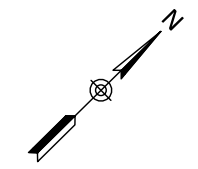
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-  Zone 2 - Buffer Planting Zone (Upland)
-  Zone 2 - Buffer Planting Zone (Wetland)
-  No Planting Zone (No planting within forested area)



Date: 07-16-2019

Job Number: 005-02168

Project Engineer: GLS

Drawn By: ABP

Checked By: CR


Revisions

Catfish Pond Mitigation Site
Durham County, North Carolina


UT1
Planting and Fencing Plan

5.5

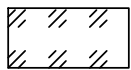
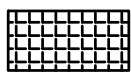
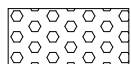
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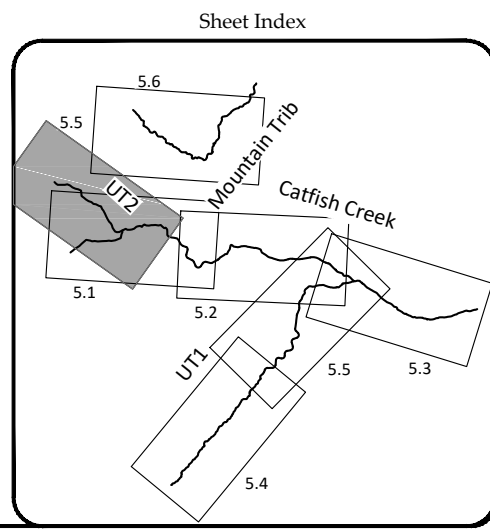
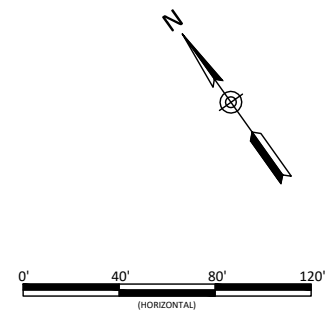
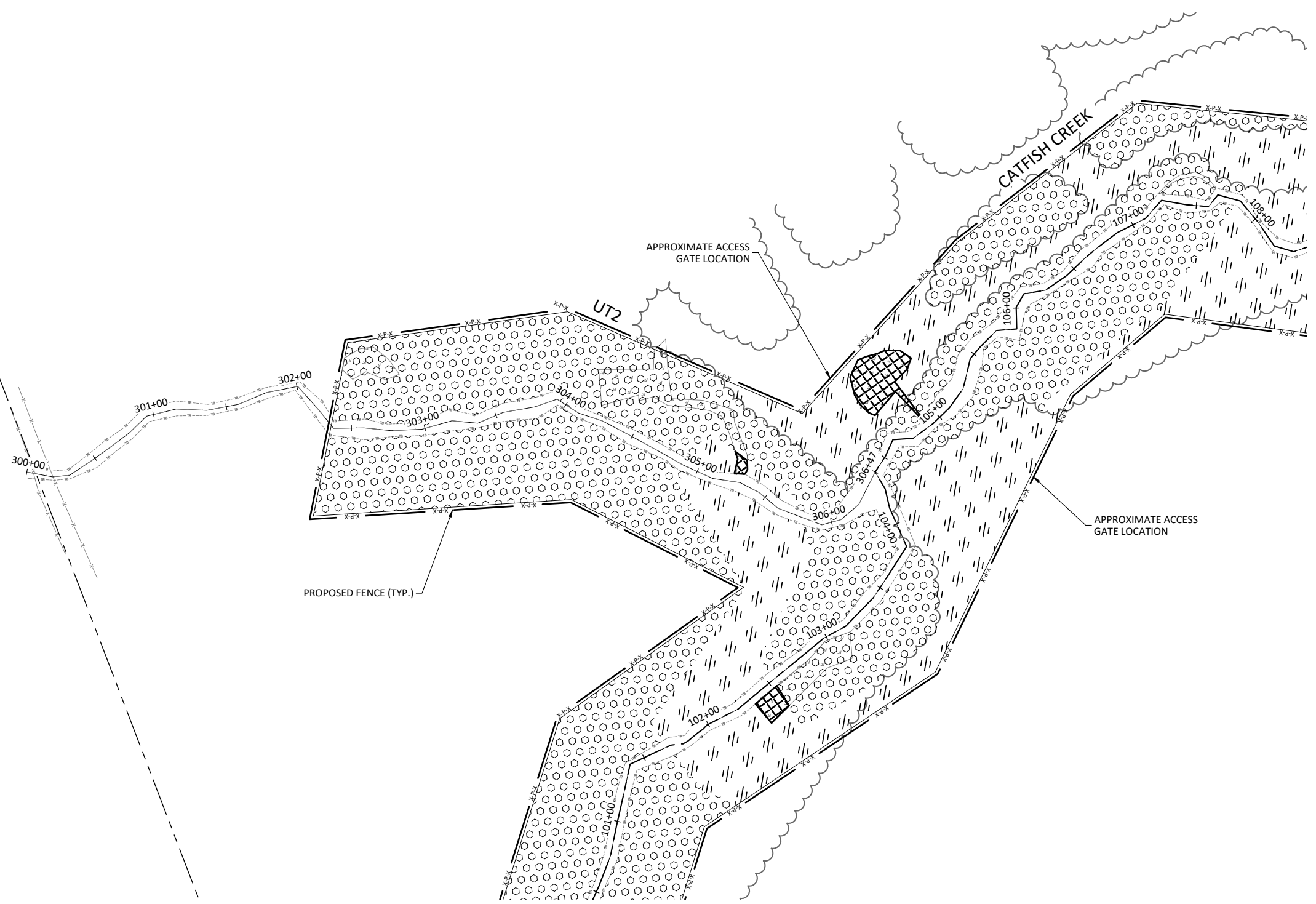


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7-17-19

-  Zone 2 - Buffer Planting Zone (Upland)
-  Zone 2 - Buffer Planting Zone (Wetland)
-  No Planting Zone (No planting within forested area)




Catfish Pond Mitigation Site
 Durham County, North Carolina
 UT2
 Planting and Fencing Plan

Revisions	


Date:	07-16-2019
Job Number:	005-02168
Project Engineer:	GLS
Drawn By:	ABP
Checked By:	CR

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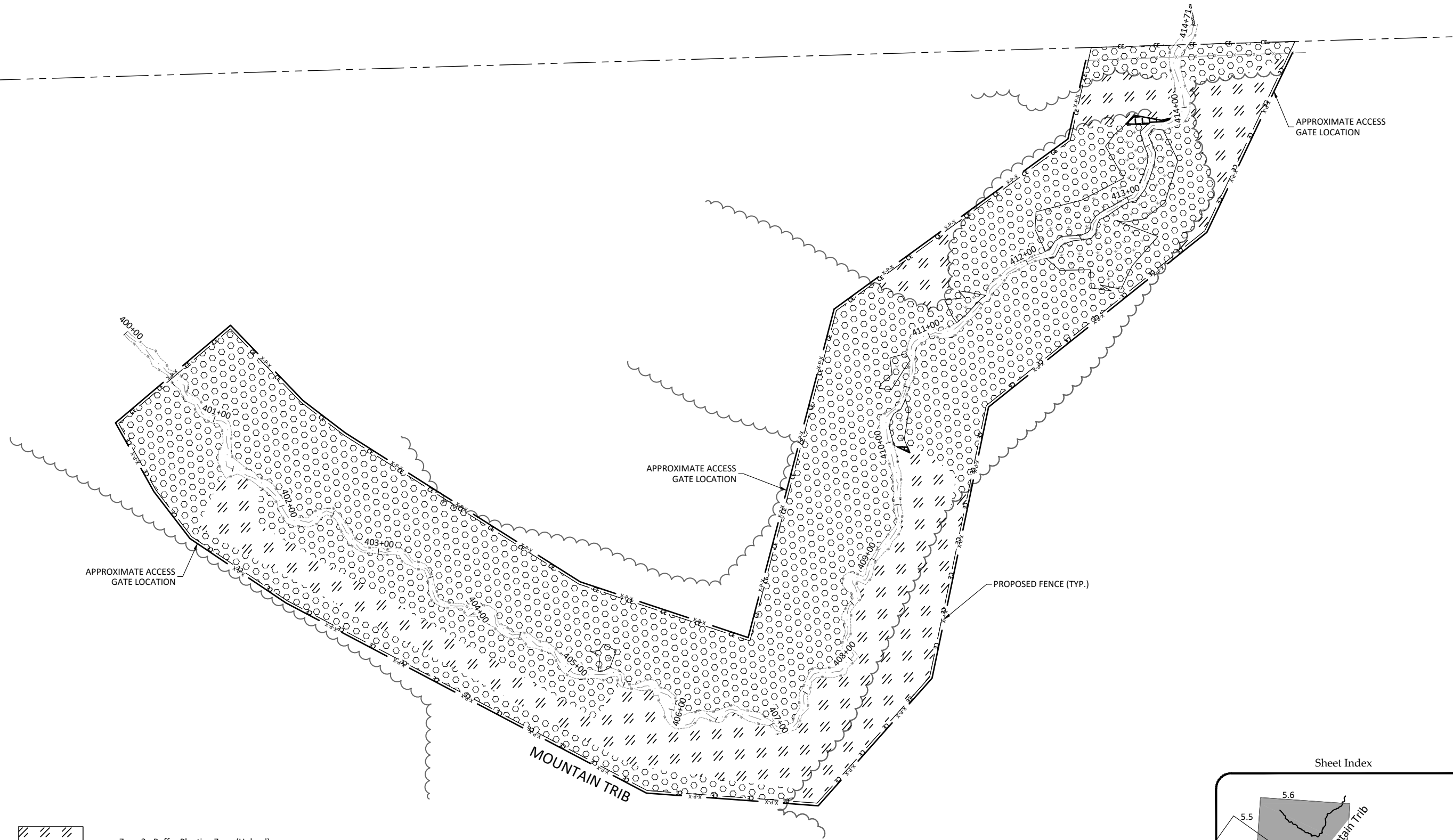
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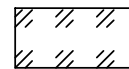
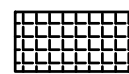
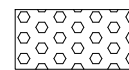


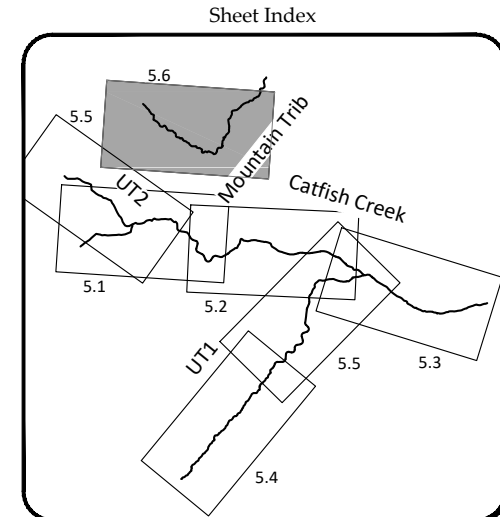
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 GEOFFREY W. HILL
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July 23, 2019

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-  Zone 2 - Buffer Planting Zone (Upland)
-  Zone 2 - Buffer Planting Zone (Wetland)
-  No Planting Zone (No planting within forested area)



Revisions

Date:	07-16-2019
Job Number:	005-02168
Project Engineer:	CLS
Drawn By:	ABP
Checked By:	CR

5.7

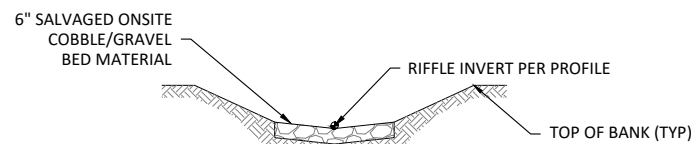
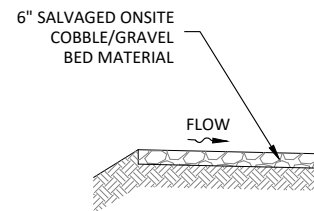
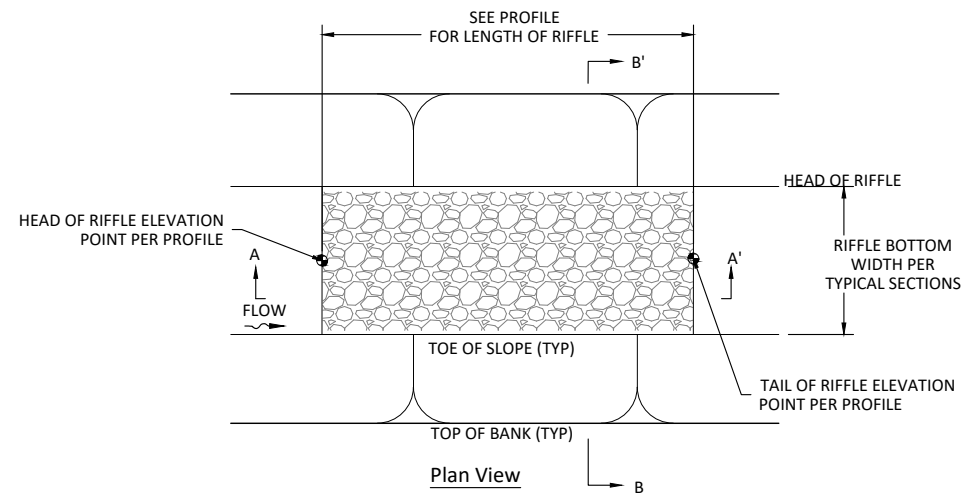
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Catfish Pond Mitigation Site
 Durham County, North Carolina
 Mountain Trib
 Planting and Fencing Plan



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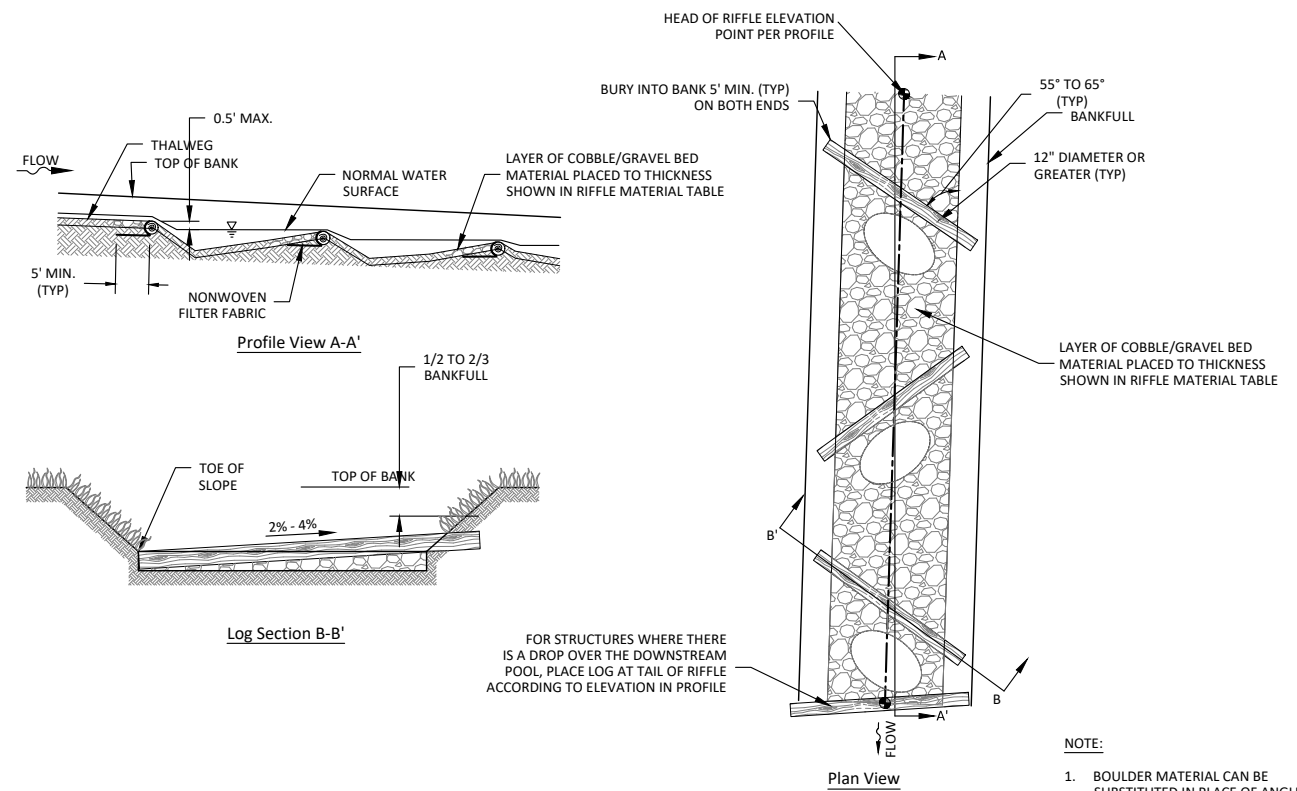
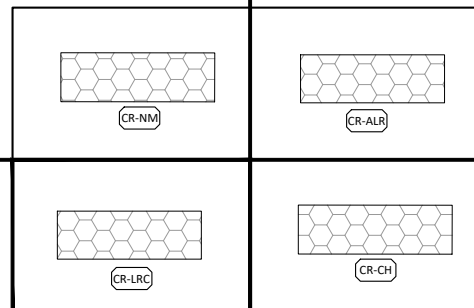
March 2, 2012
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NOTES:

- IF A RIFFLE ENDS WITH A SILL IT WILL BE SHOWN IN THE PLANS. REFER TO LOG/ROCK SILL DETAIL.
- RIFFLE MATERIAL SHALL BE A WELL-GRADED MIXTURE OF FINE GRAVELS TO LARGE COBBLE THAT MIMICS EXISTING CHANNEL SUBSTRATE.
- ALL RIFFLES WILL BE SUPPLEMENTED WITH SIMILAR ONSITE STONE TO CLASS A STONE.

1 Native Riffle
6.1 Not to Scale

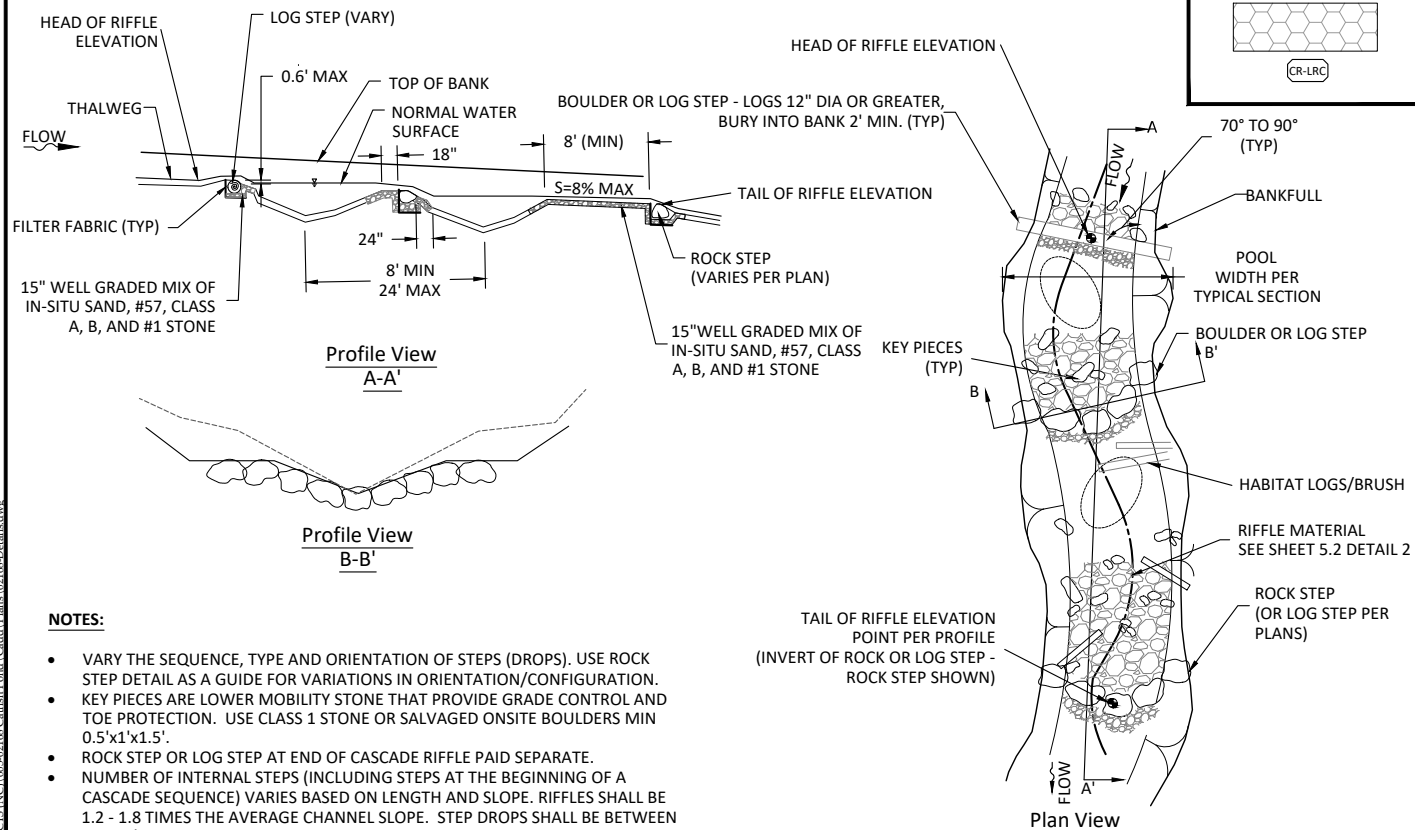


NOTE:

NOTE:

1. BOULDER MATERIAL CAN BE SUBSTITUTED IN PLACE OF ANGLED LOGS WITH APPROVAL OF ENGINEER.
2. MINIMUM LOG DIAMETER 12".
3. MINIMUM ONE LOG PER 10 LF OF RIFFLE LENGTH OR ONE LOG PER 0.3' OF DROP, WHICHEVER IS LESSER DISTANCE. REFER TO RIFFLE MATERIAL TABLE ON THIS SHEET FOR RIFFLE MATERIAL SIZING.
- 4.

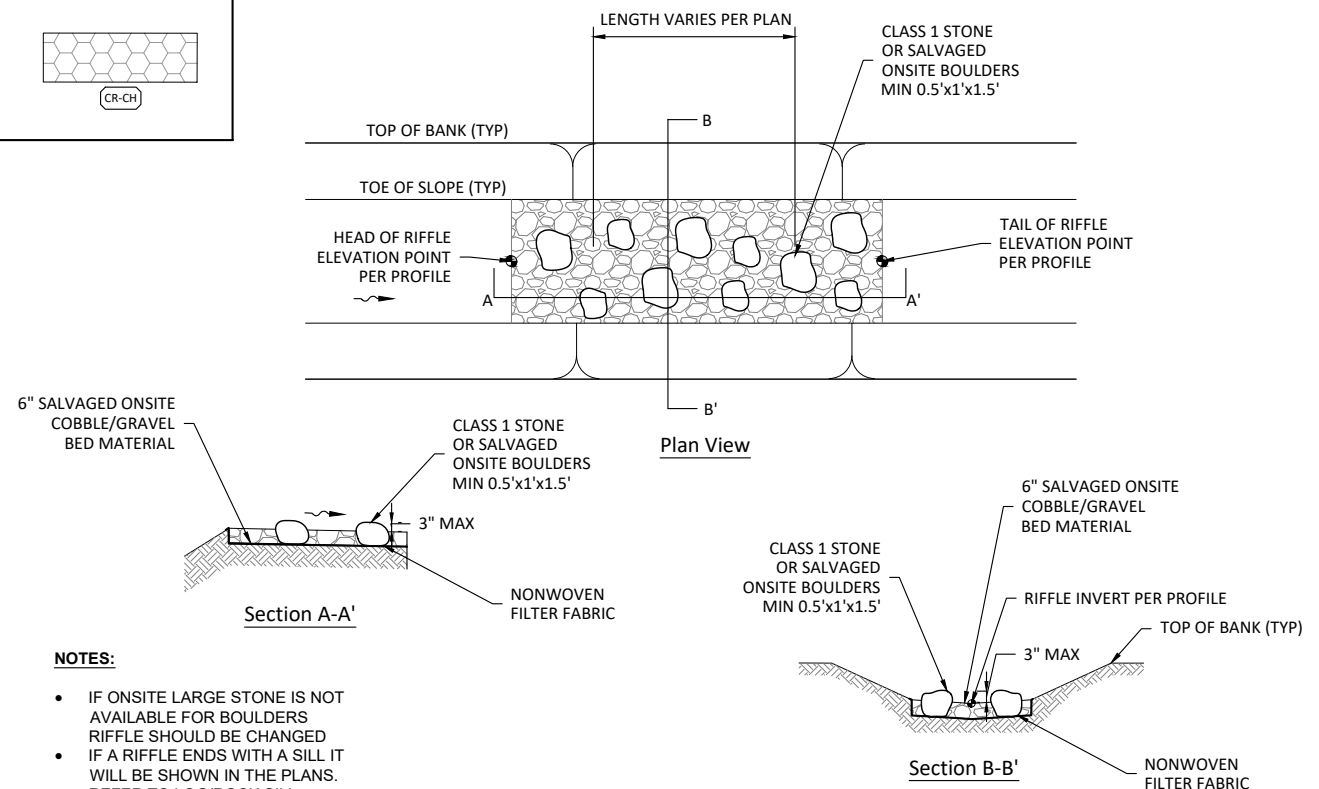
2 Angled Log Riffle
6.1 Not to Scale



NOTES:

- VARY THE SEQUENCE, TYPE AND ORIENTATION OF STEPS (DROPS). USE ROCK STEP DETAIL AS A GUIDE FOR VARIATIONS IN ORIENTATION/CONFIGURATION.
- KEY PIECES ARE LOWER MOBILITY STONE THAT PROVIDE GRADE CONTROL AND TOE PROTECTION. USE CLASS 1 STONE OR SALVAGED ONSITE BOULDERS MIN 0.5'x1'x1.5'.
- ROCK STEP OR LOG STEP AT END OF CASCADE RIFFLE PAID SEPARATE.
- NUMBER OF INTERNAL STEPS (INCLUDING STEPS AT THE BEGINNING OF A CASCADE SEQUENCE) VARIES BASED ON LENGTH AND SLOPE. RIFFLES SHALL BE 1.2 - 1.8 TIMES THE AVERAGE CHANNEL SLOPE. STEP DROPS SHALL BE BETWEEN 0.2-0.5' MEASURED AT THE WATER SURFACE.
- FOOTER ROCK OR LOG SHOWN. FOOTER ONLY REQUIRED WHEN MINIMUM UNFOOTERED DIMENSION OF ROCK OR LOG IS NOT MET. A MINIMUM OF 16" OF RIFFLE MATERIAL SHALL BE PLACED OVER FILTER FABRIC TO PROTECT.
- IF A RIFFLE ENDS WITH A SILL IT WILL BE SHOWN IN THE PLANS. REFER TO LOG/ROCK SILL DETAIL.

3 Log-Rock Cascade Riffle
6.1 Not to Scale



NOTES:

- IF ONSITE LARGE STONE IS NOT AVAILABLE FOR BOULDERS RIFFLE SHOULD BE CHANGED
- IF A RIFFLE ENDS WITH A SILL IT WILL BE SHOWN IN THE PLANS. REFER TO LOG/ROCK SILL DETAIL.
- RIFFLE MATERIAL SHALL BE A WELL-GRADED MIXTURE OF FINE GRAVELS TO LARGE COBBLE WITH A D50 = 6 INCHES.

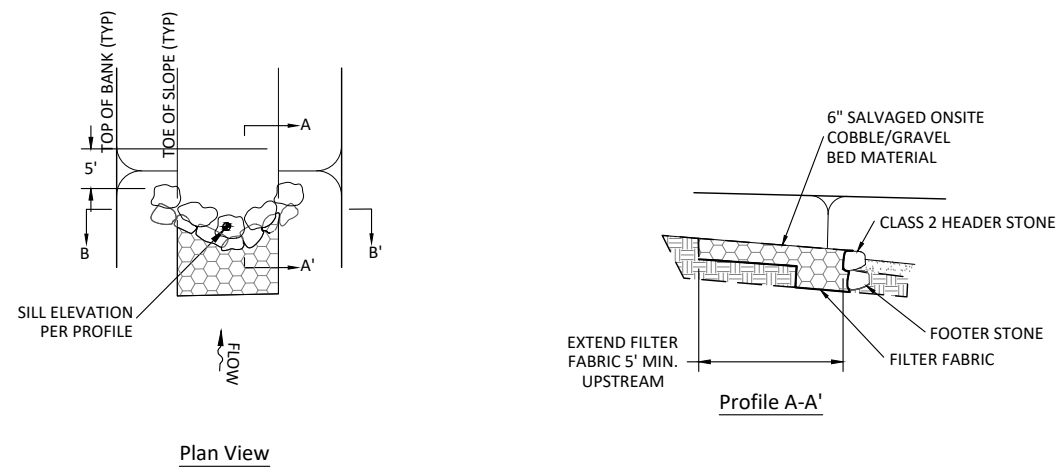
4 Chunky Riffle
6.1 Not to Scale



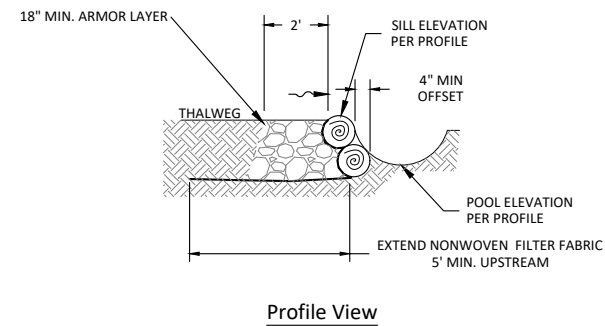
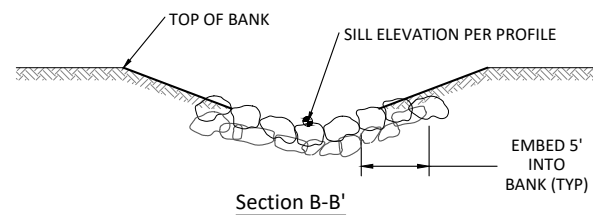
Revisions	

March 2, 2012

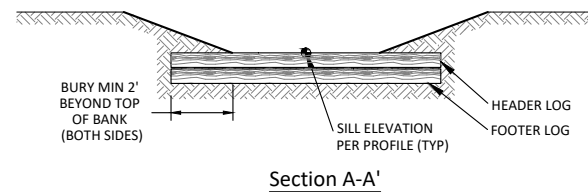
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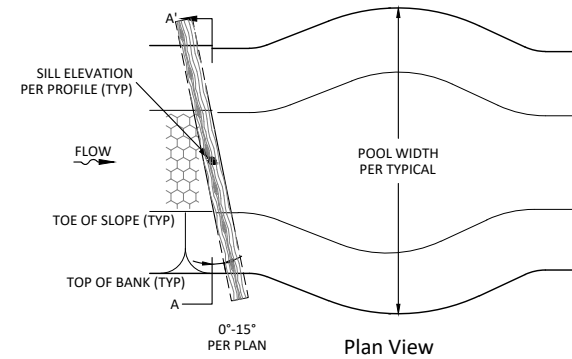
1 Rock Sill
6.3 Not to Scale



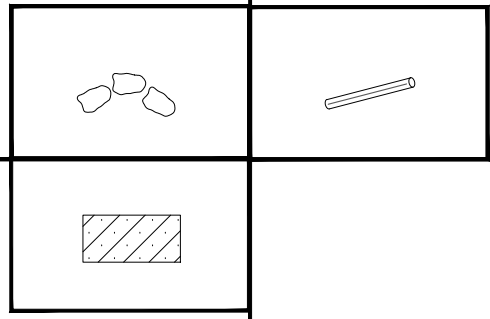
Profile View



Section A-A'

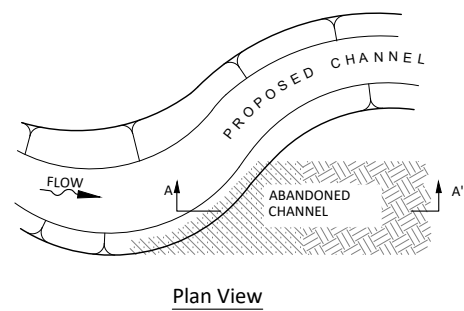


Plan View

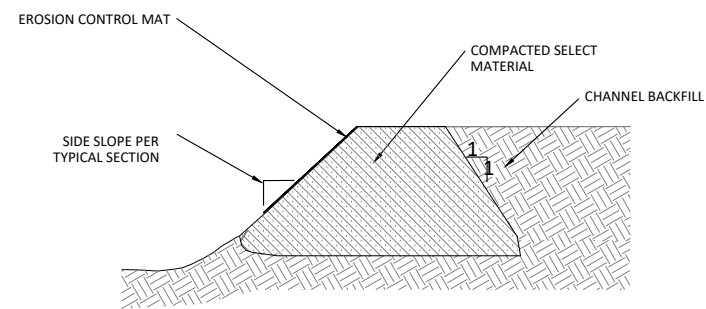


2 Angled Log Sill
6.3 Not to Scale

- NOTES:
- LOGS SHALL BE 18" DIA. MIN. AND BE OF A HARDWOOD SPECIES.
 - A SINGLE LOG OF 18" MIN DIAMETER MAY BE USED AT ENGINEER'S DIRECTION.



Plan View



Section A-A'

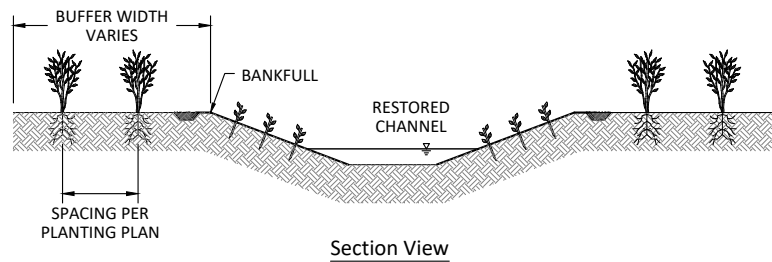
3 Channel Plug
6.3 Not to Scale



Revisions

Date:	07-16-2019
Job Number:	005-02108
Project Engineer:	GLS
Drawn By:	ABP
Checked By:	CR

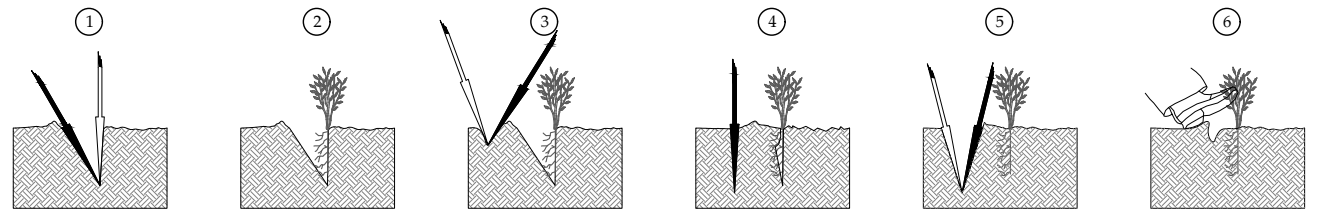
March 2, 2012
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DIBBLE BAR
 PLANTING BAR SHALL HAVE A BLADE WITH A TRIANGULAR CROSS-SECTION, AND SHALL BE 12 INCHES LONG, 4 INCHES WIDE AND 1 INCH THICK AT CENTER.

ROOTING PRUNING
 ALL ROOTS SHALL BE PRUNED TO AN APPROPRIATE LENGTH TO PREVENT J-ROOTING.

- NOTES:**
1. ALL SOILS WITHIN THE BUFFER PLANTING AREA SHALL BE DISKED, AS REQUIRED, PRIOR TO PLANTING.
 2. ALL PLANTS SHALL BE PROPERLY HANDLED PRIOR TO INSTALLATION TO INSURE SURVIVAL.



1
Bare Root Planting
 6.4 Not to Scale

INSERT THE DIBBLE, OR SHOVEL, STRAIGHT DOWN INTO THE SOIL TO THE FULL DEPTH OF THE BLADE AND PULL BACK ON THE HANDLE TO OPEN THE PLANTING HOLE. (DO NOT ROCK THE SHOVEL BACK AND FORTH AS THIS CAUSES SOIL IN THE PLANTING HOLE TO BE COMPACTED, INHIBITING ROOT GROWTH.)

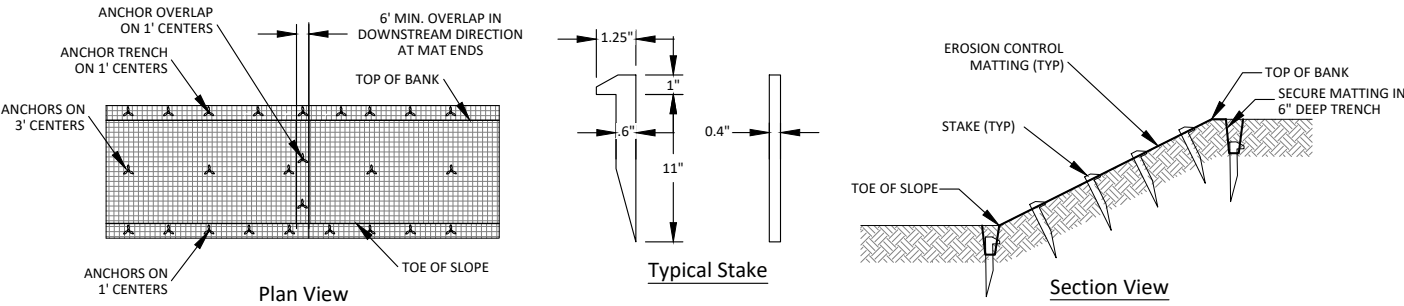
REMOVE THE DIBBLE, OR SHOVEL, AND PUSH THE SEEDLING ROOTS DEEP INTO THE PLANTING HOLE. PULL THE SEEDLING BACK UP TO THE CORRECT PLANTING DEPTH (THE ROOT COLLAR SHOULD BE 1 TO 3 INCHES BELOW THE SOIL SURFACE). GENTLY SHAKE THE SEEDLING TO ALLOW THE ROOTS TO STRAIGHTEN OUT. DO NOT TWIST OR SPIN THE SEEDLING OR LEAVE THE ROOTS J-ROOTED.

INSERT THE DIBBLE, OR SHOVEL, SEVERAL INCHES IN FRONT OF THE SEEDLING AND PUSH THE BLADE HALFWAY INTO THE SOIL. TWIST AND PUSH THE HANDLE FORWARD TO CLOSE THE TOP OF THE SLIT TO HOLD THE SEEDLING IN PLACE.

PUSH THE DIBBLE, OR SHOVEL, DOWN TO THE FULL DEPTH OF THE BLADE.

PULL BACK ON THE HANDLE TO CLOSE THE BOTTOM OF THE PLANTING HOLE. THEN PUSH FORWARD TO CLOSE THE TOP, ELIMINATING AIR POCKETS AROUND THE ROOT.

REMOVE THE DIBBLE, OR SHOVEL, AND CLOSE AND FIRM UP THE OPENING WITH YOUR HEEL. BE CAREFUL TO AVOID DAMAGING THE SEEDLING.



2
Erosion Control Matting
 6.4 Not to Scale

Materials
 Coir Fiber Matting is to be machine-produced mat made of 100% coconut fiber and must adhere to the specifications listed in the table above. A hardwood Eco-STAKE™ or similar biodegradable stakes shall be used to secure matting. No metal staples will be used on this project.

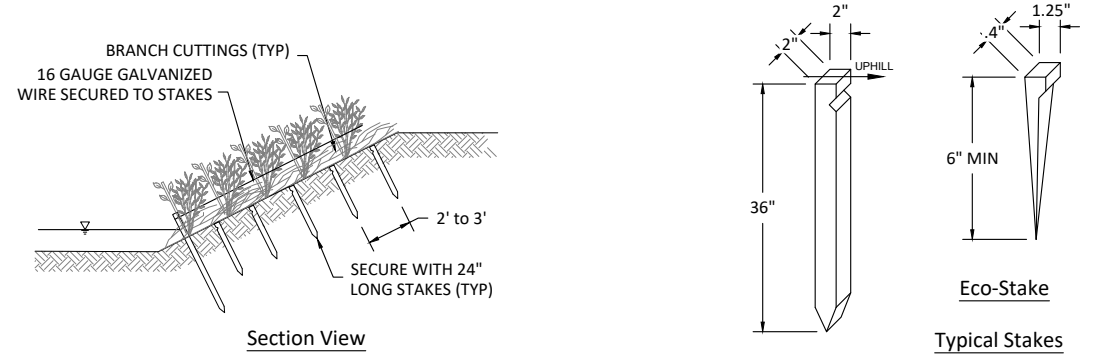
Construction Methods
 The Contractor will install Coir Fiber Matting in locations and to the widths and lengths as shown on the plans and details or as directed. Coir Fiber Matting will be secured with wooden stakes and installed at three (3) feet on center in offset rows to affect a diamond pattern. Overlap the Coir Fiber Matting at seams a minimum of six inches. Coir Fiber Matting will be overlapped so that the upstream mat end is on top of the downstream mat start. Stakes will secure matting at three foot spacing on the overlapping seams. Coir Fiber Matting will be dry when installed placed on slopes not too loosely but not in tension.

Maintenance

1. Inspect coir fiber matting at least weekly and after each significant ½ inch rain event and repair immediately.
2. Good contact with the ground must be maintained and erosion must not occur beneath the matting.
3. Any areas of the matting that are damaged or not in close contact with the ground shall be repaired and staked.
4. If erosion occurs due to poorly controlled drainage, the problem shall be fixed and the eroded area protected.
5. Monitor and repair matting as necessary until ground cover is established.

Coir Fiber Matting Specifications		
Property	Requirement	Test Method
matrix	100% coconut fiber	ECTC*
roll size	6.6 feet x 164 feet	ECTC*
thickness	0.30 inches (minimum)	ASTM D5199
elongation	34% x 38% (maximum)	ECTC*
flexibility	65030 x 29590 mg cm	ECTC*
mass per unit area	20 ounces per square yard (minimum)	ASTM D5261
stable flow velocity	11 feet per second (minimum)	ECTC*
open area (measured)	50% (maximum)	ECTC*
tensile strength	1348 x 626 pounds per foot	ASTM D5035
*C factor	0.002	ASTM D5035

*Testing methods specified by Erosion Control Technology Council (ECTC) guidelines.



3
Brush Mattress
 6.4 Not to Scale

BRANCH CUTTINGS (TYP)
 16 GAUGE GALVANIZED WIRE SECURED TO STAKES

SECURE WITH 24" LONG STAKES (TYP)

SHALL BE A MINIMUM OF 35 BRANCH CUTTINGS PER SQUARE YARD (1 INCH MAX. DIAMETER)

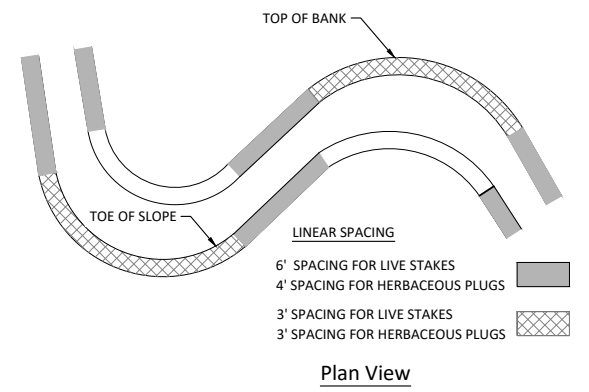
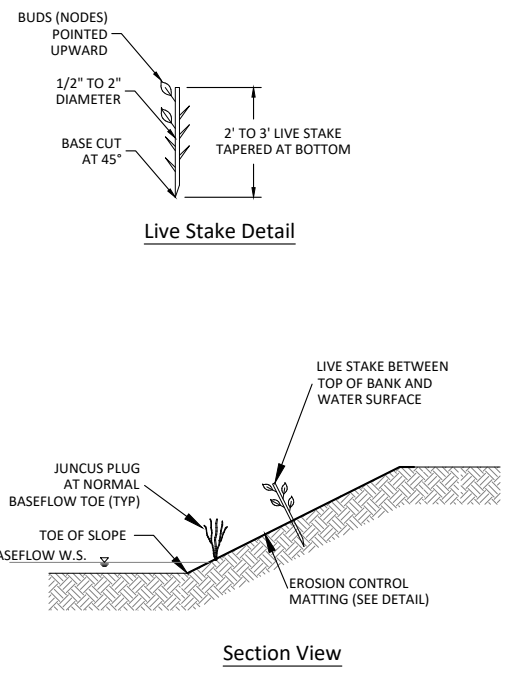
16 GAUGE GALVANIZED WIRE SECURED TO STAKES

TOP OF BANK (TYP)

FILL IN GAPS WITH TOP SOIL.

TOE OF SLOPE (TYP)

- NOTES:**
1. BOARD FOR STAKES SHALL BE 2" X 2" X 24" OR 2" X 2" X 36" AS DIRECTED BY THE ENGINEER.
 2. ROOTED/LEAFED CONDITIONS OF THE LIVING PLANT MATERIAL IS NOT REPRESENTATIVE AT THE TIME OF INSTALLATION.



4
Streambank Planting
 6.5 Not to Scale

- NOTES:**
1. CONTRACTOR RESPONSIBLE TO FOLLOW PLAN VIEW DETAILS BY REACH SHOWN ABOVE.
 2. REFER TO SPECIFICATIONS FOR PROPER STORAGE, HANDLING AND INSTALLATION.
 3. FORM PILOT HOLE IN HARD SOIL OR STONY CONDITIONS TO PREVENT DAMAGE TO LIVE STAKES.
 4. LIVE STAKES TO BE PLANTED IN AREAS AS SHOWN ON PLANS AND DIRECTED BY THE ENGINEER.
 5. INSTALL DORMANT PRIOR TO LEAF OUT. DEPICTED CONDITION WITH LEAVES NOT REPRESENTATIVE OF STAKES AT TIME OF INSTALLATION.

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PROFESSIONAL SEAL
 048920
 GEORGE W. HARRIS
 7-17-19

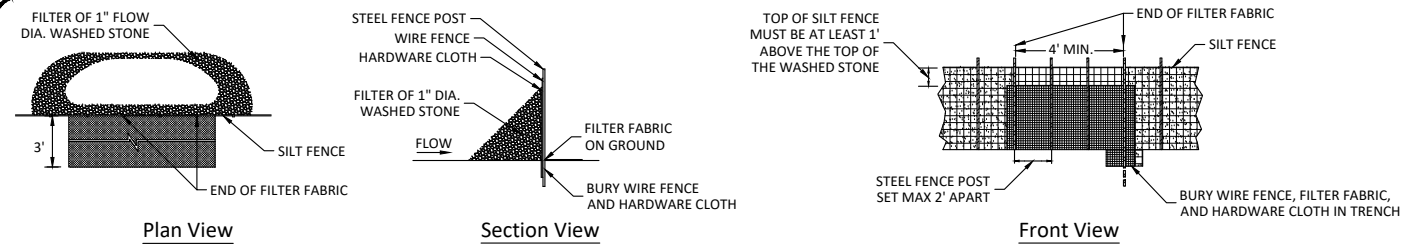
Catfish Pond Mitigation Site
Durham County, North Carolina
Details

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 Project Engineer: GLS
 Drawn By: ABP
 Checked By: CRK

6.4
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March 2, 2012
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INSTALLATION
 REFER TO THE PLANS FOR LOCATIONS AND SPECIFICATIONS. DURING INSTALLATION OF THE SILT BARRIER OR SILT FENCE, INSPECT THE INSTALLATION TO DETERMINE IF OUTLETS ARE NEEDED ACCORDING TO THE CRITERIA SET FORTH IN THE SPECIFICATIONS FOR THE BARRIER AND FENCE. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, EXTENT, OR METHOD OF INSTALLATION, CONTACT THE ENGINEER, ARCHITECT, OR RESPONSIBLE PERSONNEL ON THE SITE FOR ASSISTANCE. EROSION CONTROL PERSONNEL HAVE COPIES OF INSTRUCTIONS AND MAY HAVE PHOTOGRAPHS OF PROPERLY INSTALLED OUTLETS AS AN AID TO INSTALLATION.

IF THE SILT FENCE OUTLET IS NOT INSTALLED CORRECTLY THE FIRST TIME, IT WILL HAVE TO BE REBUILT.

DETERMINE THE EXACT LOCATION ON THE GROUND BEFORE COMPLETING INSTALLATION OF THE SILT FENCE, TAKING INTO CONSIDERATION:

INSTALL THE OUTLET AT THE LOWEST POINT (S) IN THE BARRIER OR FENCE WHERE WATER WILL POND.

INSTALL THE OUTLET WHERE IT IS ACCESSIBLE FOR INSTALLATION, MAINTENANCE, AND REMOVAL.

ALLOW AT LEAST:
 15 FEET BETWEEN THE BARRIER OR FENCE AND SINGLE-STORY BUILDINGS.
 25 FEET FOR FORK LIFTS BETWEEN THE BARRIER OR FENCE AND MULTIPLE-STORY BUILDINGS.
 10 FEET BETWEEN THE BARRIER OR FENCE AND THE TOE OF FILL SLOPES.

PLACE THE OUTLET SO THAT WATER FLOWING THROUGH IT WILL NOT CREATE AN EROSION HAZARD BELOW: AVOID STEEP SLOPES BELOW THE OUTLET AND AREAS WITHOUT PROTECTIVE VEGETATION. USE SLOPE DRAINS IF NECESSARY.

DETERMINE THE LOCATION OF THE OUTLET: FOR A SILT BARRIER, WHEN THE TRENCH IS DUG TO BURY THE BOTTOM OF THE FABRIC BECAUSE THE BARRIER WILL BE OMITTED AT THE OUTLET; FOR A SILT FENCE, WHEN THE WIRE FENCE IS IN PLACE BECAUSE THE FILTER FABRIC WILL BE OMITTED AT THE OUTLET.

REFER TO THE ILLUSTRATIONS OF THE OUTLET IN THE PLAN.

CLEAR STUMPS AND ROOTS FROM THE LOCATION OF THE OUTLET. CLEAR ADEQUATE ACCESS FOR THE EQUIPMENT NEEDED FOR INSTALLATION, MAINTENANCE, AND REMOVAL.

FOR A SILT BARRIER:
 JUST BELOW THE GAP IN THE BARRIER, PLACE A LAYER OF FILTER FABRIC ON THE GROUND TO PROTECT THE SOIL FROM EROSION BY OUTFLOW FROM THE OUTLET; PLACE 6 INCHES OF THE UPPER EDGE IN THE TRENCH. STAKE THE REMAINING EDGES OF THE FABRIC TO HOLD IT IN PLACE.

ALONG THE GAP WHERE THE OUTLET WILL GO, PLACE STEEL FENCE POSTS FOR STRENGTH. THE POSTS MUST BE A MAXIMUM OF 2 FEET APART AND DRIVEN INTO SOLID GROUND AT LEAST 18 INCHES.

PLACE HARDWARE CLOTH (WELDED GALVANIZED SCREEN WITH SQUARE 1/4 - 1/2-INCH HOLES) ON THE UPHILL SIDE OF THE POSTS TO HOLD THE WASHED STONE IN PLACE. PUT 6 INCHES OF THE BOTTOM OF THE CLOTH IN THE TRENCH AND FASTEN IT TO THE POSTS WITH LENGTHS OF WIRE.

BURY THE BOTTOM OF THE HARDWARE CLOTH AND THE UPPER EDGE OF THE FILTER FABRIC BELOW THE OUTLET IN THE TRENCH AND COMPACT THE FILL.

PLACE A FILTER OF 1-INCH DIAMETER WASHED STONE ON THE UPHILL SIDE OF THE OUTLET. PILE THE STONE UP TO THE TOP OF THE HARDWARE CLOTH AND OVER THE JOINT BETWEEN THE OUTLET AND THE BARRIER.

FOR A SILT FENCE:
 JUST BELOW THE GAP IN THE BARRIER, PLACE A LAYER OF FILTER FABRIC ON THE GROUND TO PROTECT THE SOIL FROM EROSION BY OUTFLOW FROM THE OUTLET; PLACE 6 INCHES OF THE UPPER EDGE IN THE TRENCH. STAKE THE OTHER EDGES OF THE FABRIC TO HOLD IT IN PLACE.

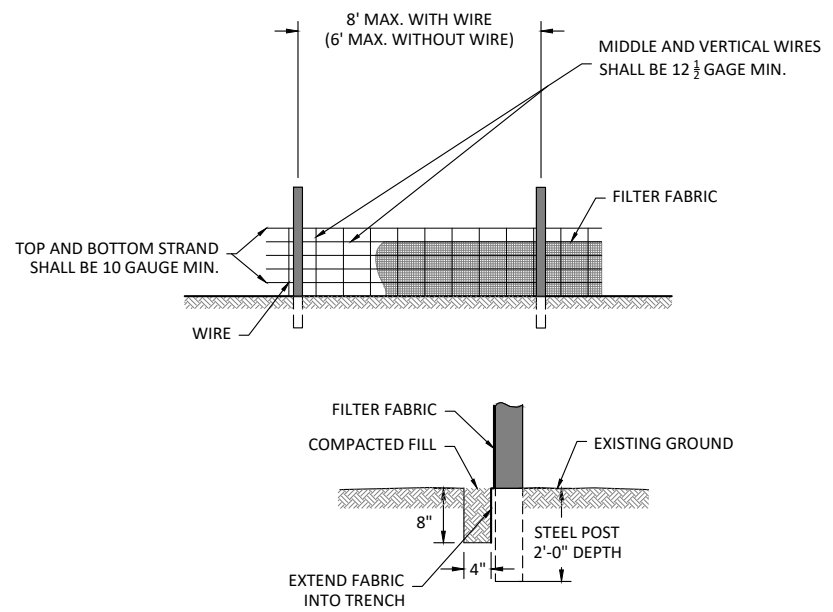
ALONG THE GAP WHERE THE OUTLET WILL GO, PLACE ADDITIONAL STEEL FENCE POSTS FOR STRENGTH. THE POSTS MUST BE A MAXIMUM OF 2 FEET APART AND DRIVEN INTO SOLID GROUND AT LEAST 18 INCHES.

PLACE HARDWARE CLOTH (WELDED GALVANIZED SCREEN WITH SQUARE 1/4 - 1/2-INCH HOLES) ON THE UPHILL SIDE OF THE POSTS TO HOLD THE WASHED STONE IN PLACE. PUT 6 INCHES OF THE BOTTOM OF THE CLOTH IN THE TRENCH AND FASTEN IT TO THE POSTS WITH LENGTHS OF WIRE.

BURY THE BOTTOM OF THE HARDWARE CLOTH, THE UPPER EDGE OF THE FILTER FABRIC BELOW THE OUTLET, AND THE WIRE FENCE IN THE TRENCH AND COMPACT THE FILL.

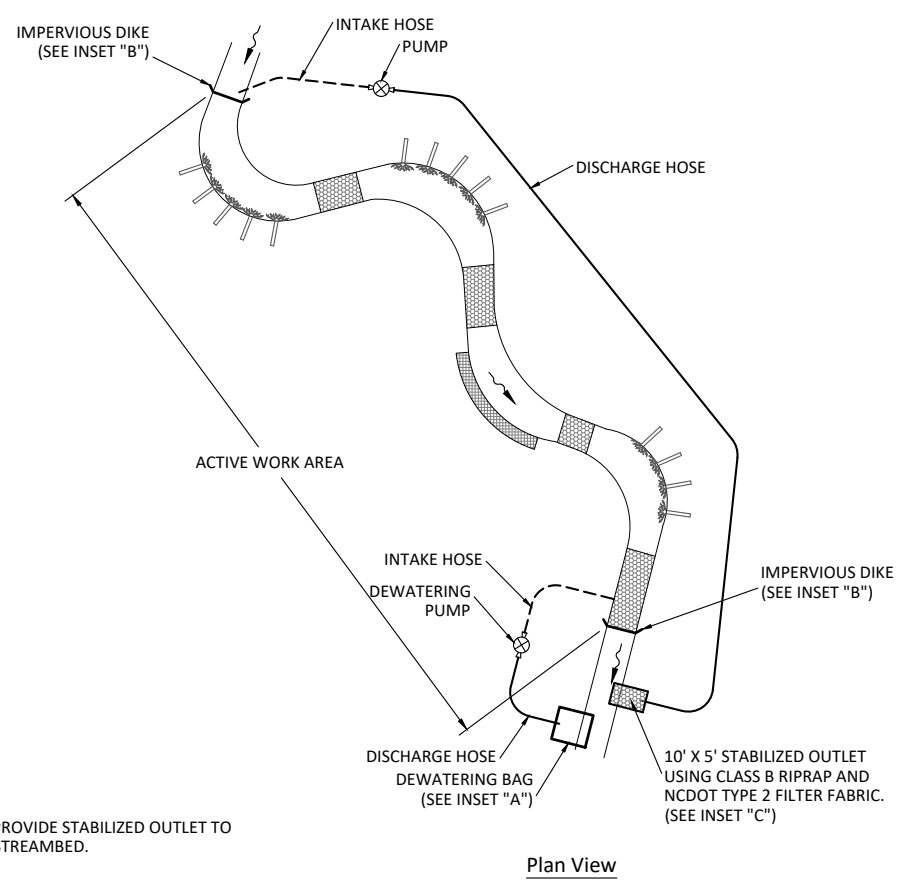
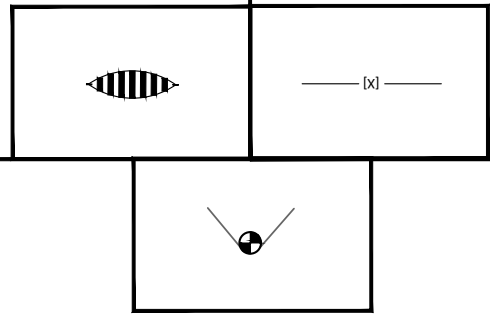
PLACE A FILTER OF 1-INCH DIAMETER WASHED STONE ON THE UPHILL SIDE OF THE OUTLET. PILE THE STONE UP TO THE TOP OF THE HARDWARE CLOTH AND OVER THE JOINT BETWEEN THE OUTLET AND THE SILT FENCE.

1
6.5
Temporary Silt Fence Gravel Outlet
Not to Scale



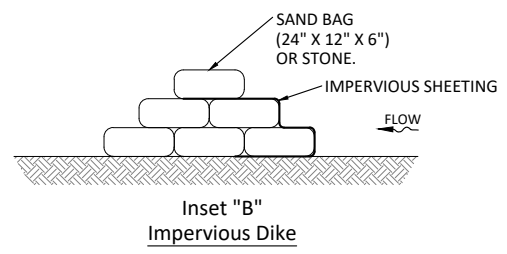
- NOTES:**
- USE WIRE A MINIMUM OF 32" IN WIDTH AND WITH A MINIMUM OF 6 LINES OF WIRES WITH 12" STAY SPACING.
 - USE FILTER FABRIC A MINIMUM OF 36" IN WIDTH AND FASTEN ADEQUATELY TO THE WIRES AS DIRECTED BY THE ENGINEER.
 - PROVIDE 5' STEEL POST OF THE SELF-FASTENER ANGLE STEEL TYPE. ANGLE STEEL TYPE.

2
6.5
Temporary Silt Fence
Not to Scale

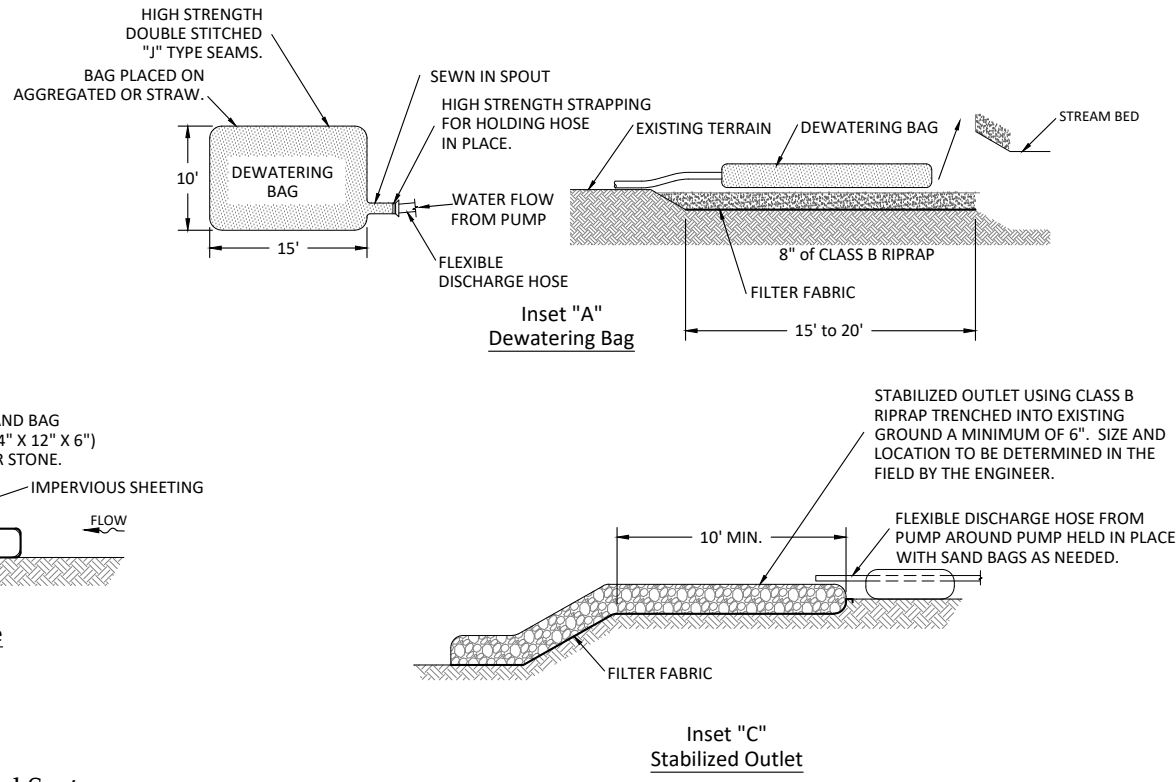


- NOTE:**
- PROVIDE STABILIZED OUTLET TO STREAMBED.

Plan View



3
6.5
Pump Around System
Not to Scale

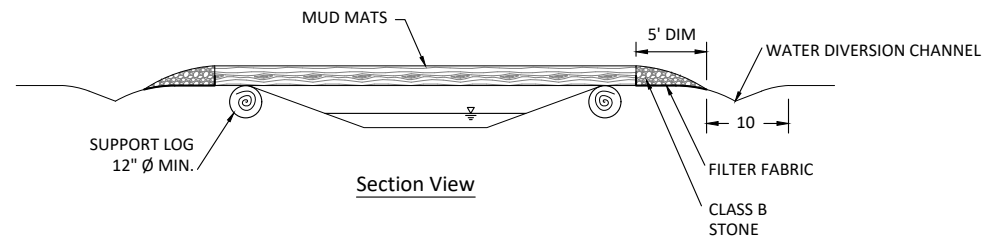


Revision	Description

March 2, 2012

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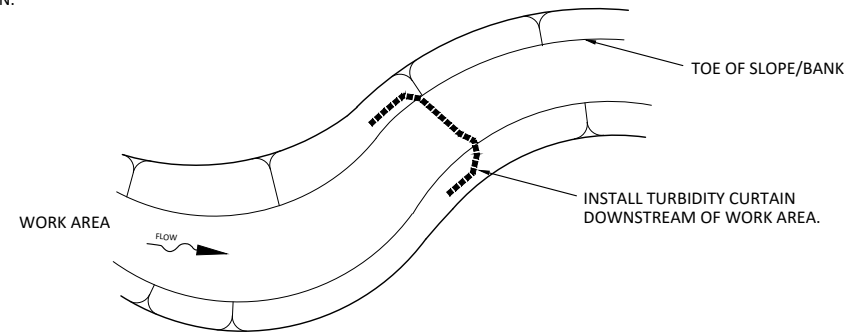
- CONSTRUCT STREAM CROSSING WHEN FLOW IS AT NORMAL BASEFLOW.
- MINIMIZE CLEARING AND EXCAVATION OF STREAMBANKS. DO NOT EXCAVATE CHANNEL BOTTOM.
- INSTALL STREAM CROSSING PERPENDICULAR TO THE FLOW.
- MAINTAIN CROSSING SO THAT RUNOFF IN THE CONSTRUCTION ROAD DOES NOT ENTER EXISTING CHANNEL.
- STABILIZE AN ACCESS RAMP OF CLASS B STONE TO THE EDGE OF THE MUD MAT.
- CONTRACTOR SHALL DETERMINE AN APPROPRIATE RAMP ANGLE ACCORDING TO EQUIPMENT UTILIZED.
- CONTRACTOR SHALL DETERMINE AN APPROPRIATE WIDTH SO THAT MUD MATS ARE WIDER THAN THE LARGEST EQUIPMENT THAT WILL UTILIZE IT.
- ALL SIDE BOARDS SHALL BE 6" MINIMUM IN HEIGHT.
- ALL MATS SHALL BE 4' IN WIDTH.
- ALL MATS SHALL HAVE NO GAPS BETWEEN TIMBERS.
- SILT FENCE TO BE INSTALLED AT 45° ANGLE TO THE ROAD WITH STONE OUTLET AT EACH CORNER OF THE TEMPORARY CROSSING TO FILTER ANY SEDIMENT AND DEBRIS FROM HAUL ROAD FROM ENTERING STREAM.



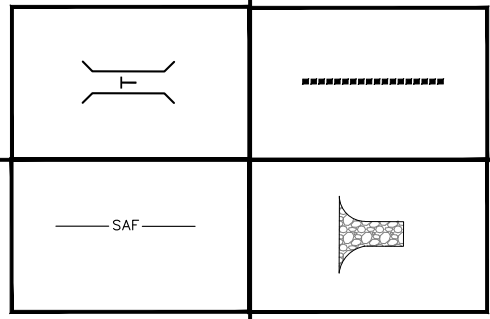
1 Temporary Stream Crossing - Timber Mat
6.6 Not to Scale

NOTES:

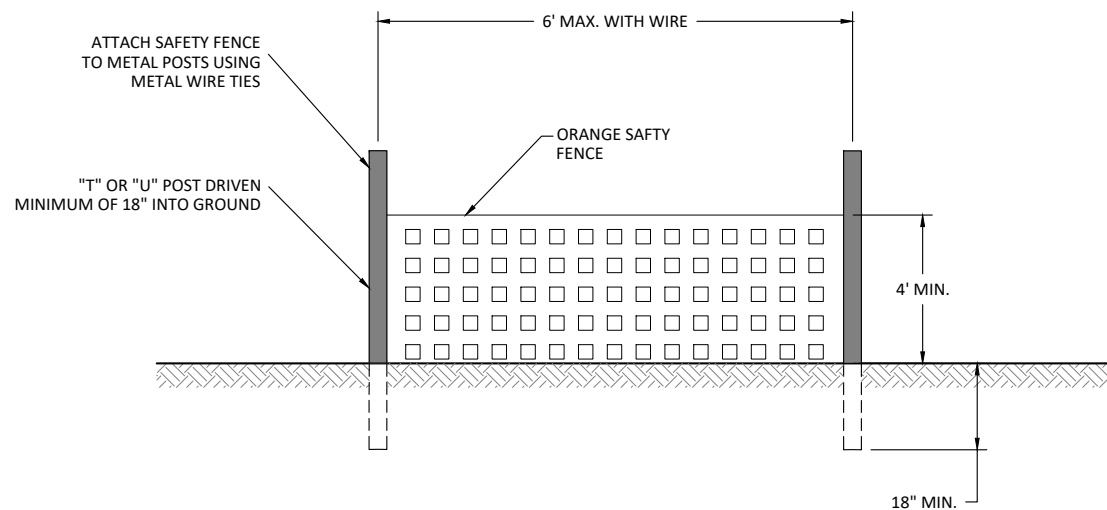
1. TURBIDITY CURTAIN SHOULD BE INSTALLED DIRECTLY DOWNSTREAM OF WORK AREA AND INSTALLED IN STREAM TO CAPTURE ANY STREAM FLOW THAT CONTACTS WORK AREA.
2. TURBIDITY CURTAIN SHOULD BE SUITABLE FOR USE IN MOVING WATER AND INSTALLED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
3. RECOMMENDED USE OF ELASTEC TYPE II DOT FASTWATER SCREEN OR SIMILAR REPLACEMENT.
4. TURBIDITY CURTAIN SHOULD BE INSPECTED, MAINTAINED, AND ADJUSTED DAILY TO ENSURE PROPER FUNCTION.



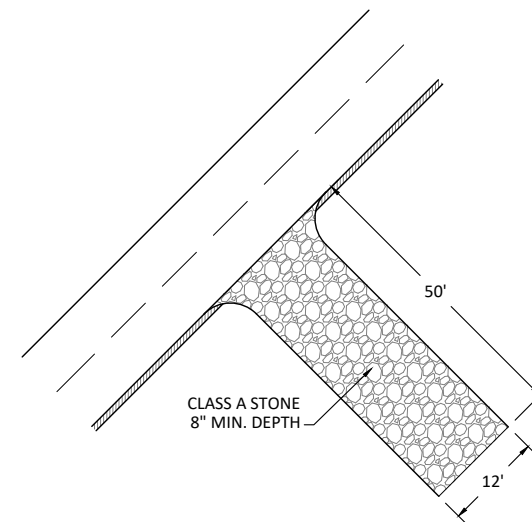
2 Turbidity Curtain
6.6 Not to Scale



MATERIAL SPECIFICATIONS		
PHYSICAL PROPERTY	TESTS	REQUIREMENTS
MATERIAL	N/A	POLYETHYLENE
RECOMMENDED COLOR	N/A	"INTERNATIONAL ORANGE"
TENSILE YIELD	ASTM D638	AVE. 2000 LBS. PER 4' WIDE
ULTIMATE TENSILE STRENGTH	ASTM D638	AVE. 2900 LBS. PER 4' WIDE
ELONGATION AT BREAK (%)	ASTM D638	GREATER THAN 1000%
CHEMICAL RESISTANCE	N/A	INERT TO MOST CHEMICALS AND ACIDS



3 Safety Fence
6.6 Not to Scale



4 Construction Entrance
6.6 Not to Scale

NOTES:

- PROVIDE TURNING RADIUS SUFFICIENT TO ACCOMMODATE LARGE TRUCKS.
- LOCATE CONSTRUCTION ENTRANCE AT ALL POINTS OF INGRESS AND EGRESS UNTIL SITE IS STABILIZED. PROVIDE FREQUENT CHECKS OF THE DEVICE AND TIMELY MAINTENANCE.
- MUST BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR DIRECT FLOW OF MUD ONTO STREETS. PERIODIC TOP DRESSING WITH STONE WILL BE NECESSARY.
- ANY MATERIAL TRACKED ONTO THE ROADWAY MUST BE CLEANED IMMEDIATELY.
- USE CLASS A STONE OR OTHER COARSE AGGREGATE APPROVED BY THE ENGINEER.
- PLACE FILTER FABRIC BENEATH STONE.

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Catfish Pond Mitigation Site
Durham County, North Carolina
Details

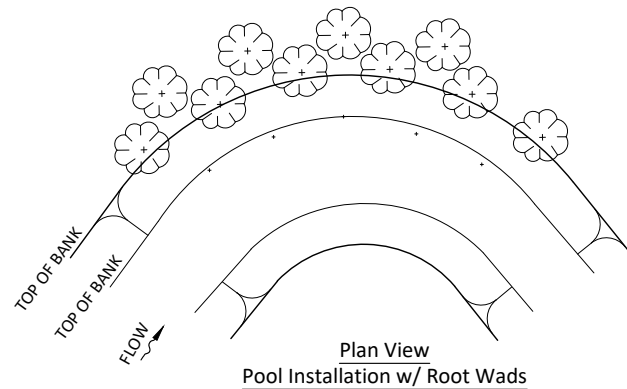
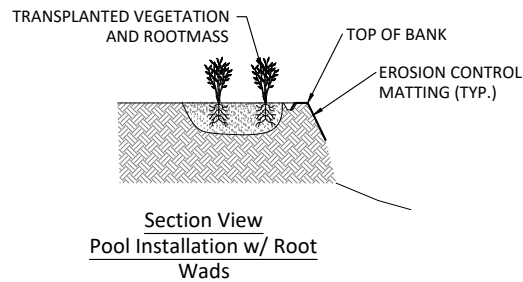
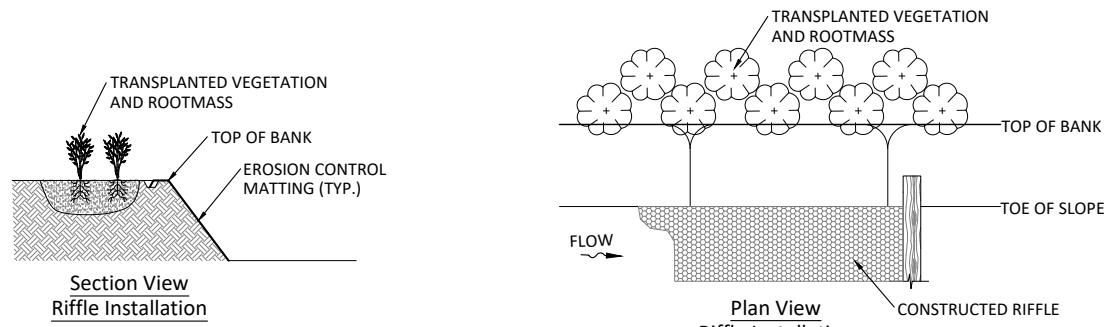
Revisions

Date: 07-16-2019
Job Number: 005-02108
Project Engineer: GLS
Drawn By: ABP
Checked By: CR

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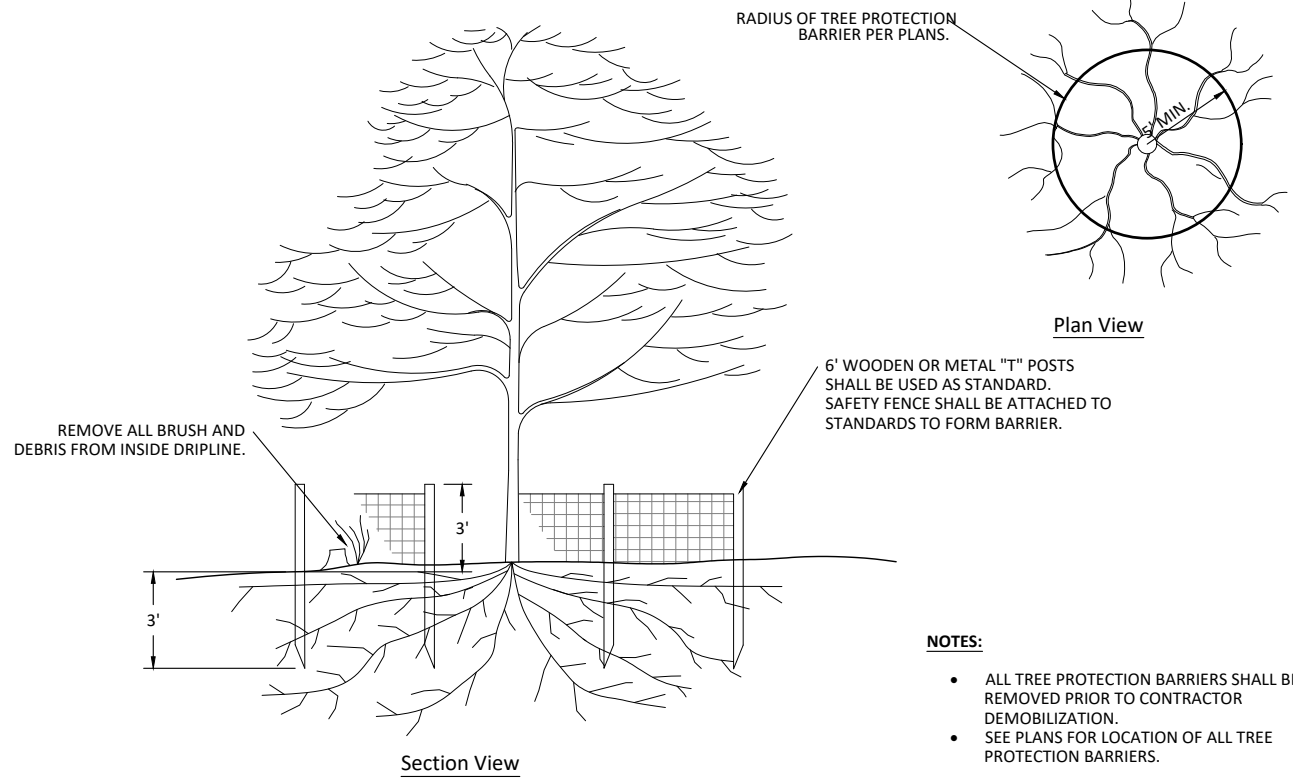
March 2, 2012
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NOTES:

- BANK TO BE STABILIZED THAT WILL ACCOMMODATE THE SIZE OF TRANSPLANT TO BE PLACED.
- EXCAVATE TRANSPLANT. EXCAVATE THE ENTIRE ROOT MASS AND AS MUCH ADDITIONAL SOIL MATERIAL AS POSSIBLE. IF ENTIRE ROOT MASS CANNOT BE EXCAVATED IN ONE BUCKET LOAD, THE TRANSPLANT IS TOO LARGE AND ANOTHER SHOULD BE SELECTED.
- PLACE TRANSPLANT IN THE BANK TO BE STABILIZED SO THAT VEGETATION IS ORIENTATED VERTICALLY.
- FILL IN ANY HOLES AROUND THE TRANSPLANT AND COMPACT.
- ANY LOOSE SOIL LEFT IN THE STREAM SHOULD BE REMOVED.
- PLACE MULTIPLE TRANSPLANTS CLOSE TOGETHER SUCH THAT THEY TOUCH.

1
6.7
Transplanted Vegetation
Not to Scale



NOTES:

- ALL TREE PROTECTION BARRIERS SHALL BE REMOVED PRIOR TO CONTRACTOR DEMOBILIZATION.
- SEE PLANS FOR LOCATION OF ALL TREE PROTECTION BARRIERS.

2
6.7
Tree Protection
Not to Scale

MATERIALS
SEED

REFER TO SECTION 1060-4 FOR SEED IN THE NCDOT STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES. SEED MAY BE MIXED BY THE SUPPLIER AND IS NOT REQUIRED TO BE MIXED ON SITE. ALL PLANT SOURCES AND MATERIALS SHALL BE DETERMINED BY THE ENGINEER. SEED WILL HAVE A PURE LIVE SEED (PLS) CERTIFICATION EQUAL TO OR GREATER THAN THAT RATE SPECIFIED ON THE PLANT SCHEDULES. IF THE PLS IS LESS THAN SPECIFIED, THE CONTRACTOR WILL INCREASE THE SEEDING RATE TO COMPENSATE FOR THE PLS DIFFERENCE.

PERMANENT SEED MIX TO BE USED INSIDE THE CONSERVATION EASEMENT SHALL BE PERMANENT RIPARIAN SEEDING AS DETAILED ON THE PLANS AND IN THIS SPECIFICATION. IMPORTANT NOTE: THE AREAS DISTURBED OUTSIDE THE CONSERVATION EASEMENT SHALL BE PERMANENTLY SEEDING WITH TALL FESCUE (FESTUCA ARUNDINACEA) TO BE PERFORMED BY THE GRADING CONTRACTOR.

PERMANENT SEED WITHIN THE CONSERVATION EASEMENT WILL BE THE SPECIES LISTED BELOW AND WILL BE APPLIED ACCORDING TO THE FOLLOWING TABLE:

Permanent Riparian Seeding - Within Conservation Easement				
Pure Live Seed (20 lbs / acre)				
Approved Date	Species Name	Common Name	Stratum	Density (lbs/acre)
All Year	<i>Panicum rigidulum</i>	Redtop Panicgrass	Herb	1.6
All Year	<i>Agrostis hyemalis</i>	Winter Bentgrass	Herb	1.8
All Year	<i>Bidens aristosa</i>	Bur Marigold	Herb	1.4
All Year	<i>Rudbeckia hirta</i>	Blackeyed Susan	Herb	1.0
All Year	<i>Coreopsis lanceolata</i>	Lanceleaf Coreopsis	Herb	1.0
All Year	<i>Carex vulpinoidea</i>	Fox Sedge	Herb	3.0
All Year	<i>Panicum clandestinum</i>	Deertongue	Herb	3.0
All Year	<i>Elymus virginicus</i>	Virginia Wild Rye	Herb	3.0
All Year	<i>Helianthus angustifolius</i>	Swamp Sunflower	Herb	0.6
All Year	<i>Panicum virgatum</i>	Switchgrass	Herb	1.0
All Year	<i>Poa palustris</i>	Fowl Bluegrass	Herb	1.0
All Year	<i>Elymus riparius</i>	Riverbank Wildrye	Herb	0.6
All Year	<i>Panicum dichotoforum</i>	Smooth Panicgrass	Herb	1.0

PERMANENT SEED OUTSIDE THE CONSERVATION EASEMENT WILL BE THE SPECIES LISTED BELOW AND WILL BE APPLIED ACCORDING TO THE FOLLOWING TABLE:

Permanent Seeding - Outside Conservation Easement				
Approved Date	Species Name	Common Name	Stratum	Density (lbs/acre)
All Year	<i>Festuca arundinacea</i>	Tall Fescue	Herb	40
All Year	<i>Festuca rubra</i>	Creeping Red Fescue	Herb	40

TEMPORARY SEED WILL BE THE SPECIES LISTED BELOW AND WILL BE APPLIED ACCORDING TO THE FOLLOWING TABLE:

Temporary Seeding				
Pure Live Seed				
Approved Date	Species Name	Common Name	Stratum	Density (lbs/acre)
Aug 15 - May 1	<i>Secale cereale</i>	Rye Grain	Herb	140
May 1 - Aug 15	<i>Setaria italica</i>	German Millet	Herb	50

ALL SEED AND SEED VARIETIES MUST BE FREE FROM STATE AND FEDERAL NOXIOUS WEED SEED. IN ADDITION, NONE OF THE FOLLOWING SEED WILL OCCUR IN THE MIX:

- | | |
|-------------------|-------------|
| ANNUAL BLUEGRASS | CORN COCKLE |
| LESPEDEZA | COCKLEBURR |
| BERMUDA BLUEGRASS | DODDER |
| SPURRED ANODA | BINDWEED |
| GIANT FOXTAIL | WILD GARLIC |
| HORSE NETTLE | WILD ONION |

FERTILIZER

REFER TO SECTION 1060-2 FOR FERTILIZER IN THE NCDOT STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES. FERTILIZER WILL BE ORGANIC FERTILIZER AND NOT A PETROLEUM-BASED FERTILIZER. NUTRIENT CONTENT AND APPLICATION RATE SHALL FOLLOW THE RECOMMENDATIONS WHICH ACCOMPANY THE SOIL TEST RESULTS PROVIDED BY THE ENGINEER. WHEN SOIL TESTS ARE NOT AVAILABLE, APPLY A 10-10-10 GRADE FERTILIZER AT A RATE OF 700-1,000 LB/ACRE. FERTILIZER SHOULD BE INCORPORATED IN THE TOP 4-6 INCHES OF SOIL. IF A HYDRAULIC SEEDER IS USED, DO NOT MIX SEED AND FERTILIZER MORE THAN 30 MINUTES BEFORE APPLICATION.

LIMESTONE

REFER TO SECTION 1060-3 FOR LIMESTONE IN THE NCDOT STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONDUCT SOIL TESTS AND THE RESPONSIBILITY OF THE CONTRACTOR ADHERE TO THE APPLICATION RATE RECOMMENDATIONS THAT ACCOMPANY THE RESULTS OF THE SOIL TESTS. IF THE PH (ACIDITY) OF THE SOIL IS NOT KNOWN, APPLY GROUND AGRICULTURAL LIMESTONE AT THE RATE OF 2 TONS/ACRE ON COARSE-TEXTURED SOILS AND 3 TONS/ACRE ON FINE TEXTURED SOILS. APPLY LIMESTONE UNIFORMLY AND INCORPORATE INTO THE TOP 4-6 INCHES OF SOIL. SOILS WITH A PH OF 6 OR HIGHER NEED NOT BE LIMED.

MULCH

REFER TO SECTION 1060-5 FOR MULCH IN THE NCDOT STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES. SEED MULCH WILL CONSIST OF STRAW OR WOOD CELLULOSE MULCH. APPLY 4,000 LB/ACRE STRAW. ANCHOR STRAW BY TACKING WITH ASPHALT, NETTING, OR A MULCH ANCHORING TOOL. NO TACKING AGENT IS NECESSARY FOR AREAS UNDER EROSION CONTROL MATTING.

WATER

WATER USED IN THE PLANTING OR CARE OF VEGETATION WILL MEET SECTION 1060-9 REQUIREMENTS OF THE NCDOT STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES.

SURFACE ROUGHENING

IF RECENT TILLAGE OPERATIONS HAVE RESULTED IN A LOOSE SURFACE, ADDITIONAL ROUGHENING MAY NOT BE REQUIRED, EXCEPT TO BREAK UP LARGE CLOUDS. IF RAINFALL CAUSES THE SURFACE TO BECOME SEALED OR CRUSED, LOOSEN IT JUST PRIOR TO SEEDING BY DISKING, RAKING, HARROWING, OR OTHER SUITABLE METHODS. GROOVE OR FURROW SLOPES STEEPER THAN 3:1 ON THE CONTOUR BEFORE SEEDING.

CONSTRUCTION METHODS

THE CONTRACTOR IS RESPONSIBLE FOR CONDUCTING SOIL TESTS TO DETERMINE THE SOIL AMENDMENT APPLICATION RATES. THEN IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO APPLY SOIL AMENDMENTS AS RECOMMENDED BY THE SOIL REPORTS. ALL SOIL AMENDMENT APPLICATIONS SHALL OCCUR PRIOR TO SEEDING.

NO SEEDING WILL BE PERFORMED WHEN AMBIENT TEMPERATURE IS BELOW 32° F OR 0° C. NO SEEDING WILL OCCUR WHEN GROUND IS FROZEN. SEEDING WILL BE PERFORMED USING A BROADCAST SPREADER. OTHER METHODS MAY BE USED BUT MUST BE APPROVED BY ENGINEER IN ADVANCE OF INSTALLATION. SEED WILL BE APPLIED WITHIN THE TOP ¼ INCH OF SOIL. THE SEED-TO-SOIL CONTACT WILL BE MAXIMIZED BY FIRING THE SOIL AROUND THE SEED WITH A CULTIPACKER, OTHER SIMILAR EQUIPMENT.

FOR AREAS WHERE SOILS HAVE BECOME COMPACTED DURING GRADING, LOOSEN THEM TO A DEPTH OF 6-8 INCHES USING A RIPPER, DISK, OR OTHER SIMILAR METHOD.

STRAW MULCH SHALL BE APPLIED SO THAT 80% OF THE SOIL SURFACE IS COVERED. IT IS RECOMMENDED THAT MULCH BE SECURED BY CRIMPING OR TACKING; HOWEVER, IT IS NOT REQUIRED. THE CONTRACTOR IS RESPONSIBLE FOR REPLACING MULCH THAT HAS BLOWN OR WASHED AWAY UNTIL PERMANENT GROUND COVER IS ACHIEVED.

GROUND COVER MUST BE ESTABLISHED ON EXPOSED SLOPES WITHIN 21 CALENDAR DAYS FOLLOWING THE COMPLETION OF ANY PHASE OF GRADING. PERMANENT GROUND COVER MUST BE ESTABLISHED FOR ALL DISTURBED AREAS WITHIN 15 WORKING DAYS OR 90 CALENDAR DAYS (WHICHEVER IS SHORTER) FOLLOWING COMPLETION OF CONSTRUCTION.

THE CONTRACTOR IS RESPONSIBLE FOR RESEEDING PORTIONS OR THE ENTIRETY OF THE PROJECT SITE FOLLOWING RAIN EVENTS THAT REMOVE SEED FROM PREVIOUSLY SEEDED AREAS. THE DIRECTIVE TO RESEED WILL BE AT THE SOLE DISCRETION OF THE DESIGNER. ALL AREAS WHICH FAIL TO SHOW A UNIFORM STAND OF GRASS FOR ANY REASON SHALL BE TREATED REPEATEDLY UNTIL A UNIFORM STAND OF AT LEAST 90% COVERAGE IS ATTAINED WITH NO BARE AREA GREATER THAN FIFTY SQUARE FEET. THE DESIGNER WILL MONITOR THE SITE IN THE LATE SUMMER/FALL AFTER PLANTING IN THE PREVIOUS DORMANT SEASON. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE A DENSE STAND OF HERBACEOUS VEGETATION ON THE SITE DURING THE FIRST YEAR OF GROWTH. THE CONTRACTOR IS REQUIRED TO COMPLETE RESEEDING REQUESTS FROM THE DESIGNER AFTER THIS VISIT WITHIN 31 DAYS OF THE DESIGNER'S NOTIFICATION. UPON APPROVAL BY THE DESIGNER, THE METHOD OF SEEDING MAY BE VARIED BY THE CONTRACTOR UNDER HIS RESPONSIBILITY TO PROVIDE A HEALTHY AND VIGOROUS UNIFORM STAND OF GRASS.

GROUND COVER MUST BE ESTABLISHED ON EXPOSED SLOPES PER THE REQUIREMENTS STATED IN THE NC DEPARTMENT OF ENVIRONMENTAL QUALITY - DIVISION OF ENERGY, MINERAL, AND LAND RESOURCES GENERAL PERMIT - NCG 010000 TO DISCHARGE STORMWATER UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM FOR CONSTRUCTION ACTIVITIES: SECTION II.B.2 GROUND STABILIZATION.

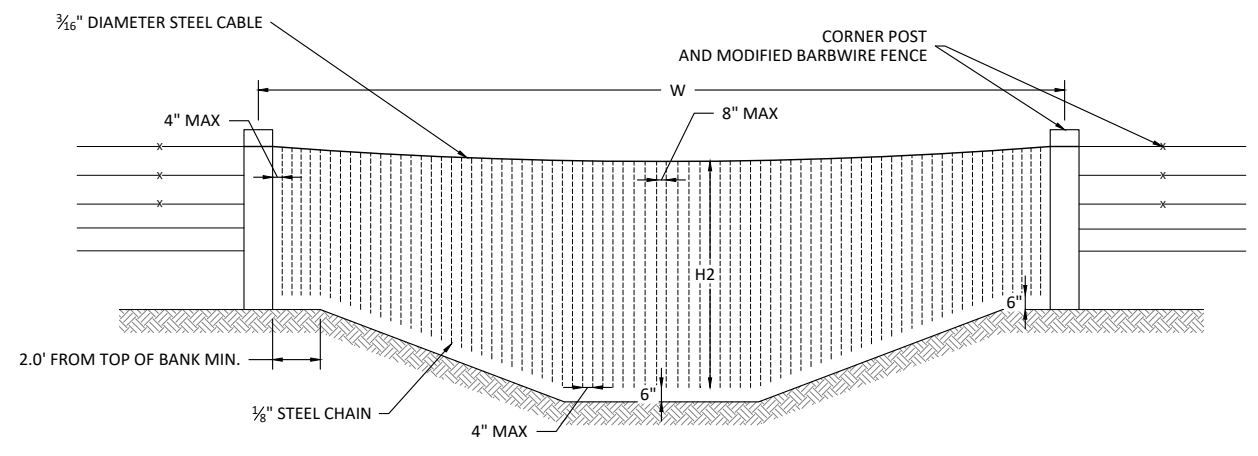
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6.7
Temporary and Permanent Seeding Requirements
Not to Scale



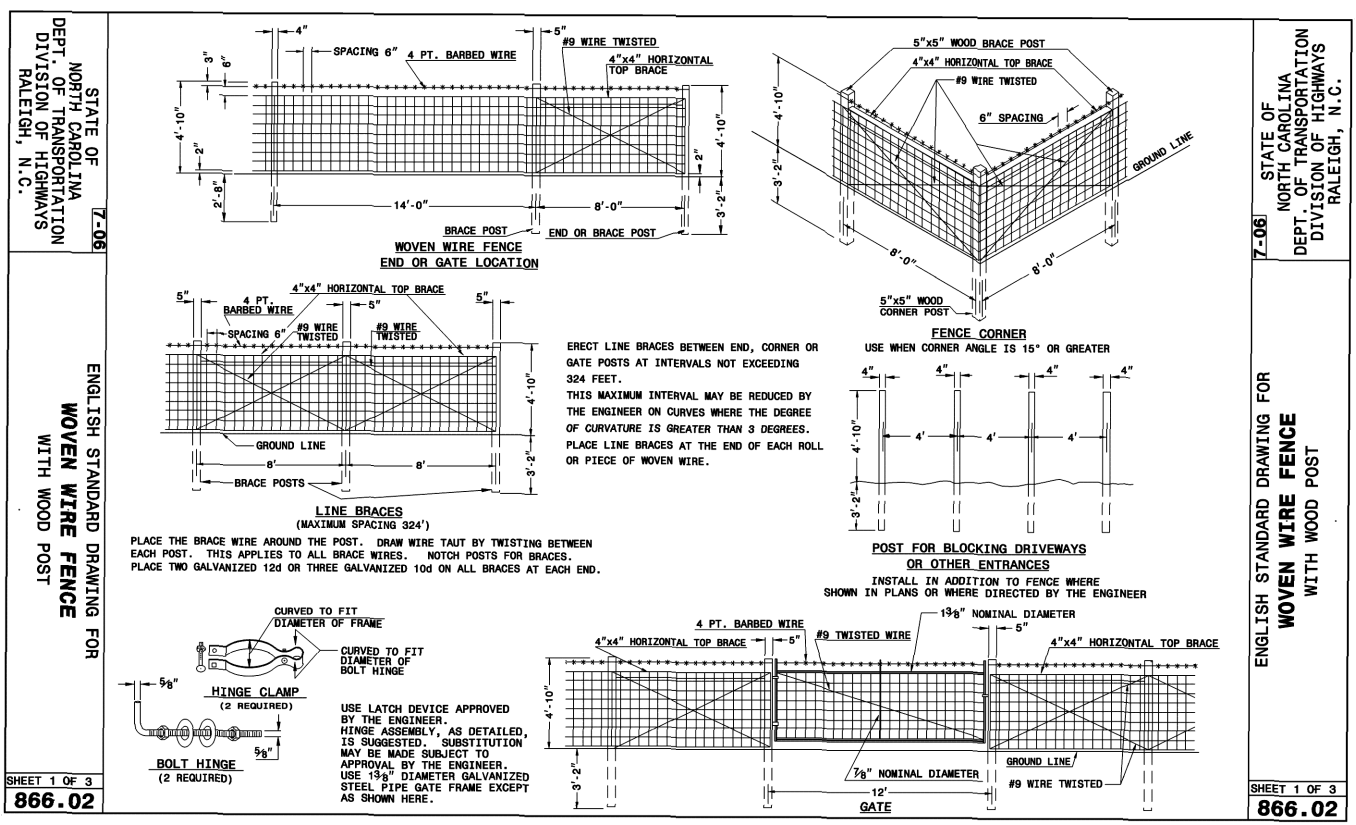
Revisions:

Date: 07-16-2019
 Job Number: 005-0216-08
 Project Engineer: GLS
 Drawn By: ABP
 Checked By: CRK

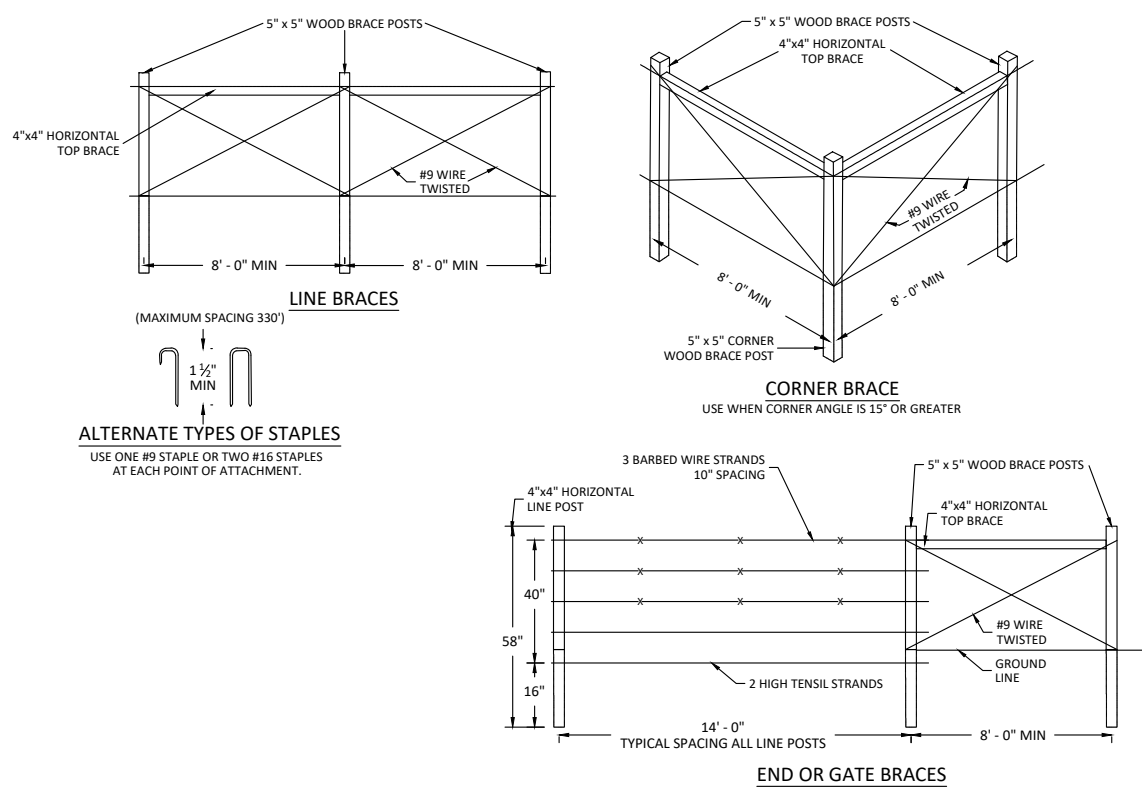
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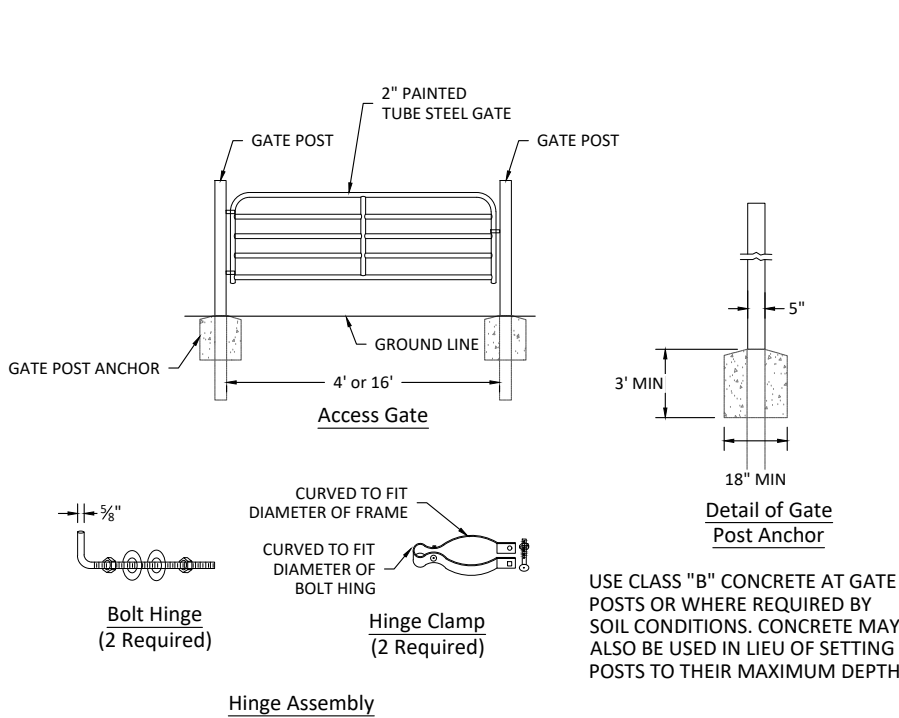
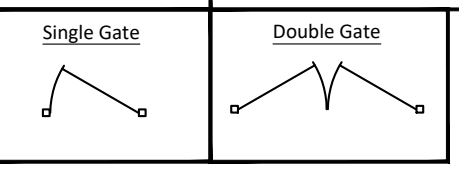
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6.8 Suspended Cable Fence
Not to Scale



2
6.8 Woven Wire Fence - Permanent CE Fencing
Not to Scale



3
6.8 Modified Barbwire Fence
Not to Scale



4
6.8 2" Tube Steel Gate
Not to Scale

- NOTES:**
- ALL POSTS AND BRACES MAY BE EITHER ROUND OR SQUARE AT THE OPTION OF THE CONTRACTOR, PROVIDED THE SAME TYPE IS USED THROUGHOUT THE PROJECT.
 - DIMENSIONS SHOWN ARE THE DIAMETER OF ROUND OR EDGE DIMENSIONS OF SQUARE POSTS AND BRACES.
 - ERECT LINE BRACES BETWEEN END, CORNER OR GATE POSTS. PLACE LINE BRACES AT INTERVALS NOT TO EXCEED 300' AN AT THE END OF THE BARBED WIRE ROLL.
 - THE 300' INTERVAL MAY BE REDUCED BY THE ENGINEER ON CURVES WHERE THE DEGREE OF CURVATURE IS GREATER THAN 3 DEGREES.
 - NOTCH BRACE POSTS 1" MINIMUM FOR HORIZONTAL BRACES. PLACE TWO GALVANIZED 10d OR THREE GALVANIZED 10d NAILS AT EACH END OF ALL BRACES.
 - PLACE THE BRACE WIRE AROUND THE POST. DRAW ALL BRACE WIRE TAUT BY TWISTING BETWEEN EACH POST.
 - INSTALL THE FENCE FACING THE PROPERTY OWNER EXCEPT THAT ON HORIZONTAL CURVES GREATER THAN THREE DEGREES (3°) INSTALL THE FENCE TO PULL AGAINST ALL POSTS. SEE NCDOT STD. 866.02 FOR FENCING AT DITCH CROSSINGS, BREAKS IN GRADES AND R/W BREAKS.
 - USE LATCH DEVICE APPROVED BY THE ENGINEER. HINGE ASSEMBLY AS SHOWN IS SUGGESTED. SUBSTITUTION MAY BE SUBJECT TO APPROVAL BY THE ENGINEER. USED 2" PAINTED STEEL PIPE FOR GATE FRAME EXCEPT AS SHOWN HERE.
 - ANY COMBINATION OF GATE AND FENCE TYPE MEETING THE APPROVAL OF THE ENGINEER IS ACCEPTABLE AND IS NOT LIMITED TO THE EXAMPLES SHOWN HEREON.

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

7-06

ENGLISH STANDARD DRAWING FOR
WOVEN WIRE FENCE
WITH WOOD POST

SHEET 1 OF 3
866.02

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

7-06

ENGLISH STANDARD DRAWING FOR
WOVEN WIRE FENCE
WITH WOOD POST

SHEET 1 OF 3
866.02

Catfish Pond Mitigation Site
Durham County, North Carolina
Details

DATE: 07-16-2019
JOB NUMBER: 005-02168
PROJECT ENGINEER: GLS
DRAWN BY: ABP
CHECKED BY: CRK

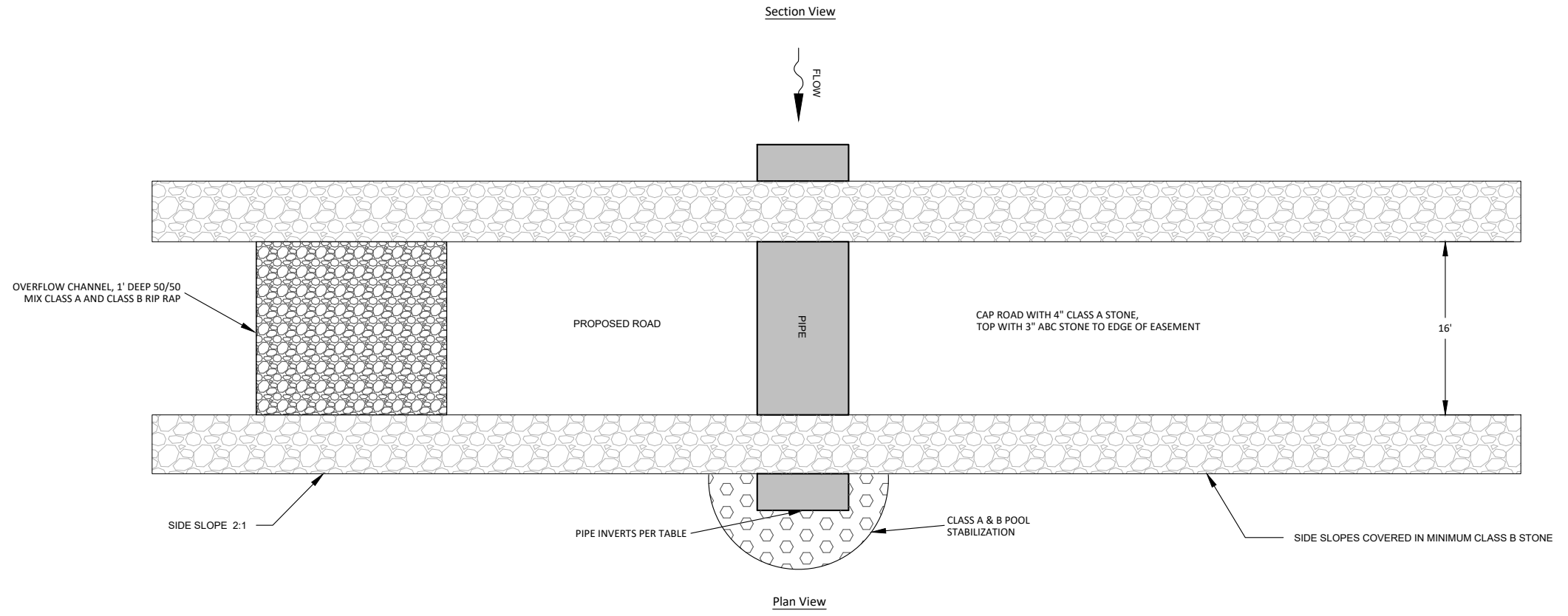
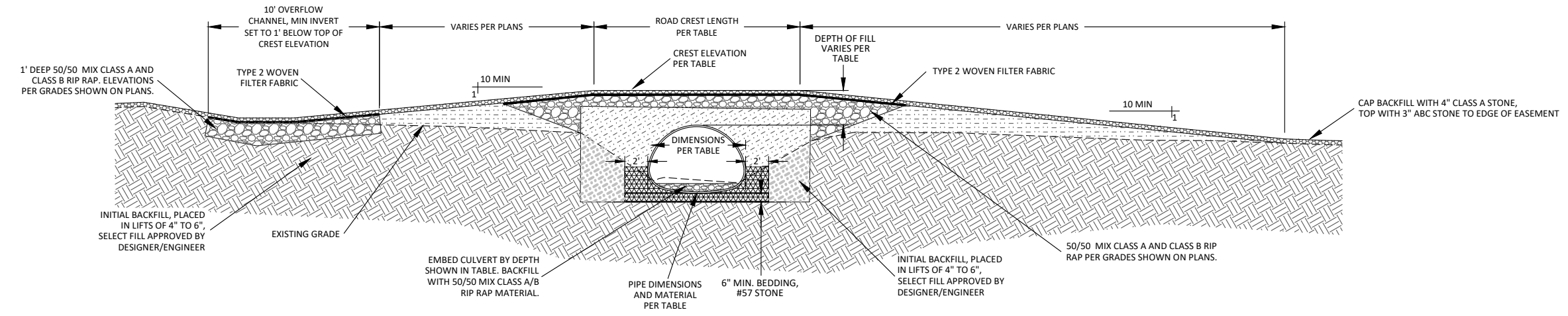
WILDLANDS ENGINEERING
312 W. Millbrook Rd. Suite 225
Raleigh, NC 27609
Tel: 919.851.9986
Fax: 704.332.3306
Firm License No. F-0831

PROFESSIONAL SEAL
048920
GREGORY W. WILDLANDS
7-17-19

6.8

Sheet

March 2, 2012



Plan Sheet	Reach	Design Station	Arch Width (in)	Arch Height (in)	Number of Barrels	Pipe Material	Pipe Length (ft)	Bed Slope	Embedded Depth (in)	Upstream Pipe Invert	Downstream Pipe Invert	Road Crest Elevation	Top Width (ft)	Side Slopes
2.3	Reach 4	112+95	49	33	1	CMP	40.0	0.8%	6	461.79	461.47	466.0	16 ft	2:1
2.9	UT1 Reach 1	203+18	57	38	1	CMP	33.5	0.8%	6	456.25	455.99	460.5	16 ft	2:1
2.12	UT1 Reach 2	216+02	49	33	2	CMP	30.3	0.8%	6	443.06	442.79	446.5	16 ft	2:1

Elevations are in ft. NAVD 88

1
6.9 CMP Pipe Arch Culvert Crossing
Not to Scale

WILDLANDS
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312 W. Millbrook Rd. Suite 225
Raleigh, NC 27609
Tel: 919.851.9986
Fax: 704.332.3306
Firm License No. F-0831



Catfish Pond Mitigation Site
Durham County, North Carolina

Details

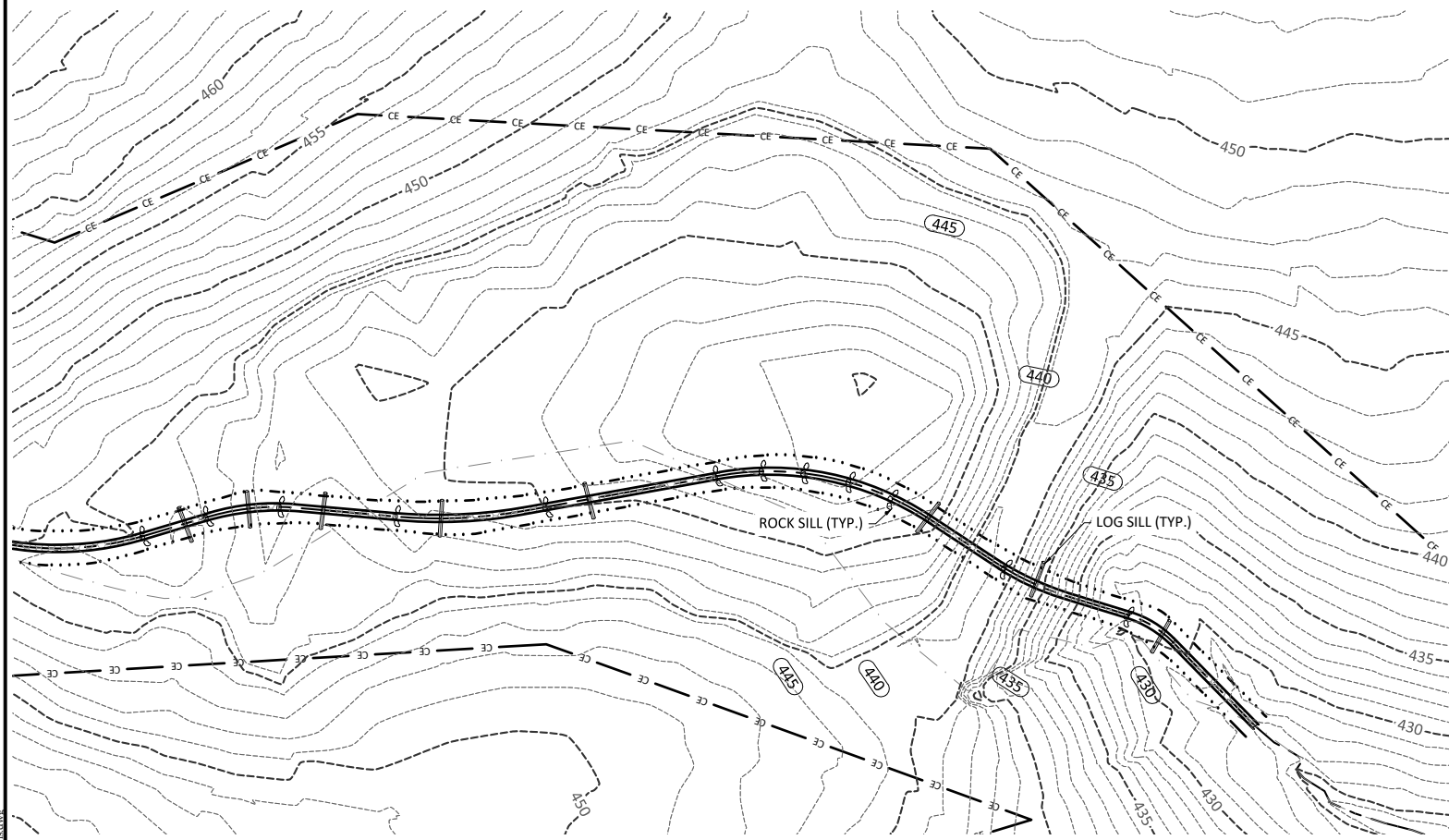
Revisions:

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Job Number: 005-02168
Project Engineer: GLS
Drawn By: ABP
Checked By: CR

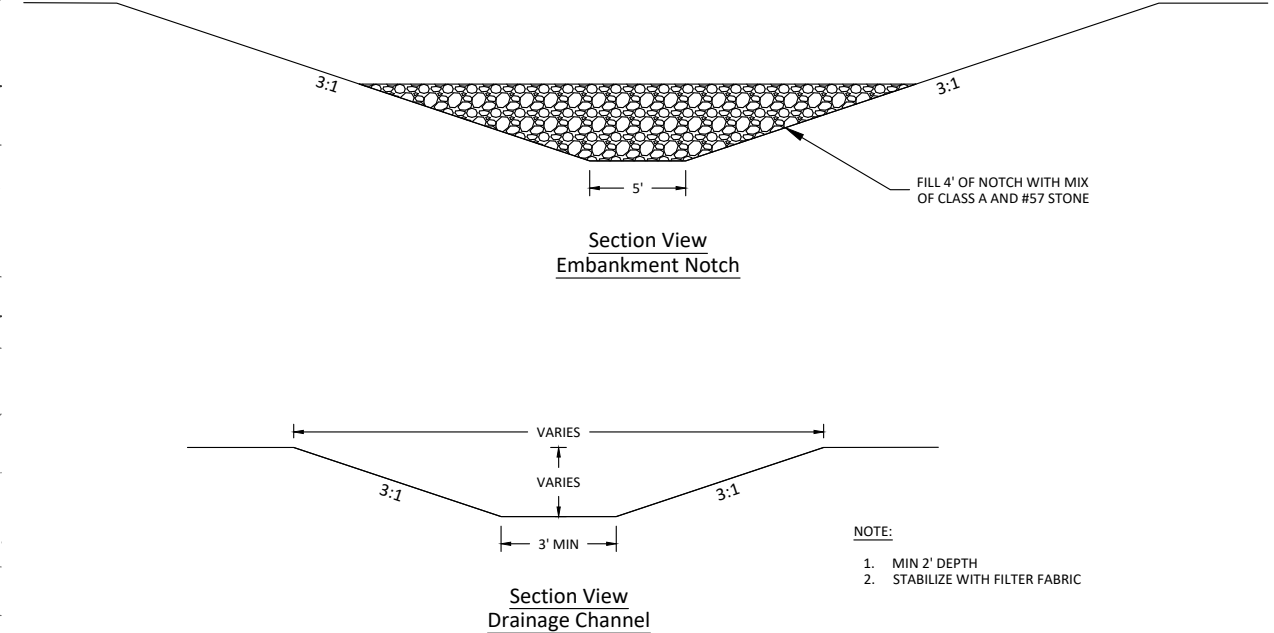
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- NOTE:**
1. ALL DEWATERING SHALL BE DONE THROUGH A SILT BAG.
 2. POND SHALL BE DEWATERED BEFORE NOTCH OR DRAINAGE CHANNEL IS CONSTRUCTED.
 3. POND WILL BE DEWATERED WITH A PUMP AS SHOWN IN THE PUMP AROUND DETAIL (SEE DETAIL 3, 6.6). THE POND WATER LEVEL WILL BE DRAWN DOWN AT A RATE OF APPROXIMATELY ONE FOOT PER DAY.
 4. EXCAVATE NOTCH AND DRAINAGE CHANNEL.
 5. PUMP AROUND SHALL BE IN PLACE AND FUNCTIONING WHILE PROPOSED CHANNEL IS CONSTRUCTED.
 6. ALLOW POND BED TO DRY BEFORE PLACING FILL.
 7. REMOVE UNSUITABLE SOILS AND REPLACE WITH SELECT FILL AS DIRECTED.
 8. CONSTRUCT NEW CHANNEL.
 9. REMOVE NOTCH UPON COMPLETION.



1 Catfish Pond Removal
6.10 Not to Scale



Catfish Pond Mitigation Site
Durham County, North Carolina

Details

Revisions

Date: 07-16-2019
Job Number: 005-02108
Project Engineer: GLS
Drawn By: ABP
Checked By: CR

6.10

GROUND STABILIZATION AND MATERIALS HANDLING PRACTICES FOR COMPLIANCE WITH THE NCG01 CONSTRUCTION GENERAL PERMIT

Implementing the details and specifications on this plan sheet will result in the construction activity being considered compliant with the Ground Stabilization and Materials Handling sections of the NCG01 Construction General Permit (Sections E and F, respectively). The permittee shall comply with the Erosion and Sediment Control plan approved by the delegated authority having jurisdiction. All details and specifications shown on this sheet may not apply depending on site conditions and the delegated authority having jurisdiction.

SECTION E: GROUND STABILIZATION

Required Ground Stabilization Timeframes		
Site Area Description	Stabilize within this many calendar days after ceasing land disturbance	Timeframe variations
(a) Perimeter dikes, swales, ditches, and perimeter slopes	7	None
(b) High Quality Water (HQW) Zones	7	None
(c) Slopes steeper than 3:1	7	If slopes are 10' or less in length and are not steeper than 2:1, 14 days are allowed
(d) Slopes 3:1 to 4:1	14	-7 days for slopes greater than 50' in length and with slopes steeper than 4:1 -7 days for perimeter dikes, swales, ditches, perimeter slopes and HQW Zones -10 days for Falls Lake Watershed
(e) Areas with slopes flatter than 4:1	14	-7 days for perimeter dikes, swales, ditches, perimeter slopes and HQW Zones -10 days for Falls Lake Watershed unless there is zero slope

Note: After the permanent cessation of construction activities, any areas with temporary ground stabilization shall be converted to permanent ground stabilization as soon as practicable but in no case longer than 90 calendar days after the last land disturbing activity. Temporary ground stabilization shall be maintained in a manner to render the surface stable against accelerated erosion until permanent ground stabilization is achieved.

GROUND STABILIZATION SPECIFICATION

Stabilize the ground sufficiently so that rain will not dislodge the soil. Use one of the techniques in the table below:

Temporary Stabilization	Permanent Stabilization
<ul style="list-style-type: none"> Temporary grass seed covered with straw or other mulches and tackifiers Hydroseeding Rolled erosion control products with or without temporary grass seed Appropriately applied straw or other mulch Plastic sheeting 	<ul style="list-style-type: none"> Permanent grass seed covered with straw or other mulches and tackifiers Geotextile fabrics such as permanent soil reinforcement matting Hydroseeding Shrubs or other permanent plantings covered with mulch Uniform and evenly distributed ground cover sufficient to restrain erosion Structural methods such as concrete, asphalt or retaining walls Rolled erosion control products with grass seed

POLYACRYLAMIDES (PAMS) AND FLOCCULANTS

- Select flocculants that are appropriate for the soils being exposed during construction, selecting from the *NC DWR List of Approved PAMS/Flocculants*.
- Apply flocculants at or before the inlets to Erosion and Sediment Control Measures.
- Apply flocculants at the concentrations specified in the *NC DWR List of Approved PAMS/Flocculants* and in accordance with the manufacturer's instructions.
- Provide ponding area for containment of treated Stormwater before discharging offsite.
- Store flocculants in leak-proof containers that are kept under storm-resistant cover or surrounded by secondary containment structures.

EQUIPMENT AND VEHICLE MAINTENANCE

- Maintain vehicles and equipment to prevent discharge of fluids.
- Provide drip pans under any stored equipment.
- Identify leaks and repair as soon as feasible, or remove leaking equipment from the project.
- Collect all spent fluids, store in separate containers and properly dispose as hazardous waste (recycle when possible).
- Remove leaking vehicles and construction equipment from service until the problem has been corrected.
- Bring used fuels, lubricants, coolants, hydraulic fluids and other petroleum products to a recycling or disposal center that handles these materials.

LITTER, BUILDING MATERIAL AND LAND CLEARING WASTE

- Never bury or burn waste. Place litter and debris in approved waste containers.
- Provide a sufficient number and size of waste containers (e.g dumpster, trash receptacle) on site to contain construction and domestic wastes.
- Locate waste containers at least 50 feet away from storm drain inlets and surface waters unless no other alternatives are reasonably available.
- Locate waste containers on areas that do not receive substantial amounts of runoff from upland areas and does not drain directly to a storm drain, stream or wetland.
- Cover waste containers at the end of each workday and before storm events or provide secondary containment. Repair or replace damaged waste containers.
- Anchor all lightweight items in waste containers during times of high winds.
- Empty waste containers as needed to prevent overflow. Clean up immediately if containers overflow.
- Dispose waste off-site at an approved disposal facility.
- On business days, clean up and dispose of waste in designated waste containers.

PAINT AND OTHER LIQUID WASTE

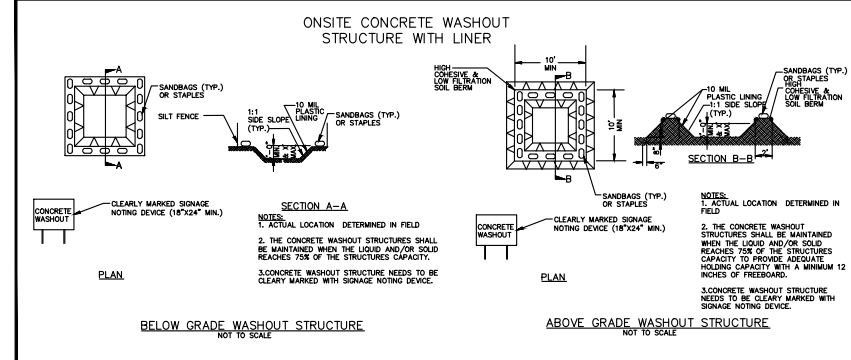
- Do not dump paint and other liquid waste into storm drains, streams or wetlands.
- Locate paint washouts at least 50 feet away from storm drain inlets and surface waters unless no other alternatives are reasonably available.
- Contain liquid wastes in a controlled area.
- Containment must be labeled, sized and placed appropriately for the needs of site.
- Prevent the discharge of soaps, solvents, detergents and other liquid wastes from construction sites.

PORTABLE TOILETS

- Install portable toilets on level ground, at least 50 feet away from storm drains, streams or wetlands unless there is no alternative reasonably available. If 50 foot offset is not attainable, provide relocation of portable toilet behind silt fence or place on a gravel pad and surround with sand bags.
- Provide staking or anchoring of portable toilets during periods of high winds or in high foot traffic areas.
- Monitor portable toilets for leaking and properly dispose of any leaked material. Utilize a licensed sanitary waste hauler to remove leaking portable toilets and replace with properly operating unit.

EARTHEN STOCKPILE MANAGEMENT

- Show stockpile locations on plans. Locate earthen-material stockpile areas at least 50 feet away from storm drain inlets, sediment basins, perimeter sediment controls and surface waters unless it can be shown no other alternatives are reasonably available.
- Protect stockpile with silt fence installed along toe of slope with a minimum offset of five feet from the toe of stockpile.
- Provide stable stone access point when feasible.
- Stabilize stockpile within the timeframes provided on this sheet and in accordance with the approved plan and any additional requirements. Soil stabilization is defined as vegetative, physical or chemical coverage techniques that will restrain accelerated erosion on disturbed soils for temporary or permanent control needs.



CONCRETE WASHOUTS

- Do not discharge concrete or cement slurry from the site.
- Dispose of, or recycle settled, hardened concrete residue in accordance with local and state solid waste regulations and at an approved facility.
- Manage washout from mortar mixers in accordance with the above item and in addition place the mixer and associated materials on impervious barrier and within lot perimeter silt fence.
- Install temporary concrete washouts per local requirements, where applicable. If an alternate method or product is to be used, contact your approval authority for review and approval. If local standard details are not available, use one of the two types of temporary concrete washouts provided on this detail.
- Do not use concrete washouts for dewatering or storing defective curb or sidewalk sections. Stormwater accumulated within the washout may not be pumped into or discharged to the storm drain system or receiving surface waters. Liquid waste must be pumped out and removed from project.
- Locate washouts at least 50 feet from storm drain inlets and surface waters unless it can be shown that no other alternatives are reasonably available. At a minimum, install protection of storm drain inlet(s) closest to the washout which could receive spills or overflow.
- Locate washouts in an easily accessible area, on level ground and install a stone entrance pad in front of the washout. Additional controls may be required by the approving authority.
- Install at least one sign directing concrete trucks to the washout within the project limits. Post signage on the washout itself to identify this location.
- Remove leavings from the washout when at approximately 75% capacity to limit overflow events. Replace the tarp, sand bags or other temporary structural components when no longer functional. When utilizing alternative or proprietary products, follow manufacturer's instructions.
- At the completion of the concrete work, remove remaining leavings and dispose of in an approved disposal facility. Fill pit, if applicable, and stabilize any disturbance caused by removal of washout.

HERBICIDES, PESTICIDES AND RODENTICIDES

- Store and apply herbicides, pesticides and rodenticides in accordance with label restrictions.
- Store herbicides, pesticides and rodenticides in their original containers with the label, which lists directions for use, ingredients and first aid steps in case of accidental poisoning.
- Do not store herbicides, pesticides and rodenticides in areas where flooding is possible or where they may spill or leak into wells, stormwater drains, ground water or surface water. If a spill occurs, clean area immediately.
- Do not stockpile these materials onsite.

HAZARDOUS AND TOXIC WASTE

- Create designated hazardous waste collection areas on-site.
- Place hazardous waste containers under cover or in secondary containment.
- Do not store hazardous chemicals, drums or bagged materials directly on the ground.

**PART III
SELF-INSPECTION, RECORDKEEPING AND REPORTING**

SECTION A: SELF-INSPECTION

Self-inspections are required during normal business hours in accordance with the table below. When adverse weather or site conditions would cause the safety of the inspection personnel to be in jeopardy, the inspection may be delayed until the next business day on which it is safe to perform the inspection. In addition, when a storm event of equal to or greater than 1.0 inch occurs outside of normal business hours, the self-inspection shall be performed upon the commencement of the next business day. Any time when inspections were delayed shall be noted in the Inspection Record.

Inspect	Frequency (during normal business hours)	Inspection records must include:
(1) Rain gauge maintained in good working order	Daily	Daily rainfall amounts. If no daily rain gauge observations are made during weekend or holiday periods, and no individual-day rainfall information is available, record the cumulative rain measurement for those unattended days (and this will determine if a site inspection is needed). Days on which no rainfall occurred shall be recorded as "zero." The permittee may use another rain-monitoring device approved by the Division.
(2) E&SC Measures	At least once per 7 calendar days and within 24 hours of a rain event ≥ 1.0 inch in 24 hours	1. Identification of the measures inspected, 2. Date and time of the inspection, 3. Name of the person performing the inspection, 4. Indication of whether the measures were operating properly, 5. Description of maintenance needs for the measure, 6. Description, evidence, and date of corrective actions taken.
(3) Stormwater discharge outfalls (SDOs)	At least once per 7 calendar days and within 24 hours of a rain event ≥ 1.0 inch in 24 hours	1. Identification of the discharge outfalls inspected, 2. Date and time of the inspection, 3. Name of the person performing the inspection, 4. Evidence of indicators of stormwater pollution such as oil sheen, floating or suspended solids or discoloration, 5. Indication of visible sediment leaving the site, 6. Description, evidence, and date of corrective actions taken.
(4) Perimeter of site	At least once per 7 calendar days and within 24 hours of a rain event ≥ 1.0 inch in 24 hours	If visible sedimentation is found outside site limits, then a record of the following shall be made: 1. Actions taken to clean up or stabilize the sediment that has left the site limits, 2. Description, evidence, and date of corrective actions taken, and 3. An explanation as to the actions taken to control future releases.
(5) Streams or wetlands onsite or offsite (where accessible)	At least once per 7 calendar days and within 24 hours of a rain event ≥ 1.0 inch in 24 hours	If the stream or wetland has increased visible sedimentation or a stream has visible increased turbidity from the construction activity, then a record of the following shall be made: 1. Description, evidence and date of corrective actions taken, and 2. Records of the required reports to the appropriate Division Regional Office per Part III, Section C, Item (2)(a) of this permit of this permit.
(6) Ground stabilization measures	After each phase of grading	1. The phase of grading (installation of perimeter E&SC measures, clearing and grubbing, installation of storm drainage facilities, completion of all land-disturbing activity, construction or redevelopment, permanent ground cover). 2. Documentation that the required ground stabilization measures have been provided within the required timeframe or an assurance that they will be provided as soon as possible.

NOTE: The rain inspection resets the required 7 calendar day inspection requirement.

**PART III
SELF-INSPECTION, RECORDKEEPING AND REPORTING**

SECTION B: RECORDKEEPING

1. E&SC Plan Documentation

The approved E&SC plan as well as any approved deviation shall be kept on the site. The approved E&SC plan must be kept up-to-date throughout the coverage under this permit. The following items pertaining to the E&SC plan shall be documented in the manner described:

Item to Document	Documentation Requirements
(a) Each E&SC Measure has been installed and does not significantly deviate from the locations, dimensions and relative elevations shown on the approved E&SC Plan.	Initial and date each E&SC Measure on a copy of the approved E&SC Plan or complete, date and sign an inspection report that lists each E&SC Measure shown on the approved E&SC Plan. This documentation is required upon the initial installation of the E&SC Measures or if the E&SC Measures are modified after initial installation.
(b) A phase of grading has been completed.	Initial and date a copy of the approved E&SC Plan or complete, date and sign an inspection report to indicate completion of the construction phase.
(c) Ground cover is located and installed in accordance with the approved E&SC Plan.	Initial and date a copy of the approved E&SC Plan or complete, date and sign an inspection report to indicate compliance with approved ground cover specifications.
(d) The maintenance and repair requirements for all E&SC Measures have been performed.	Complete, date and sign an inspection report.
(e) Corrective actions have been taken to E&SC Measures.	Initial and date a copy of the approved E&SC Plan or complete, date and sign an inspection report to indicate the completion of the corrective action.

2. Additional Documentation

In addition to the E&SC Plan documents above, the following items shall be kept on the site and available for agency inspectors at all times during normal business hours, unless the Division provides a site-specific exemption based on unique site conditions that make this requirement not practical:

- (a) This general permit as well as the certificate of coverage, after it is received.
- (b) Records of inspections made during the previous 30 days. The permittee shall record the required observations on the Inspection Record Form provided by the Division or a similar inspection form that includes all the required elements. Use of electronically-available records in lieu of the required paper copies will be allowed if shown to provide equal access and utility as the hard-copy records.
- (c) All data used to complete the Notice of Intent and older inspection records shall be maintained for a period of three years after project completion and made available upon request. [40 CFR 122.41]

**PART III
SELF-INSPECTION, RECORDKEEPING AND REPORTING**

SECTION C: REPORTING

1. Occurrences that must be reported

Permittees shall report the following occurrences:

- (a) Visible sediment deposition in a stream or wetland.
- (b) Oil spills if:
 - They are 25 gallons or more,
 - They are less than 25 gallons but cannot be cleaned up within 24 hours,
 - They cause sheen on surface waters (regardless of volume), or
 - They are within 100 feet of surface waters (regardless of volume).
- (a) Releases of hazardous substances in excess of reportable quantities under Section 311 of the Clean Water Act (Ref: 40 CFR 110.3 and 40 CFR 117.3) or Section 102 of CERCLA (Ref: 40 CFR 302.4) or G.S. 143-215.85.
- (b) Anticipated bypasses and unanticipated bypasses.
- (c) Noncompliance with the conditions of this permit that may endanger health or the environment.

2. Reporting Timeframes and Other Requirements

After a permittee becomes aware of an occurrence that must be reported, he shall contact the appropriate Division regional office within the timeframes and in accordance with the other requirements listed below. Occurrences outside normal business hours may also be reported to the Division's Emergency Response personnel at (800) 662-7956, (800) 858-0368 or (919) 733-3300.

Occurrence	Reporting Timeframes (After Discovery) and Other Requirements
(a) Visible sediment deposition in a stream or wetland	<ul style="list-style-type: none"> • Within 24 hours, an oral or electronic notification. • Within 7 calendar days, a report that contains a description of the sediment and actions taken to address the cause of the deposition. Division staff may waive the requirement for a written report on a case-by-case basis. • If the stream is named on the <u>NC 303(d) list</u> as impaired for sediment-related causes, the permittee may be required to perform additional monitoring, inspections or apply more stringent practices if staff determine that additional requirements are needed to assure compliance with the federal or state impaired-waters conditions.
(b) Oil spills and release of hazardous substances per Item 1(b)-(c) above	<ul style="list-style-type: none"> • Within 24 hours, an oral or electronic notification. The notification shall include information about the date, time, nature, volume and location of the spill or release.
(c) Anticipated bypasses [40 CFR 122.41(m)(3)]	<ul style="list-style-type: none"> • A report at least ten days before the date of the bypass, if possible. The report shall include an evaluation of the anticipated quality and effect of the bypass.
(d) Unanticipated bypasses [40 CFR 122.41(m)(3)]	<ul style="list-style-type: none"> • Within 24 hours, an oral or electronic notification. • Within 7 calendar days, a report that includes an evaluation of the quality and effect of the bypass.
(e) Noncompliance with the conditions of this permit that may endanger health or the environment [40 CFR 122.41(l)(7)]	<ul style="list-style-type: none"> • Within 24 hours, an oral or electronic notification. • Within 7 calendar days, a report that contains a description of the noncompliance, and its causes; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time noncompliance is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. [40 CFR 122.41(l)(6). • Division staff may waive the requirement for a written report on a case-by-case basis.



Appendix 8
Invasive Species Plan

1.0 Invasive Species Plan

Annual monitoring and semi-annual site visits will be conducted to assess the condition of the finished project. These site inspections may identify the presence of invasive vegetation. If, during the monitoring period, invasive species threaten the survivability of planted woody vegetation in an area that exceeds 1% of the planted easement acreage, the invasive species shall be treated. Smaller areas may be treated at the discretion of the project engineer and biologist, if deemed in the best interest of the Site. Generally, the treatment plan shall follow the below guidelines in Table 1 for common invasive species found in riparian areas; however, the treatment may be changed based on the professional judgement of the project engineer and biologist. For invasive species not listed in the below table that threaten the survivability of the planted woody vegetation, Wildlands shall notify DMS of the invasive species observed and the plan for treatment prior to treating the species. All invasive species treatment will be reported in the following year's monitoring plan.

Table 1. Invasive Species Treatment – Catfish Pond Mitigation Site

Invasive Species	Recommended Removal Technique
<p>Honeysuckle (<i>Lonicera japonica</i>)</p>	<p>Small infestations of <i>L. japonica</i> can be pulled by hand. Monitor to remove any re-sprouts. Care should be taken to bag and remove the plants, including mature fruits to prevent re-establishment. Large infestations of <i>L. japonica</i> will usually require a combination of cut stump and foliar herbicide treatments. Where vines have grown into the tree canopy, cut each stem as close to the ground as possible. Treat the freshly cut surface of the rooted stem with a 25 percent solution of glyphosate or triclopyr. Remove the twining vines to prevent them from girdling and killing desirable vegetation. Groundcovers of <i>L. japonica</i> can be treated with a foliar solution of 2 percent glyphosate or triclopyr plus a 0.5 percent non-ionic surfactant to thoroughly wet all the leaves.</p>
<p>Chinese Privet (<i>Ligustrum sinense</i>)</p>	<p>Thoroughly wet all leaves with one of the following herbicides in water with a surfactant: a glyphosate herbicide as a 3-percent solution (12 ounces per 3-gallon mix) in the late fall or early winter when safety to surrounding vegetation is desired, or elsewhere, Arsenal AC* as a 1-percent solution (4 ounces per 3-gallon mix). Backpack mist blowers can broadcast glyphosate as a 3-percent solution (12 ounces per 3-gallon mix) or Escort XP* at 1 ounce per acre (0.2 dry ounces per 3-gallon mix and 10 gallons per acre) during winter for safety to dormant hardwoods. Summer applications of glyphosate may not be as effective as other times and require a higher percent solution. The best time for Arsenal AC* and Escort XP* is summer to fall. For stems too tall for foliar sprays and when safety to surrounding vegetation is desired, apply a basal spray of Garlon 4 as a 20-percent solution (5 pints per 3-gallon mix) in a labeled basal oil product, vegetable oil or mineral oil with a penetrant, or fuel oil or diesel fuel (where permitted); or undiluted Pathfinder II. Elsewhere, apply Stalker* as a 6- to 9-percent solution (1.5 to 2 pints per 3-gallon mix) in a labeled basal oil product, vegetable oil or mineral oil with a penetrant, or fuel oil or diesel fuel (where permitted) to young bark as a basal spray making certain to treat all stems in a clump; or cut and immediately treat the stump tops with Arsenal AC* as a 5-percent solution (20 ounces per 3-gallon mix) or Velpar L* as a 10-percent solution in water (1 quart per 3-gallon mix) with a surfactant. When safety to surrounding vegetation is desired, immediately treat stump tops and sides with Garlon 3A or with a glyphosate herbicide as a 20-percent solution (5 pints per 3-gallon mix) in water with a surfactant. ORTHO Brush-B-Gon and Enforcer Brush Killer are effective undiluted for treating cut-stumps and available in retail garden stores (safe to surrounding plants). For large stems, make stem injections using Arsenal AC* or when safety to surrounding vegetation is desired, Garlon 3A or a glyphosate herbicide using dilutions and cut-spacings specified on the herbicide label</p>

Invasive Species	Recommended Removal Technique
	(anytime except March and April). An EZ-Ject tree injector can help to reach the lower part of the main stem; otherwise, every branching trunk must be hack-and-squirt injected.
Kudzu (<i>Pueraria montana</i>)	Small patches of <i>P. montana</i> that are not well-established can usually be eliminated by persistent weeding, mowing, or grazing during the growing season. The spread of a well-established infestation of <i>P. montana</i> can be controlled the same way, but cutting will typically not kill the roots of larger plants. For vines in tree canopies, cut the vines near the ground and apply a 50 percent solution of triclopyr to the stumps. This procedure remains effective at lower temperatures as long as the ground is not frozen. Large infestations can be effectively controlled with a foliar solution of 2 to 3 percent glyphosate or triclopyr plus a 0.5 percent non-ionic surfactant to thoroughly wet all leaves. The ambient air temperature should be above 65 degrees Fahrenheit. After the above ground vegetation is controlled and it is possible to dig and cut into the central root crown, apply a 50 percent solution of glyphosate or triclopyr to the wound. The most successful chemical control of <i>P. montana</i> can be achieved with a foliar solution of 0.75 percent clopyralid plus a 0.5 percent non-ionic surfactant. Monitor all treatments in subsequent years for re-sprouting.
Porcelain berry (<i>Ampelopsis glandulosa</i> var. <i>brevipedunculata</i>)	The most effective chemical control of <i>A. brevipedunculata</i> has been achieved using triclopyr formulations toward the end of the growing season when plants are transporting nutrients to their roots. Apply a 2 percent solution of triclopyr plus a 0.5 percent non-ionic surfactant to the foliage. Or cut the plants first, allow time for re-growth, and then apply the herbicide mixture. <i>A. brevipedunculata</i> can also be killed with a mixture of 25 percent triclopyr and 75 percent mineral oil applied to the basal parts of the stem to a height of 2 to 3 feet from the ground. This method should be used judiciously since it takes a lot of chemical and can result in overspray. It has been used successfully in situations where no other technique is feasible, such as cliff faces or other exposed sites.
Japanese Hops (<i>Humulus japonicus</i>)	Pre-emergent herbicide containing sulfometuron methyl (Oust XP) applied in early spring causes minimal damage to established perennial vegetation. Mechanical control by cutting or mowing as close to the ground as possible beginning in late spring and recurring frequently until fall dieback is recommended. Post emergent herbicide treatment two times a year (mid and late summer) to prevent the fall seed set is recommended. Glyphosate provides good post-emergent chemical control. Hop seeds in the soil last up to three years. Repeat treatments for two to three years should be expected, or longer in areas subject to flooding that may receive influx of seeds from upstream infestations. Cultural control methods which favor fast-growing tall tree species to create dense shade in spring and summer and canopy closure will discourage infestations, as Japanese hop prefers direct sunlight and does not tolerate heavy shade. Establishing an early thick groundcover of hairy vetch, wheat, barley or rye can reduce hop germination and seedling survival. (National Park Service, Plant Conservation Alliance, Alien Plants Working Group, 2009)
Johnson Grass (<i>Sorghum halepense</i>)	Recommended control procedures: Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (June to October with multiple applications applied to regrowth). <ul style="list-style-type: none"> • Recommendation for mature grass control: apply Outrider* as a broadcast spray at 0.75 to 2 ounces per acre (0.2 to 0.6 dry ounce per 3-gallon mix) plus a nonionic surfactant to actively growing Johnsongrass. For handheld and high-volume sprayers, apply 1 ounce of Outrider per 100 gallons of water plus a nonionic surfactant at 0.25 percent. Outrider is a selective herbicide that can be applied over the top of certain other grasses to kill Johnsongrass, or apply Plateau as a 0.25-percent solution (1 ounce per 3-gallon mix) when plants are 18 to 24 inches (45 to 60 cm) tall or larger. • Recommendation for seedling control: apply Journey as a 0.3-percent solution (1.2 ounces per 3-gallon mix) before Johnsongrass sprouts and when desirable species are

Appendix 9
Maintenance Plan

1.0 Maintenance Plan

The site shall be monitored on a regular basis and a physical inspection of the site shall be conducted a minimum of once per year throughout the post-construction monitoring period until performance standards are met. These site inspections may identify site components and features that require routine maintenance. Routine maintenance should be expected most often in the first two (2) years following site construction and may include the following:

Table1: Maintenance Plan – Catfish Pond Mitigation Site

Component/Feature	Maintenance through project close-out
Stream	Routine channel maintenance and repair activities may include chinking of in-stream structures to prevent piping, securing of loose coir matting, and supplemental installations of live stakes and other target vegetation along the channel. Areas where storm water and floodplain flows intercept the channel may also require maintenance to prevent bank erosion.
Vegetation	Vegetation shall be maintained to ensure the health and vigor of the targeted community. Routine vegetation maintenance and repair activities may include supplemental planting, pruning, mulching, and fertilizing. Exotic invasive plant species shall be controlled by mechanical and/or chemical methods. Any vegetation control requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDCA) rules and regulations.
Site boundary	Site boundaries shall be identified in the field to ensure clear distinction between the mitigation site and adjacent properties. Boundaries may be identified by fence, marker, bollard, post, tree-blazing, or other means as allowed by site conditions and/or conservation easement. Boundary markers disturbed, damaged, or destroyed will be repaired and/or replaced on an as-needed basis.

Appendix 10
Credit Release Schedule

1.0 Credit Release Schedule

All credit releases will be based on the total credit generated as reported by the as-built survey of the mitigation site. Under no circumstances shall any mitigation project be debited until the necessary DA authorization has been received for its construction or the District Engineer (DE) has otherwise provided written approval for the project in the case where no DA authorization is required for construction of the mitigation project. The DE, in consultation with the Interagency Review Team (IRT), will determine if performance standards have been satisfied sufficiently to meet the requirements of the release schedules below. In cases where some performance standards have not been met, credits may still be released depending on the specifics of the case. Monitoring may be required to restart or be extended, depending on the extent to which the site fails to meet the specified performance standard. The release of project credits will be subject to the criteria described as follows:

Table A: Credit Release Schedule – Stream Credits – Catfish Pond Mitigation Site

Credit Release Milestone	Credit Release Activity	Interim Release	Total Released
1	Site Establishment (includes all required criteria)	0%	0%
2	Completion of all initial physical and biological improvements made pursuant to the Mitigation Plan	30%	30%
3	Year 1 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	40%
4	Year 2 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	50%
5	Year 3 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	60%
6	Year 4 monitoring report demonstrates that channels are stable and interim performance standards have been met	5%	65% (75%*)
7	Year 5 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	75% (85%*)
8	Year 6 monitoring report demonstrates that channels are stable and interim performance standards have been met	5%	80% (90%*)
9	Year 7 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	90% (100%*)

*10% reserve credits to be held back until the bankfull performance standard has been met.

1.1 Initial Allocation of Released Credits

The initial allocation of released credits, as specified in the mitigation plan can be released by DMS without prior written approval of the DE upon satisfactory completion of the following activities:

- Approval of the final Mitigation Plan.
- Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property.
- Completion of project construction (the initial physical and biological improvements to the mitigation site) pursuant to the mitigation plan; per the DMS Instrument, construction means that a mitigation site has been constructed in its entirety, to include planting, and an as-built

report has been produced. As-built reports must be sealed by an engineer prior to project closeout, if appropriate but not prior to the initial allocation of released credits.

- d. Receipt of necessary DA permit authorization or written DA approval for projects where DA permit issuance is not required.

1.2 Subsequent Credit Releases

All subsequent credit releases must be approved by the DE, in consultation with the IRT, based on a determination that required performance standards have been achieved. For stream projects a reserve of 10% of a site's total stream credits shall be released after two bankfull events have occurred, in separate years, provided the channel is stable and all other performance standards are met. In the event that less than two bankfull events occur during the monitoring period, release of these reserve credits shall be at the discretion of the IRT. As projects approach milestones associated with credit release, the DMS will submit a request for credit release to the DE along with documentation substantiating achievement of criteria required for release to occur. This documentation will be included with the annual monitoring report.

Appendix 11
Financial Assurance

1.0 Financial Assurances

Pursuant to Section IV H and Appendix III of the Division of Mitigation Service's In-Lieu Fee Instrument dated July 28, 2010, the North Carolina Department of Environment and Natural Resources has provided the US Army Corps of Engineers Wilmington District with a formal commitment to fund projects to satisfy mitigation requirements assumed by DMS. This commitment provides financial assurance for all mitigation projects implemented by the program.

Appendix 12



RIPARIAN BUFFER MITIGATION PLAN

July 18, 2019

CATFISH POND MITIGATION SITE

Durham County, NC
NCDEQ Contract No. 7424
DMS ID No. 100039

Neuse River Basin
HUC 03020201

USACE Action ID No. SAW 2018-00424
DWR Project No. 2018-0196
RFP #: 16-007279

PREPARED FOR:



NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

DRAFT RIPARIAN BUFFER MITIGATION PLAN

CATFISH POND MITIGATION SITE

Durham County, NC
NCDEQ Contract No. 7424
DMS ID No. 100039

Neuse River Basin
HUC 03020201

PREPARED FOR:



NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

PREPARED BY:



Wildlands Engineering, Inc.
312 W Millbrook Road, Suite 225
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Phone: (919) 851-9986

This Mitigation Plan has been written in conformance with the requirements of the following:

- 15A NCAC 02B .0295 Mitigation Program Requirements for Protection and Maintenance of Riparian Buffers.
- 15A NCAC 02B .0240, Nutrient Offset Payments Rule, amended effective September 1, 2010
- NCDEQ Division of Mitigation Services In-Lieu Fee Instrument signed and dated July 28, 2010.

These documents govern DMS operations and procedures for the delivery of compensatory mitigation.

Contributing Staff:

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1.0 Introduction

The Catfish Pond Mitigation Site (Site) is a riparian restoration project in conjunction with a stream mitigation project. The Site is located in Durham County approximately 12 miles north of the City of Durham and approximately 3 miles east of the Orange County/Durham County border (Figure 1). The Site is comprised of approximately 20.73 acres along Catfish Creek and three additional unnamed tributaries. Currently, the Site is characterized by a mix of active pastures, fields, and woodlands. The project will restore or enhance riparian areas within the project area, which will provide 522,327.570 buffer credits or 18.1 acres worth of buffer mitigation.

The Site is located within the Hydrologic Unit Code (HUC) 03020201020040 and North Carolina Department of Water Resources (NCDWR) Sub-basin 03-04-01. Catfish Creek and the three unnamed tributaries on the Site flow into Mountain Creek, which subsequently flows to Little River, the Eno River, and then Falls Lake. Falls Lake is classified as water supply waters (WS-IV) and nutrient sensitive waters (NSW).

The 2009 Neuse River Basinwide Water Quality Plan lists major stressors in Subbasin 03-04-01 to be total suspended solids (TSS), nutrients, and chlorophyll α . The 2010 Neuse River Basin Restoration Priorities (RBRP) highlights the importance of riparian areas for stream restoration projects. Riparian areas retain and remove nutrients and suspended sediments. Of the 123 miles of streams in the Neuse 01 CU, 23% do not have adequate riparian areas. The RBRP states that “priority [restoration] projects should increase or improve buffers.” Another goal of the RBRP for the Neuse 01 HU is to support the Falls Lake watershed plan. The RBRP also states that a goal for the Neuse 01 CU is to, “...promote nutrient and sediment reduction in agricultural areas by restoring and preserving wetlands, streams, and riparian buffers.”



This riparian restoration project will reduce sediment and nutrient loading, improve terrestrial and in stream habitats, and improve stream and bank stability. The area surrounding the streams proposed for mitigation is a mixture of active pasture, fields, and woodlands. By removing cattle access to onsite tributaries to Little River Reservoir and Falls Lake, restoring a forest to maintained riparian areas and protecting and preserving existing forested riparian areas; the project will reduce nutrient and sediment inputs to project streams, and ultimately to Falls Lake. The restored floodplain areas will filter sediment during

rainfall events. The establishment of riparian areas will create shading to minimize thermal pollution. Finally, invasive vegetation will be treated within the project area as needed and the proposed native vegetation will provide cover and food for wildlife.



2.0 Mitigation Project Summary

The major goals of the proposed riparian restoration project are to provide ecological and water quality enhancements to the Falls Lake watershed of the Neuse River Basin by creating a functional riparian corridor and restoring the riparian areas. Specific enhancements to water quality and ecological processes are outlined below in Table 1.

Table 1: Ecological and Water Quality Goals – Catfish Pond Mitigation Site

Goal	Objective	CU-Wide and RBRP Objectives Supported
Exclude cattle from project streams.	Install fencing around project areas adjacent to cattle pastures.	Reduce and control sediment inputs; Reduce and manage nutrient inputs; Contribute to protection of or improvement to a Water Supply Waterbody.
Decrease nutrient levels	Filtering runoff from the agricultural fields through restored native riparian zones. The off-site nutrient input will also be absorbed on-site by filtering flood flows through restored floodplain areas, where flood flows can disperse through native vegetation.	Reduce nutrient inputs to waters of the Falls Lake watershed.
Decrease water temperature and increase dissolved oxygen concentrations	Establishment and maintenance of riparian areas will create additional long-term shading of the channel flow to reduce thermal pollution.	Improve habitat to wildlife by providing additional habitat.
Restore and enhance native floodplain vegetation.	Plant native tree species in riparian zone where currently insufficient.	Reduce and control sediment inputs; Reduce and manage nutrient inputs; Provide a canopy to shade streams and reduce thermal loadings; Contribute to protection of or improvement to a Water Supply Waterbody.
Permanently protect the project Site from harmful uses.	Establish a conservation easement on the Site.	Protect aquatic habitat; protect water supply waters.

2.1 Existing Site Conditions

The proposed riparian restoration project will approximately put 20.5 acres of agricultural fields and woodlands along Catfish Creek and three unnamed tributaries that drain into the Falls Lake watershed, part of the Neuse River Basin, under a conservation easement. Out of the 20.7 acres, 18.2 acres will be proposed for a combination of riparian area restoration or enhancement.

In general, this area has maintained its rural, farming character over the last 78 years with only minor changes in land cover. This consistency in land use within the project watershed indicates that watershed processes affecting hydrology, sediment supply, and nutrient and pollutant delivery have not varied widely over this time period. With a lack of developmental pressure, watershed processes and stressors from outside the project limits are likely to remain consistent throughout the implementation, monitoring, and closeout of this project.



The Site contains two perennial streams: Catfish Creek (Reaches 2, 3, 4, 5, 6, and 7) and UT1 Reaches 1, 2, 3, and 4), and contains three intermittent streams: Catfish Creek Reach 1, UT2, and Mountain Tributary.

Catfish Creek Reach 1 begins at a small groundwater seep on the west end of the Site and flows east. A headcut is present on Reach 2. Catfish Creek Reach 3 begins at the confluence of UT2. Catfish Creek Reaches 1, 2, and 3 are very similar in their current condition. These reaches are moderately to steeply sloped and flow through somewhat confined valleys. Riparian vegetation is primarily comprised of a mature overstory with limited understory and herbaceous vegetation due to cattle grazing. Cattle access and riparian area grazing are the major limiting factors in the overall health and stability of Catfish Creek Reaches 1, 2, and 3.

Catfish Creek Reach 4 flows east to an existing farm crossing. Cattle access within this reach has resulted in extensive adverse impacts to the vegetation. Based on observations, the cattle have begun using the channel as a wallow area and cattle trail. Understory vegetation along the reach is limited and extensively grazed. Some overstory hardwood species are present but the understory ground cover is sparse and dominated by pasture grasses.

Catfish Creek Reach 5 begins below an existing farm crossing and continues east to Catfish Pond. The stream flows through a somewhat confined, moderately sloped valley with a mature hardwood dominated overstory and a sparse understory due to cattle grazing.

Catfish Creek Reach 6 flows through Catfish Pond. Currently, all of Reach 6 is contained within Catfish Pond or the pond embankment, which was installed sometime between 1940 and 1955. Cattle have unlimited access. Vegetation around the pond is limited to pasture grasses and some trees. As part of the Catfish Pond Stream Mitigation Project, the manmade dam will be removed and stream restored. The pond is not currently viable for buffer credit but is being removed and the channel restored as part of the stream mitigation project. The pond area will be viable for buffer and nutrient credit after stream restoration has been completed and the as-built report has been submitted to the IRT.

Catfish Creek Reach 7 begins at the confluence with UT1 and continues to the confluence of Mountain Creek and Catfish Creek. Catfish Creek Reach 7 has a bedform dominated by bedrock features. At multiple locations along the reach there is evidence of cattle wallows and trampled banks. The riparian area is at first in relatively good condition along the left bank, with impacts limited to cattle grazing of the understory. Elsewhere along Reach 7, however, cattle impacts are more pervasive, with sparse overstory trees and little to no understory. Ground cover is dominated by pasture grasses and cattle trampling is widespread.

UT1 flows onto the site from a wooded parcel south of project and flows northeast. The entire stream is accessed by livestock and, based on historical aerials, the channel and floodplain were heavily altered sometime between 1955 and 1972. In the 1972 historic aerial photo, a large area of deforestation along the stream corridor is evident. It also appears that the surrounding floodplain was manipulated from a forested system to agricultural fields for production. UT1 was divided into four separate reaches.

UT1 Reach 1 begins at the southern project boundary and flows northeast to the confluence with an ephemeral tributary. Along UT1 Reach 1 there is a narrow riparian area with some woody and herbaceous vegetation. Throughout the reach there are cattle entry and exit points which have resulted in unstable banks leading to scour and incision.

UT1 Reach 2 begins at the confluence of UT1 and the ephemeral tributary and flows northeast until an existing farm crossing. A fence line associated with the parcel boundary bisects UT1 Reach 2. Downstream of the fence line, there is no woody or herbaceous vegetation within the floodplain and



vegetation is dominated by pasture grasses. Upstream of the parcel boundary, the woody vegetation is limited with some areas of hazel alder and green ash. The stream banks are cattle trampled. Upstream of the fence line, it is difficult to identify the main stem of the channel because cattle trampling has resulted in a braided stream system. As part of the Catfish Pond Stream Mitigation Project, a single thread channel will be constructed.

UT1 Reach 3 begins downstream of the fence at the parcel boundary and continues through a farm crossing. The downstream end of the existing farm crossing drops approximately 10 vertical feet at a stacked rock retaining wall. The riparian area is essentially only pasture grasses.

UT1 Reach 4 begins at the existing farm crossing and continues until the confluence with Catfish Creek. UT1 Reach 4 is vertically stable due to widespread bedrock in the channel. Grazing areas in the floodplain have limited understory vegetation along the left bank and the right bank is limited to a single row of trees.

UT2 to Catfish Creek and Mountain Tributary are both intermittent headwater tributaries within the project area. UT2 begins at the farthest western edge of the project and flows southeast towards Catfish Creek. Mountain Tributary begins in the northwest corner of the project area and flows southeast before turning and flowing northeast into Mountain Creek. The reach ends at an existing culvert crossing. These headwater tributaries are in a similar existing condition with an established riparian woody canopy and a grazed understory. Overall, ecological degradation of these streams is directly attributed to cattle impacts.

Table 2: Buffer Project Attributes – Catfish Pond Mitigation Site

Project Name	Catfish Pond Mitigation Site
Hydrologic Unit Code	03020201020040
River Basin	Neuse River
Geographic Location (Lat, Long)	36° 9' 48.03" N, 78° 54' 37.66" W
Site Protection Instrument (DB, PG)	To be recorded
Total Credits (BMU)	526,262.570
Types of Credits	Riparian Buffer & Nutrient Offset
Mitigation Plan Date	April 2019
Initial Planting Date	January 2020
Baseline Report Date	February 2020
MY1 Report Date	November 2020
MY2 Report Date	November 2021
MY3 Report Date	November 2022
MY4 Report Date	November 2023
MY5 Report Date	November 2024

2.2 Watershed Characterization

The Site is located in Durham County approximately 12 miles north of the City of Durham and approximately 3 miles east of the Orange County/Durham County border (Figure 1). The Site is located

within the Hydrologic Unit Code (HUC) 03020201020040 and North Carolina Department of Water Resources (NCDWR) Sub-basin 03-04-01. Site topography, as indicated on the Rougemont, NC USGS 7.5 minute topographic quadrangles, includes mostly steeply sloped areas with some moderate slopes along the main tributary (UT1) (Figure 3).

Drainage areas for the streams and riparian areas were determined by delineating watersheds on the Rougemont USGS 7.5-minute topographic quadrangles. Figure 4 shows the watershed boundaries for each area. Each of the riparian buffer watersheds is mix of active pastures, fields, and woodlands. The watershed and current land use are summarized in Table 3 below.



Table 3: Drainage Areas and Associated Land Use – Catfish Pond Mitigation Site

Revised Reach Name	DWR Stream Designation	Watershed Area (acres)	Land Use
Catfish Creek	Perennial	197	46% forested; 54% managed herbaceous cover/pasture; 0.2% Woody Wetland
UT1	Perennial	108	32% forested; 66% managed herbaceous cover/pasture; 1% Shrub
UT2	Intermittent	32	99% forested; 1% managed herbaceous cover/pasture
Mountain Tributary	Intermittent	30	92% forested; 8% managed herbaceous cover/pasture

2.3 Soils

The proposed project is mapped by the Durham County Soil Survey. Project area soils are described below in Table 4. Figure 5 is a soil map of the Site. Wehadkee soils underly upper UT1 and upper Catfish Creek. Tatum underlies Catfish Creek Reaches 4, 5, and 6. Georgeville soils are prevalent on Mountain Tributary. Chewalca and Wehadkee soils are present as Catfish Creek approaches the Mountain Creek floodplain.

Table 4: Project Soil Types and Descriptions – Catfish Pond Mitigation Site

Soil Name	Description
Wehadkee silt loam	This soil is found on narrow floodplains with a slope of 0 to 2 percent. This soil is typically poorly drained and frequently floods. The surface layer of the series is loam with a thickness of about 8 inches. The subsoil of sandy clay loam has a depth of 43 inches. This soil is fairly well suited for pasture.
Tatum gravelly silt loam	This well-drained soil is found on uplands with a slope of 15 to 25 percent. The surface layer has a gravelly silt loam of about 7 inches. The subsoil of silty clay loam extends to a depth of 42 inches and weathered bedrock is present from 42 to 80 inches. This soil is well suited to pine and hardwood forest and to pasture. Slope and the erosion resulting from runoff are the major concerns in management.
Georgeville silt loam	This well-drained soil is found on narrow side slopes on uplands with a slope of 6 to 10 percent. It has a surface layer of reddish-brown or brown silt loam to about 7 inches. Its subsoil is red, firm silty clay or silty clay loam to about 10 inches. Slope and the erosion resulting from runoff are the major concerns for management.
Chewacla and Wehadkee soils	These soils are about 60 percent Chewacla soil and 35 percent Wehadkee soil. These are somewhat poorly drained soils on floodplains with slopes of 0 to 2 percent that flood frequently. They occur as long, level areas parallel to the major streams and rivers. These soils have a surface layer of loam to about 4 inches and a subsurface layer of silty clay loam to about 26 inches. These soils are well suited to hardwood forest and pasture.

Source: Durham County Soil Survey, USDA-NRCS, <http://efotg.nrcs.usda.gov>

2.4 Geology

The project is located in the Ecoregion 45c - Carolina Slate Belt of the Piedmont physiographic province. The Carolina Slate Belt extends from southern Virginia, across the Carolinas, and into Georgia. The Carolina Slate Belt consists of metamorphosed igneous and sedimentary rock including gneiss and schist that has been intruded by younger granitic rocks (NCGS, 2013). The underlying geology of the proposed Site is mapped as late Proterozoic to Cambrian (1 billion to 500 million years in age) intermediate meta-volcanic rock (CZiv) and felsic meta-volcanic rock (CZfv) (NCGS, 1985). The intermediate meta-volcanic rock is described as metamorphosed andesitic tuffs and flows that are medium to dark grayish green in color with minor felsic and mafic meta-volcanics. The felsic meta-volcanic rock is described as metamorphosed daeitic to rhyolitic flows and tuffs that is light gray to greenish gray in color that interbedded with intermediate meta-volcanic rock. Instances of exposed bedrock along project channels.

Sources:

<http://www.geology.enr.state.nc.us/usgs/carolina.htm>

<http://www.geology.enr.state.nc.us/Mineral%20resources/mineralresources.html>

2.5 Vegetation

Upland portions of the Site maintained for cattle grazing are dominated by pasture grasses including tall fescue (*Schedonorus arundinaceus*), bermudagrass (*Cynodon dactylon*), and red fescue (*Festuca rubra*). Herbaceous vegetation in wetland and riparian areas includes tearthumb (*Polygonum sagittatum*), common rush (*Juncus effuses*), spotted ladysthumb (*Polygonum persicaria*), yellow jewelweed (*Impatiens pallida*), *Carex* species (*Carex spp.*), and Japanese stilt grass (*Microstegium vimineum*). Forested riparian areas are generally narrow or discontinuous, but common tree species present in the canopy are American sycamore (*Platanus occidentalis*), green ash (*Fraxinus pennsylvanica*), sweetgum



(*Liquidambar styraciflua*), yellow poplar (*Liriodendron tulipifera*), and red maple (*Acer rubrum*). Additional woody plants present in smaller proportions or lower strata include eastern red cedar (*Juniperus virginiana*), white oak (*Quercus alba*), hazel alder (*Alnus serrulata*), black willow (*Salix nigra*), paw paw (*Asimina triloba*), greenbriar (*Smilax rotundifolia*), Chinese privet (*Ligustrum sinense*), and Japanese honeysuckle (*Lonicera japonica*).

2.6 Site Constraints and Access

The Site is accessible via a gravel driveway off Roxboro Road. Three internal easement crossings for farm use are part of the proposed conservation easement. These breaks are not included in the credits calculated for the project. In places, the Site’s easement and planting will extend beyond the required 50-foot minimum riparian buffer for streams in the Falls Lake Watershed. There are no known airport facilities within five miles of the project area (Figure 1). There are no other known constraints on the proposed Site. A permanent access easement from Roxboro Road to the Site is recorded.

2.7 Current Site Resources

On February 23, 2018, Ms. Katie Merritt, with DWR, conducted on-site determinations to review features and land use within the project boundary. The resulting DWR site viability letter and map confirming the Site as suitable for riparian buffer mitigation has been included in the Appendix.

2.8 Historic Site Resources

The Catfish Pond Buffer Mitigation Site has historically been forested or used for agricultural purposes. Historic aerial photos are included in the Appendix and date back to 1940, showing the site in various stages of timber clearing, row crop production, and open pasture. In general, this area has maintained its rural, farming character over the last 78 years with only minor changes in land cover.

3.0 Site Protection Instrument

3.1 Site Protection Instruments Summary Information

The land required for riparian area planting, management, and stewardship of the mitigation project includes portions of the parcels listed in Table 5. An option agreement for the project area has been signed by the property owner and a Memorandum of Option has been recorded at the Durham County Register of Deeds. The proposed conservation easement on this property has not yet been recorded.

Table 5: Site Protection Instrument – Catfish Pond Mitigation Site

Landowner	PIN	County	Site Protection Instrument	Deed Book and Page Number	Acreage to be Protected
Gary Penny Jack B. Penny, Jr Richard Penny	0827-02-67-0407 0827-02-68-0515	Durham	CE	DB: 8235 PG: 776-780	20.73

All site protection instruments require 60-day advance notification to the Corps and the State prior to any action to void, amend, or modify the document. No such action shall take place unless approved by the State.

4.0 Regulatory Considerations

Table 6, below, is a summary of regulatory considerations for the Site. These considerations are expanded upon in Sections 4.1-4.3. A copy of the signed Categorical Exclusion Form for the project can be found in the Catfish Pond Stream Mitigation Plan



Table 6: Project Attribute Table – Catfish Pond Mitigation Site

Regulatory Considerations			
Parameters	Applicable?	Resolved?	Supporting Docs?
Water of the United States - Section 404	Yes	Yes	(Appendix) Site Viability Letter
Water of the United States - Section 401	Yes	Yes	(Appendix) Site Viability Letter
Endangered Species Act	Yes	Yes	Catfish Pond Stream Mitigation Plan Appendix (Categorical Exclusion)
Historic Preservation Act	Yes	Yes	Catfish Pond Stream Mitigation Plan Appendix (Categorical Exclusion)
Coastal Zone Management Act	No	No	N/A
FEMA Floodplain Compliance	Yes	In Process	N/A
Essential Fisheries Habitat	No	N/A	N/A

4.1 Threatened and Endangered Species

The NC Natural Heritage Program (NHP) database and the US Fish and Wildlife Service (USFWS) database were searched for federally listed threatened and endangered plant and animal species in Durham County, NC. Three federally listed species, the bald eagle (*Haliaeetus leucocephalus*), smooth coneflower (*Echinacea laevigata*), and Michaux’s sumac (*Rhus michauxii*) are currently listed in Durham County. Table 7 lists their federal status and habitat.

Table 7: Listed Threatened and Endangered Species in Durham County, NC – Dry Creek Mitigation Site

Species	Federal Status	Habitat
Vertebrate		
Bald eagle (<i>Haliaeetus leucocephalus</i>)	BGPA	Near large open water bodies: lakes, marshes, seacoasts, and rivers
Vascular Plant		
Smooth coneflower (<i>Echinacea laevigata</i>)	E	Glades, woodlands, cedar barrens and open areas over mafic rocks.
Michaux’s sumac (<i>Rhus michauxii</i>)	E	Woodland edges, woodland, sandhills and sandy forest.

E = Endangered; BGPA=Bald & Golden Eagle Protection Act

The USFWS does not currently list any Critical Habitat Designations for any of the Federally listed species within Durham County. Wildlands requested review and comment from the United States Fish and Wildlife Service on February 9, 2018 in respect to the Catfish Pond Mitigation Site and its potential impacts on threatened or endangered species. USFWS responded on March 2, 2018 and stated the “proposed action is not likely to adversely affect any federally listed endangered or threatened species, their formally designated critical habitat or species currently proposed for listing under the Act”. All correspondence with USFWS is include in the approved Categorical Exclusion found in the Catfish Pond Stream Mitigation Plan

A pedestrian survey conducted on April 13, 2018 indicated that the Site provides suitable habitat for the smooth coneflower and Michaux’s sumac but no species were identified on the site. Therefore,



Wildlands determined that the project would have “no effect: on any of the three federally listed species.

4.2 Cultural Resources and Significant Natural Heritage Areas

The National Historic Preservation Act declares a national policy of historic preservation to protect, rehabilitate, restore, and reuse districts, sites, buildings, structures, and objects significant in American architecture, history, archaeology, and culture, and Section 106 mandates that federal agencies take into account the effect of an undertaking on a property that is included in, or is eligible for inclusion in, the National Register of Historic Places.

There are no existing structures in the project area. The Site is not located near any sites listed on the National Register with the State Historic Preservation Office (SHPO). SHPO was contacted in a letter dated February 9, 2018 and had no concerns or comments on the project site. The approved Categorical Exclusion for the project is located in the Dry Creek Stream Mitigation Plan.

4.3 FEMA Floodplain Compliance

The project is within the FEMA FIRM panel 3720082700J, effective October 19, 2018. The streams within the project limits are outside the Special Flood Hazard Area with the exception of the lower extent of Catfish Creek. Approximately 400 feet of Catfish Creek experiences backwater from Mountain Creek floodplain and lies within Zone AE. The project design has been developed to avoid hydrologic trespass to adjacent property. The E2 approach minimizes change to the profile and cross section, thus reducing the risk of changes to flooding.

Wildlands will coordinate with Durham County to obtain a floodplain development permit, if necessary.

4.4 Other Environmental Issues

An EDR Radius Map Report with Geocheck was ordered for the Site through Environmental Data Resources, Inc. on January 29, 2018. The target property and the adjacent properties are not listed in any of the Federal, State, or Tribal environmental databases searched by EDR. There were no known or potential hazardous waste sites identified within one mile of the Parcel.



5.0 Determination of Credits

Mitigation credits presented in Table 8a and 8b and Figures 6 and 9 are projections based upon site design and are intended to be used as either riparian buffer credits or nutrient offset credits, dependent on the need. Upon completion of site construction, the project components and credits data will be revised to be consistent with the as-built condition.

Table 8a: Buffer Project Areas and Assets: Riparian Buffer Credits – Catfish Pond Mitigation Site

Jurisdictional Streams	Restoration Type	Requested Credit Type	Feature Name	Min-Max Buffer Width (ft)	Total Area (sf)	Creditable Area (sf)	Initial Credit Ratio (x:1)	% Full Credit	Final Credit Ratio (x:1)	Riparian Buffer Credits (BMU)
Subject or Nonsubject	Restoration	Stream	Catfish Creek, Mountain Tributary, and UT1	30-49	5,598	5,598	1	100%	1.0000	5,598.000
				50-100	254,366	254,366	1	100%	1.0000	254,366.000
				101-200	1,424	1,424	1	33%	3.03030	469.920
Subject or Nonsubject	Enhancement via Cattle Exclusion	Stream	Catfish Creek, Mountain Tributary, UT1, UT2	0-100	521,936	521,936	2	100%	1.0000	260,968.000
				101-200	5,610	5,610	2	33%	6.06061	925.649
									Total:	522,327.570

Table 8b: Buffer Project Areas and Assets: Convertible to Nutrient Offset Credits – Catfish Pond Mitigation Site

Location	Jurisdictional Streams	Restoration Type	Reach ID / Component	Buffer Width (ft)	Creditable Area (ac)*	Creditable Area (sqft)	Eligible Credit Area (ac)**	Convertible to Nutrient offset (Yes or No)	Nutrient Offset: N (lbs)	Nutrient Offset: P (lbs)
Rural or Urban	Subject or Nonsubject	Restoration	Catfish Creek, Mountain Tributary, and UT1	0-200	5.8722	255,790	5.8722	Yes	13,347.464	859.680
								Total	13,347.464	859.680

*The above creditable areas all meet the 50-foot minimum width for nutrient offset credits. Small sections along Catfish Creek R7 (20 lf), Mountain Tributary (26 lf), and UT1 R1 (19 lf), R2 (40 lf, by crossing) & R4 (11 lf) have buffer widths of 30-49 feet, and do not meet nutrient offset requirements. These can be seen when comparing Figure 6 – Buffer Credit Calcs Map with Figure 9 – Nutrient Offset Map and represent the differences between buffer credit area and nutrient credit area. This difference totals 5,597 sf.

** Impacts that occur in the watershed of Falls Lake in the upper Neuse River Basin may be offset only by load reductions in the same watershed; 15A NCAC 02B .0282 (2) (Figure 10)

6.0 Mitigation Work Plan

The Wildlands Team proposes to restore high quality ecological function to Catfish Creek and three unnamed tributaries on the Site. Riparian restoration and enhancement will occur adjacent to mitigated stream onsite. The ecological uplift can be summarized as transforming agriculturally impacted areas to a protected forested riparian corridor. The project design will ensure that no adverse impacts to wetlands or existing riparian areas occur. All riparian restoration activities will commence in concurrence with the stream mitigation activities and not before. Therefore, the mitigation area where riparian restoration is being performed may be altered slightly depending on the implementation of the Catfish Pond Stream Mitigation Plan. Figure 7 illustrates the conceptual design for the Site. More detailed descriptions of the proposed restoration activity follow in Sections 6.1 through 6.3.

6.1 Parcel Preparation

An in-line pond on Catfish Creek will be removed as part of the stream restoration. Stream restoration through the pond is shown on plan sheet 2.6 in Appendix 7. The earthen dam is proposed to be removed and a portion of the dam will be used to fill the pond bottom to provide a stable foundation for construction of the new channel. The remainder of the excavated material will be used to fill portions of the old channels in other areas of the site. Once the dam is removed, the stream restoration will begin near the upstream extent of the existing impoundment. Below the existing dam the restored channel will follow the existing alignment until it reaches the confluence with UT1. Further details on pond removal are provided on plan sheet 6.10 in Appendix 7.

There are no additional permits necessary outside of the 401/404 permits for the pond removal.

The restoration areas will be planted using hand labor with dibble bars or other acceptable forestry practices.

Several invasive species have been identified on site. During the construction for the Catfish Pond Stream Mitigation Plan, dense areas of invasive species will be treated.

6.2 Riparian Area Restoration Activities

The revegetation plan for the riparian restoration area will include permanent seeding, planting bare root trees, live stakes, and herbaceous plugs. These revegetation efforts will be coupled with treating invasive species. The specific species composition to be planted was selected based on the community type, observation of occurrence of species in riparian areas adjacent to the Parcel, and best professional judgement on species establishment and anticipated site conditions in the early years following project implementation. Tree species planted across the riparian areas of the site will include a mixture of the following species: American sycamore (*Platanus occidentalis*), green ash (*Fraxinus pennsylvanica*), river birch (*Betula nigra*), eastern cottonwood (*Populus deltoids*), willow oak (*Quercus phellos*), Shumard oak (*Quercus shumardii*), swamp chestnut oak (*Quercus michauxii*), white oak (*Quercus alba*), overcup oak (*Quercus lyrata*), possumhaw viburnum (*Viburnum nudum*), Allegheny serviceberry (*Amelanchier laevis*), and red buckeye (*Aesculus pavia*).

Trees will be planted at a density sufficient to meet the performance standards outlined in the Rule 15A NCAC 02B .0295 of 260 trees per acre at the end of five years. A planting plan is provided on plan sheet 5.0 – 5.7 in Appendix 7. No one tree species will be greater than 50% of the established stems. An appropriate seed mix will also be applied as necessary to provide temporary ground cover for soil stabilization and reduction of sediment loss during rain events in disturbed areas. This will be followed by an appropriate permanent seed mixture. Planting is scheduled to begin in January 2020.



Vegetation management and herbicide applications may be needed during tree establishment in the restoration areas to prevent establishment of invasive species that could compete with the planted native species. An invasive species plan is provided in Appendix 8.

6.3 Riparian Area Enhancement Activities

Cattle will be excluded using permanent fencing in the buffer enhancement areas (Figure 7) as followed by 15A NCAC 02B .0296(o). The enhancement area will be protected in perpetuity under a conservation easement. Planting isn't anticipated to be needed except where require in the stream mitigation planting plan, which is included with the preliminary plans. A seed mix will be applied where cattle have caused bare soils and removed all vegetation if sufficient sunlight is possible to grow the species in the seed mix.

Cattle will be fenced out of the easement area. The proposed fencing boundary is shown in Figure 6.

7.0 Performance Standards

The performance criteria for the Site follows approved performance criteria presented in the guidance documents outlined in RFP 16-007242 and the Consolidated Buffer Rule (15A NCAC 02B .0295). Annual monitoring and semi-annual site visits will be conducted to assess the condition of the finished project. The riparian restoration project has been assigned specific performance criteria components for vegetation. Performance criteria will be evaluated throughout the five-year post-construction monitoring. An outline of the performance criteria components follows.

7.1 Vegetation

The final vegetative success criteria will be the health, survival, and density of at least 260 stems per acre at the end of the fifth year of monitoring, with a minimum of four native hardwood tree or shrub species composition and no one species comprises more than 50 percent of stems. Vigor, species composition, and density will all be assessed. The extent of invasive species coverage will also be monitored and controlled as necessary throughout the required monitoring period.

7.2 Photo Reference Stations

Photographs will be taken within the project area once a year to visually document stability for five years following construction. Permanent markers will be established and located with GPS equipment so that the same locations and view directions on the Site are photographed each year.

7.3 Visual Assessments

Visual assessments should support the specific performance standards for each metric as described above. Visual assessments will be performed within the Site on a semi-annual basis during the five-year monitoring period. Problem areas with vegetative health will be noted (e.g. low stem density, vegetation mortality, invasive species or encroachment). Areas of concern will be mapped and photographed accompanied by a written description in the annual report. Problem areas will be re-evaluated during each subsequent visual assessment. Should remedial actions be required, recommendations will be provided in the annual monitoring report.

To ensure compliance with 0295 (0) (6): A visual assessment of the cattle exclusion and preservation areas within the conservation easement will also be performed each year to confirm:

- Fencing is in good condition throughout the site; no cattle access within the conservation easement area; no encroachment has occurred; diffuse flow is being maintained in the conservation easement area; and there has not been any cutting, clearing, filling, grading, or similar activities that would negatively affect the functioning of the riparian area.



- Any issues identified during the visual assessment of the cattle exclusion and preservation areas will be photographed and mapped as part of the annual monitoring report with remedial efforts proposed or documented.

7.4 Reporting Performance Criteria

Using the DMS Riparian Buffer and Nutrient Offset Buffer Baseline and Annual Monitoring Report Template version 2.0 (May 2017), a baseline monitoring document and as-built record drawings of the project will be developed for the constructed Site. Complete monitoring reports will be prepared in the fall of each monitoring year and submitted to DMS. Annual monitoring reports will be based on the above referenced DMS Template (May 2017). The monitoring period will extend five years beyond completion of construction or until performance criteria have been met.

7.5 Maintenance and Contingency Plans

The Wildlands Team will develop necessary adaptive measures or implement appropriate remedial actions in the event that the Site or a specific component of the Site fails to achieve the success criteria outlined above. The project-specific monitoring plan developed during the design phase will identify an appropriate threshold for maintenance intervention based on the monitored items. Any actions implemented will be designed to achieve the success criteria specified previously, and will include a work schedule and updated monitoring criteria (if applicable).

8.0 Monitoring Plan

The Site monitoring plan has been developed to ensure that the required performance standards are met and project goals and objectives are achieved. The monitoring report shall provide project data chronology that will facilitate an understanding of project status and trends, ease population of DMS databases for analysis and research purposes and assist in close-out decision making.

8.1 Monitoring Components

Project monitoring components are listed in more detail in Table 9 and Figure 8.

8.2 Vegetation

Vegetation monitoring quadrants will be installed across the Site to measure the survival of the planted trees (Figure 8). Planted stems in the monitoring plot will all be flagged. The first annual monitoring activities will commence at the end of the first growing season, at least five months after planting has been completed, and will be reassessed annually no earlier than the Fall of each year. Species composition, density, and survival rates will be evaluated on an annual basis by plot and for the entire site. The number of monitoring quadrants required and frequency of monitoring will be based on the DMS monitoring guidance documents. Vegetation monitoring will follow the CVS-EEP Protocol for Recording Vegetation (2008) or another DMS approved protocol. Reference photographs of the vegetation plots and Site will be taken during the annual vegetation assessments. Planted vegetation must average 7 feet in height at the end of MY5. Survival rate will be 320 stems per acre at MY3 and 260 stems per acre at MY5.

8.3 Photo reference stations

Photographs will be taken within the project area once a year to visually document stability for five years following construction. Permanent markers will be established and located with GPS equipment so that the same locations and view directions on the Site are photographed each year.

8.4 Visual Assessment

Visual assessments will be performed within the Site on a semi-annual basis during the five-year monitoring period. Problem areas with vegetative health will be noted (e.g. low stem density, vegetation mortality, invasive species or encroachment).



Table 9: Monitoring Components – Catfish Pond Mitigation Site

Parameter	Monitoring Feature	Quantity	Frequency
Vegetation	CVS Level 2	5	Annual
Visual Assessment		Yes	Semi-Annual
Exotic and nuisance vegetation			Semi-Annual
Project Boundary			Semi-Annual

9.0 Long-Term Management Plan

The Site will be transferred to the North Carolina Department of Environmental Quality (NCDEQ) Stewardship Program. This party shall serve as conservation easement holder and long-term steward for the property and will conduct periodic inspection of the site to ensure that restrictions required in the conservation easement are upheld. The NCDEQ Stewardship Program is developing an endowment system within the non-reverting, interest-bearing Conservation Lands Conservation Fund Account. The use of funds from the Endowment Account will be governed by North Carolina General Statute GS 113A-232(d)(3). Interest gained by the endowment fund may be used for stewardship, monitoring, stewardship administration, and land transaction costs, if applicable.

The Stewardship Program will periodically install signage as needed to identify boundary markings as needed (Table 10). Any future livestock or associated fencing or permanent crossings will be the responsibility the owner of the underlying fee to maintain.

Table 10: Long-term Management Plan – Catfish Pond Mitigation Site

Long-Term Management Activity	Long-Term Manager Responsibility	Landowner Responsibility
Signage will be installed and maintained along the Site boundary to denote the area protected by the recorded conservation easement.	The long-term steward will be responsible for inspecting the Site boundary and for maintaining or replacing signage to ensure that the conservation easement area is clearly marked.	The landowner shall report damaged or missing signs to the long-term manager, as well as contact the long-term manager if a boundary needs to be marked, or clarification is needed regarding a boundary location. If land use changes in future and fencing is required to protect the easement, the landowner is responsible for installing appropriate approved fencing.
The Site will be protected in its entirety and managed under the terms outlined in the recorded conservation easement.	The long-term manager will be responsible for conducting annual inspections and for undertaking actions that are reasonably calculated to swiftly correct the conditions constituting a breach. The USACE, and their authorized agents, shall have the right to enter and inspect the Site and to take actions necessary to verify compliance with the conservation easement.	The landowner shall contact the long-term manager if clarification is needed regarding the restrictions associated with the recorded conservation easement.

10.0 Adaptive Management Plan

Upon completion of Site construction, Wildlands will implement the post-construction monitoring defined in Section 8. Project maintenance will be performed during the monitoring years to address minor issues as necessary. If, during annual monitoring it is determined the Site's ability to achieve Site performance standards are jeopardized, Wildlands will notify the members of DMS/NCDWR and work with the DMS/NCDWR to develop contingency plans and remedial actions.

The Wildlands Team will develop necessary adaptive measures or implement appropriate remedial actions in the event that the Site or a specific component of the Site fails to achieve the success criteria outlined above. The project-specific monitoring plan developed during the design phase will identify an appropriate threshold for maintenance intervention based on the monitored items. Any actions implemented will be designed to achieve the success criteria specified previously and will include a work schedule and updated monitoring criteria (if applicable).

11.0 References

Natural Resources Conservation Service (NRCS). Web Soil Survey of Durham County.

<http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>

North Carolina Division of Water Quality (NCDWQ), 2011. Surface Water Classifications.

<http://deq.nc.gov/about/divisions/water-resources/planning/classification-standards/classifications>

North Carolina Geological Survey (NCGS), 1985, Geologic Map of North Carolina: Raleigh, North Carolina Department of Natural Resources and Community Development, Geological Survey Section, scale 1:500,00, in color.

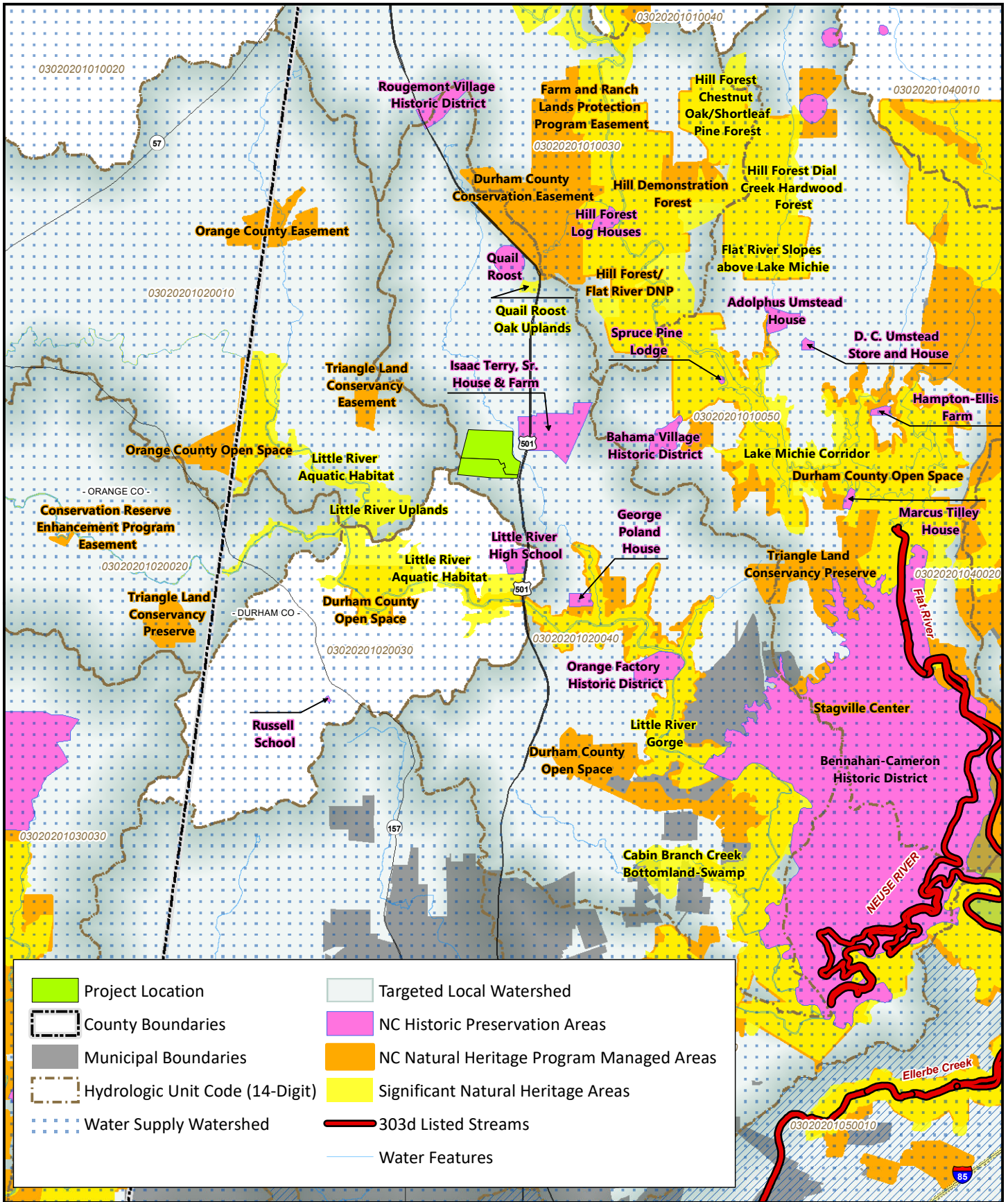
NCGS, 2013. Mineral Resources. <http://deq.nc.gov/about/divisions/energy-mineral-land-resources/north-carolina-geological-survey/mineral-resources>

North Carolina Natural Heritage Program (NHP), 2018. Natural Heritage Element Occurrence Database, Durham County, NC.

United States Fish and Wildlife Service (USFWS), 2018. Endangered Species, Threatened Species, Federal Species of Concern and Candidate Species, Durham County, NC.

<https://www.fws.gov/raleigh/species/cntylist/durham.html>





0 0.75 1.5 Miles



Figure 1 Vicinity Map
 Catfish Pond Mitigation Site
 Riparian Buffer Mitigation Plan
 Neuse River Basin 03020201

Durham County, NC

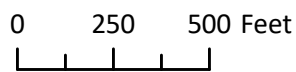
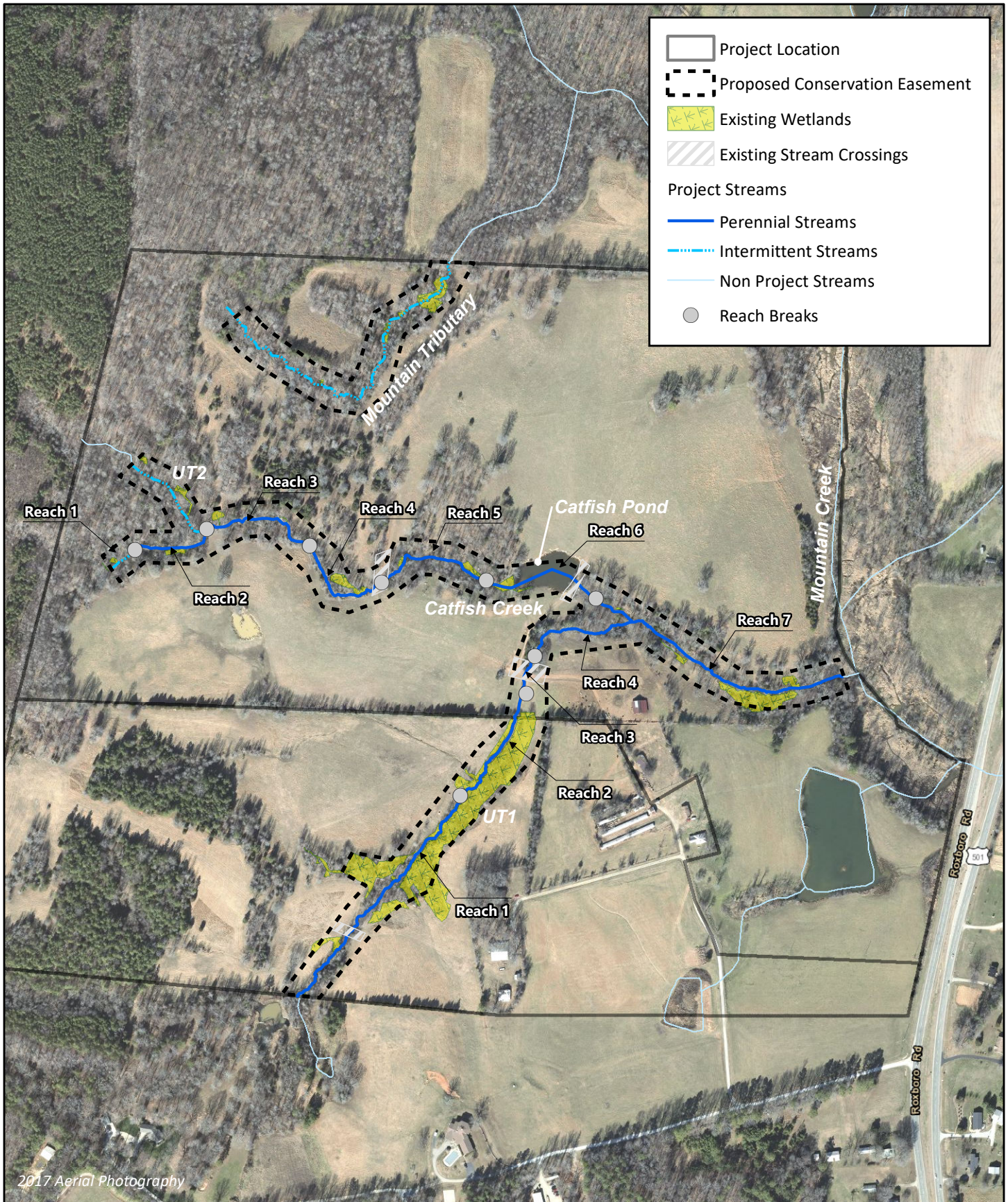


Figure 2 Site Map
 Catfish Pond Mitigation Site
 Riparian Buffer Mitigation Plan
 Neuse River Basin 03020201

Durham County, NC

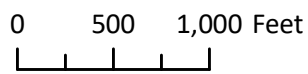
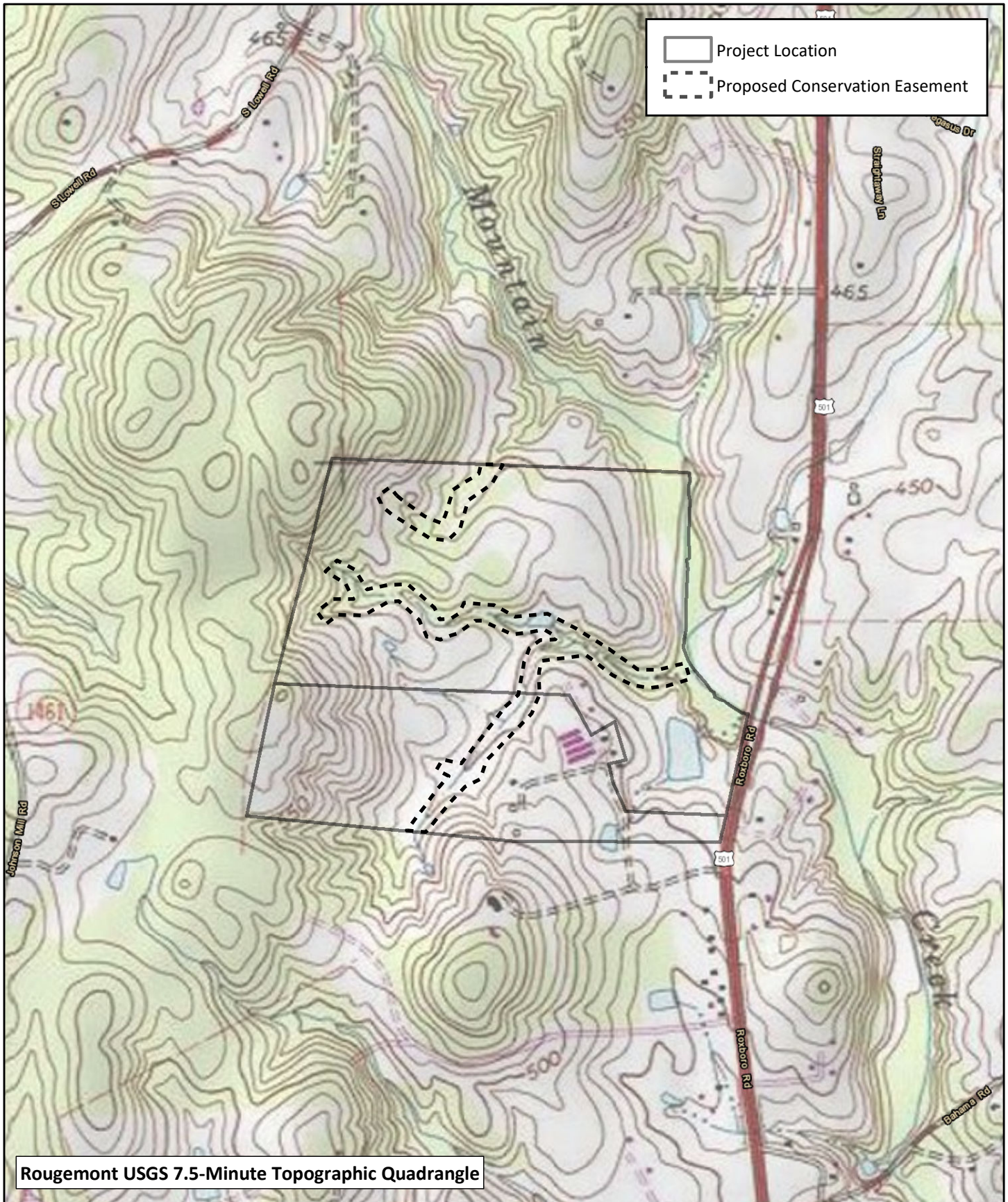
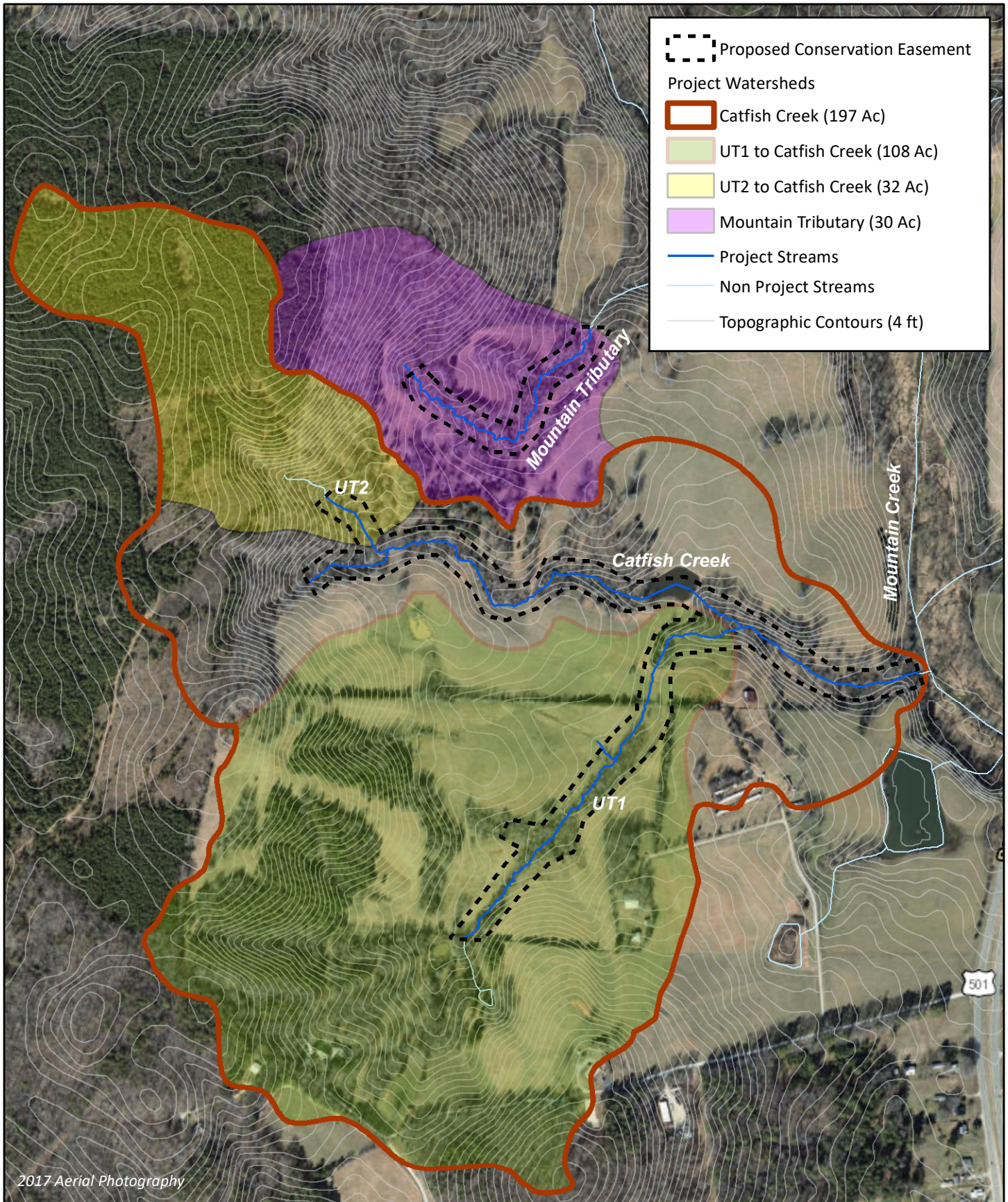










Figure 3 USGS Topographic Map
Riparian Buffer Mitigation Plan
Catfish Pond Mitigation Site
Neuse River Basin 03020201



-  Proposed Conservation Easement
- Project Watersheds**
-  Catfish Creek (197 Ac)
-  UT1 to Catfish Creek (108 Ac)
-  UT2 to Catfish Creek (32 Ac)
-  Mountain Tributary (30 Ac)
-  Project Streams
-  Non Project Streams
-  Topographic Contours (4 ft)

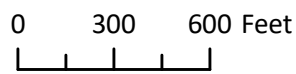


Figure 4 Watershed Map
 Catfish Pond Mitigation Site
 Riparian Buffer Mitigation Plan
 Neuse River Basin 03020201

Durham County, NC

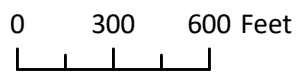
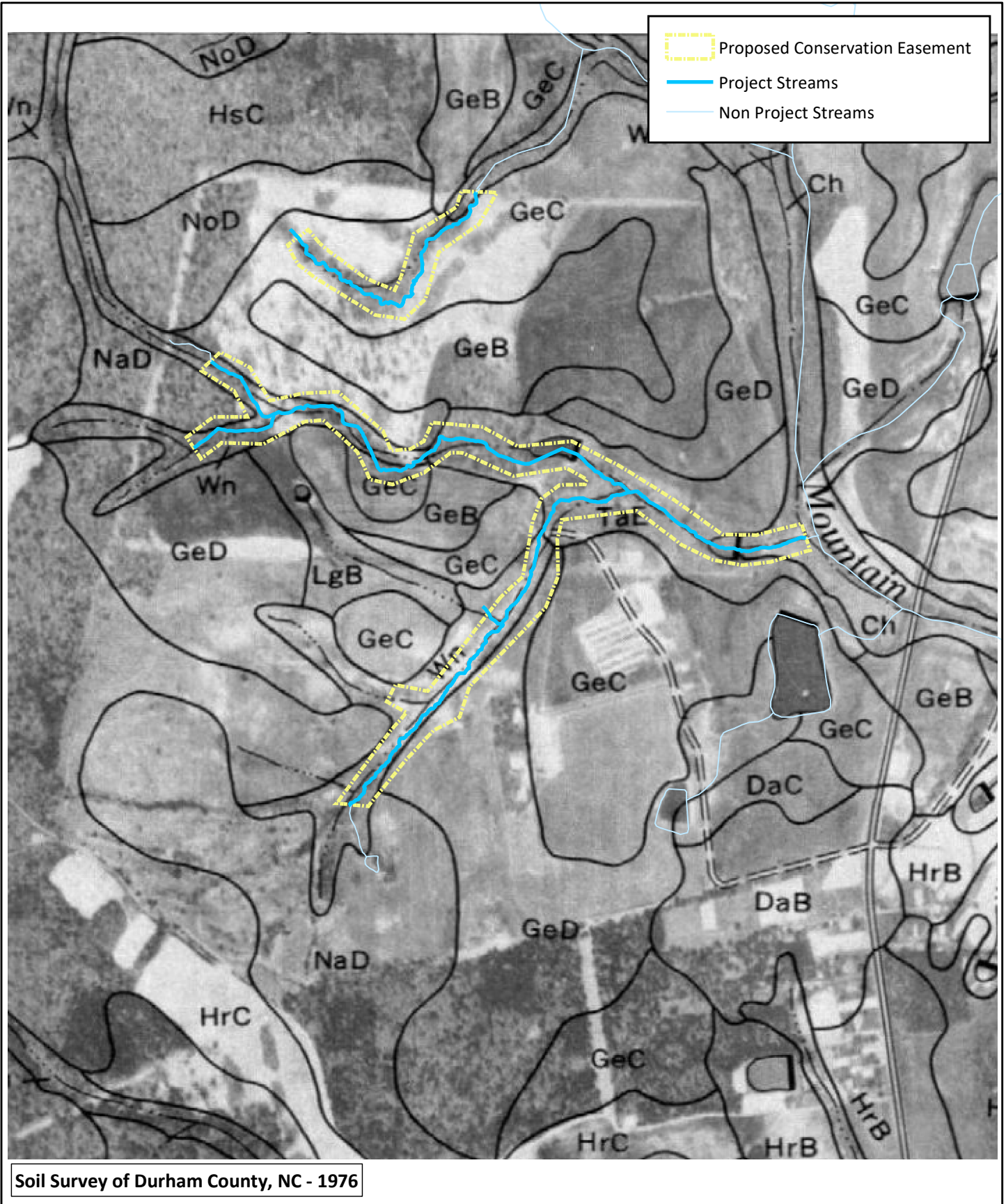
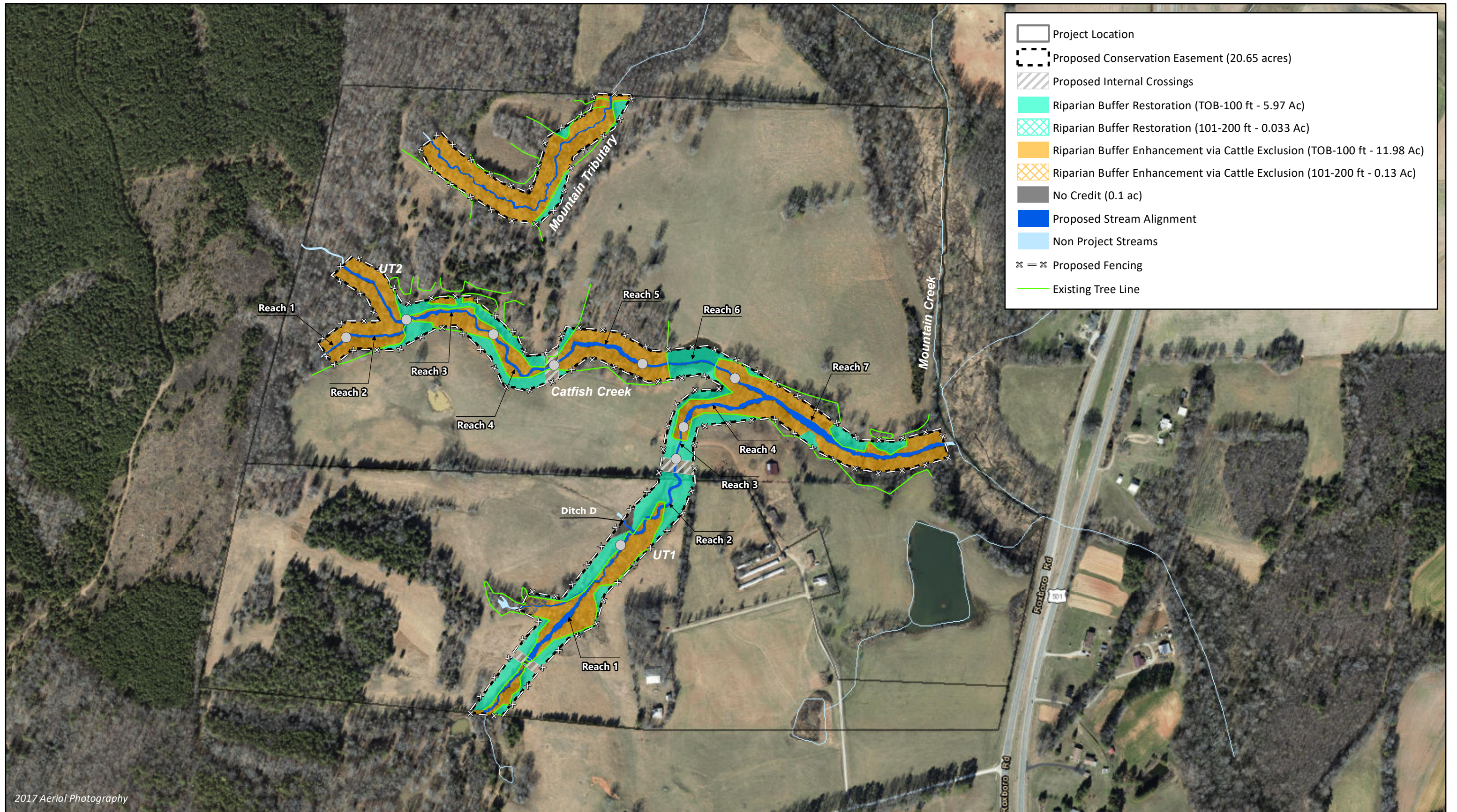
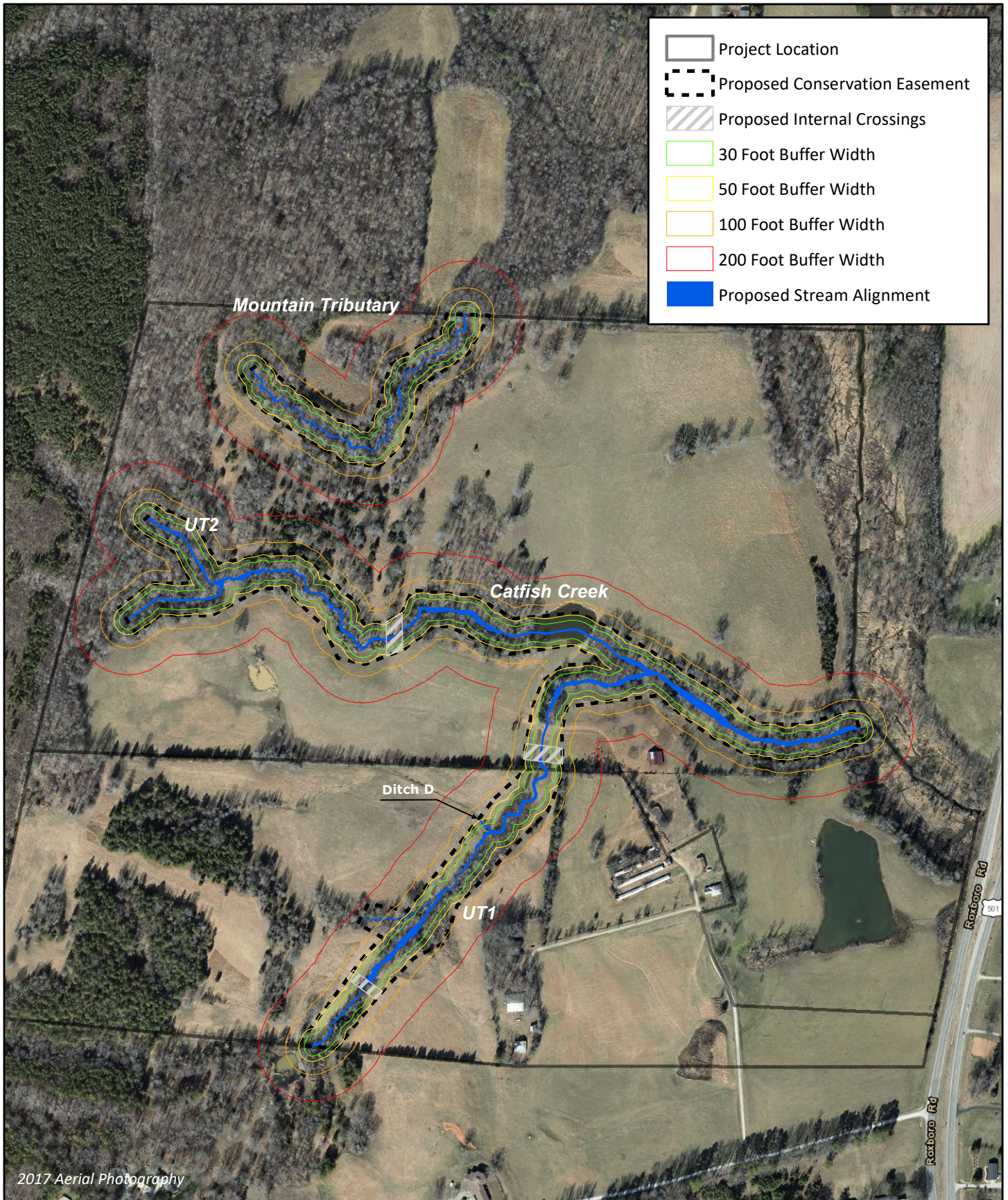


Figure 5 NRCS 1976 Soils Map
 Catfish Pond Mitigation Site
 Riparian Buffer Mitigation Plan
 Neuse River Basin 03020201

Durham County, NC





	Project Location
	Proposed Conservation Easement
	Proposed Internal Crossings
	30 Foot Buffer Width
	50 Foot Buffer Width
	100 Foot Buffer Width
	200 Foot Buffer Width
	Proposed Stream Alignment

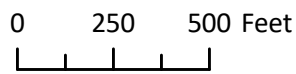
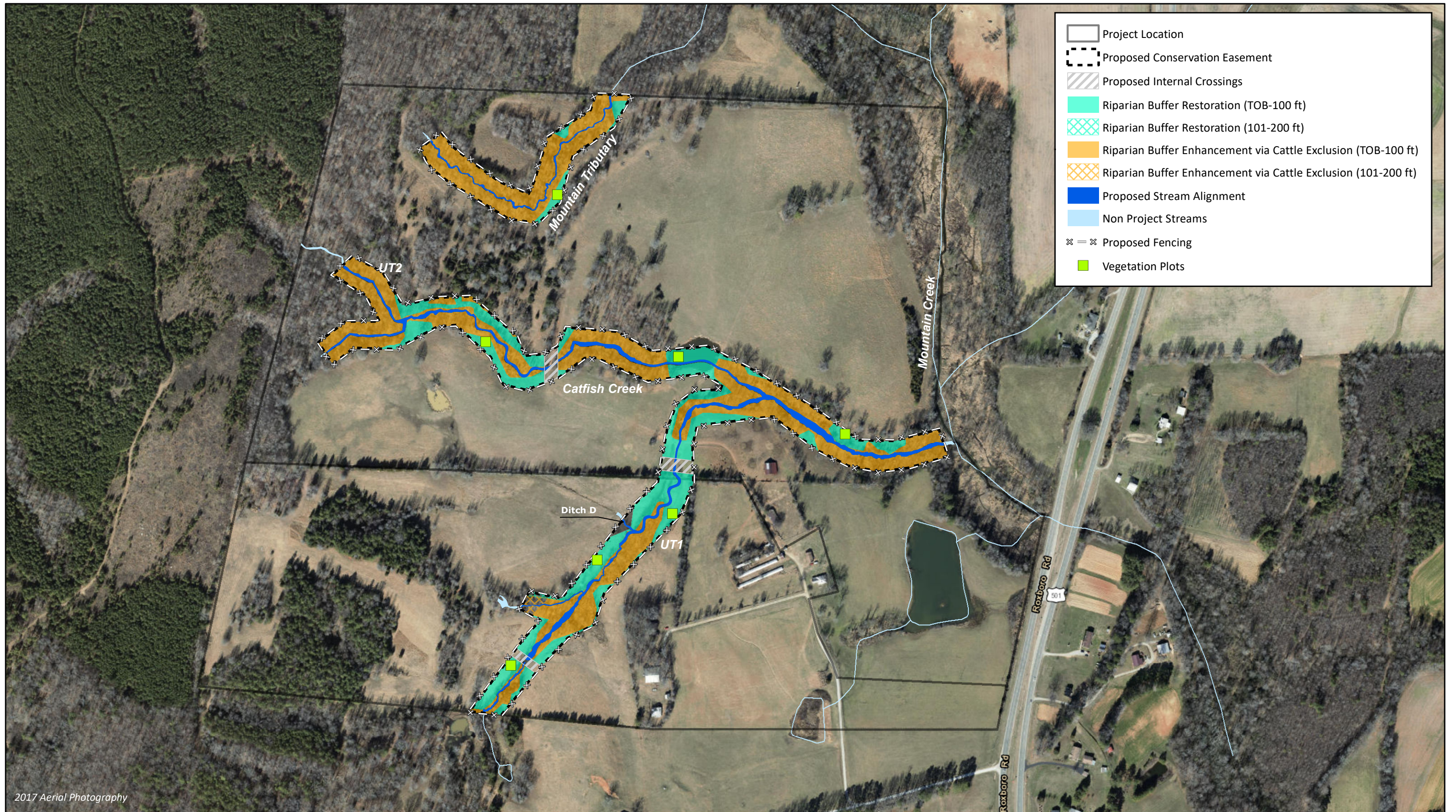


Figure 7 Riparian Buffer Zones Map
 Catfish Pond Mitigation Site
 Riparian Buffer Mitigation Plan
 Neuse River Basin 03020201

Durham County, NC



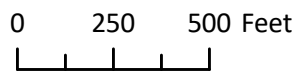
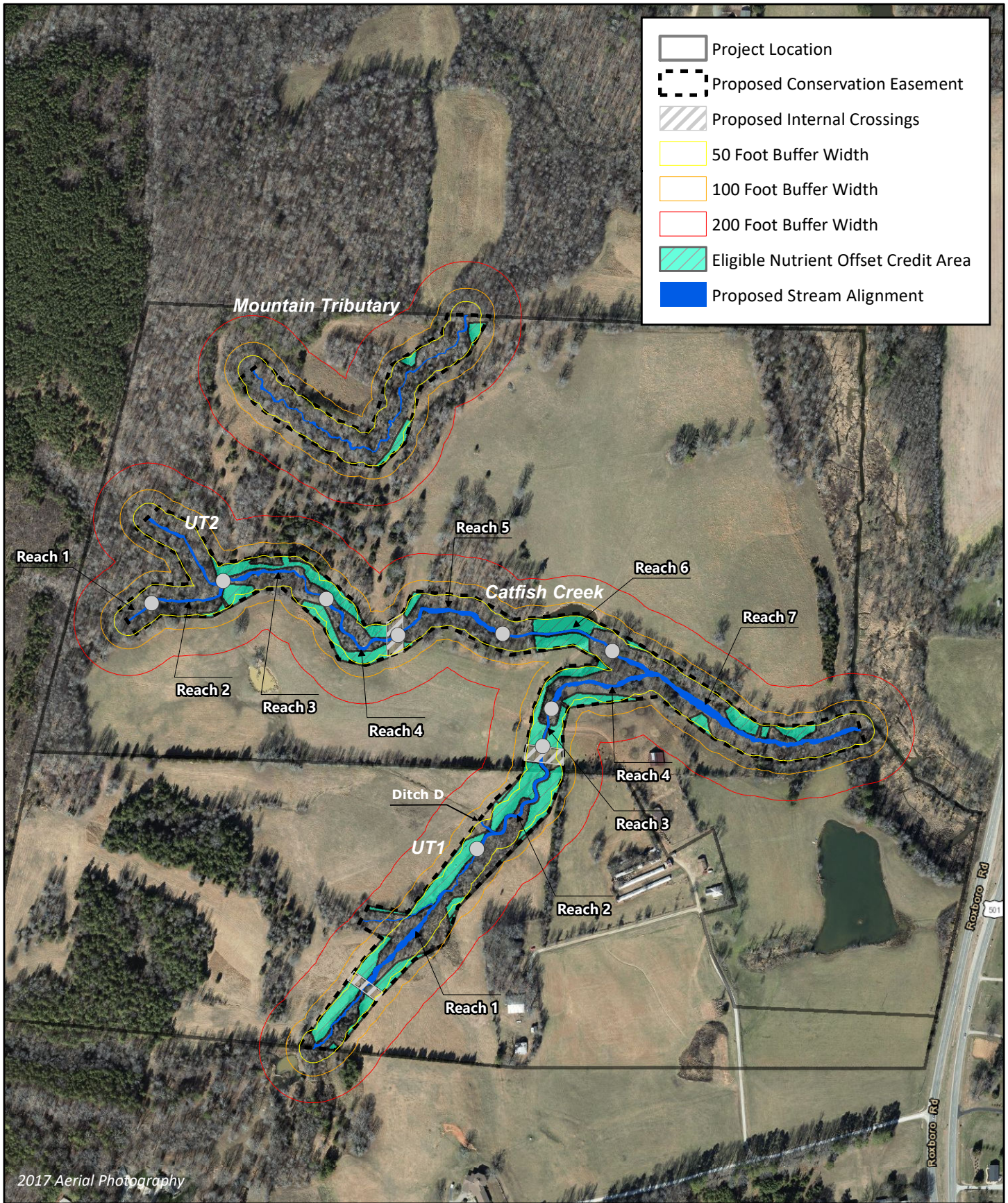
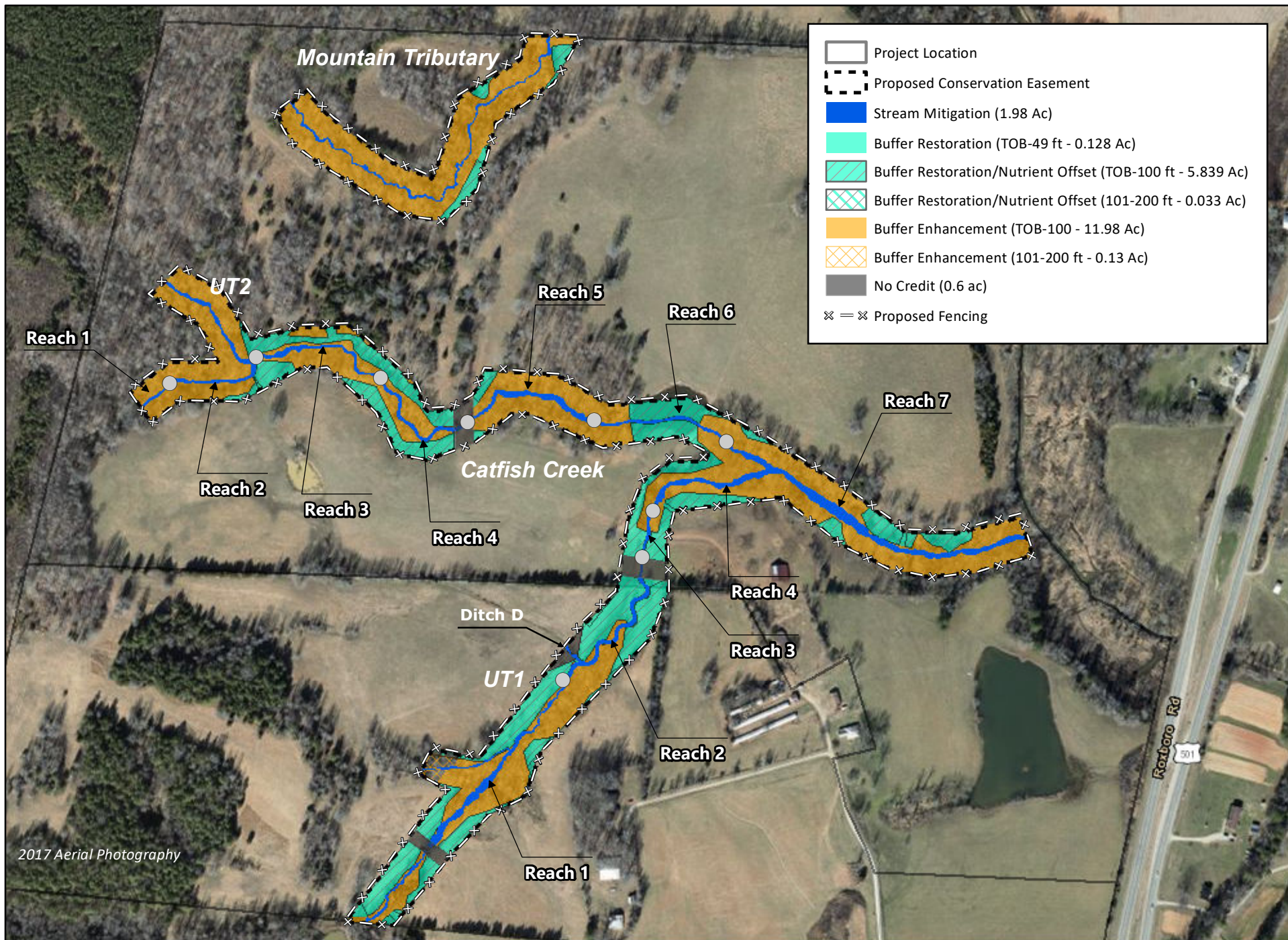


Figure 9 Nutrient Offset Zones Map
 Catfish Pond Mitigation Site
 Riparian Buffer Mitigation Plan
 Neuse River Basin 03020201

Durham County, NC



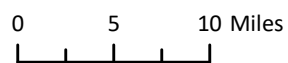
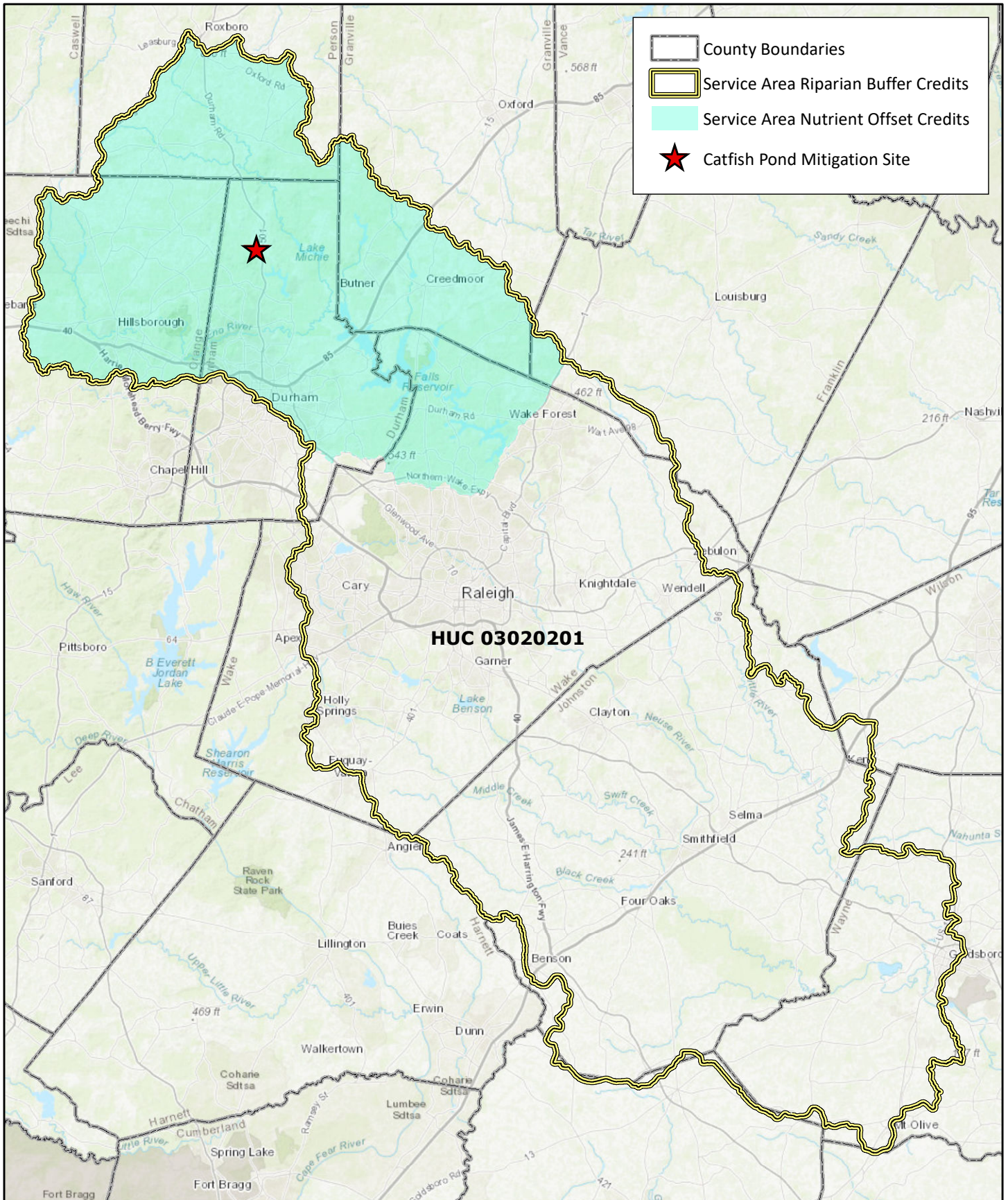


Figure 10 Service Area Map
Catfish Pond Mitigation Site
Riparian Buffer Mitigation Plan
Neuse River Basin 03020201

Durham County, NC

Appendix 12-a Catfish Pond Existing Conditions Photographs



Catfish Creek (R1-R2) - August 2018



Catfish Creek (R3) - August 2018



Catfish Creek (R4)



Catfish Creek (R5)



Catfish Creek (R6) - August 2018



Catfish Creek (R7) - April 2018



Mountain Tributary - April 2018



UT1 (R1)- August 2018



UT1 (R2) - April 2018



UT1 (R4) - August 2018



Feature D - August 2018



UT2 - August 2018



Catfish Pond livestock - August 2018



Appendix 12-b. Catfish Pond Buffer Viability Letter

ROY COOPER
Governor
MICHAEL S. REGAN
Secretary
LINDA CULPEPPER
Interim Director

March 13, 2018

DWR ID# 2018-0196
Johnston County

Wildlands Engineering, Inc.
Attn: John Hutton
312 West Millbrook Rd, Suite 225
Raleigh, NC 27609
(via electronic mail: scott@waterlandsolutions.com)

Re: Site Viability for Buffer Mitigation & Nutrient Offset – Catfish Pond Site
Off US-501 (36.158391, -78.907343)
Neuse 03020201 (Falls Lake WS)
Durham County

Dear Mr. Hutton,

On February 23, 2018, Katie Merritt, with the Division of Water Resources (DWR), assisted you and others from Wildlands Engineering, Inc. at the proposed Catfish Pond Mitigation Site (Site) in Bahama, NC. The Site is located in the Falls Lake WS of the Neuse River Basin within the 8-digit Hydrologic Unit Code 03020201. The Site is being proposed as part of a full-delivery stream restoration project for the Division of Mitigation Services (RFP #16-007279). Members of the Interagency Review Team (IRT) and Division of Mitigation Services were also present onsite. At your request, on February 23, 2018, Ms. Merritt performed an onsite assessment of riparian land uses adjacent to streams and ditches onsite, which are shown on the attached map labeled “Figure 6A Concept Map”.

Ms. Merritt’s evaluation of the features onsite and their associated mitigation determination for the riparian areas are provided in the table below. This evaluation was made from Top of Bank (TOB) out to 200’ from each feature for buffer mitigation pursuant to 15A NCAC 02B .0295 (effective November 1, 2015) and for nutrient offset credits pursuant to 15A NCAC 02B .0240.

<u>Feature</u>	<u>Classification</u>	<u>¹Subject to Buffer Rule</u>	<u>Riparian Land uses adjacent to Feature (0-200’)</u>	<u>Buffer Credit Viable</u>	<u>²Nutrient Offset Viable at 2,273 lbs/acre</u>	<u>Mitigation Type Determination w/in riparian areas</u>
UT1	Stream & Wetland complex <i>Proposed for stream restoration</i>	Yes (where stream is restored)	Combination of forested and non/forested pasture grazed by cattle	Yes ⁴	Yes (<i>non-forested fields only</i>)	Fields - Restoration Site per 15A NCAC 02B .0295 (n) Forested Areas - Enhancement Site per 15A NCAC 02B .0295 (o) (6) <i>Crossing 1 has impeded flow and Crossing 2 is severely perched with impeded flow. Both crossings need be repaired/replaced.</i>

Catfish Pond Full-Delivery Site
Wildlands
March 13, 2018

<u>Feature</u>	<u>Classification</u>	<u>¹Subject to Buffer Rule</u>	<u>Riparian Land uses adjacent to Feature (0-200')</u>	<u>Buffer Credit Viable</u>	<u>²Nutrient Offset Viable at 2,273 lbs/acre</u>	<u>Mitigation Type Determination w/in riparian areas</u>
D	Ditch	No	Non-forested pasture grazed by cattle	*See Note	Yes	Fields - Restoration Site per 15A NCAC 02B .0295 (n) *The ditch meets 15A NCAC 02B .0295 (o)(8) (A, B, C & E). More information is needed for complete assessment.
Catfish Creek	Stream	Yes	Combination of forested and non/forested pasture grazed by cattle	Yes ⁴	Yes (<i>non-forested fields only</i>)	Fields - Restoration Site per 15A NCAC 02B .0295 (n) Forested Areas - Enhancement Site per 15A NCAC 02B .0295 (o) (6) <i>Crossing 3 has impeded flow and needs to be repaired/replaced</i>
Catfish Pond	In-line pond (<i>proposed for stream Restoration</i>)	Yes	Combination of forested and non/forested pasture grazed by cattle	*Yes ⁴	Yes (<i>non-forested fields only</i>)	Fields - Restoration Site per 15A NCAC 02B .0295 (n) Forested Areas - Enhancement Site per 15A NCAC 02B .0295 (o) (6) *If stream channel is created & restored through the pond, the new riparian areas will be viable as a Restoration Site
UT2	Stream	Yes	Mostly forested pasture with some open canopy areas and grazed by cattle	Yes ⁴	Yes (<i>non-forested fields only</i>)	Fields - Restoration Site per 15A NCAC 02B .0295 (n) Forested Areas - Enhancement Site per 15A NCAC 02B .0295 (o) (6)
Mountain Tributary	Stream	Yes	Mostly forested pasture with some open canopy areas and grazed by cattle	Yes ⁴	Yes (<i>non-forested fields only</i>)	Fields - Restoration Site per 15A NCAC 02B .0295 (n) Forested Areas - Enhancement Site per 15A NCAC 02B .0295 (o) (6)

¹Subjectivity calls for the features were determined by DWR in correspondence dated March 12, 2018 using the 1:24,000 scale quadrangle topographic map prepared by USGS and the most recent printed version of the soil survey map prepared by the NRCS

² NC Division of Water Resources - Methodology and Calculations for determining Nutrient Reductions associated with Riparian Buffer Establishment

³The area of preservation credit within a buffer mitigation site shall comprise of no more than 25 percent (25%) of the total area of buffer mitigation per 15A NCAC 0295 (o)(5) and 15A NCAC 0295 (o)(4). Site cannot be a Preservation only site to comply with this rule.

⁴The area described as an Enhancement Site was assessed and determined to comply with all of 15A NCAC 02B .0295(o)(6).

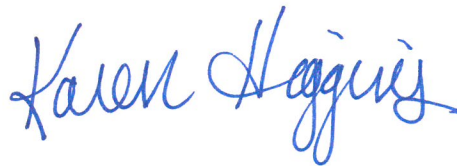
The attached map (Figure 6A Concept Map) showing the project site and features was provided by Wildlands Engineering and was initialed by Ms. Merritt on March 13, 2018. ***There were at least 3 crossings that need to be repaired or replaced to allow for aquatic passage and continuous hydrologic connectivity throughout the stream/s.*** This letter should be provided in any future stream, wetland, buffer and/or nutrient offset mitigation plans for this Site.

This letter does not constitute an approval of this site to generate mitigation credits. Pursuant to 15A NCAC 02B .0295, a mitigation proposal and a mitigation plan shall be submitted to DWR for written approval **prior** to conducting any mitigation activities in riparian areas and/or surface waters for buffer mitigation credit. Pursuant to 15A NCAC 02B .0240, a proposal regarding a proposed nutrient load-reducing measure for nutrient offset credit shall be submitted to DWR for approval prior to any mitigation activities in riparian areas and/or surface waters.

All vegetative plantings, performance criteria and other mitigation requirements for riparian restoration, enhancement and preservation must follow the requirements in 15A NCAC 02B .0295 to be eligible for buffer and/or nutrient offset mitigation credits. For any areas depicted as not being viable for nutrient offset credit above, one could propose a different measure, along with supporting calculations and sufficient detail to support estimates of load reduction, for review by the DWR to determine viability for nutrient offset in accordance with 15A NCAC 02B .0240. For any areas generating wetland mitigation credit, no buffer or nutrient offset credit can be generated.

This viability assessment will expire on March 13, 2020 or upon the submittal of an As-Built Report to the DWR, whichever comes first. Please contact Katie Merritt at (919)-807-6371 if you have any questions regarding this correspondence.

Sincerely,

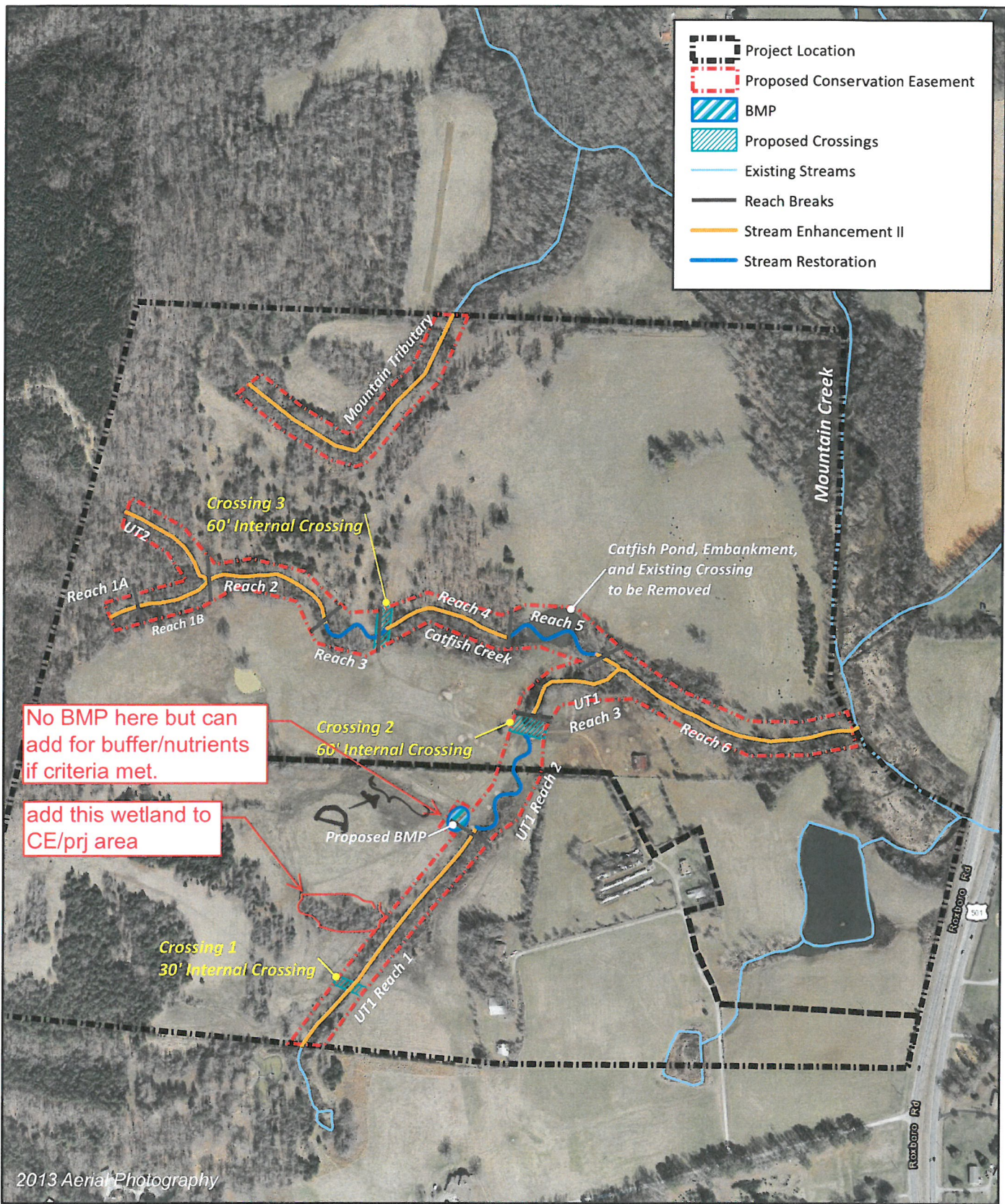


Karen Higgins, Supervisor
401 and Buffer Permitting Branch

KAH/km

Attachments: Figure 6A Concept Map

cc: File Copy (Katie Merritt)
DMS - Jeff Schaffer (via electronic mail)



KYM
 3/13/18
 DWR# 2018-0194

Figure 6A Concept Map (Option 1)
 Catfish Pond Mitigation Site
 Neuse River Basin 03020201