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

REPLY TO
ATTENTION OF:

May 30, 2017

Regulatory Division

Re: NCIRT Review and USACE Approval of the Cedar Branch Restoration Site Draft Mitigation Plan; SAW-2003-21395; DMS Project #97009

Mr. Tim Baumgartner
North Carolina Division of Mitigation Services
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 Cedar Branch Restoration Site Draft Mitigation Plan, which closed on January 23, 2017. Please note that the comment period was extended to address IRT concerns with the proposed project. All comments are attached for your review.

Based on our review of comments, and the provider's response, we have determined that all concerns with the Draft Mitigation Plan have been addressed, and the plan is hereby approved with this correspondence. Issues that were identified during the review, as described in the attached comment memos and response to comments, 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. 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 interest in restoring and protecting aquatic resources. If you have questions regarding this letter, the mitigation plan review process, or the requirements of the Mitigation Rule, please contact Andrea Hughes at (919) 554-4884, extension 59.

Sincerely,

Henry M. Wicker, Jr.
Deputy Chief, Regulatory

Enclosures

Electronic Copies Furnished:
NCIRT Distribution List
Paul Wiesner, NCDMS

KCI ASSOCIATES OF NC

ISO 9001:2008 CERTIFIED

ENGINEERS • PLANNERS • SCIENTISTS • CONSTRUCTION MANAGERS

4505 Falls of Neuse Rd., Suite 400 • Raleigh, NC 27609 • Phone 919-783-9214 • Fax 919-783-9266

May 3, 2017

Andrea Hughes, Mitigation Project Manager
Regulatory Division
Wilmington District, Corps of Engineers
69 Darlington Avenue
Wilmington, North Carolina 28403-1343

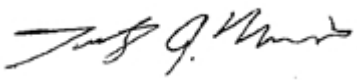
NCDMS Project Name: Cedar Branch Restoration Site, Randolph County, NC
USACE AID#: SAW-2003-21395
NCDMS #: 97009

Dear Ms. Hughes,

Following an on-site meeting at Cedar Branch with Todd Tugwell of USACE and Tim Morris and Adam Spiller of KCI on April 28th, 2017, we have made the following changes to the Cedar Branch Restoration Site Mitigation Plan. This version will be resubmitted to NCDMS as the final mitigation plan and included with the PCN application for the project.

- Additional notes were added in Section 7.2 Design Parameters regarding the wetland fringe that is anticipated to develop along some portions of T1 and T3. Enhancement I work along T1 and T3 may be altered based on field conditions to focus on developing a floodprone bench that will have an improved hydrologic connection with the enhanced channel.
- Visual monitoring of fringe wetlands along T1 and T3 was added in Section 10 Monitoring Requirements. Three groundwater gauges have been added along T1 and T3 for informational purposes.
- The stream gauges shown in the Proposed Monitoring Plan (Appendix C) have been moved upstream based on the locations discussed in the field. These gauges will be held to a standard of 30 days of continuous flow within a calendar year for a minimum of three of the first four years assuming normal precipitation conditions per comments from Sue Homewood, NCDWR, January 24, 2017.
- A note was added to Sheet 5 in the plans commenting that cross-section and profile on T1 and T3 may be adjusted in the field to better promote wetland development along the bankfull bench/floodplain.

Sincerely,



Tim Morris
Project Manager

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

REPLY TO
ATTENTION OF:

CESAW-RG/Hughes January 31, 2017

MEMORANDUM FOR RECORD

SUBJECT: Cedar Branch Restoration Site - NCIRT Comments during 30-day Mitigation Plan Review

PURPOSE: The comments listed below were posted to the NCDMS Mitigation Plan Review Portal during the 30-day comment period in accordance with Section 332.8(g) of the 2008 Mitigation Rule.

NCDMS Project Name: Cedar Branch Restoration Site, Randolph County, NC

USACE AID#: SAW-2003-21395

NCDMS #: 97009

30-Day Comment Deadline: January 23, 2017

Kathy Matthews, USFWS, December 22, 2016:

There are no USFWS-listed species at the site or for many miles downstream of the site.

Travis Wilson, NCWRC, January 23, 2017

The mitigation plan incorporates a 5 year monitoring plan, this should be updated to utilize a 7 year monitoring plan.

Sue Homewood, NCDWR, January 24, 2017:

1. DWR believes that the stream reaches located at the Cedar Branch Restoration Site have clearly been impacted from current and historical land-use practices and that the restorative measures proposed by KCI will provide ecological uplift to the site streams.
2. The stream mitigation approaches on the Proposed Monitoring Map, in Appendix C, should match the proposed mitigation map Figures 8 and 9 (p28 and 29) and the Determination of Credits Table (p20). On the Monitoring Map (Appendix C), TI below the T1-1 and T1 confluence is shown as R and should be changed to E1 and T2 is shown as restoration and should be changed to EII.
3. During the site visit conducted in September 2015 the IRT members questioned whether T1 (upper portion), T1-1 and T-3 (upper portion) were jurisdictional. The mitigation plan notes that a JD was performed by the USACE but the mitigation plan does not include a map with the JD documentation, therefore this concern cannot be resolved/verified at this time.

4. Although T1-1 and T-3 (upper portion) are proposed for EII credit, DWR still has concerns that these areas lack the characteristics of an intermittent stream. DWR recommends placing a monitoring gauge in the thalweg along the upper third of each stream's reach to ensure a minimum of 30d of flow is achieved during a normal rainfall year for at least three out of the first four monitoring years.
5. The mitigation plan proposes EI for the upper portion of T3 in order to "bring the incised channel up to reconnect bankfull flows to the existing floodplain". It is DWR staff's opinion that a channel as small as T3 does not regularly access a floodplain therefore raising the bed to "connect flows to the floodplain" is not justified. Regardless, staff has a concern that raising the bed will disconnect the channel with the groundwater table, as was discussed during the 2015 site visit, and request that flow monitoring be provided for the EI portion of this channel to document success.
6. Tributary 5 was not reviewed during the 2015 site visit. DWR suggests that this tributary should be visited by an IRT member to confirm the proposed plan and credits for this tributary.
7. Table 7 (p23) lists the Functional Outcomes and Monitoring Measurements through listing project Goals, Objectives, Functional Level, Functional-Based Parameter Effects, and Monitoring Measurements. While DWR does agree that the removal of cattle (Objective) will likely have a positive effect on the site's Physio-Chemical water quality (Functional Level) via Nutrient and Bacteria Reduction (Function-Based Parameter Effects), DWR does not believe that relying on the "Estimation Reductions Based on Converted Land Use" is an accepted monitoring measurement as this is a prediction rather than being based on field monitoring.
8. Although the stormwater BMP's are not proposed for mitigation credit, DWR is concerned that the proposed design may result in long term impacts to the receiving stream and/or buffers. Specifically, DWR has concerns that the plans indicate a shallow detention area of natural soils which appear to be un-vegetated which is to be covered by an installed mulch layer. Without ensuring sufficient infiltration rates of the soil below the detention area, the area is likely to pond regularly and the mulch is likely to redistribute and not provide proper soil coverage to ensure that erosion will not occur within the area. In addition, there is a concern that the mulch will be washed into the rock outlet when the area is completely ponded during heavy storm events.
9. It will be necessary to identify the location of any jurisdictional wetlands within the project boundary on all documents when the 404/401 application is submitted. The application should identify any impacts, permanent or temporary, to these wetlands and/or any measures taken to avoid impacts to these wetlands.
10. Please note that the project will be held to the currently accepted performance standards as stated in the 2003 SMGs, and the project should state so in Section 9.0.

Andrea Hughes, USACE, January 26, 2017

1. Page 20, Table 5: There appear to be discrepancies regarding the resources and the proposed treatments. During our site visit on September 22, 2015, the Corps and DWR questioned the jurisdictional status of the upper reaches of Tributary 1 and Tributary 1-1. The chart proposes to generate credits associated with both reaches beginning at the property boundary.

2. Page 20, Table 5: Also, for Tributary 1, the chart indicates E1 from station 55+50 to 58+24 and restoration from Station 58+24 to 61 +18. According to field notes, for T-1 below the confluence with T1-1, KCI indicated that E1 might be requested to properly transition into the restoration work on UTCC.
3. Page 20, Table 5: The table indicates restoration of Tributary 3-1. The Corps and DWR discussed the proposed treatments for Tributary 3-1 and the upper reaches of Tributary 3 (above confluence with T3) with the provider during the site visit. It was determined that additional information (groundwater wells) would be required to justify a restoration approach for these areas. The mitigation plan does not include additional information to justify restoration.
4. Page 20, Table 5: The mitigation plan includes an additional resource (Tributary 5) that was not proposed at the technical stage or discussed/reviewed during the site visit. We recommend a site visit to review this resource and the proposed treatment.
5. Page 21, Section 6.0: The credit release schedule is 7 years with a 5% release in years 4 and 6.
6. Page 22, Section 7.2: The plan indicates two BMPs will be constructed within the boundaries of the mitigation site. The plan sheets indicate these areas will be graded to a depth of 6 inches and layered with mulch. We concur with DWR concerns regarding the placement of mulch and would prefer these areas be vegetated. While the provider is not requesting mitigation credit associated with the BMPs, these areas are located within buffer areas that would typically be planted with woody vegetation.
7. Page 25, Crossings: This section states that fencing will be installed upstream and downstream of each crossing. This conflicts with plan sheet 17 that depicts fencing upstream of the UTCC crossing only. The plan sheet indicates no fencing for the crossing on UT 4, or the downstream end of the culvert on UTCC. Also, please be advised that according to NRCS stream crossing standards code 578, stream crossings for agricultural use can be no more than 30 feet wide. Since the stream crossings located outside the easement on UT 4 and UTCC exceed 30 feet, a permit may be required.
8. Page 30, Section 9.0: The final vegetation performance standard is 210 stems per acre at Year 7 with interim standards of 320 stems per acre at Year 3 and 260 stems per acre at Year 5. If volunteer stems are proposed for inclusion, they must be a species from the approved planting list.
9. Page 31, Section 10.0: Monitoring (stream geomorphology and vegetation) should be for a period of 7 years post construction. The monitoring should include data collection in years 1,2,3,5 and 7 with visual monitoring in years 4 and 6. There should be a minimum of 180 days between post construction data collection and Year 1 monitoring data collection. Full monitoring reports are required in years 1,2,3,5 and 7 with limited reports in years 4 and 6.
10. Page 32, Table 10: According to Table 5 on page 20, monitoring should occur on approximately 6,135 linear feet of stream channel (Restoration and E1 reaches).
11. Page 31, Section 11.0: The long term management plan must include a list of management activities, and discussion regarding long term management funding for the mitigation site.
12. Appendix B: According to the field notes taken by John Thomas on October 15, 2015, the JD map was revised. The mitigation plan did not include a copy of the revised map.

13. Appendix C: Regarding the monitoring plan, we recommend adding a cross-section below the proposed road crossing on UTCC. Also, regarding proposed treatments, the monitoring map is not consistent with Table 20 or the figures on pages 28 and 29.
14. Other: Intermittent reaches where the provider proposes to raise the bed elevation should be monitored to demonstrate a minimum of 30 days of continuous flow on an annual basis.

HUGHES.ANDREA.WADE.1258339165

Digitally signed by HUGHES.ANDREA.WADE.1258339165
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=HUGHES.ANDREA.WADE.1258339165
Date: 2017.01.31 08:40:00 -05'00'

Andrea Hughes
Mitigation Project Manager
Regulatory Division

KCI ASSOCIATES OF NC

ISO 9001:2008 CERTIFIED

ENGINEERS • PLANNERS • SCIENTISTS • CONSTRUCTION MANAGERS

4505 Falls of Neuse Rd., Suite 400 • Raleigh, NC 27609 • Phone 919-783-9214 • Fax 919-783-9266

February 23, 2017

Andrea Hughes, Mitigation Project Manager
Regulatory Division
Wilmington District, Corps of Engineers
69 Darlington Avenue
Wilmington, North Carolina 28403-1343

NCDMS Project Name: Cedar Branch Restoration Site, Randolph County, NC
USACE AID#: SAW-2003-21395
NCDMS #: 97009

Dear Ms. Hughes,

Please find below our responses in italics to the NCIRT Comments dated January 31, 2017 for the Cedar Branch Restoration Site Mitigation Plan. These changes will be made as outlined in the Revised Final Mitigation Plan that will be resubmitted to NCDMS and included with the PCN application for the project.

Kathy Matthews, USFWS, December 22, 2016:
There are no USFWS-listed species at the site or for many miles downstream of the site.

Thank you, noted.

Travis Wilson, NCWRC, January 23, 2017
The mitigation plan incorporates a 5 year monitoring plan, this should be updated to utilize a 7 year monitoring plan.

We will change the mitigation plan to reflect a 7-year monitoring plan.

Sue Homewood, NCDWR, January 24, 2017:

1. DWR believes that the stream reaches located at the Cedar Branch Restoration Site have clearly been impacted from current and historical land-use practices and that the restorative measures proposed by KCI will provide ecological uplift to the site streams.

2. The stream mitigation approaches on the Proposed Monitoring Map, in Appendix C, should match the proposed mitigation map Figures 8 and 9 (p28 and 29) and the Determination of Credits Table (p20). On the Monitoring Map (Appendix C), TI below the T1-1 and T1 confluence is shown as R and should be changed to E1 and T2 is shown as restoration and should be changed to EII.

This has been updated in the mitigation plan. We apologize for not changing that map.

3. During the site visit conducted in September 2015 the IRT members questioned whether T1 (upper portion), T1-1 and T-3 (upper portion) were jurisdictional. The mitigation plan notes that a JD was performed by the USACE but the mitigation plan does not include a map with the JD documentation, therefore this concern cannot be resolved/verified at this time.

The map used for the JD submission is now included along with the JD approval and shows those reaches as being jurisdictional intermittent streams.

4. Although T1-1 and T-3 (upper portion) are proposed for EII credit, DWR still has concerns that these areas lack the characteristics of an intermittent stream. DWR recommends placing a monitoring gauge in the thalweg along the upper third of each stream's reach to ensure a minimum of 30d of flow is achieved during a normal rainfall year for at least three out of the first four monitoring years.

Pressure transducer gauges will be placed in T1, T1-1, and T-3 to monitor the presence of flow for 30 days or more for a minimum of three years. An additional gauge will be installed at the bottom of UTCC to monitor for bankfull occurrences. The approximate locations of these gauges have been added to the monitoring map in Appendix C.

5. The mitigation plan proposes EI for the upper portion of T3 in order to "bring the incised channel up to reconnect bankfull flows to the existing floodplain". It is DWR staff's opinion that a channel as small as T3 does not regularly access a floodplain therefore raising the bed to "connect flows to the floodplain" is not justified. Regardless, staff has a concern that raising the bed will disconnect the channel with the groundwater table, as was discussed during the 2015 site visit, and request that flow monitoring be provided for the EI portion of this channel to document success.

See response to #4.

6. Tributary 5 was not reviewed during the 2015 site visit. DWR suggests that this tributary should be visited by an IRT member to confirm the proposed plan and credits for this tributary.

KCI has removed Tributary 5 from the credit calculations. We do feel that T5 is an intermittent stream. It emanates from a spring seep in the woods. KCI was not planning to do anything to the stream in the woods other than to stabilize a few headcuts where T5 entered UTCC. KCI was only requesting restoration credit for the extension of this channel from the woods line to the proposed location of UTCC (in the current ag. Field). Since this stream was not investigated as part of the JD walk with John Thomas and given the fact that site visits will likely delay project acceptance, we have removed T5 from the credit table. We will still design and construct the T5 extension, we just will not request credits for it. A photo is provided below for your reference. We would be happy to collect video footage of the channel in the woods if the IRT sees any justification in the attached photo for T5 credits.

7. Table 7 (p23) lists the Functional Outcomes and Monitoring Measurements through listing project Goals, Objectives, Functional Level, Functional-Based Parameter Effects, and Monitoring Measurements. While DWR does agree that the removal of cattle (Objective) will likely have a positive effect on the site's Physio-Chemical water quality (Functional Level) via Nutrient and Bacteria Reduction (Function-Based Parameter Effects), DWR does not believe that relying on the "Estimation Reductions Based on Converted Land Use" is an accepted monitoring measurement as this is a prediction rather than being based on field monitoring.

KCI used nutrient and bacterial guidance provided by NCDMS, "Quantifying Benefits to Water Quality from Livestock Exclusion and Riparian Buffer Establishment for Stream Restoration" (2016), for these calculations. While we realize that these load reductions are estimates, it does provide a way to approximate the functional uplift provided for water quality using site-specific parameters.

8. Although the stormwater BMP's are not proposed for mitigation credit, DWR is concerned that the proposed design may result in long term impacts to the receiving stream and/or buffers. Specifically, DWR has concerns that the plans indicate a shallow detention area of natural soils which appear to be un-vegetated which is to be covered by an installed mulch layer. Without ensuring sufficient infiltration rates of the soil below the detention area, the area is likely to pond regularly and the mulch is likely to redistribute and not provide proper soil coverage to ensure that erosion will not occur within the area. In addition, there is a concern that the mulch will be washed into the rock outlet when the area is completely ponded during heavy storm events.

KCI has used similar structures on our past projects and has not experienced this problem. However, we will add a 2" layer of topsoil above the mulch and then the entire BMP will be seeded with a wetland mix and stabilized. These BMPs generally become vegetated quickly due to the high incoming nutrient loads. This vegetation stabilizes any disturbed soils and/or mulch in the structure. However, KCI will watch these structures post-construction to ensure that no erosion is occurring. They have been added explicitly to our "Planned Maintenance" table in the mitigation plan.

9. It will be necessary to identify the location of any jurisdictional wetlands within the project boundary on all documents when the 404/401 application is submitted. The application should identify any impacts, permanent or temporary, to these wetlands and/or any measures taken to avoid impacts to these wetlands.

Three small wetlands, totaling approximately 0.05 acre, were identified during the delineation process and are included on the map submitted as part of the JD (now included in Appendix B). The wetlands are also shown on Figure 4, Current Conditions Plan View, and will be added to Figure 9 as well to show the wetlands in the context of the proposed mitigation. Wetland A is a forested wetland (0.02 acre) of marginal quality with cattle impacts. The other two wetlands (Wetlands B and C) are emergent features of poor quality found at the intersection of the agricultural fields and stream floodplains. All three of these wetlands will be enhanced during the construction process by removing cattle and planting with native vegetation. These actions will be described in the PCN.

10. Please note that the project will be held to the currently accepted performance standards as stated in the 2003 SMGs, and the project should state so in Section 9.0.

This has been added to the first paragraph in Section 9.0.

Andrea Hughes, USACE, January 26, 2017

1. Page 20, Table 5: There appear to be discrepancies regarding the resources and the proposed treatments. During our site visit on September 22, 2015, the Corps and DWR questioned the jurisdictional status of the upper reaches of Tributary 1 and Tributary 1-1. The chart proposes to generate credits associated with both reaches beginning at the property boundary.
2. Page 20, Table 5: Also, for Tributary 1, the chart indicates E1 from station 55+50 to 58+24 and restoration from Station 58+24 to 61 +18. According to field notes, for T-1 below the confluence with T1-1, KCI indicated that E1 might be requested to properly transition into the restoration work on UTCC.

For items #1-2, please see the attached memo submitted to NCDMS on July 29, 2016 that describes our revised mitigation approach in respect to the site visit in 2015. Both T1 and T1-1 were approved as jurisdictional intermittent streams under the JD.

3. Page 20, Table 5: The table indicates restoration of Tributary 3-1. The Corps and DWR discussed the proposed treatments for Tributary 3-1 and the upper reaches of Tributary 3 (above confluence with T3) with the provider during the site visit. It was determined that additional information (groundwater wells) would be required to justify a restoration approach for these areas. The mitigation plan does not include additional information to justify restoration.

A pressure transducer will be installed along the top of T3 to ensure the presence of 30 days of flow or more within each year. In the final design, only Enhancement I credit is being requested for T3, not restoration as discussed earlier for that reach. As stated on page 16 in the mitigation plan, T3 channel is incised and vertically unstable for its entire length with numerous headcuts. T3-1 is a short, steep tributary that is also incised and vertically unstable.

4. Page 20, Table 5: The mitigation plan includes an additional resource (Tributary 5) that was not proposed at the technical stage or discussed/reviewed during the site visit. We recommend a site visit to review this resource and the proposed treatment.

Please see response to NCDWR's comment above regarding T5.

5. Page 21, Section 6.0: The credit release schedule is 7 years with a 5% release in years 4 and 6.

We will change this in the mitigation plan.

6. Page 22, Section 7.2: The plan indicates two BMPs will be constructed within the boundaries of the mitigation site. The plan sheets indicate these areas will be graded to a depth of 6 inches and layered with mulch. We concur with DWR concerns regarding the placement of mulch and would prefer these areas be vegetated. While the provider is not requesting mitigation credit associated with the BMPs, these areas are located within buffer areas that would typically be planted with woody vegetation.

Please see previous response to DWR. We are not planning on planting these areas with woody vegetation since they are treating incoming agricultural run-off and herbaceous vegetation is more effective at providing treatment. These BMPs will be watched closely and included in our maintenance plan.

7. Page 25, Crossings: This section states that fencing will be installed upstream and downstream of each crossing. This conflicts with plan sheet 17 that depicts fencing upstream of the UTCC crossing only. The plan sheet indicates no fencing for the crossing on UT 4, or the downstream end of the culvert on UTCC. Also, please be advised that according to NRCS stream crossing standards code 578, stream crossings for agricultural use can be no more than 30 feet wide. Since the stream crossings located outside the easement on UT 4 and UTCC exceed 30 feet, a permit may be required.

The depiction on Sheet 17 is correct, and the text in the mitigation plan has been modified to reflect that. The upstream portion of the crossing on UTCC will be fenced, since it will be located adjacent to the cattle pasture and used to carry both livestock and equipment. The lower end and the UT4 crossing will not be fenced, since they are not located next to any pasture. The easement exclusions are 50' wide, but the crossings themselves will be only 16' wide. The easement exceptions are wider than the actual physical crossings to accommodate any changes to the property the landowner might make at a later date (subject to any additional permitting requirements at that time).

8. Page 30, Section 9.0: The final vegetation performance standard is 210 stems per acre at Year 7 with interim standards of 320 stems per acre at Year 3 and 260 stems per acre at Year 5. If volunteer stems are proposed for inclusion, they must be a species from the approved planting list.

This will be added to this section.

9. Page 31, Section 10.0: Monitoring (stream geomorphology and vegetation) should be for a period of 7 years post construction. The monitoring should include data collection in years 1,2,3,5 and 7 with visual monitoring in years 4 and 6. There should be a minimum of 180 days between post construction data collection and Year 1 monitoring data collection. Full monitoring reports are required in years 1,2,3,5 and 7 with limited reports in years 4 and 6.

The mitigation plan will be updated with these requirements.

10. Page 32, Table 10: According to Table 5 on page 20, monitoring should occur on approximately 6,135 linear feet of stream channel (Restoration and E1 reaches).

This will be changed in Table 10.

11. Page 31, Section 11.0: The long term management plan must include a list of management activities, and discussion regarding long term management funding for the mitigation site.

The following will be added to the mitigation plan:

Upon approval for close-out by the Interagency Review Team (IRT), the site will be transferred to the NCDEQ Stewardship Program. This party shall be responsible for periodic inspection of the site to ensure that restrictions required in the conservation easement are upheld. Monitoring visits are conducted in order to report site integrity or breaches of easement. Site visits also include periodic boundary re-marking and documentation of site conditions.

The NCDEQ Stewardship Program currently houses DMS stewardship endowments within the non-reverting, interest-bearing Conservation Lands Stewardship Endowment Account. The use of funds from the Endowment Account is governed by North Carolina General Statute GS 113A-232(d)(3). Interest gained by the endowment fund may be used only for the purpose of stewardship, monitoring, stewardship administration, and land transaction costs, if applicable. The NCDEQ Stewardship Program intends to manage the account as a non-wasting endowment. Only interest generated from the endowment funds will be used to steward the compensatory mitigation site. Interest funds not used for those purposes will be re-invested in the Endowment Account to offset losses due to inflation.

12. Appendix B: According to the field notes taken by John Thomas on October 15, 2015, the JD map was revised. The mitigation plan did not include a copy of the revised map.

This map will be included in Appendix B.

13. Appendix C: Regarding the monitoring plan, we recommend adding a cross-section below the proposed road crossing on UTCC. Also, regarding proposed treatments, the monitoring map is not consistent with Table 20 or the figures on pages 28 and 29.

We apologize for not having the monitoring map up-to-date; it has been updated. We have also added the additional cross-section on UTCC.

14. Other: Intermittent reaches where the provider proposes to raise the bed elevation should be monitored to demonstrate a minimum of 30 days of continuous flow on an annual basis.

See previous response to DWR comments above. We will install pressure transducers on the intermittent reaches of T1, T1-1, and T3 as well as on the bottom of UTCC for bankfull monitoring. The approximate locations of these gauges have been marked on the revised monitoring map in Appendix C.

Public Comments: The following relevant comments were received during the public comment period:

1. An adjoining neighbor expressed concern that the mitigation project could result in flooding to his property.
    a. **KCI Contacted Mr. Bobby McKoy who had inquired about flooding and explained the project to him relative to his concerns about flooding. Mr. McKoy's property is well upgradient of the project and in no jeopardy of being flooded. KCI also explained our obligation to address hydrologic trespass issues in the design process.**

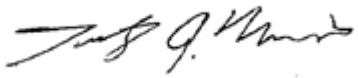
2. We received a phone call from an adjacent land owner expressing concern that the property owner is not fully aware of the buffer restrictions. The land owner claims that the property owner leases the land for farming and they expressed concern that the parties farming the land would not be aware of the restrictions and would continue to farm up to the edge of the stream.

a. **KCI contacted Mr. Drew Thomas regarding his concerns relating to farming activities adjacent to the buffer and explained the specifics of enforcement of easement restrictions both during the monitoring period (with KCI) and afterwards (with DMS and the Stewardship Program). KCI also addressed several other concerns that Mr. Thomas has regarding the project including access and manure application. Mr. Thomas mentioned that he was not in opposition to the project and the easement, he just wanted to make sure the landowner would not be requesting access through his or other neighbors properties and that easement violations would be enforced if needed**.

3. **KCI also spoke to Mr. Colon Farlow and Mr. Joe Nelson regarding other issues and concerns. Both of these landowners were more concerned with the process and wanted to get a basic understanding of the need for mitigation and the timing of the project.**

Please contact me if you have any questions or would like clarification concerning these responses.

Sincerely,



Tim Morris.
Project Manager

Attachment - Response to Credit Changes to DMS

KCI ASSOCIATES OF NORTH CAROLINA, PA

ENGINEERS • SCIENTISTS • SURVEYORS • CONSTRUCTION MANAGERS

Landmark Center II, Suite 220 4601 Six Forks Road Raleigh, NC 27609 (919) 783-9214 (919) 783-9266 Fax

MEMORANDUM

Date: July 29, 2016

To: Matthew Reid

From: Tim Morris, Project Manager
KCI Associates of North Carolina, PA

Subject: Cedar Branch Restoration Site
Draft Mitigation Plan – Credit Revisions
Lower Yadkin River Basin - 03040103
Randolph County, North Carolina
Contract No. #6598
DMS Project #97009

General Comment:

- The crediting approach for Tributary 1(55+50-61+18), Tributary 2 (80+00-81+27) and Tributary 3-1(150+00-150+78) does not agree with what was discussed with the IRT at the Post Contract Meeting conducted on September 22, 2015. Please review the memorandum dated September 22, 2015 from KCI acknowledging the IRT concerns and update the Mitigation Plan as necessary. These three reaches are currently shown as Restoration, but the IRT did not agree with that approach.

KCI's deviations from the mitigation approach discussed at the IRT meeting in September 2015 are primarily due to design constraints that were encountered once the stream design process was initiated.

Tributary 1 and Tributary 1-1 – During the field walk, the IRT expressed major concern about the streams above the confluence of T1 and T1-1. The main concern was the small drainage areas associated with these streams. The IRT questioned whether they were even jurisdictional. As a result of the meeting, KCI has changed the restoration approach on the area above the T1 – T1-1 confluence to EII. Both features were determined to be jurisdictional intermittent streams by John Thomas of ACOE.

Although the IRT also expressed some concern about potentially impacting some larger trees downstream of the confluence of T1-1 and T-1, they did not indicate that KCI's restoration approach was inappropriate below the confluence, at least not according to our notes. We realize that the memo indicates "KCI may request EI for the linear footage below the confluence of T1 and T1-1". That sentence should have said "above", not "below" as the area we were discussing in that section was strictly the area above the confluence and we noted that there may need to have grade control installed to arrest some of the small head-cuts located a short distance above the confluence. Per your comments, we have changed our approach for the area downstream of the confluence to have a short stretch of EI (from 55+50 to 58+24) that transitions through the

area with the larger trees to full restoration (58+24 to 61+18) where the floodplain widens to the south to the confluence of UTCC. Where practical, we have designed the EI section to minimize damage to the mature trees that line the channel, especially on the right bank. KCI feels that this approach is consistent with the feedback we received during the IRT site visit and incorporates your comments on the draft mitigation plan.

Tributary 2 – KCI's memo states that *"IRT recommended a light touch here and would only grant restoration credit to accommodate the tie-in of the Tributary to the UTCC at a higher elevation."* During the design process, it was determined that the UTCC channel at the point of the confluence with T2 had to be at a design bed elevation of 675.88. The corresponding elevation in T2 is located approximately 78' upstream from T2's confluence with the mainstem. This tie-in point will require grading and channel filling in line with a restoration approach in order to prevent T2 from being in a backwater condition through the reach. KCI considers this approach consistent with what was discussed in the field, although the tie-in point is further upstream than what we estimated in the memo (50' at the time). Although additional grading will likely be required above the tie-in point, KCI has changed the length above here from restoration to EII (49') based on your comments.

Tributary 3-1 – Tributary 3-1 was not investigated in detail during the IRT site visit. The IRT walked this stretch of channel briefly and agreed with our approach as restoration. Section 6 of the memo mistakenly indicated T3-1 as EI, but this does not match our notes from the site walk.

Please see the table below with the proposed revisions to the mitigation crediting approach. Changes from the first mitigation plan draft are highlighted in red.

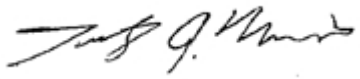
Cedar Branch Restoration Site, Randolph County									
Mitigation Credits									
	Stream		**Riparian Wetland**		**Non-riparian Wetland**		**Buffer**	**Nitrogen Nutrient Offset**	**Phosphorous Nutrient Offset**
Type	R	RE	R	RE	R	RE			
Linear Feet/Acres	**5,234**	**1,909**							
Credits	**5,234**	**1,004**							
TOTAL CREDITS	**6,238**								

Project Components						
Project Component -or- Reach ID	**Proposed Stationing/ Location**	**Existing Footage/ Acreage**	**Approach (PI, PII etc.)**	**Mitigation Ratio**	**Restoration Footage or Acreage**	**Restoration -or- Restoration Equivalent**
Tributary 1	50+00 to 55+50	550	Enhancement II	2.5:1	550	220
	55+50 to 58+24	**257**	**Enhancement I**	**1.5:1**	**274**	**183**
	58+24 to 61+18	**229**	**Restoration**	**1:1**	**294**	**294**
Tributary 1-1	70+00 to 73+13	313	Enhancement II	2.5:1	313	125
Tributary 2	**80+00 to 80+49**	**46**	**Enhancement II**	**2.5:1**	**49**	**20**
	80+49 to 81+27	**77**	**Restoration**	**1:1**	**78**	**78**
Tributary 3	90+00 to 96+27	624	Enhancement I	1.5:1	627	418
	96+27 to 101-57	517	Restoration	1:1	530	530
Tributary 3-1	150+00 to 150+78	68	Restoration	1:1	78	78
Tributary 4	250+00 to 257+42	677	Restoration	1:1	692	692
Tributary 5	300+00 to 300+96	64	Enhancement II	2.5:1	96	38
UTCC	10+00 to 46+12	3,246	Restoration	1:1	3,562	3,562

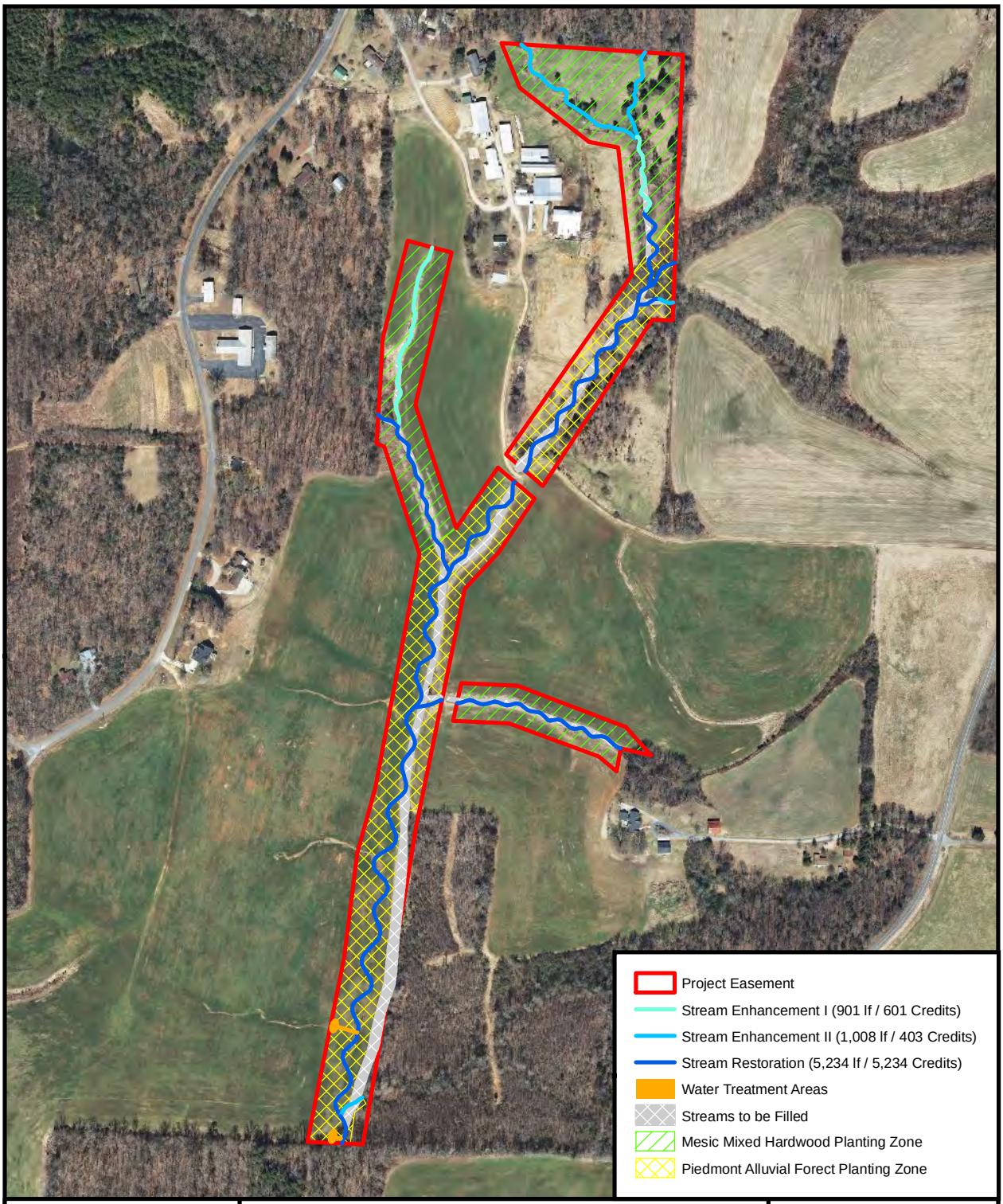
Component Summation						
Restoration Level	**Stream (linear feet)**	**Riparian Wetland (acres)**		**Non-riparian Wetland (acres)**	**Buffer (square feet)**	**Upland (acres)**
		Riverine	Non-Riverine			
Restoration	**5,234**					
Enhancement						
Enhancement I	**901**					
Enhancement II	**1,008**					
Creation						
Preservation						
High Quality Preservation						
TOTAL CREDITS	**6,238**					

Please contact me if you have any questions or would like clarification concerning these responses.

Sincerely,



Tim Morris
Project Manager



PROPOSED MITIGATION
CEDAR BRANCH RESTORATION SITE
RANDOLPH COUNTY, NC

Source: NC OneMap Orthoimagery, 2014.

Updated 7/25/2016

Memoranda

ENGINEERS ♦ SURVEYORS ♦ SCIENTISTS ♦ CONSTRUCTION MANAGERS

LANDMARK CENTER II, SUITE 220 ♦ 4601 SIX FORKS ROAD ♦ RALEIGH, NC 27609 ♦ 919-783-9214 ♦ (FAX) 919-783-9266

TO:	Matthew Reid, DMS PM Todd Tugwell, ACOE
FROM:	Tim Morris, KCI
DATE:	September 22, 2015
SUBJECT:	Cedar Branch Stream Restoration Project IRT Site Review Meeting KCI Project Number: 2015859 DMS Project Number 97005

Attendees:

Ginny Baker, NC DWR
Sue Homewood, NC DWR
Shari Bryant NC WRC
Todd Tugwell, ACOE
Andrea Hughes, ACOE
Paul Weisner, DMS
Matthew Reid, DMS
Periann Russell, DMS
Garrett Weeks, DMS
Tim Morris, KCI
Steve Stokes, KCI
Adam Spiller, KCI

An IRT field review was conducted for the above referenced project on September 22, 2015 starting at 10:30am. Weather was partly sunny. Rainfall totals were 1.89" in the previous 30 days and 0.00" in the previous 12 days. Streams were primarily dry throughout the project with occasional areas of standing water within the pools in the lower section of Tributary 1 and Tributary 4. Tim Morris and Adam Spiller from KCI presented the project to the attendees. The following issues and concerns were documented at the meeting and will be addressed in the future development of the site.

1. The IRT expressed concern regarding the proposed mitigation approach for the upper reach of T1 (to its confluence with T1-1) and T1-1. These tributaries were dry at the time of the site visit. The small drainage area above both of these channels made the IRT

question the need for restoration and even the jurisdictional status of these headwater channels. As a result of this and a walk of the channels, the IRT recommended an EII approach.

Response: KCI will change the mitigation approach on these two reaches from R to EII. KCI believes that several areas within the lower portions of both T1 and T1-1 may require grade control to arrest/stabilize existing headcuts and to properly transition into the Restoration work on UTCC that will be targeted for P1 Restoration. Depending on the level of work required to stabilize these areas, KCI may request EI for the linear footage below the confluence of T1 and T1-1. This approach will be will be vetted at the mitigation plan stage.

2. The IRT expressed concern regarding the restoration approach proposed on T2. IRT recommended a light touch here and would only grant restoration credit to accommodate the tie-in of the Tributary to the UTCC at a higher elevation.

   Response: KCI will accommodate this restoration approach in the mitigation plan.

3. The IRT expressed concern regarding the mitigation approach for T3 from the head of T3 to the confluence with T3-1. The IRT questioned the increase in function that would be achieved to justify the Restoration approach. KCI indicated that increased function would be derived by stabilizing the channel and existing headcuts and elevating the existing groundwater table to create an integrated headwater stream/wetland fringe component that is currently absent. The IRT indicated that installing groundwater wells along the channel in the preconstruction stage may be warranted to help justify a Restoration approach, but that an EI approach was a more acceptable restoration approach for this reach.

   Response: KCI is leaning towards an EI approach in this reach based on the feedback from the IRT, however, we will consider the additional monitoring elements required to justify Restoration as we gather more data and develop the mitigation plan.

4. The IRT expressed concern regarding the two most upstream crossings on UTCC. These crossings are in close proximity to each other.

   Response: These crossings will be combined into a single, albeit wider, crossing at the transition point between the cattle pasture and the crop field.

5. IRT did not believe the proposed BMP's were justified in the design and that the buffer would provide all of the function that would be needed.

Response: KCI will remove the BMP's from the design of the project.

6. Based on the feedback from the IRT, and assuming EII for T1 and T1-1 upstream of their confluence and EI for the rest of T1, EII for half of T2, and EI for the upper portion of T3 and for T3.1, the credit yield for this site will be decreased by 720 credits as a result of this meeting.

MITIGATION PLAN

Cedar Branch Restoration Site
Randolph County, North Carolina
DMS Contract 6598
DMS Project Number 97009

Lower Yadkin River Basin
Cataloging Unit 03040103

Prepared for:

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

Final (Revised) – May 2017

MITIGATION PLAN

Cedar Branch Restoration Site
Randolph County, North Carolina
DMS Contract 6598
DMS Project Number 97009

Lower Yadkin River Basin
Cataloging Unit 03040103

Prepared for:

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

Prepared by:

KCI Associates of North Carolina, PC
4505 Falls of Neuse Rd, Suite 400
Raleigh, NC 27609
(919) 783-9214

Final (Revised) – May 2017

EXECUTIVE SUMMARY

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 NCDMS operations and procedures for the delivery of compensatory mitigation.

The Cedar Branch Restoration Site (CBRS) is a full-delivery mitigation project being developed for the North Carolina Division of Mitigation Services (DMS) in the Lower Yadkin River Basin (03040103 8-digit cataloging unit) in Randolph County, North Carolina. The site's natural hydrologic regime has been substantially modified through the relocation and straightening of the existing stream channels, impacted by cattle access, and cleared of any riparian buffer. This site offers the chance to restore impacted agricultural lands to a stable stream ecosystem with a functional riparian buffer and floodplain access.

The NCEEP's publication in 2009 identified HUC 03040103050040 (Caraway Creek) as a Targeted Local Watershed (TLW). The project is also located within the Upper Uwharrie Local Watershed Plan (LWP) study area. The goals and priorities for the CBRS are based on the information presented in the Lower Yadkin River Basin Restoration Priorities: maintaining and enhancing water quality, restoring hydrology, and improving fish and wildlife habitat (NCEEP, 2009). The project will support the following basin priorities:

- Managing stormwater runoff
- Reducing fecal coliform inputs
- Improving/restoring riparian buffers
- Reducing sediment loading
- Improving stream stability
- Reducing nutrient loading
- Excluding livestock and implementing other agricultural BMP's

The goals for the project are to:

- Restore channelized and livestock-impacted streams to stable C/Cb channels.
- Restore a forested riparian buffer to provide bank stability, filtration, and shading.

The project goals will be addressed through the following objectives:

- Relocate a channelized stream to its historic landscape position.
- Install cross-sections sized to the bankfull discharge.
- Create bedform diversity with pools, riffles, and habitat structures
- Fence out livestock to reduce nutrient, bacterial, and sediment impacts from adjacent grazing and farming practices.
- Plant the site with native trees and shrubs and a herbaceous seed mix.

CBRS is located approximately 2.8 miles west of Sophia, North Carolina in Randolph County. Specifically, the site is 0.5 miles west on Mt. Olive Church Road from its intersection with Edgar Road (SR-1526). The center of the site is at approximately 35°49'25.96" N and -79°54'30.78" W near the center of the eastern half of the Glenola USGS Quadrangle.

The CBRS will restore a stable stream ecosystem along an Unnamed Tributary to Caraway Creek (UTCC) and seven of its on-site tributaries with a combination of Restoration, Enhancement I, and Enhancement

II techniques. The majority of the project streams will use a Priority 1 Approach aside from those areas that require a Priority 2 transition out of steep or incised areas. Once site grading is complete, the riparian communities will be planted with native tree species. The site will be monitored for seven years or until the success criteria are met.

Cedar Branch Restoration Site, Randolph County DMS Contract 6598; DMS Project Number 97009									
Mitigation Credits									
	Stream		**Riparian Wetland**		**Non-riparian Wetland**		**Buffer**	**Nitrogen Nutrient Offset**	**Phosphorous Nutrient Offset**
Type	R	RE	R	RE	R	RE			
Linear Feet/Acres	5,234	1,813							
Credits	5,234	966							
TOTAL CREDITS	6,200								

R=Restoration RE=Restoration Equivalent

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

1.0 RESTORATION PROJECT GOALS AND OBJECTIVES

DMS develops River Basin Restoration Priorities (RBRP) to guide its restoration activities within each of the state's 54 cataloging units. RBRPs delineate specific watersheds that exhibit both the need and opportunity for wetland, stream and riparian buffer restoration. These watersheds are called Targeted Local Watersheds (TLWs) and receive priority for DMS planning and restoration project funds.

The 2009 Lower Yadkin Pee-Dee River Basin RBRP identified HUC 03040103050040 (Caraway Creek) as a Targeted Local Watershed (NCEEP 2009). The watershed is characterized by 20% agriculture land use. The past impacts to streams in this watershed include nonpoint source agricultural pollution from more than 20 animal operations. The RBRP listed impacts from agriculture use, including stream bank erosion, excessive sedimentation, livestock access to streams, and stormwater pollution (fecal coliforms), as the major stressors within this TLW. The basin priorities as listed in the RBRP are:

-Managing stormwater runoff
-Reducing fecal coliform inputs
-Improving/restoring riparian buffers
-Reducing sediment loading
-Improving stream stability
-Reducing nutrient loading
-Excluding livestock and implementing other agricultural BMP's.

The Cedar Branch Restoration Site (CBRS) was identified as an opportunity to help achieve these priorities within the TLW. The goals for the project are to:

- Restore channelized and livestock-impacted streams to stable C/Cb channels.
- Restore a forested riparian buffer to provide bank stability, filtration, and shading.

The project goals will be addressed through the following objectives:

- Relocate a channelized stream to its historic landscape position.
- Install cross-sections sized to the bankfull discharge.
- Create bedform diversity with pools, riffles, and habitat structures.
- Fence out livestock to reduce nutrient, bacterial, and sediment impacts from adjacent grazing and farming practices.
- Plant the site with native trees and shrubs and a herbaceous seed mix.

2.0 SITE SELECTION

2.1 Directions

The CBRS is situated in the northwestern corner of Randolph County. The site is located approximately 2.8 miles west of Sophia, North Carolina. Specifically, the site is 0.5 mile west on Mt. Olive Church Road from its intersection with Edgar Road (SR-1526). The center of the site is at approximately 35°49'25.96" N and -79°54'30.78" W near the center of the eastern half of the Glenola USGS Quadrangle. To reach the site from Raleigh: Proceed west on I-40 for approximately 73 miles and keep left at the fork to stay on I-85 south. After approximately 7 miles, take Exit 113B to merge onto I-74 east and then stay on I-74 east for approximately 4 miles. Then take Exit 79 and turn right onto Cedar Square Rd. After 0.3 mile, turn left onto US-311 S and after another 0.3 mile turn right onto Edgar Rd. Travel 2.9 miles and turn right onto Mt. Olive Church Rd and continue for approximately 0.5 mile. Turn left onto Farlowe Pines Dr. to reach the CBRS after approximately 0.2 mile. Section 2.3 shows the Vicinity Map (Figure 1) for the site.

2.2 Site Selection

CBRS is part of the 03040103050040 Hydrologic Unit (HU) (Caraway Creek), which is a TLW, located within the Lower Yadkin Pee-Dee River Basin. The project is also located in the Upper Uwharrie Local Watershed Plan (LWP) study area. The Upper Uwharrie Watershed was designated a LWP Study Area due to poor water quality and aquatic habitat degradation issues, as well as the rapid urban growth of the upper portions of the watershed (NCDENR, EEP 2005b). The CBRS is located within the Middle Caraway Creek – Rural Mainstem Subwatershed, which is mainly agricultural, especially along the tributaries to Caraway Creek, and irrigation from the farms may cause low-flow conditions in streams (NCDENR, EEP 2005a). The subwatershed received a rating of "Assumed Function Deficit" for habitat function, and "Assumed Function Threatened" for water quality and hydrology functions. The stressors within Caraway Creek are removal of riparian buffer vegetation, hydraulic modifications, poorly installed culverts, residential road runoff, runoff from small "garden" plots in the floodplain, and obstructions of fish passage.

There are no conservation or protected areas located adjacent to the project site, but the site will connect to a forested buffer at the end of the project stream that eventually connects to Caraway Creek. While most of the project land is in agriculture or pasture, the upstream headwaters have forested riparian buffers. With the protection of this stream, there will be continuous buffers along the majority of streams within the project watershed and downstream to Caraway Creek.

The nearest named downstream water body is Caraway Creek, which is just under 0.5 river mile downstream of the site. The section of Caraway Creek downstream of the site is identified as 13-2-3, and is classified for surface water as Class C. This reach of Caraway Creek was not listed as impaired under the draft 2016 303(d) list.

2.2.1 Historic Site Geology/Geomorphic Setting

The site lies within the Southern Outer Piedmont (Level IV 45b) ecoregion of the Piedmont physiographic province. The Southern Outer Piedmont is mostly irregular plains with tree plantations and pine dominating old field sites. In less altered areas, mixed oak forests can be found. The geology of this area is typified by gneiss, schist, and granite rock types, covered with deep saprolite and mostly red, clayey subsoils (Griffith et al. 2002). The CBRS is within the Carolina Slate Belt and the geologic formation mapped at the project is Mafic Metavolcanic Rock (CZmv), which consists of metamorphosed basaltic to andesitic tuffs and flows, grayish green to black and locally includes hypabyssal intrusives and minor felsic metavolcanic rock (USGS 2016).

The valley at the site is best described as partly confined, with the valley wall shaping the channel in many places. There is bedrock control in the existing stream channels in three locations: two along the middle portion of UTCC and one on T3 just upstream of the confluence of UTCC and T3. The top of the project drainage area starts at approximately elevation 772 feet and is 636 feet at the bottom of the watershed. Valley slopes range from approximately 2-6% across the different incoming drainages. These valleys are primarily colluvial with little active sediment transport within the headwater streams.

According to the Soil Survey of Randolph County, the majority of the proposed project area is mapped as MeC2—Mecklenburg clay loam, 8 to 15 percent slopes, moderately eroded (MeC2) with a small percentage of WvC2—Wynott-Enon complex, 8 to 15 percent slopes, moderately eroded (WvC2) (see Figure 3). Mecklenburg clay loam is a well-drained soil located on upland hillslopes and ridges. The Wynott-Enon complex is also well-drained and is typically located in uplands and interfluves. Neither of

these two soil types present major limitations for typical construction activities associated with stream restoration.

2.2.2 Chronology of Impacts

The CBRS has undergone modifications that have altered the site hydrology and vegetation. Historic aerials were examined for any information about how the site has changed over recent history (Figures 5a and 5b). Historic aerials were obtained from the USGS EarthExplorer and Google Earth for 1948, 1961, 1973, 1981, 1993, 1999, 2002, and 2014.

The site has been systematically impacted over the past 80 years, serving as a dairy farm for at least fifty of those years. The primary impacts to the system were associated with channelization and clearing throughout the site to utilize the resources in support of agricultural production. In the earliest site photo from 1948, the upper portion of the project has already been cleared and there is farmland along all of the upper tributaries. The lower portion of the project is still forested. For almost the next 30 years, the site remained in a similar condition, with small areas of clearing throughout the farm to support the dairy operation established at the property. Between 1981 and 1993, the field to the west of the most downstream project reach was cleared to the edge of the floodplain. During this time, the main project stream (UTCC) most likely meandered throughout its entire floodplain and this area remained forested. By 1999, two waste lagoons used by the dairy operation were built at the upstream end of the property. Between 1999 and 2002, the forested floodplain at the downstream end of the project was cleared and row crops were planted. The lagoons were officially closed and filled in 2003. By 2009, the lagoons returned to pasture and the site has remained in a similar condition since then.

Over the 67 years of available record, physical impacts included: channel modification, ditching, and vegetation removal. As a result, functional impacts included: un-regulated access by cattle to portions of the project and associated non-point source runoff from agricultural operations to the entire system. Based on field evaluations, historic photograph interpretation, and LIDAR, the project stream is believed to have meandered through this valley system before it was cleared and straightened.

2.3 Project Site Vicinity Map

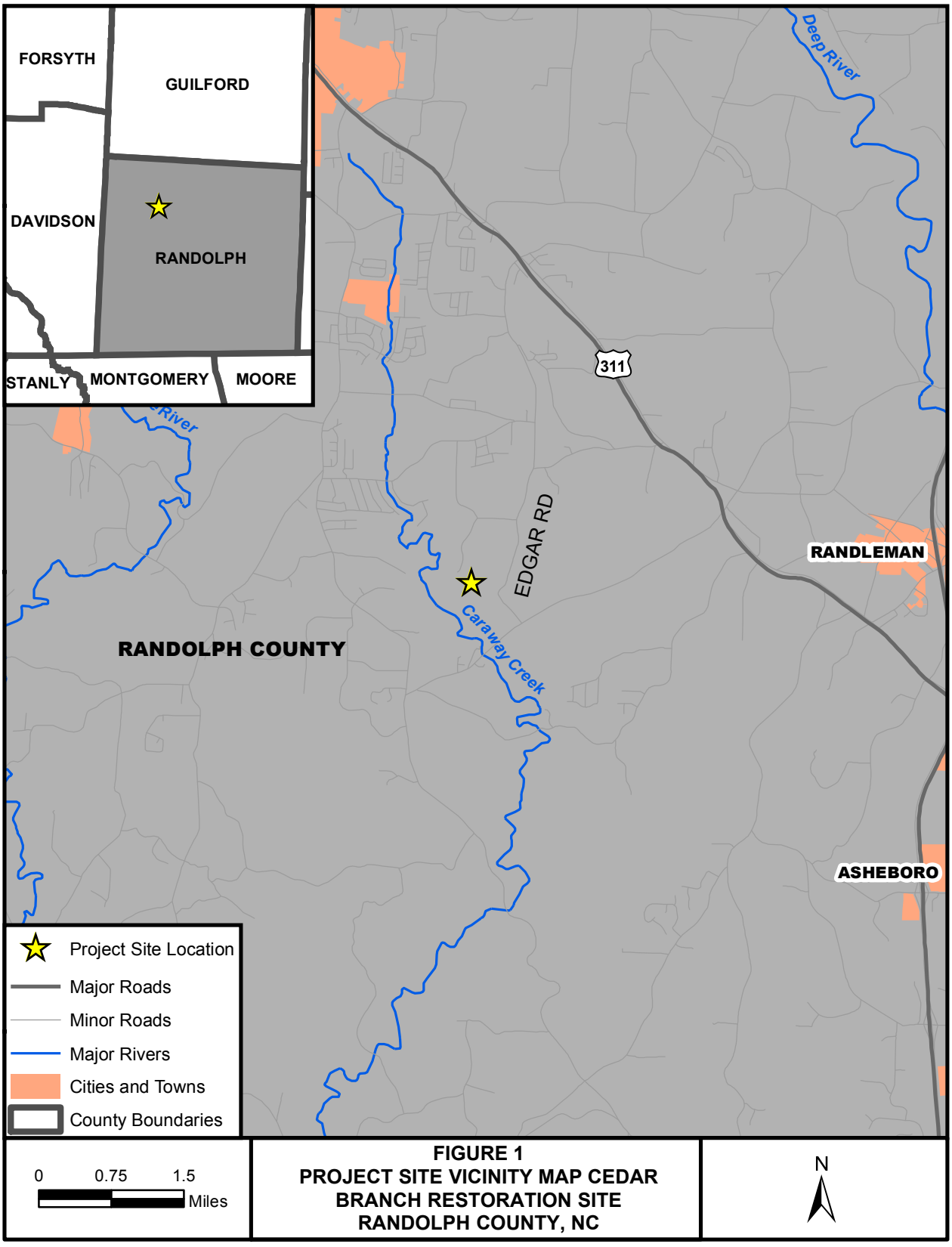


FIGURE 1
PROJECT SITE VICINITY MAP CEDAR BRANCH RESTORATION SITE
RANDOLPH COUNTY, NC

2.4 Project Site Watershed Map

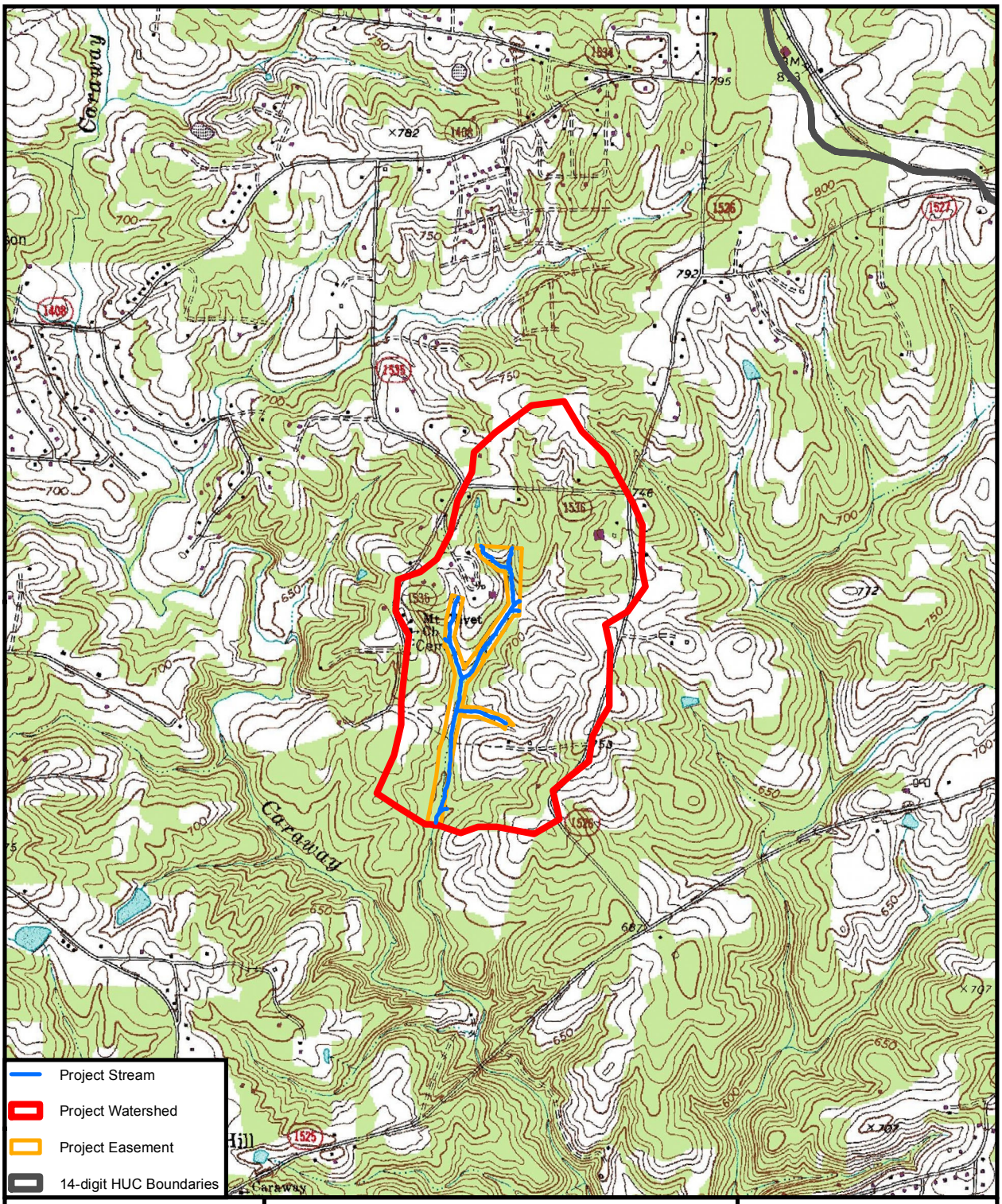


FIGURE 2
PROJECT SITE WATERSHED MAP
CEDAR BRANCH RESTORATION SITE
RANDOLPH COUNTY, NC

2.5 Soil Survey

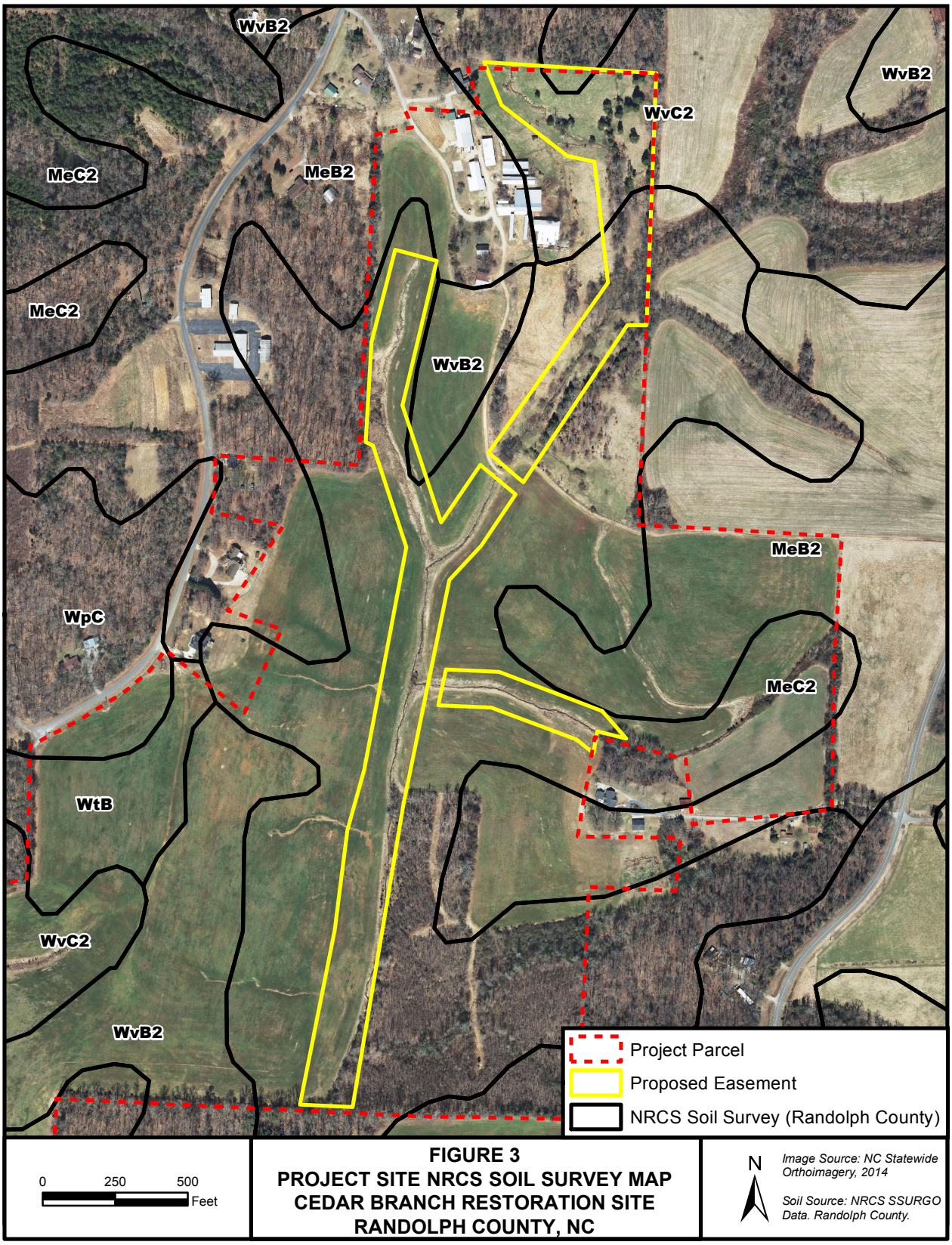


FIGURE 3
PROJECT SITE NRCS SOIL SURVEY MAP
CEDAR BRANCH RESTORATION SITE
RANDOLPH COUNTY, NC

2.6 Project Site Current Condition Plan View

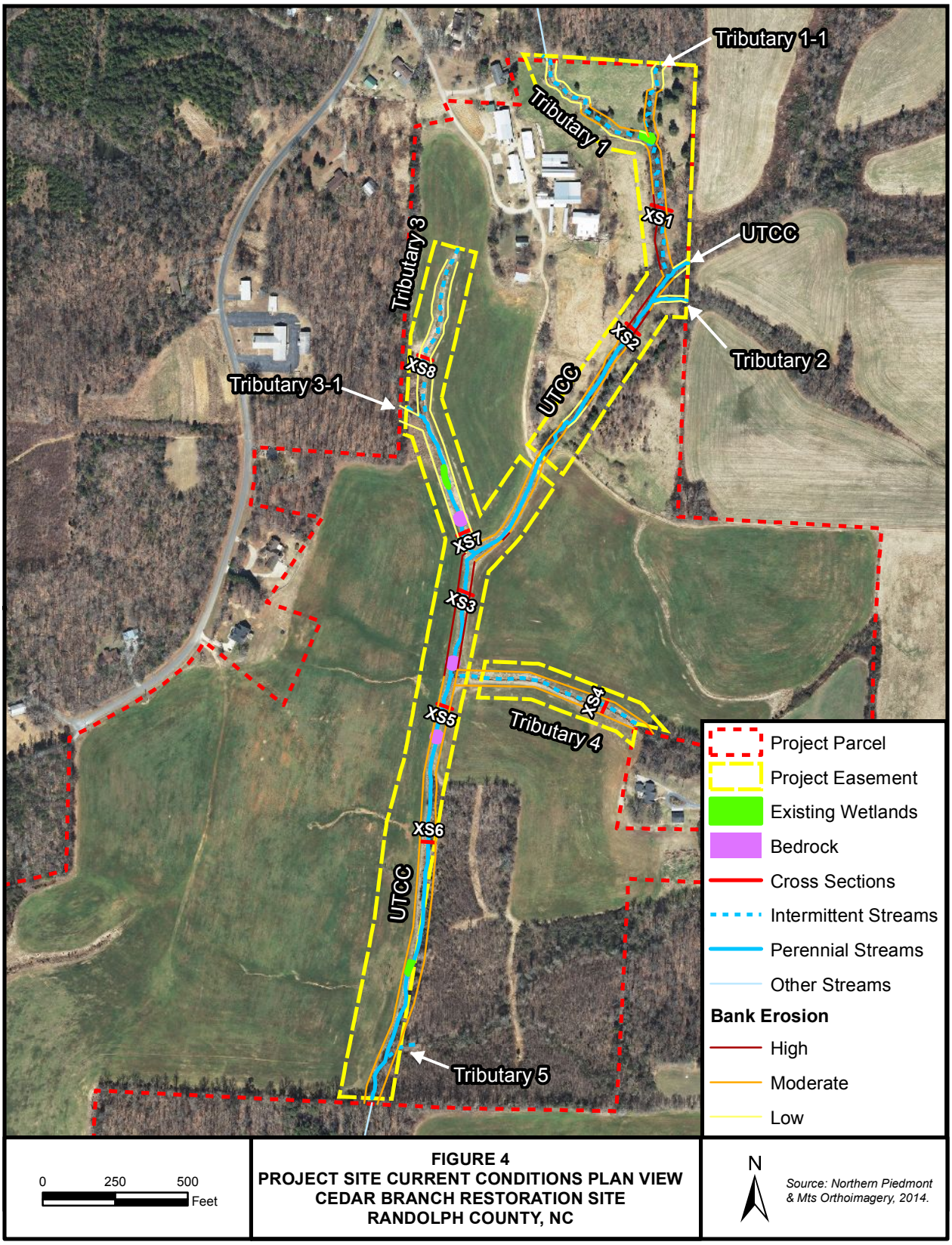


FIGURE 4
PROJECT SITE CURRENT CONDITIONS PLAN VIEW
CEDAR BRANCH RESTORATION SITE
RANDOLPH COUNTY, NC

2.7 Project Site Historical Condition Plan View

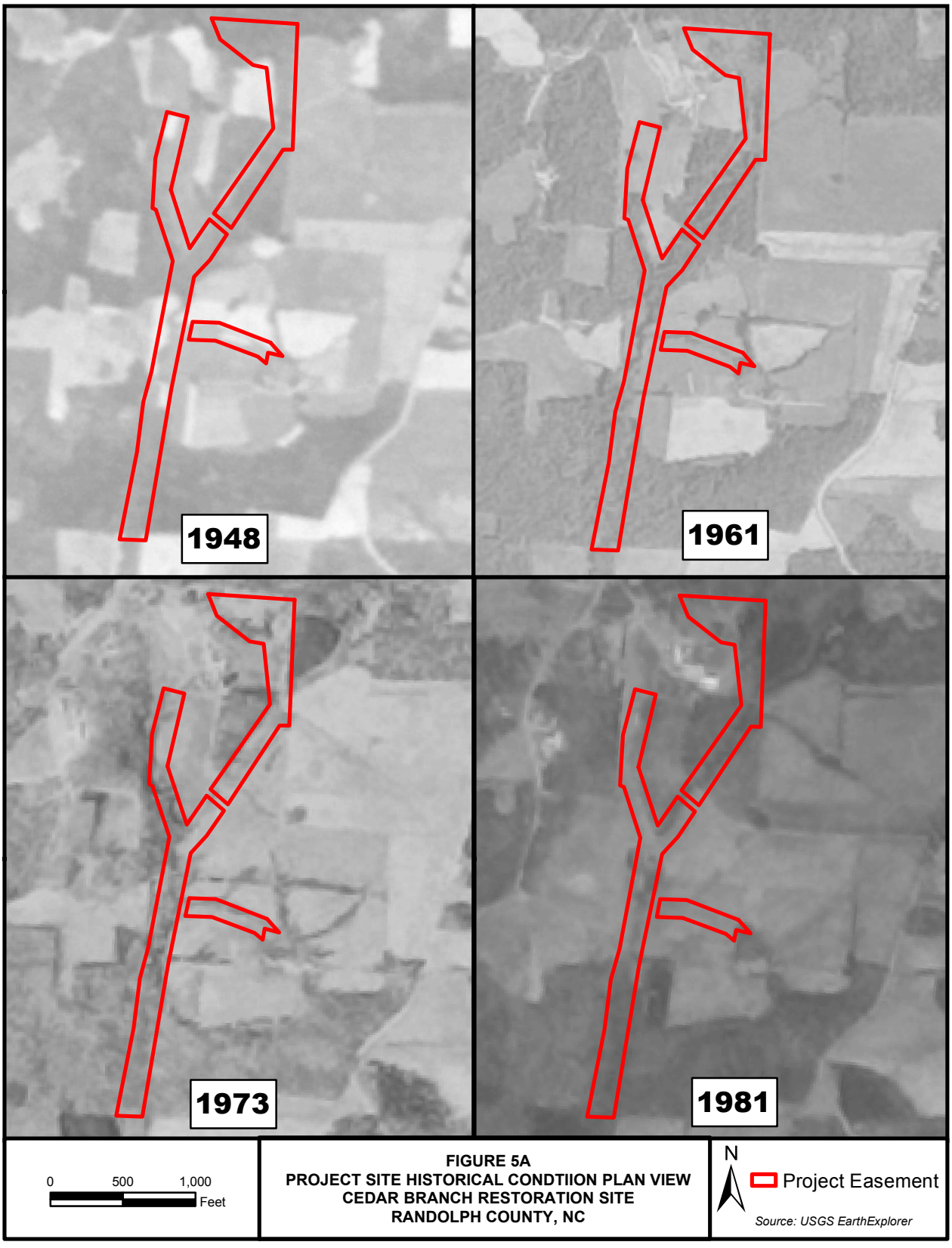


FIGURE 5A
PROJECT SITE HISTORICAL CONDTIION PLAN VIEW
CEDAR BRANCH RESTORATION SITE
RANDOLPH COUNTY, NC

2.7 Project Site Historical Condition Plan View

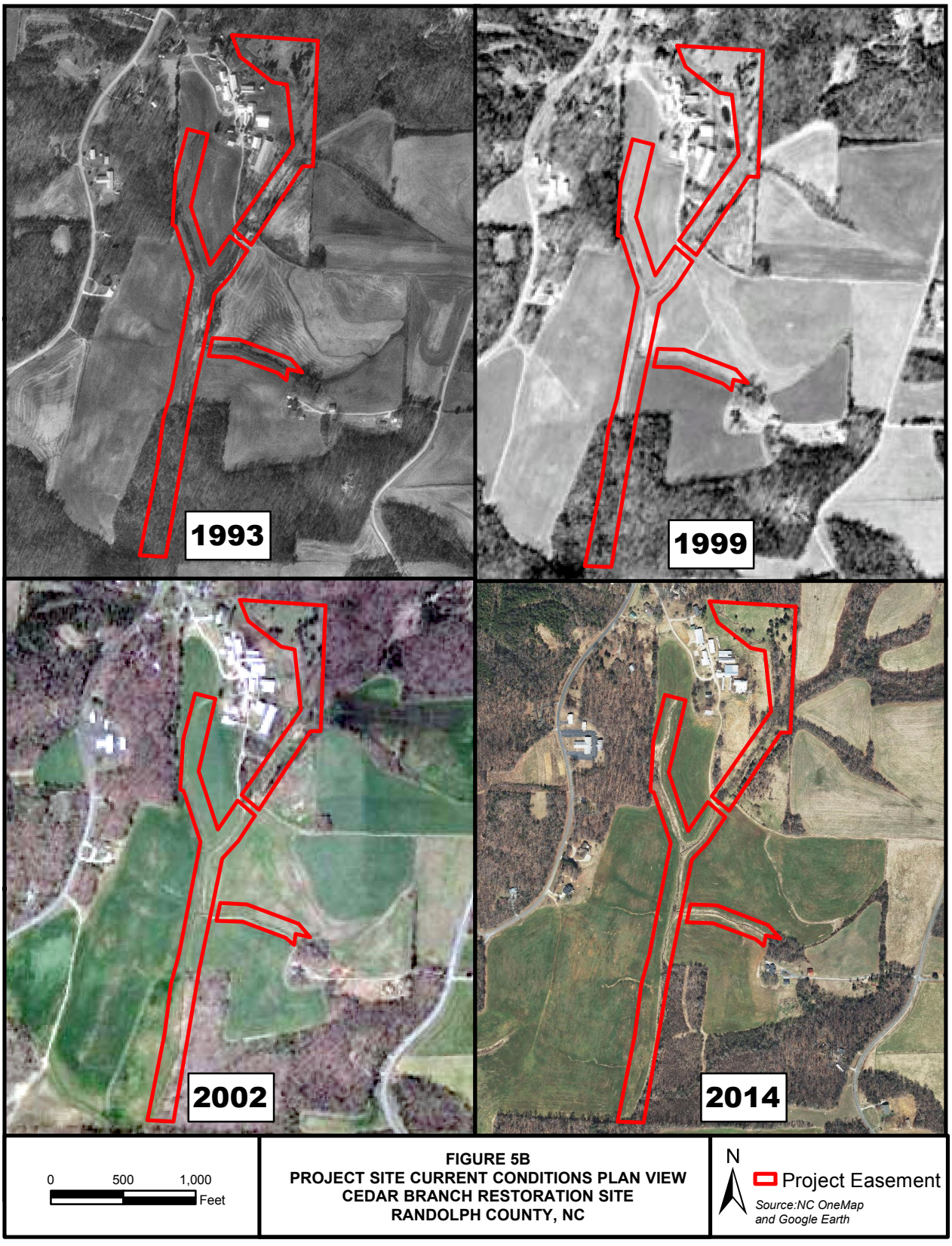


FIGURE 5B
PROJECT SITE CURRENT CONDITIONS PLAN VIEW
CEDAR BRANCH RESTORATION SITE
RANDOLPH COUNTY, NC

2.8 Site Photographs

View looking south at the confluence of T1 and T1-1. Livestock access has degraded the bed and bank and impaired water quality. 3/19/15

View looking south and downstream at T1. Elevating the channel will increase floodplain connection and hydrology. 3/19/15

View north and upstream on UTCC. Restoration will integrate the stream with its floodplain. 4/13/15

Drain emptying into the top of T3. On-site drainage will be directed into BMP's to mitigate nutrient and soil loading. 3/19/15

View north and upstream on T3. Streams will be buffered with a native vegetative buffer to limit soil and nutrient runoff from adjacent row crop operations. 3/19/15

View south and downstream on T3 towards its confluence with UTCC where enhancement will restore a vegetative buffer. 3/19/15

View south and downstream on UTCC. Natural meanders will be returned to the channel and a vegetative buffer will be installed to reduce sediment and nutrient loading. 3/19/15

View west and downstream on T4. Restoration will integrate T4 with its floodplain. 3/19/15

Tile drain emptying into T4. On-site drainage will be directed into BMP's to mitigate nutrient and soil loading. 4/13/15

Looking west and downstream on T4 at its confluence with UTCC. Restoration will integrate T4 with its floodplain. 4/13/15

View looking south at the relic floodplain, where the lower portion of UTCC and its planted riparian buffer will be relocated. 4/13/15

Looking north and upstream at the lower portion of UTCC that is to be relocated. 4/13/15

	
View south and downstream on T5 in the forest east of UTCC. 4/8/16	Looking east and downstream at the confluence of T5 and UTCC. T5 will be extended to the restored UTCC. 4/8/16

3.0 SITE PROTECTION INSTRUMENT

3.1 Site Protection Instrument Summary Information

The land required for the construction, management, and stewardship of this mitigation project includes portions of the following parcel. The conservation easement plat and documents for the CBRS have been completed and recorded. A copy of the land protection instrument is included in Appendix A.

Table 1. Site Protection Instrument Summary

Landowner	PIN	County	Site Protection Instrument	Deed Book and Page Number	Acreage protected
GERALDINE A FARLOW LIFE ESTATE	7725946466	Randolph	Conservation Easement A	DB 2472, PG 702	11.93
	7725946466	Randolph	Conservation Easement B	DB 2472, PG 702	1.70
	7725946466	Randolph	Conservation Easement C	DB 2472, PG 702	7.71

Easement Boundary Marking

Livestock exclusion fencing will be installed along the easement boundary around the upper portion of the site that is currently subject to livestock grazing. Woven wire fence will be installed as described within the project's RFP. The rest of the site will be marked and surveyed as per DMS's requirements contained within http://deq.nc.gov/about/divisions/mitigation-services/dms-vendors/rfp-forms-templates. In addition, the easement boundaries will be marked with salt-treated wooden posts placed approximately 100 feet apart. Each line post will be marked with a conservation easement placard. Corner posts will be marked with signs stating "Conservation Easement Corner."

3.2 Site Protection Instrument Figure

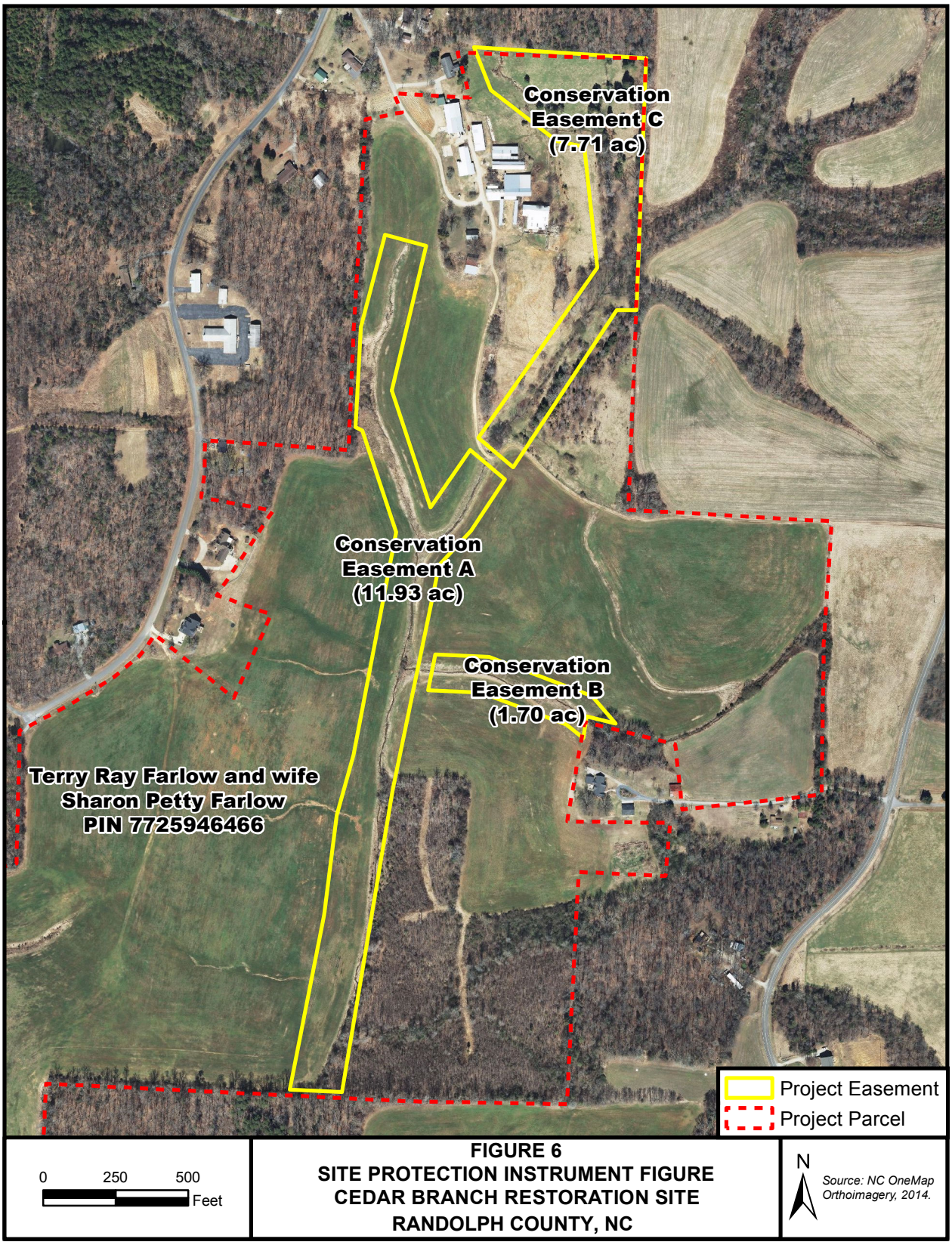


FIGURE 6
SITE PROTECTION INSTRUMENT FIGURE
CEDAR BRANCH RESTORATION SITE
RANDOLPH COUNTY, NC

4.0 BASELINE INFORMATION

Table 2. Project Information

Project Name	Cedar Branch Restoration Site		
County	Randolph County		
Project Area (acres)	21.3 acres		
Project Coordinates (lat. and long.)	35.823878° N, -79.90855° W		
Project Watershed Summary Information			
Physiographic Province	Piedmont		
River Basin	Yadkin		
USGS Hydrologic Unit 8-digit	03040103	**USGS Hydrologic Unit 14-digit**	03040103050040
DWQ Sub-basin	13-2-3		
Project Drainage Area (acres)	294 acres		
Project Drainage Area Percentage of Impervious Area	4%		
CGIA Land Use Classification	Managed Herbaceous Cover 59% (173 ac), Mixed Hardwoods/Conifers 34% (100 ac), Low Density Developed 5% (15 ac), Transportation 2% (6 ac)		

Existing Reach Summary Information						
Parameters	**UTCC**	**T1, T1-1**	**T2**	**T3, T3-1**	**T4**	**T5**
Length of reach (linear feet)	3,038	1,349	124	1,209	627	61
Drainage area (acres)	88 acres	30 acres	18 acres	28 acres	30 acres	31 acres
NCDWQ Water Quality Classification	C	C	C	C	C	C
Rosgen Classification	G4c-E4	G4	G4	E4	G4	C4b
Evolutionary trend	Channelized, Stage III	Channelized, Stage III	Channelized, Stage III	Channelized, Stage III	Channelized, Stage III	Stable
Mapped Soil Series	Mecklenburg Clay Loam	Wynott-Enon Complex	Mecklenburg Clay Loam	Mecklenburg Clay Loam	Mecklenburg Clay Loam	Mecklenburg Clay Loam
Drainage class	Well drained	Well drained	Well drained	Well drained	Well drained	Well drained
Soil Hydric status	Hydric	Hydric	Hydric	Hydric	Hydric	Hydric
Slope	1.5%	3.1%	3.1%	3.7%	3.1%	2.7%
FEMA classification	Zone X	Zone X	Zone X	Zone X	Zone X	Zone X
Existing vegetation community	Pasture, Headwater Forest	Pasture, Headwater Forest	Headwater Forest	Pasture	Pasture	Headwater Forest

Existing Wetland Summary Information		
Parameters		
Size of Wetland (acres)	0.02 (WA)	0.03 (WB and WC)
Wetland Type	Bottomland Hardwood Forest	Bottomland Hardwood Forest
Mapped Soil Series	Wynott-Enon Complex	Mecklenburg clay loam
Drainage class	Well Drained	Well Drained
Soil Hydric Status	Hydric	Hydric
Source of Hydrology	Stream Floodplain	Hillside Seepage and Stream Floodplain
Hydrologic Impairment	Ditching and Grazing	Ditching and Grazing
Existing vegetation community	Forested Wetland (Headwater Forest)	Emergent Wetland (Non-Tidal Freshwater Marsh)

Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States – Section 404	Yes	Applying for NWP 27	Jurisdictional Determination
Waters of the United States – Section 401	Yes	Applying for NWP 27	Jurisdictional Determination
Endangered Species Act**	No	N/A	N/A
Historic Preservation Act**	No	N/A	N/A
Coastal Zone Management Act ** (CZMA)/ Coastal Area Management Act (CAMA)	No	N/A	N/A
Essential Fisheries Habitat**	No	N/A	N/A

**Items addressed in the Categorical Exclusion in Appendix B.

4.1 Watershed Summary Information

The project watershed for the CBRS is comprised of 0.5 square mile (294 acres) and is shown in Figure 2. Current land use in the project watershed consists of pasture/farmland (59%/173 ac), forest (34%/100 ac), low-density development (5%/15 ac), and roads (2%/6 ac). The project watershed upstream of the site remains forested and connects to a forested corridor of Caraway Creek downstream of the project.

4.2 Reach Summary Information

Existing Conditions

The project has experienced landscape and vegetative modifications to allow for agriculture and grazing. The existing site conditions are shown in Section 2.6 (Figure 4) and seen in site photographs (Section 2.8). There are eight streams located throughout the site.

Tributary 1 (T1) begins at the northern boundary of the property, and drains approximately 12 acres. The project reach begins at a fence line, where it comes out of a forested parcel. Upstream of the fence is a stable natural channel. Once it comes onto the project, the stream has been heavily impacted by cattle. Banks that are accessible to cattle are degrading and lack a defined bank shape; where the stream is well defined by the valley, the bank forms are distinct, but vertical with hoof prints along the tops of bank. The hydrology in T1 is intermittent, with seeps from the western hill slope forming the channel flow. After approximately 550 linear feet, an intermittent tributary joins T1. This tributary (T1-1), is approximately 313 linear feet, and also comes onto the site at the northern fence line, but from a distinct spring under an exposed root system. This spring is T1-1's primary hydrologic source within its 9-acre drainage. Similar to T1, this stream has been impacted by cattle. Upstream of this confluence, both of these streams lack a riparian buffer with the exception of isolated cedar trees. After the confluence, the channel does have isolated trees that are providing partial canopy cover, but active headcuts have also developed within T1. Cattle have impacted the banks here. From the confluence with T1-1, T1 flows approximately 486 linear feet to the main project stream, an unnamed tributary to Caraway Creek (UTCC). Both T1 and T1-1 are intermittent streams throughout their project lengths and have a combined drainage area of 30 acres at the confluence of T1 with UTCC.

UTCC begins at a fence line near the northeastern part of the site. Where the project reach enters the site, the drainage area is 88 acres. It is a perennial stream with steep and eroding banks. The channel is incised within the valley and has partial canopy cover provided by isolated trees, but the trees are small and early successional species. The cattle have impacted the stream banks and kept the herbaceous and

shrub growth sparse. After the fence line, UTCC flows 80 linear feet to the confluence with T1 and then 100 linear feet to the confluence with Tributary 2 (T2), which also begins at the eastern fence line. T2 is a perennial channel draining 18 acres and has similar bank conditions and vegetative cover to the nearby reach of UTCC. T2 is approximately 123 linear feet long.

After the confluence with T2, UTCC flows through pasture that is dominated by large privet and small early successional trees. A black plastic pipe directs drainage from a roadside ditch directly to UTCC. From T2, UTCC continues for approximately 650 linear feet to a fence at the end of the cattle pasture; on the other side of the fence, row crops begin. There is also an existing 42”-concrete culvert crossing for farm equipment. Row crops are maintained to the top of bank of the channel. The channel has been straightened, and is on average deep and narrow. The channel banks alternate from being covered with grasses and other weeds to being vertical, shear, and eroding. As the stream flows south from the crossing, a distinct relic floodplain is evident throughout the valley bottom along the western side of the channel from this point until the downstream end of the project. Approximately 480 linear feet after the culvert, Tributary 3 (T3) joins UTCC from the west.

T3 begins in the middle of a field at a black pipe that drains the upslope area near the road and buildings to the northeast. It is intermittent, fed by seeps coming from the western slope, and flows 1,141 linear feet until its confluence with UTCC. The T3 channel is incised and vertically unstable for its entire length with numerous headcuts. Another short intermittent tributary, T3-1 (68 linear feet), joins T3 from the west midway between the start of T3 and the confluence with UTCC. T3-1 is also seep driven, intermittent, incised, and vertically unstable. Downstream of the confluence of T3 and T3-1, T3 is a perennial channel. T3-1 has a drainage area of 10 acres; T3 drains 7 acres at its start and has a 28-acre drainage area at the confluence with UTCC.

After the confluence with T3, UTCC continues to flow south with a relic floodplain still evident on its western side. At this point in the landscape, UTCC is still incised with a bank height ratio over 1.5, and intermittent undercut and eroding banks. After approximately 450 linear feet, Tributary 4 (T4) joins UTCC from the east. T4, approximately 677 linear feet, is an intermittent stream that begins at a cluster of trees, but then has no vegetated buffer for its length within the project. Similar to other UTCC tributaries that have been impacted by on-site agriculture, there is minimal bedform. A black drainage pipe with a direct outlet to the channel enters midway down the tributary. While less incised into the valley as other tributaries, there is still no accessible bench or floodplain along T4. The T4 drainage area is 30 acres at its confluence with UTCC.

After the confluence with T4, UTCC flows for approximately 420 linear feet along the eastern edge of the valley where the stream has been moved and channelized. The relic floodplain to the west is the widest along this section. Over the history of this site, this was the last portion of the site to be cleared. The eastern side of the channel is a steep hillslope covered in early successional trees that are growing back from the clear-cutting that occurred around 2001. The stream here is less incised as it flows down the valley, with bank height ratios between 1.0-1.5. The bedform is more varied than upstream, but because the channel has been straightened, it lacks the heterogeneity in features that a meandering channel would provide. The western side of the channel receives unmitigated runoff from extensive row cropping and the floodprone area is smaller than the wide relic floodplain that it used to occupy.

Tributary 5 (T5) enters UTCC from the property line along the forested slope to the east. T5 is 64 linear feet long and drains approximately 12 acres. T5 has not been impacted by agriculture in recent history and maintains functional bed and bank features. T5 joins UTCC approximately 150 linear feet before the

end of the project. The project ends where UTCC flows into the forest at the south end of the project. These woods form part of the large forested buffer that is contiguous with an expansive undeveloped region along Caraway Creek. Where UTCC flows off of the project parcel, the drainage area is 294 acres.

Channel Morphology (Pattern, Dimension, and Profile)

A Rosgen Level II assessment was conducted to gather existing stream dimension data throughout the project site to determine the degree of channel instability. Four channel cross-sections were surveyed along the length of UTCC and used to classify the stream as a Rosgen G4c stream type at the beginning of the reach and then transitioning to an E4 towards the end. Four other cross-sections were surveyed along T1, T3 and T4, which classified as Rosgen G4, E4, and G4, respectively. Section 2.6 shows the locations of these cross-sections. The cross-sectional data developed from this survey are presented in Appendix C.

Bankfull Verification

KCI conducted bankfull verification by locating two stable cross-sections found immediately outside of the project area (UTCC Upstream and UTCC Downstream), along with two cross-sections within the project that had stable bankfull indicators (UTCC On-Site and UT1 On-Site) (see Appendix B). A local regional curve was created using these cross-sections as shown below to compare with the Piedmont Regional Curve (Harman et al 1999). The local curve showed that the Piedmont Curve was underestimating the cross-sectional area compared to the data collected from the local project streams. Based on this analysis, we used the local bankfull data to determine bankfull elevations and cross-sectional areas for the proposed channel sizing.

Table 3. Local Regional Curve Data

Cross-Section Location	Acres	Drainage Area (Sq. Miles)	Field XS Area (sf)	XS Area Estimate (sf) from Local Regional Curve	Q (cfs)
Onsite T1	25.2	0.04	5.0	5.1	14.4
UTCC Upstream	84.3	0.13	11.7	10.9	40.5
Onsite UTCC	177.9	0.28	17.0	17.5	96.2
UTCC Downstream	313.3	0.49	24.8	25.0	111.2

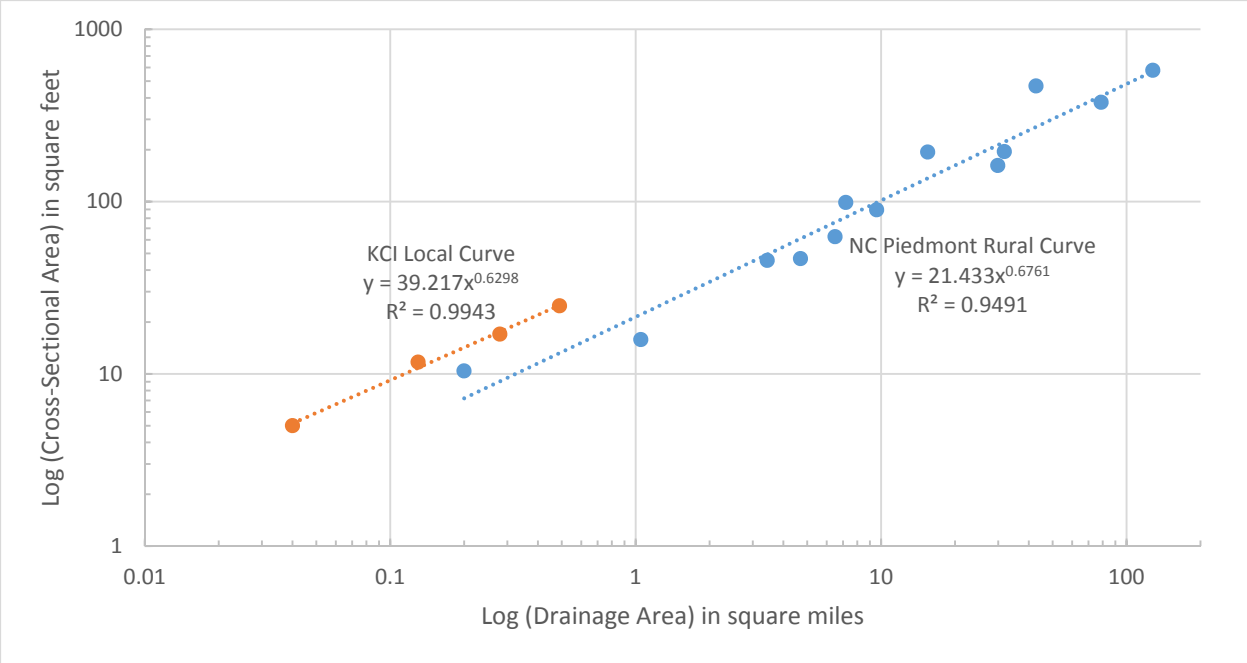


Figure 7. Local Curve for Bankfull Determination

To further evaluate the field measurements taken within the project, we compared the flow results for the four cross-sections to two different hydrologic methods. First, we compared our results to the 2-year recurrence interval flow calculations using the USGS Rural Peak-Flow Regression Equations for North Carolina in the USGS National Streamflow Statistics Program (USGS 2016). Bankfull values in the North Carolina Piedmont average a 1.4-year recurrence interval (Harman et al. 1999), and as such should be lower than the 2-year USGS values. Our field results are higher than expected compared to the USGS values, but do not exceed the higher endpoint given by the USGS results. The effective discharge equation for a 1.5 recurrence interval (Simon et al. 2004) was also used as a comparison tool; in general, the $Q_{1.5}$ values were slightly above the field flow values calculated, but were similar. This comparison shows that our field calculations are within the range of other established discharge estimations. In addition to these results, KCI also completed a TR-55 model for the watershed, but the results were much higher than was reasonable for the site, and not considered valid for this system.

Table 4. Local XS Flow Compared to USGS Regression for North Carolina

Cross-Section Location	Drainage Area (Sq. Miles)	Field Q (cfs)[1]	USGS Regression 2-year Q (cfs)	USGS Regression Low Prediction (cfs)	USGS Regression High Prediction (cfs)	1.5 Effective Discharge[4] (cfs)
Onsite T1	0.04	14.4	18.6[3]	N/A[3]	N/A[3]	28.2
UTCC Upstream	0.13	40.5	43.4	23.0	82.0	57
Onsite UTCC	0.28	96.2	73.7	39.6	137.0	90.1
UTCC Downstream	0.49	111.2	110.0	59.5	204.0	125.8

1. Calculated in Bentley Flowmaster using field bankfull dimensions and Manning's formula.
2. Calculated using USGS NSS, North Carolina Region 1 Equations assuming impervious percentage of 3.7%.
3. USGS NC Region 1 Equation considered valid for 0.1-1.0 square mile only.
4. Simon et al. 2004 equation for Piedmont (Ecoregion 45) for 1.5 Recurrence Interval.

4.3 Regulatory Considerations

A jurisdictional determination was submitted to the US Army Corps of Engineers on August 31, 2015 and was approved October 19, 2015. The approved jurisdictional determination is included in Appendix B. Following the completion of the mitigation plan, a pre-construction notification (PCN) will be completed to apply for a Nationwide 27 Permit (NWP) to comply with Sections 401 and 404 of the Clean Water Act with the Wilmington District of the US Army Corps of Engineers and the NCDEQ Division of Water Resources.

5.0 DETERMINATION OF CREDITS

Table 5. Determination of Credits

Cedar Branch Restoration Site, Randolph County									
	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Linear Feet/Acres	5,234	1,813							
Credits	5,234	966							
TOTAL CREDITS	6,200								

Project Components						
Project Component -or- Reach ID	**Proposed Stationing/ Location**	**Existing Footage/ Acreage**	**Approach (PI, PII etc.)**	**Mitigation Ratio**	**Restoration Footage or Acreage**	**Restoration -or- Restoration Equivalent**
Tributary 1	50+00 to 55+50	550	Enhancement II	2.5:1	550	220
	55+50 to 58+24	257	Enhancement I	1.5:1	274	183
	58+24 to 61+18	229	Restoration	1:1	294	294
Tributary 1-1	70+00 to 73+13	313	Enhancement II	2.5:1	313	125
Tributary 2	80+00 to 80+49	46	Enhancement II	2.5:1	49	20
	80+49 to 81+27	77	Restoration	1:1	78	78
Tributary 3	90+00 to 96+27	624	Enhancement I	1.5:1	627	418
	96+27 to 101-57	517	Restoration	1:1	530	530
Tributary 3-1	150+00 to 150+78	68	Restoration	1:1	78	78
Tributary 4*	250+00 to 257+42	677	Restoration	1:1	692	692
Tributary 5	300+00 to 300+96	64	N/A	N/A	(96)	0
UTCC*	10+00 to 46+12	3,246	Restoration	1:1	3,562	3,562

Component Summation						
Restoration Level	**Stream (linear feet)**	**Riparian Wetland (acres)**		**Non-riparian Wetland (acres)**	**Buffer (square feet)**	**Upland (acres)**
		Riverine	Non-Riverine			
Restoration	5,234					
Enhancement						
Enhancement I	901					
Enhancement II	912					
TOTAL CREDITS	**6,200**					

* Crossings have been removed from creditable linear footage for all project streams. Tributary 5 does not have any mitigation credit, but is included to show its stationing as part of the mitigation project.

6.0 CREDIT RELEASE SCHEDULE

All credit releases will be based on the total credits generated as reported by the as-built survey of the mitigation site. Under no circumstances shall any mitigation project be debited until the necessary Department of the Army (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 6. Stream Credit Release Schedule – 7-year Timeframe

Monitoring Year	Credit Release Activity	Interim Release	Total Released
0	Initial Allocation – see requirements below	30%	30%
1	First year monitoring report demonstrates performance standards are being met	10%	40%
2	Second year monitoring report demonstrates performance standards are being met	10%	50% (60%*)
3	Third year monitoring report demonstrates performance standards are being met	10%	60% (70%*)
4	Fourth year monitoring report demonstrates performance standards are being met	5%	65% (75%*)
5	Fifth year monitoring report demonstrates performance standards are being met	10%	75% (85%*)
6	If required, sixth year monitoring report demonstrates performance standards are being met	5%	80% (90%*)
7	If required, seventh year monitoring report demonstrates performance standards are being met, and project has received close-out approval from IRT	10%	90% (100%*)

**See Subsequent Credit Releases description below*

The initial allocation of released credits, as specified in the mitigation plan can be released by the NCDMS 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 NCDMS 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.
- Receipt of necessary DA permit authorization or written DA approval for projects where DA permit issuance is not required

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 project with a 7-year monitoring period, a reserve of 10% of a site's total stream credits shall be released after two bank-full 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 NCDMS 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.

7.0 MITIGATION WORK PLAN

7.1 Planting Plan

All unforested portions of the project easement will be planted to establish a forested riparian buffer. The planting plan is shown in the attached project plan sheets (Appendix D). Trees and shrubs will be planted at a density of 968 stems per acre (9 feet x 5 feet spacing) in an area of approximately 19.6 acres to achieve a mature survivability of 210 stems per acre after seven years. Woody vegetation planting will be conducted during dormancy. Species to be planted may consist of the following and any substitutions from the planting plan will be taken from this list:

Common Name	**Scientific Name**
River Birch	*Betula nigra*
American Persimmon	*Diospyros virginiana*
Green Ash	*Fraxinus pennsylvanica*
Tulip Poplar	*Liriodendron tulipifera*
American Sycamore	*Platanus occidentalis*
White Oak	*Quercus alba*
Southern Red Oak	*Quercus falcata*
Swamp Chestnut Oak	*Quercus michauxii*
Pin Oak	*Quercus palustris*
Willow Oak	*Quercus phellos*

On the restored stream banks, live stakes will be used to provide natural stabilization. Species identified for live staking include:

Common Name	**Scientific Name**
Silky Dogwood	*Cornus amomum*
Black Willow	*Salix nigra*
Silky Willow	*Salix sericea*

A custom herbaceous seed mix composed of native species will also be developed and used to further stabilize and restore the wetland. The seed mix includes Orchardgrass (*Dactylis glomerata*), Bluestem (*Andropogon glomeratus*), Virginia wildrye (*Elymus virginicus*), River Oats (*Chasmanthium latifolium*), Purple Love Grass (*Eragrostis spectabilis*), Deertongue (*Panicum clandestinum*), and Switch Grass (*Panicum virgatum*).

7.2 Design Parameters

Restoration work on the site includes: the realignment of the project streams to their relic floodplains, exclusion of cattle, installation of two BMPs at point sources of concentrated flow coming from outside the easement, and the establishment of a native riparian buffer. Two culvert crossings are planned for the site, which will not be included within the project easement.

The project will restore and enhance a total of 7,047 lf, which will generate 6,200 lf of stream credit within the conservation easement. An overview map of the proposed mitigation is shown in Section 7.3 (Figure 8) and the project plan sheets are included in Appendix D.

As a result of the restoration actions, the table below takes the proposed goals and objectives of the site described in Section 1 and relates them to the anticipated functional uplift (adapted from Harman *et al.* 2012). The primary stream functions that will be improved are stream hydraulics, through the redevelopment of a Priority 1 stream; stream geomorphology, through the restoration of a stable stream form with diverse bed features, structure, and vegetation; and physico-chemical functions, with the reductions in bacterial and nutrient inputs to the project streams from converted land use (pasture to forested buffer) and filtering capabilities of the riparian buffer. These nutrient and bacterial parameters will not be monitored directly, but rather have been estimated as a reduced contribution to project streams of 1.026 $x10^{14}$ fecal coliform colonies, 1,129 pounds of total nitrogen, and 80 pounds of total phosphorus per year (based on NCDMS 2016 guidance; see Appendix C for calculations).

Table 7. Functional Outcomes and Monitoring Measurements

Goals	Objective	Functional Level	Function-Based Parameter Effects	Monitoring Measurement
Restore channelized and livestock-impacted streams to stable C/Cb channels	Relocate a channelized stream to its historic landscape position	Hydraulics	Floodplain Connectivity	Flood Frequency
				Bank Height Ratio and Entrenchment Ratio
	Install cross-sections sized to the bankfull discharge	Geomorphology	Bank Migration/Lateral Stability	Cross-Sectional Survey
				Visual Inspection of Bank Stability
	Create bedform diversity with pools, riffles, and habitat structures	Geomorphology	Bed Form Diversity	Percent Riffle and Pool, Facet Slopes, Visual Inspection
				Visual Inspection of Feature Maintenance
Restore a forested riparian buffer to provide bank stability, filtration, and shading	Fence out livestock to reduce nutrient, bacterial, and sediment impacts from adjacent grazing and farming practices.	Geomorphology	Bed Material Characterization	Pebble Count
		Physico-Chemical	Nutrient and Bacteria Reductions	Estimated Reductions Based on Converted Land Use
	Plant the site with native trees and shrubs and a herbaceous seed mix.	Geomorphology/ Species Composition	Vegetation	Density
				Species Composition/Diversity

Table adapted from Harman et al. 2012

In addition to the stream restoration, two BMPs will be installed with biofiltration components that will enhance nutrient cycling and serve as a sink for detrimental pollutants before they reach the stream. These structures will consist of 2" layer of mulch overlaid with 2" of topsoil. Following installation, they will be seeded with a wetland seed mix. The BMPs will be monitored to ensure they stabilize and are not contributing any sediment to the project streams.

Design Summary

The project streams were designed using a modified reference reach approach using a local regional curve developed from stable reference cross-sections (see Appendix B for reference data). Stable pattern data were taken from the UT Fisher River reference. This reference site is located in Surry County, and is approximately 65 miles to the northwest of the Cedar Branch Site, higher up in the Yadkin Basin. The reference site has a drainage area of approximately 0.38 square mile, which is similar to UTCC (0.45 square mile). The sediment size is also comparable between the two sites, ranging from fine to coarse gravel for the D50-D84 values. UT Fisher River is classified as a B4c due to its entrenchment, which is different from the C4 and C4b project streams, but the pattern data remains relevant due to the similarities between the streams as described above. In addition to the data from the on-site reference and UT Fisher River, common reference values from Harmon et al. 2012 were also used to aid the development of the design criteria. The proposed channel design values have been adjusted as necessary to fit the existing site conditions based on these sources. In general, the proposed values for pattern fit within the ranges given by the UT Fisher River reference reach. Slope values were adjusted slightly as needed to fit the needs of transitional areas and the existing site (valley) conditions. The proposed channel slopes have been designed so the existing valley slope matches the new top of bank slope as much as possible. Appendix C contains the proposed morphological criteria and the project plan sheets are in Appendix D.

Unnamed Tributary to Caraway Creek (3,562 lf R)

UTCC is the primary stream channel at the site and will be restored along its entire project length as a C4-type channel using a Priority 1 approach as much as possible. As the stream comes onto the property at a fence line, there will be a transitional period at the tie-in with the existing stream where the restoration will take the form of a Priority 2 channel until the channel elevation is graded gradually to match the slope of the valley. Any portions that are restored with a Priority 2 approach (transitional areas) will conform to the guidelines that DMS has prescribed for Priority 2 restoration within this project's RFP, which includes a consistent bench at least 1.5 times the bankfull width beyond the belt-width extent, preservation and reapplication of existing topsoil in the bench, and at least 5:1 slopes from the floodplain to the terrace. The upper portion of channel, where the cattle have access to the stream (approximately 1,000 linear feet) has varying densities of sparse trees along the channel. The design dictates that these trees should be minimally impacted and that the large trees will be preserved wherever possible.

Once the stream leaves the cattle pasture, there is a well-defined floodplain and the stream is bordered by row crops that extend to the top of bank. The stream will be brought back up from its currently incised condition to access the relic floodplain. The stream will be restored to remeander through this floodplain, which is generally to the west of the current alignment. This restoration approach will continue to the end of the project, where the stream will connect to the existing channel at the southern edge of the field of row crops. This restoration will improve stream functions that are compromised because of the site conditions.

Tributary 1 and Tributary 1-1 (T1 550 lf EII, 274 lf EI, 294 lf R; T1-1 313 lf EII)

Both of these reaches will begin as Enhancement II, which will consist of excluding the cattle and expanding and planting the riparian buffer with native species. Existing large trees will be preserved as

much as possible. T1 will change to Enhancement I and then restoration by the end of the stream. The restoration work will use a Priority 1 approach combined with a Priority 2 approach in transitional areas. Following regulatory feedback on the draft mitigation plan, the design of the Enhancement I portion of the stream may be altered in the field to encourage the formation of wetlands along the constructed bankfull bench and floodplain. The design cross-section will be used as a starting point, but will be adjusted in the field as necessary to ensure there is a wide bankfull bench that will receive and retain hydrological inputs from slope seepage, overbank events, and surface water to form an anticipated wetland fringe community. Large trees have been designed around as much as possible to preserve shading and habitat. As an additional benefit to the project, the buffer around T1 and T1-1 will extend at least 50' from the western side of T1 to the eastern property line. This will create a unified buffer between these two reaches and an extended buffer on the eastern sides of T1 and T1-1 as shown in Figure 8.

Tributary 2 (49 lf EII, 78 lf R)
This short reach will be treated in a similar fashion to UTCC at the beginning of the project with a combination Priority 1/2 approach beginning with Enhancement II and changing over to restoration. The channel will transition from an incised stream at its start to a stream with access to its floodplain. The restoration will start approximately 78' upstream from T2's confluence with UTCC, which is the tie-in point that will require a restoration approach in order to prevent T2 from being in a backwater condition through the reach. Mature trees along this channel will also be protected as much as possible.

Tributary 3 and Tributary 3-1 (T3 627 lf EI, 530 lf R; T3-1 78 lf R)
The alignment of the top portion of T3 will remain in its current location using Enhancement I while bringing the incised channel up to reconnect flows to a bankfull bench. Multiple step pools will be installed for grade control and pool habitat along this steep reach. The riparian buffer will be expanded and planted with native species to encourage a wetland fringe community to develop. Similar to T1, a bankfull bench will be constructed to integrate the stream into the adjacent wetland fringe community and the designed channel cross-section and profile may be altered to encourage frequent out-of-bank flooding. The bottom portions of T3 and T3-1 will be completed using a Priority 1 restoration approach and will involve remeandering the alignment and introducing multiple pools and structures to create bed diversity. As with all the tributaries within the project, a 50' vegetated buffer will be installed along the new alignments.

Tributary 4 (692 lf R)
The reach will be restored using a combination of Priority 1 and 2 approaches. Priority 2 will be needed for the highly incised transitional area at the top half of the reach, and then the stream will move to Priority 1 for the remainder of the alignment.

Tributary 5 (96 lf – no credit)
No credit is being proposed for T5, but the reach is included in the overall mitigation design for the site. T5 will use a transitional Priority 1/2 approach similar to T2. Less work will be completed on the upper portion of the reach, but at the bottom, T5 will extend from its current location, adding two new meanders with riffle-pool bed morphology in order to connect to the new UTCC alignment.

Crossings
Two culverted crossings will be installed as part of the project, one on UTCC and another on UT4. The UTCC crossing will be fenced on the upstream end where it runs adjacent to pasture. The culverts have been designed to be embedded 1' below the proposed streambed elevation to allow aquatic organism passage and will have floodplain drain pipes to connect flows on either side of the crossing during large events.

7.3 Data Analysis

Sediment Analysis

The on-site streams currently have a mixture of gravel, sand, and cobble bed materials. Once T1 and UTCC flow onsite, they are highly influenced by erosion that is occurring from the cattle impacts that are contributing high quantities of fine sediment. This is further exacerbated along T3, T4, and the lower sections of UTCC where the streams lack a vegetated buffer and receive sediment from adjacent row crop run-off.

In order to analyze the existing sediment conditions within the project streams, one bar sample and eight pebble counts were performed for trend analysis. These data are provided in Appendix C. The project streams contain gravel with a minimal subpavement layer. The sediment sampling show that the average D50 for UTCC is 16 mm, for T1 is 12 mm, for T3 is 6.5 mm, and for T4 is 6.4 mm. These values classify the sediment in the project streams in the medium gravel range. The D84's for UTCC, T1, T3, and T4 are 55, 50, 33, and 35 mm, respectively.

Based on the collected sediment and cross-section data, shear stress values were calculated using both average channel boundary shear stress and a modified critical shear stress (USDA, Forest Service 2008). The modified shear stress was calculated using the D84 values from field samples and compared to the average channel boundary shear stress based on the existing and proposed channel dimensions and slopes. The results are shown in the table below.

Table 8. Shear Stress Results

XS	Reach	Avg Shear Stress (lb/sf)	D50 (mm)	D84 (mm)	Sample Type	Modif. Critical Shear Stress (lb/sf)	Predicted Grain Size Movement (mm)
Existing	UTCC / XS2	1.02	7.3	31	PC	0.17	
Existing	UTCC / XS3	1.02	44	110	PC	0.88	
Existing	UTCC / XS5	1.20	6.4	13	PC	0.12	
Existing	UTCC / XS6	0.93	6	65	PC	0.19	
Existing	Trib 1 / XS1	1.42	12	50	PC	0.28	
Existing	Trib 3 / XS7	1.72	6.7	31	PC	0.16	
Existing	Trib 3 / XS8	1.88	6.3	34	PC	0.23	
Existing	Trib 4 / XS4	1.34	6.4	35	PC	0.16	
Proposed	UTCC-Top	0.73	7.4	31	PC	0.17	56
Proposed	UTCC-Middle	0.76	44	110	PC	0.88	58
Proposed	UTCC-Bottom	0.86	6	65	PC	0.19	66
Proposed	Trib 1	0.96	12	50	PC	0.28	75
Proposed	Trib 2	0.65	6.3	34	PC	0.16	50
Proposed	Trib 3 & 3-1	1.35	6.3	34	PC	0.16	106
Proposed	Trib 4	1.08	6.4	35	PC	0.16	84
Proposed	Trib 5	0.81	N/A	N/A	PC	N/A	63

Based on the calculated average channel boundary shear stress for the proposed channels, the stream will have adequate stream power to transport the existing D84 material as shown by the critical shear

stress values. Due to the project slopes that were a site design constraint, the average channel boundary shear stress is higher than that needed to move the existing D84 (critical shear stress). The sediment supply from upstream sources is low in this small forested watershed, and once erosion from project slopes and banks are stabilized, there will be limited incoming gravel to replenish the newly restored channels. The results indicate the need for riffle reinforcement to protect the newly constructed riffles from excessive scour, especially when the channel is newly constructed and not as well imbricated. Proposed riffle grade control structures have been designed with a mix of Class A, B, and 1 stone with 10% ABC stone; Class A (the smallest among Classes A, B, and 1) has an approximate modified critical shear stress of 1.95 lb/sf, which is large enough to withstand all of the predicted average channel boundary stresses. In this way, the channel will act more as a threshold channel than an alluvial channel. The last column in the table above provides a predicted grain size that will move at the calculated modified critical shear stress for the proposed channel. The largest grain size predicted to be mobilized is 106 mm. Given the mix of the constructed riffle, 106 mm equates to the midrange of the Class A Stone (approximately 4 in.). It can be expected that approximately 85% of the constructed riffle stone will be greater than this diameter. Additionally, our experience has revealed minimal movement of constructed riffle material when it is well mixed and placed in the stream bed in similar design conditions.

Geomorphic Assessment

A project-wide assessment of stream stability and causes of impairment was performed at the project. The project streams are generally in Stage III (Degradation) in the channel evolutionary process (Simon and Rinaldi 2006). The primary disturbance to the system has been the relocation and straightening of the project streams, which has disconnected flow from a frequently accessible floodplain or floodprone areas. There have been disturbances to the sediment regime of the site, but they are localized on-site from upslope erosion from cattle and direct impacts on stream banks made by cattle hooves. The upstream watershed is forested and not a cause of downstream disturbance at this point in time.

KCI conducted a survey to determine the degree of departure from a stable system occurring on the project streams. The results are categorized into project streams with low, moderate, or high amounts of erosion (see mapping in Figure 4). Of the project streams, approximately 29% are experiencing low levels of erosion, 60% moderate levels, and 11% high levels of erosion. All of the areas of bank erosion are undergoing active scour as opposed to any widespread mass wasting. The removal of riparian vegetation and impacts from cattle hooves have induced bank erosion across the site. As mentioned previously, approximately 62% of the project streams have bank height ratios greater than 1.5, indicating the degree of incision that has occurred across the project channels. Because the type of impairments are caused by local sources, the project has a high potential for success. Returning the restored streams to an elevation where the floodplain or floodprone area will be accessible will alleviate the near-bank stress that is inducing bank erosion and failure. Exclusion of cattle will eliminate the additional stress to the channel banks as well. Excess sedimentation from farm fields and pasture will be reduced through the conversion of the immediate streamside areas to forested riparian buffer and will be further aided by the filtering capacity of the restored buffers.

7.4 Proposed Mitigation

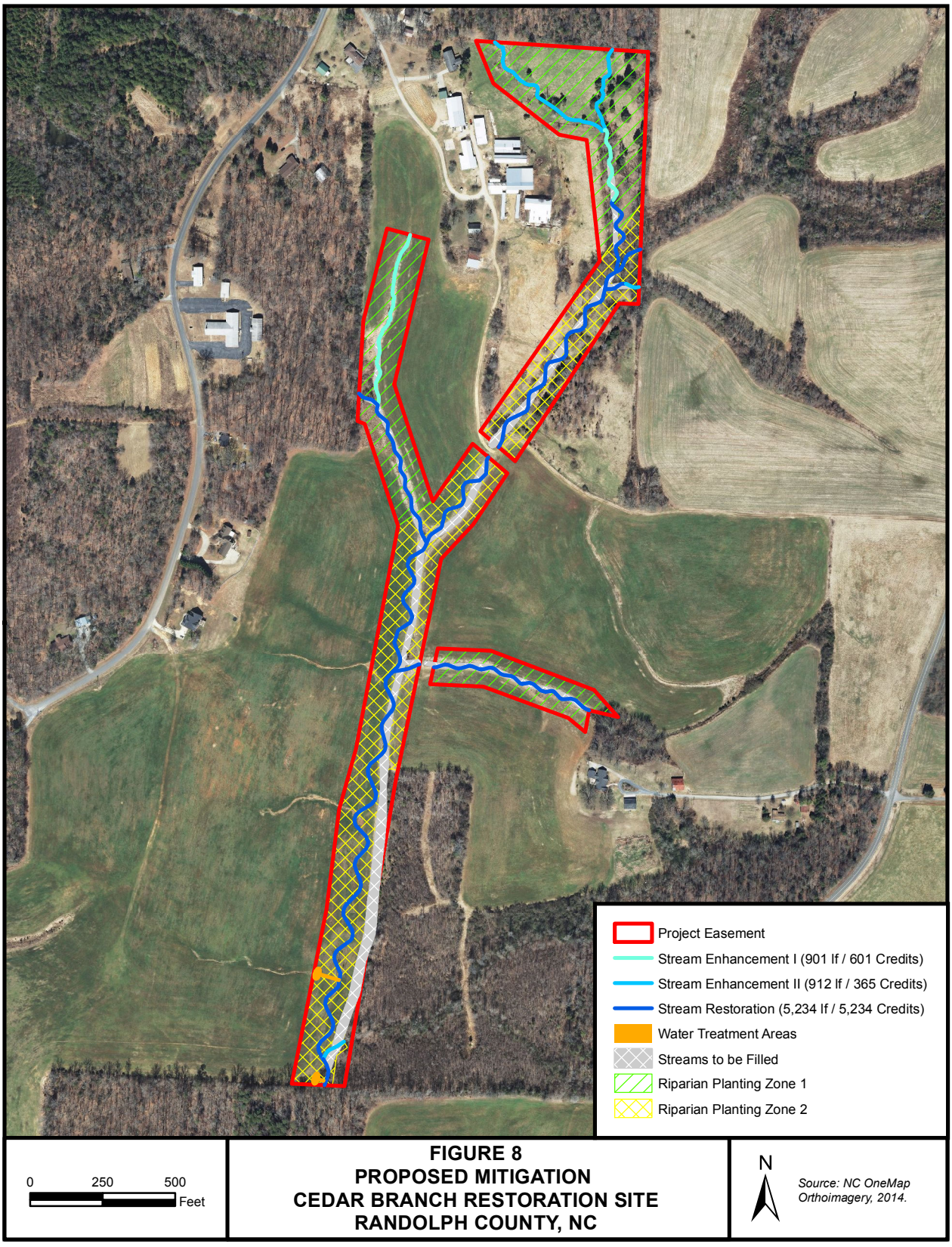


FIGURE 8
PROPOSED MITIGATION
CEDAR BRANCH RESTORATION SITE
RANDOLPH COUNTY, NC

7.5 Proposed Mitigation Type

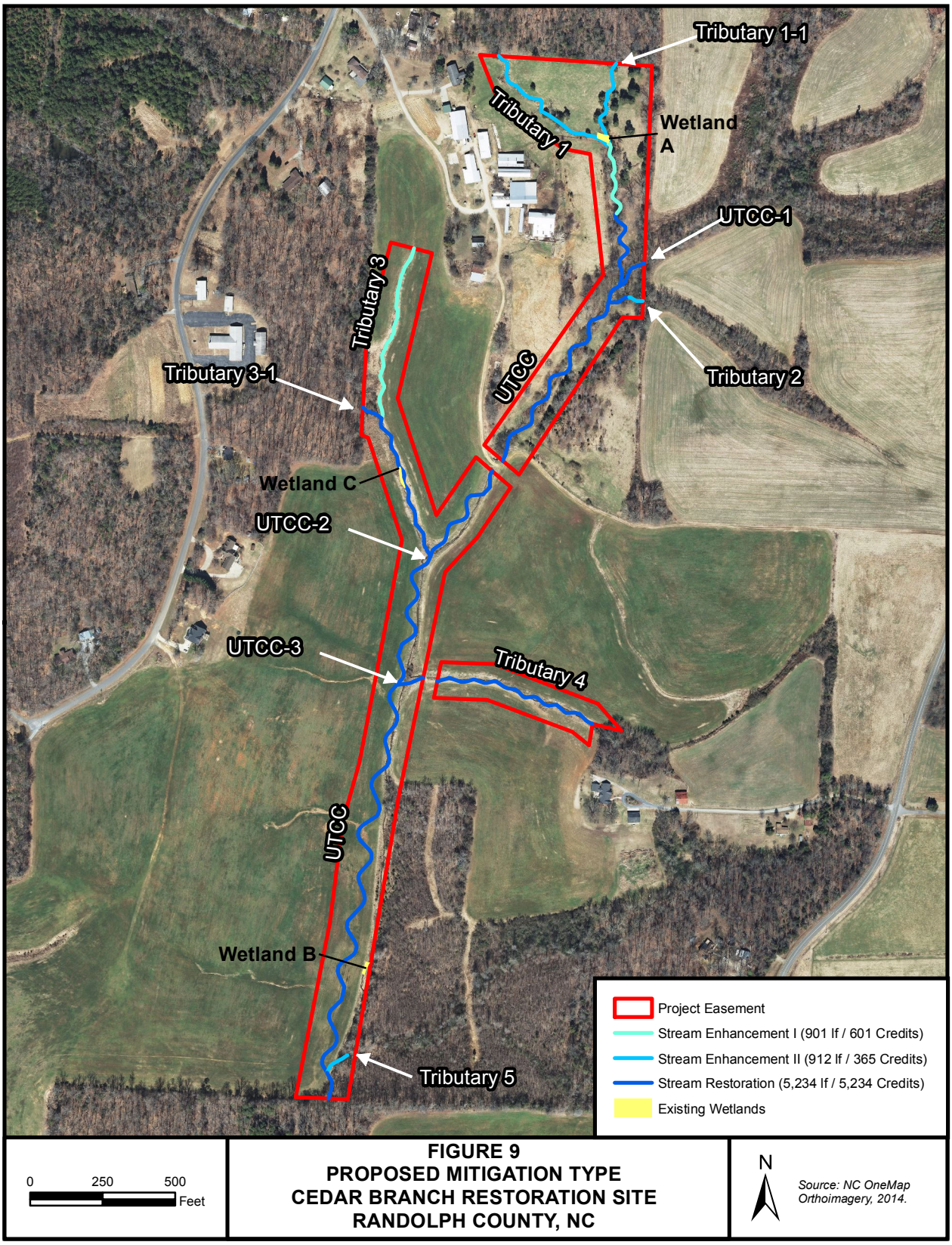


FIGURE 9
PROPOSED MITIGATION TYPE
CEDAR BRANCH RESTORATION SITE
RANDOLPH COUNTY, NC

8.0 MAINTENANCE PLAN

The site will be monitored on a regular basis, with a physical inspection of the site 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 years following site construction and may include the following:

Table 9. Planned Maintenance

Component/Feature	Maintenance Through Project Close-Out
Stream	Routine channel maintenance and repair activities may include securing of loose coir matting and supplemental installations of live stakes and other target vegetation along the channel. Areas where stormwater and floodplain flows intercept the channel (such as the proposed water quality treatment areas) may also require maintenance to prevent bank failures, knick points, and erosion.
Vegetation	Vegetation shall be maintained to ensure the health and vigor of the targeted plant community. Any vegetation control requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDA) 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 by KCI on an as needed basis up until the project is closed out.

9.0 PERFORMANCE STANDARDS

Monitoring of the Cedar Branch Restoration Site shall occur for seven years following construction or until the success criteria have been met. The following performance standards must follow the *North Carolina Stream Mitigation Guidelines* (USACE 2003) and the *Stream and Wetland Mitigation Monitoring Guidelines* (NCEEP 2014b). The table at the end of this section expands on the functional improvements anticipated for this site and how these improvements are linked to the monitoring of the performance standards.

Vegetation Performance

The site must achieve a woody stem density of 320 stems/acre after three years, 260 stems/acre after five years, and 210 stems/acre after seven years to be considered successful. Plot data with individual species lists will be provided. Volunteer species must be on the approved planting list if counted toward success. If monitoring indicates that the specified survival rate is not being met, appropriate corrective actions will take place, which may include invasive species control and replanting.

Stream Hydrologic Performance

During the monitoring period, a minimum of two bankfull events must be recorded within the monitoring period. These two bankfull events must occur in separate monitoring years. Bankfull events will be verified using automatic stream monitoring gauges to record daily stream depth readings. The Q_{gs} flow (69 cfs based on 66% of the USGS 2-year regression flow estimate at the bottom of the site – 105 cfs) will also be monitored at the site to document a minimum of two flow events. In addition, flow must be recorded in the upper reaches of T1, T1-1, and T3 for a minimum of 30 continuous days within a calendar year (assuming normal precipitation) for three out of four of the first four monitoring years.

Stream Geomorphology Performance

The site's geomorphology will be monitored per the NCEEP 2014 monitoring guidelines. Adjustment and lateral movement following construction and as the Cb or C-type channels settle over the monitoring period are to be expected. Geomorphological measurements of cross-sections will be used to determine if any adjustments that occur are out of the range typically expected for this type of stream. The bank height ratios should not exceed 1.2 and the entrenchment ratios should be 2.2 or greater. All riffle cross-sections should fall within the parameters for the appropriate stream type. The cross-sections along the Enhancement I reaches of T1 and T3 will be monitored, but are expected to be more dynamic since they will be built to connect to potential wetlands on the bankfull bench. This approach is based on discussions in the field after IRT review of the draft mitigation plan.

10.0 MONITORING REQUIREMENTS

Monitoring of the Cedar Branch Stream Restoration Site shall consist of the collection and analysis of stream hydrology, stability, and vegetation survivability data to support the evaluation of the project in meeting established performance standards described above over a period of seven years. The Proposed Monitoring Plan in Appendix C shows the proposed locations of monitoring features described below.

Vegetation Monitoring

The success of the riparian buffer will be evaluated using 12 ten-by-ten meter or equivalently-sized vegetative sampling plots within the planted area. Trees and shrubs will be grouped into height classifications and the species notated. Volunteers will be recorded in the same manner, but counted separately from planted trees. The corners of each monitoring plot will be permanently marked in the field and the coordinates of the plot corners will be recorded using conventional survey or GPS. Additionally, a photograph will be taken of each plot that will be replicated each monitoring year. Beginning at the end of the first growing season, KCI will monitor the planted vegetation in monitoring years 1, 2, 3, 5, and 7.

Stream Hydrologic Monitoring

Bankfull events on-site will be verified using an automatic stream monitoring gauge to record daily stream depth readings. Four pressure transducer gauges will be installed across the site to monitor flow at the following locations: T-1 (top), T1-1 (top), T3 (top), and bottom of UTCC.

Groundwater Hydrologic Monitoring

Three pressure transducer gauges will be installed across the site to monitor groundwater elevations at the following locations: one will be placed between along the Enhancement I reach of T-1, and two will be placed along the Enhancement I reach of T3. These data will be recorded for informational purposes.

Stream Geomorphology Monitoring

The stream monitoring will follow the procedures established in the USDA Forest Service Manual, Stream Channel Reference Sites (Harrelson et al. 1994) and the methodologies utilized in the Rosgen stream assessment and classification system (1994 and 1996). The collected data will consist of detailed dimensional measurements, longitudinal profiles, and bed materials sampling.

<u>Dimension</u>

Fifteen permanent cross-sections will be established along the restored reaches and will be used to evaluate any changes in stream dimension. Permanent monuments will be established at the left and right extents of each cross-section by conventional survey. The cross-section surveys shall provide a detailed

measurement of the stream and banks and will include points on the adjacent floodplain or valley, at the top of bank, bankfull, at all breaks in slope, the edge of water, and thalweg. Dimensional ratios will be calculated for each cross-section based on the survey data. Cross-section measurements will take place in Years 1, 2, 3, 5, and 7.

Profile

After construction, the profile of all project channels will be surveyed. Measurements will include slopes (average, pool, and riffle) as well as calculations of pool-to-pool spacing. The profile will only be surveyed during the baseline monitoring unless there are indications that changes are occurring in the restored profile over the course of monitoring.

Bed Materials

Pebble counts will be conducted at each monitored riffle cross-section for the purpose of repeated classification and to evaluate sediment transport during Years 1, 2, 3, 5, and 7.

Visual Assessment

An annual site walk will be conducted at the end of each monitoring period to document any problem areas. Specific problem areas that could arise include excessive bank erosion, bed deposition or aggradation, problems with the installed structures, or sparse vegetative cover. The findings of the visual assessment as well as any recommended corrective actions for problem areas will be summarized in the monitoring reports by way of a Current Conditions Plan View (CCPV) figure.

Photograph reference points will be established to assist in characterizing the site and to allow qualitative evaluation of the site conditions. The location of each photo point will be marked in the monitoring plan and the bearing/orientation of the photograph will be documented to allow for repeated use.

Each cross-section will be photographed to show the form of the channel with the tape measure stretched over the channel for reference in each photograph. An effort will be made to consistently show the same area in each photograph.

The development of wetland fringe communities along T1 and T3 will be described annually, including noting which species are present and if any indicators of surface hydrology are present.

Reporting

Annual monitoring data will be reported using the most current DMS monitoring template (NCEEP 2014). The monitoring report shall provide a project data chronology that will facilitate an understanding of project status and trends, population of DMS databases for analysis, research purposes, and assist in decision making regarding project close-out. The report will document the monitored components and include all collected data, analyses, and photographs. The first scheduled monitoring will be conducted during the first full growing season following project completion; a minimum of 180 days must occur between post-construction baseline data collection and Year 1 monitoring. Full monitoring reports will be completed in Years 1, 2, 3, 5, and 7. A limited monitoring report (CCPV, photos, stream gauge data, and site narrative) will be submitted in Years 4 and 6.

Table 10. Monitoring Parameters

Parameter	Quantity	Frequency	Notes
Stream Pattern and Profile	Approx. 6,135 linear feet	Once at Baseline	
Dimension	15 Cross-Sections	Monitoring Years 1, 2, 3, 5, and 7	
Substrate	Pebble counts at permanent riffle cross-sections	Monitoring Years 1, 2, 3, 5, and 7	
Surface Water Hydrology	Automatic Recording Gauges	Annual (3 gauges on tops of T1, T1-1, and T3)	30 days continuous flow within a calendar year required for intermittent portions of T1, T1-1, and T3 for 3 of the first 4 years of monitoring assuming normal precipitation
Vegetation	12 permanent vegetation monitoring plots	Monitoring Years 1, 2, 3, 5, and 7	
Project boundary		Semi-annual	Locations of vegetation damage, boundary encroachments, etc. will be mapped

11.0 LONG-TERM MANAGEMENT PLAN

Upon approval for close-out by the Interagency Review Team (IRT), the site will be transferred to the NCDEQ Stewardship Program. This party shall be responsible for periodic inspection of the site to ensure that restrictions required in the conservation easement are upheld. Endowment funds required to uphold easement and deed restrictions shall be negotiated prior to site transfer to the responsible party.

The NCDEQ Stewardship Program currently houses DMS stewardship endowments within the non reverting, interest-bearing Conservation Lands Stewardship Endowment Account. The use of funds from the Endowment Account is governed by North Carolina General Statute GS 113A-232(d)(3). Interest gained by the endowment fund may be used only for the purpose of stewardship, monitoring, stewardship administration, and land transaction costs, if applicable. The NCDEQ Stewardship Program intends to manage the account as a non-wasting endowment. Only interest generated from the endowment funds will be used to steward the compensatory mitigation site. Interest funds not used for those purposes will be re-invested in the Endowment Account to offset losses due to inflation.

12.0 ADAPTIVE MANAGEMENT PLAN

Upon completion of site construction KCI will implement the post-construction monitoring protocols previously defined in this document. Project maintenance will be performed as described previously in this document. If, during the course of annual monitoring it is determined the site's ability to achieve site performance standards are jeopardized, KCI will notify the DMS and the USACE of the need to develop a Plan of Corrective Action. The Plan of Corrective Action may be prepared using in-house technical staff or may require engineering and consulting services. Once the Corrective Action Plan is prepared and finalized KCI will:

1. Notify the DMS and USACE as required by the Nationwide 27 permit general conditions.
2. Revise performance standards, maintenance requirements, and monitoring requirements as necessary and/or required by the USACE.
3. Obtain other permits as necessary.
4. Implement the Corrective Action Plan.

5. Provide the USACE a Record Drawing of Corrective Actions. This document shall depict the extent and nature of the work performed.

13.0 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 U.S. 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.

14.0 REFERENCES

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1. Vicksburg, MS: U.S. Army Engineer Waterways Experiment Station.

Griffith, G., J. Omernik, and J. Comstock. 2002. Ecoregions of North Carolina, Regional Descriptions. US E.P.A. Last accessed 8/2016 at: https://archive.epa.gov/wed/ecoregions/web/html/ncsc_eco.html

Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J. R. Everhart, and R.E. Smith, 1999. Bankfull Hydraulic Geometry Relationships for North Carolina Streams. Wildland Hydrology. AWRA Symposium Proceedings. Edited by D.S. Olsen and J.P. Potyondy. American Water Resources Association. June 30 – July 2, 1999. Bozeman, MT.

Harman, W., R. Starr, M. Carter, K. Tweedy, M. Clemmons, K. Suggs, C. Miller. 2012. A Function-Based Framework for Stream Assessment and Restoration Projects. US Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, Washington, DC EPA 843-K-12-006.

NCDENR, Ecosystem Enhancement Program. 2005a. Local Watershed Plan for the Yadkin River Basin: Upper Uwharrie River Watershed. Raleigh, NC. Last accessed 11/2015 at: http://portal.ncdenr.org/c/document_library/get_file?uuid=915e0164-8786-4a36-91b9-8305515def02&groupId=60329

NCDENR, Ecosystem Enhancement Program. 2005b. Upper Uwharrie Local Watershed Plan: Fact Sheet. Raleigh, NC. Last accessed 11/2015 at: http://portal.ncdenr.org/c/document_library/get_file?uuid=80ebfb8a-3478-4ecf-bac1-e888d8ddb563&groupId=60329

NCDENR, Ecosystem Enhancement Program. 2009. Lower Yadkin Pee-Dee River Basin Priorities 2009. Raleigh, NC. Last accessed 11/2015 at: http://portal.ncdenr.org/c/document_library/get_file?uuid=081b34ec-8b4c-434f-9e25-57c713cb136c&groupId=60329

NCDENR, Ecosystem Enhancement Program. 2014. Stream and Wetland Mitigation Monitoring Guidelines. Last accessed 6/2015 at: http://portal.ncdenr.org/c/document_library/get_file?p_l_id=60409&folderId=18877169&name=DLFE-86606.pdf

NCDEQ, Division of Mitigation Services. 2016. Quantifying Benefits to Water Quality from Livestock Exclusion and Riparian Buffer Establishment for Stream Restoration. Last accessed 8/2016 at: http://deq.nc.gov/about/divisions/mitigation-services/dms-vendors/rfp-forms-templates

NCDEQ, Division of Water Resources. Draft 2016 303(d) list. Raleigh, NC. Last accessed 9/2016 at: https://deq.nc.gov/about/divisions/water-resources/planning/classification-standards/303d/303d-files

North Carolina Archaeological Council. 2011. The Archaeology of North Carolina: Three Archaeological

Symposia. Charles R. Ewen, Thomas R. Whyte, and R.P. Stephen Davis, Jr. http://www.rla.unc.edu/NCAC/Publications/NCAC30/index.html

Simon, A., W. Dickerson, and A. Heins. 2004. Suspended-sediment transport rates at the 1.5-year recurrence interval for ecoregions of the United States: transport conditions at the bankfull and effective discharge? Geomorphology 58: 243–262.

Simon, A. and M. Rinaldi. 2006. Disturbance, stream incision, and channel evolution: The roles of excess transport capacity and boundary materials in controlling channel response. Geomorphology 79: 361–383.

Stream Mitigation Guidelines, April 2003, US Army Corps of Engineers Wilmington District.

USDA, Forest Service, National Technology and Development Program. 2008. Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings. Appendix E: Methods for Streambed Mobility/Stability Analysis. Last accessed 9/2016 at: http://www.fs.fed.us/eng/pubs/pdf/StreamSimulation/

USDA, Natural Resources Conservation Service. 2006. Soil Survey of Randolph County. Raleigh, North Carolina. Last accessed at: http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/north_carolina/NC151/0/Randolph.pdf

USGS. 2016. Mafic Metavolcanic Rock. http://mrdata.usgs.gov/geology/state/sgmcunit.php?unit=NCCAZmv%3B6 Last accessed 8/2016.

USGS. 2016. National Streamflow Statistics Program, Version 6. Database Version NSS_v6_2016-04-25.mdb. Last accessed 9/2016 at: http://water.usgs.gov/software/NSS/.

Appendix A. Site Protection Instrument

BK 2472 PG 702 (14)
This document presented and filed:
12/16/2015 04:01:19 PM
DEED
Fee $26.00 Excise Tax: $641.00
20014104
Randolph County North Carolina
Krista M. Lowe, Register of Deeds

STATE OF NORTH CAROLINA

DEED OF CONSERVATION EASEMENT AND RIGHT OF ACCESS PROVIDED PURSUANT TO FULL DELIVERY MITIGATION CONTRACT

$641.00 R/S
RANDOLPH COUNTY
✓PH Ben C. Morgan
SPO File Number: 76-BN
DMS Project Number: 97009

Prepared by: Office of the Attorney General
Property Control Section
Return to: NC Department of Administration
State Property Office
1321 Mail Service Center
Raleigh, NC 27699-1321

THIS DEED OF CONSERVATION EASEMENT AND RIGHT OF ACCESS, made this 16th day of December, 2015, by Geraldine A. Farlow, unmarried (life estate) and Terry Ray Farlow and wife, Sharon Petty Farlow (remainder) (collectively, "**Grantor**"), whose mailing address is 3258 Farlow Pines Drive, Sophia North Carolina 27350, to the State of North Carolina ("**Grantee**"), whose mailing address is State of North Carolina, Department of Administration, State Property Office, 1321 Mail Service Center, Raleigh, NC 27699-1321. The designations of Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine, or neuter as required by context.

WITNESSETH:

WHEREAS, pursuant to the provisions of N.C. Gen. Stat. § 143-214.8 et seq., the State of North Carolina has established the Division of Mitigation Services (formerly known as the Ecosystem Enhancement Program) within the Department of Environmental Quality for the purposes of acquiring, maintaining, restoring, enhancing, creating and preserving wetland and riparian resources that contribute to the protection and improvement of water quality, flood prevention, fisheries, aquatic habitat, wildlife habitat, and recreational opportunities; and

WHEREAS, this Conservation Easement from Grantor to Grantee has been negotiated, arranged and provided for as a condition of a full delivery contract between **KCI Environmental Technologies and Construction Inc.** and the North Carolina Department of Environmental Quality, to provide stream, wetland and/or buffer mitigation pursuant to the North Carolina Department of Environmental Quality Purchase and Services Contract Number **6598**.

WHEREAS, The State of North Carolina is qualified to be the Grantee of a Conservation Easement pursuant to N.C. Gen. Stat. § 121-35; and

WHEREAS, the Department of Environment and Natural Resources and the United States Army Corps of Engineers, Wilmington District entered into a Memorandum of Understanding, (MOU) duly executed by all parties on November 4, 1998. This MOU recognized that the Wetlands Restoration Program was to provide effective compensatory mitigation for authorized impacts to wetlands, streams and other aquatic resources by restoring, enhancing and preserving the wetland and riparian areas of the State; and

WHEREAS, the Department of Environment and Natural Resources, the North Carolina Department of Transportation and the United States Army Corps of Engineers, Wilmington District entered into a Memorandum of Agreement, (MOA) duly executed by all parties in Greensboro, NC on July 22, 2003, which recognizes that the Ecosystem Enhancement Program is to provide for compensatory mitigation by effective protection of the land, water and natural resources of the State by restoring, enhancing and preserving ecosystem functions; and

WHEREAS, the Department of Environment and Natural Resources, the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the North Carolina Wildlife Resources Commission, the North Carolina Division of Water Quality, the North Carolina Division of Coastal Management, and the National Marine Fisheries Service entered into an agreement to continue the In-Lieu Fee operations of the North Carolina Department of Natural Resources' Ecosystem Enhancement Program with an effective date of 28 July, 2010, which supersedes and replaces the previously effective MOA and MOU referenced above; and

WHEREAS, the acceptance of this instrument for and on behalf of the State of North Carolina was granted to the Department of Administration by resolution as approved by the Governor and Council of State adopted at a meeting held in the City of Raleigh, North Carolina, on the 8th day of February 2000; and

WHEREAS, the Division of Mitigation Services in the Department of Environmental Quality, which has been delegated the authority authorized by the Governor and Council of State to the Department of Administration, has approved acceptance of this instrument; and

WHEREAS, Grantor owns in fee simple certain real property situated, lying, and being in **New Market** Township, Randolph County, North Carolina (the "**Property**"), and being more particularly described as that certain parcel of land containing approximately **157.66** acres in

deed recorded in **Deed Book 2220 at Page 1422** of the **Randolph** County Registry, North Carolina; and

WHEREAS, Grantor is willing to grant a Conservation Easement and Right of Access over the herein described areas of the Property, thereby restricting and limiting the use of the areas of the Property subject to the Conservation Easement to the terms and conditions and purposes hereinafter set forth, and Grantee is willing to accept said Easement and Access Rights. The Conservation Easement shall be for the protection and benefit of the waters of ***Caraway Creek.***

NOW, THEREFORE, in consideration of the mutual covenants, terms, conditions, and restrictions hereinafter set forth, Grantor unconditionally and irrevocably hereby grants and conveys unto Grantee, its successors and assigns, forever and in perpetuity, a Conservation Easement along with a general Right of Access.

The Conservation Easement Area consists of the following:

Conservation Easement A containing **11.93 acres**, Conservation Easement B containing **1.70 acres** and Conservation Easement C containing **7.71 acres** as shown on the plat of survey entitled "Conservation Easement Survey for State of North Carolina Department of Environmental Quality, Project Name: Cedar Branch Restoration Site, DMS Project #: **97009**, SPO File No. 76-BN: Property of Geraldine A. Farlow - Life Estate, and Terry Ray Farlow and wife, Sharon Petty Farlow – remainder" dated November 11, 2015 by **James M. Gellenthin**, PLS Number **L-3860** and recorded in the **Randolph County**, North Carolina Register of Deeds at **Plat Book 146 Page 45.**

See attached "**Exhibit A**", Legal Description of area of the Property hereinafter referred to as the "Conservation Easement Area"

The purposes of this Conservation Easement are to maintain, restore, enhance, construct, create and preserve wetland and/or riparian resources in the Conservation Easement Area that contribute to the protection and improvement of water quality, flood prevention, fisheries, aquatic habitat, wildlife habitat, and recreational opportunities; to maintain permanently the Conservation Easement Area in its natural condition, consistent with these purposes; and to prevent any use of the Easement Area that will significantly impair or interfere with these purposes. To achieve these purposes, the following conditions and restrictions are set forth:

I. DURATION OF EASEMENT

Pursuant to law, including the above referenced statutes, this Conservation Easement and Right of Access shall be perpetual and it shall run with, and be a continuing restriction upon the use of, the Property, and it shall be enforceable by the Grantee against the Grantor and against Grantor's heirs, successors and assigns, personal representatives, agents, lessees, and licensees.

II. GRANTOR RESERVED USES AND RESTRICTED ACTIVITIES

The Conservation Easement Area shall be restricted from any development or usage that would impair or interfere with the purposes of this Conservation Easement. Unless expressly reserved as a compatible use herein, any activity in, or use of, the Conservation Easement Area by the Grantor is prohibited as inconsistent with the purposes of this Conservation Easement. Any rights not expressly reserved hereunder by the Grantor have been acquired by the Grantee. Any rights not expressly reserved hereunder by the Grantor, including the rights to all mitigation credits, including, but not limited to, stream, wetland, and riparian buffer mitigation units, derived from each site within the area of the Conservation Easement, are conveyed to and belong to the Grantee. Without limiting the generality of the foregoing, the following specific uses are prohibited, restricted, or reserved as indicated:

A. Recreational Uses. Grantor expressly reserves the right to undeveloped recreational uses, including hiking, bird watching, hunting and fishing, and access to the Conservation Easement Area for the purposes thereof.

B. Motorized Vehicle Use. Motorized vehicle use in the Conservation Easement Area is prohibited except within a Crossing Area(s) or Road or Trail as shown on the recorded survey plat.

C. Educational Uses. The Grantor reserves the right to engage in and permit others to engage in educational uses in the Conservation Easement Area not inconsistent with this Conservation Easement, and the right of access to the Conservation Easement Area for such purposes including organized educational activities such as site visits and observations. Educational uses of the property shall not alter vegetation, hydrology or topography of the site.

D. Damage to Vegetation. Except within Crossing Area(s) as shown on the recorded survey plat and as related to the removal of non-native plants, diseased or damaged trees, or vegetation that destabilizes or renders unsafe the Conservation Easement Area to persons or natural habitat, all cutting, removal, mowing, harming, or destruction of any trees and vegetation in the Conservation Easement Area is prohibited.

E. Industrial, Residential and Commercial Uses. All industrial, residential and commercial uses are prohibited in the Conservation Easement Area.

F. Agricultural Use. All agricultural uses are prohibited within the Conservation Easement Area including any use for cropland, waste lagoons, or pastureland.

G. New Construction. There shall be no building, facility, mobile home, antenna, utility pole, tower, or other structure constructed or placed in the Conservation Easement Area.

H. Roads and Trails. There shall be no construction or maintenance of new roads, trails, walkways, or paving in the Conservation Easement .

All existing roads, trails and crossings within the Conservation Easement Area shall be shown on the recorded survey plat.

I. Signs. No signs shall be permitted in the Conservation Easement Area except interpretive signs describing restoration activities and the conservation values of the Conservation Easement Area, signs identifying the owner of the Property and the holder of the Conservation Easement, signs giving directions, or signs prescribing rules and regulations for the use of the Conservation Easement Area.

J. Dumping or Storing. Dumping or storage of soil, trash, ashes, garbage, waste, abandoned vehicles, appliances, machinery, or any other material in the Conservation Easement Area is prohibited.

K. Grading, Mineral Use, Excavation, Dredging. There shall be no grading, filling, excavation, dredging, mining, drilling, hydraulic fracturing; removal of topsoil, sand, gravel, rock, peat, minerals, or other materials.

L. Water Quality and Drainage Patterns. There shall be no diking, draining, dredging, channeling, filling, leveling, pumping, impounding or diverting, causing, allowing or permitting the diversion of surface or underground water in the Conservation Easement Area. No altering or tampering with water control structures or devices, or disruption or alteration of the restored, enhanced, or created drainage patterns is allowed. All removal of wetlands, polluting or discharging into waters, springs, seeps, or wetlands, or use of pesticide or biocides in the Conservation Easement Area is prohibited. In the event of an emergency interruption or shortage of all other water sources, water from within the Conservation Easement Area may temporarily be withdrawn for good cause shown as needed for the survival of livestock on the Property.

M. Subdivision and Conveyance. Grantor voluntarily agrees that no further subdivision, partitioning, or dividing of the Conservation Easement Area portion of the Property owned by the Grantor in fee simple ("fee") that is subject to this Conservation Easement is allowed. Any future transfer of the Property shall be subject to this Conservation Easement and Right of Access and to the Grantee's right of unlimited and repeated ingress and egress over and across the Property to the Conservation Easement Area for the purposes set forth herein.

N. Development Rights. All development rights are permanently removed from the Conservation Easement Area and are non-transferrable.

O. Disturbance of Natural Features. Any change, disturbance, alteration or impairment of the natural features of the Conservation Easement Area or any intentional introduction of non-native plants, trees and/or animal species by Grantor is prohibited.

The Grantor may request permission to vary from the above restrictions for good cause shown, provided that any such request is not inconsistent with the purposes of this Conservation Easement, and the Grantor obtains advance written approval from the N.C. Ecosystem Enhancement Program, whose mailing address is 1652 Mail Services Center, Raleigh, NC 27699-1652.

III. GRANTEE RESERVED USES

A. Right of Access, Construction, and Inspection. The Grantee, its employees and agents, successors and assigns, receive a perpetual right and easement of access to the Conservation Easement Area over the Property at reasonable times to undertake any activities to restore, construct, manage, maintain, enhance, protect, and monitor the stream, wetland and any other riparian resources in the Conservation Easement Area, in accordance with restoration activities or a long-term management plan. Unless otherwise specifically set forth in this Conservation Easement, the rights granted herein do not include or establish for the public any access rights.

B. Restoration Activities. These activities include planting of trees, shrubs and herbaceous vegetation, installation of monitoring wells, utilization of heavy equipment to grade, fill, and prepare the soil, modification of the hydrology of the site, and installation of natural and manmade materials as needed to direct in-stream, above ground, and subterraneous water flow.

C. Signs. The Grantee, its employees and agents, successors or assigns, shall be permitted to place signs and witness posts on the Property to include any or all of the following: describe the project, prohibited activities within the Conservation Easement, or identify the project boundaries and the holder of the Conservation Easement.

D. Fences. Conservation Easements are purchased to protect the investments by the State (Grantee) in natural resources. Livestock within conservations easements damages the investment and can result in reductions in natural resource value and mitigation credits which would cause financial harm to the State. Therefore, Landowners (Grantor) with livestock are required to restrict livestock access to the Conservation Easement area. Repeated failure to do so may result in the State (Grantee) repairing or installing livestock exclusion devices (fences) within the conservation area for the purpose of restricting livestock access. In such cases, the landowner (Grantor) must provide access to the State (Grantee) to make repairs.

E. Crossing Area(s). The Grantee is not responsible for maintenance of crossing area(s), however, the Grantee, its employees and agents, successors or assigns, reserve the right to repair crossing area(s), at its sole discretion and to recover the cost of such repairs from the Grantor if such repairs are needed as a result of activities of the Grantor, his successors or assigns.

IV. ENFORCEMENT AND REMEDIES

A. Enforcement. To accomplish the purposes of this Conservation Easement, Grantee is allowed to prevent any activity within the Conservation Easement Area that is inconsistent with the purposes of this Conservation Easement and to require the restoration of such areas or features in the Conservation Easement Area that may have been damaged by such unauthorized activity or use. Upon any breach of the terms of this Conservation Easement by Grantor, the Grantee shall, except as provided below, notify the Grantor in writing of such breach and the Grantor shall have ninety (90) days after receipt of such notice to correct the damage caused by such breach. If the breach and damage remains uncured after ninety (90) days, the Grantee may

enforce this Conservation Easement by bringing appropriate legal proceedings including an action to recover damages, as well as injunctive and other relief. The Grantee shall also have the power and authority, consistent with its statutory authority: (a) to prevent any impairment of the Conservation Easement Area by acts which may be unlawful or in violation of this Conservation Easement; (b) to otherwise preserve or protect its interest in the Property; or (c) to seek damages from any appropriate person or entity. Notwithstanding the foregoing, the Grantee reserves the immediate right, without notice, to obtain a temporary restraining order, injunctive or other appropriate relief, if the breach is or would irreversibly or otherwise materially impair the benefits to be derived from this Conservation Easement, and the Grantor and Grantee acknowledge that the damage would be irreparable and remedies at law inadequate. The rights and remedies of the Grantee provided hereunder shall be in addition to, and not in lieu of, all other rights and remedies available to Grantee in connection with this Conservation Easement.

B. Inspection. The Grantee, its employees and agents, successors and assigns, have the right, with reasonable notice, to enter the Conservation Easement Area over the Property at reasonable times for the purpose of inspection to determine whether the Grantor is complying with the terms, conditions and restrictions of this Conservation Easement.

C. Acts Beyond Grantor's Control. Nothing contained in this Conservation Easement shall be construed to entitle Grantee to bring any action against Grantor for any injury or change in the Conservation Easement Area caused by third parties, resulting from causes beyond the Grantor's control, including, without limitation, fire, flood, storm, and earth movement, or from any prudent action taken in good faith by the Grantor under emergency conditions to prevent, abate, or mitigate significant injury to life or damage to the Property resulting from such causes.

D. Costs of Enforcement. Beyond regular and typical monitoring expenses, any costs incurred by Grantee in enforcing the terms of this Conservation Easement against Grantor, including, without limitation, any costs of restoration necessitated by Grantor's acts or omissions in violation of the terms of this Conservation Easement, shall be borne by Grantor.

E. No Waiver. Enforcement of this Easement shall be at the discretion of the Grantee and any forbearance, delay or omission by Grantee to exercise its rights hereunder in the event of any breach of any term set forth herein shall not be construed to be a waiver by Grantee.

V. MISCELLANEOUS

A. This instrument sets forth the entire agreement of the parties with respect to the Conservation Easement and supersedes all prior discussions, negotiations, understandings or agreements relating to the Conservation Easement. If any provision is found to be invalid, the remainder of the provisions of the Conservation Easement, and the application of such provision to persons or circumstances other than those as to which it is found to be invalid, shall not be affected thereby.

B. Grantor is responsible for any real estate taxes, assessments, fees, or charges levied upon the Property. Grantee shall not be responsible for any costs or liability of any kind related to the ownership, operation, insurance, upkeep, or maintenance of the Property, except as expressly

provided herein. Upkeep of any constructed bridges, fences, or other amenities on the Property are the sole responsibility of the Grantor. Nothing herein shall relieve the Grantor of the obligation to comply with federal, state or local laws, regulations and permits that may apply to the exercise of the Reserved Rights.

C. Any notices shall be sent by registered or certified mail, return receipt requested to the parties at their addresses shown herein or to other addresses as either party establishes in writing upon notification to the other.

D. Grantor shall notify Grantee in writing of the name and address and any party to whom the Property or any part thereof is to be transferred at or prior to the time said transfer is made. Grantor further agrees that any subsequent lease, deed, or other legal instrument by which any interest in the Property is conveyed is subject to the Conservation Easement herein created.

E. The Grantor and Grantee agree that the terms of this Conservation Easement shall survive any merger of the fee and easement interests in the Property or any portion thereof.

F. This Conservation Easement and Right of Access may be amended, but only in writing signed by all parties hereto, or their successors or assigns, if such amendment does not affect the qualification of this Conservation Easement or the status of the Grantee under any applicable laws, and is consistent with the purposes of the Conservation Easement. The owner of the Property shall notify the State Property Office and the U.S. Army Corps of Engineers in writing sixty (60) days prior to the initiation of any transfer of all or any part of the Property or of any request to void or modify this Conservation Easement. Such notifications and modification requests shall be addressed to:

Division of Mitigation Services Program Manager
State Property Office
1321 Mail Service Center
Raleigh, NC 27699-1321

and

General Counsel
US Army Corps of Engineers
69 Darlington Avenue
Wilmington, NC 28403

G. The parties recognize and agree that the benefits of this Conservation Easement are in gross and assignable provided, however, that the Grantee hereby covenants and agrees, that in the event it transfers or assigns this Conservation Easement, the organization receiving the interest will be a qualified holder under N.C. Gen. Stat. § 121-34 et seq. and § 170(h) of the Internal Revenue Code, and the Grantee further covenants and agrees that the terms of the transfer or assignment will be such that the transferee or assignee will be required to continue in perpetuity the conservation purposes described in this document.

VI. QUIET ENJOYMENT

Grantor reserves all remaining rights accruing from ownership of the Property, including the right to engage in or permit or invite others to engage in only those uses of the Conservation Easement Area that are expressly reserved herein, not prohibited or restricted herein, and are not inconsistent with the purposes of this Conservation Easement. Without limiting the generality of the foregoing, the Grantor expressly reserves to the Grantor, and the Grantor's invitees and licensees, the right of access to the Conservation Easement Area, and the right of quiet enjoyment of the Conservation Easement Area,

TO HAVE AND TO HOLD, the said rights and easements perpetually unto the State of North Carolina for the aforesaid purposes,

AND Grantor covenants that Grantor is seized of said premises in fee and has the right to convey the permanent Conservation Easement herein granted; that the same is free from encumbrances and that Grantor will warrant and defend title to the same against the claims of all persons whomsoever.

Remainder of page intentionally left blank

IN TESTIMONY WHEREOF, the Grantor has hereunto set his hand and seal, the day and year first above written.

Geraldine A. Farlow (SEAL)
Geraldine A. Farlow

NORTH CAROLINA
COUNTY OF RANDOLPH

I, Sharon A. Grose, a Notary Public in and for the County and State aforesaid, do hereby certify that Geraldine A. Farlow, Grantor, personally appeared before me this day and acknowledged the execution of the foregoing instrument.

IN WITNESS WHEREOF, I have hereunto set my hand and Notary Seal this the 16th day of December, 2015.

Sharon A. Grose
Notary Public

My commission expires: May 5, 2018

SHARON A. GROSE NOTARY PUBLIC RANDOLPH COUNTY, NC

IN TESTIMONY WHEREOF, the Grantor has hereunto set his hand and seal, the day and year first above written.

_____ (SEAL)
Terry Ray Farlow

_____ (SEAL)
Sharon Petty Farlow

NORTH CAROLINA
COUNTY OF RANDOLPH

I, Sharon A. Grose, a Notary Public in and for the County and State aforesaid, do hereby certify that Terry Ray Farlow and wife, Sharon Petty Farlow, Grantor, personally appeared before me this day and acknowledged the execution of the foregoing instrument.

IN WITNESS WHEREOF, I have hereunto set my hand and Notary Seal this the 16th day of December, 2015.

_____
Notary Public

My commission expires: May 5, 2018

SHARON A. GROSE NOTARY PUBLIC RANDOLPH COUNTY, NC

Exhibit A

CEDAR BRANCH CONSERVATION EASEMENT "A"

A PARCEL OF LAND TO BE USED FOR CONSERVATION EASEMENT PURPOSES LOCATED ON LANDS NOW OR FORMERLY OWNED BY TERRY AND SHARON FARLOW (GERALDINE A. FARLOW – LIFE ESTATE, TAX PIN 7725946466) AS RECORDED BOOK 2220 PAGE 1422, LOCATED IN NEW MARKET TOWNSHIP, RANDOLPH COUNTY, NORTH CAROLINA AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT A FOUND PIN ON THE EAST LINE OF MOUNT OLIVE CHURCH ROAD (NCSR 1536, 60 FOOT PUBLIC RIGHT OF WAY), SAID PIN BEING LOCATED AT THE SOUTHWEST CORNER OF LANDS NOW OR FORMERLY OWNED BY JOEL FARLOW (DB 1040 PG 208) AND HAVING NORTH CAROLINA STATE PLANE COORDINATES (NAD 83) OF N:755468.11, E:1729240.12; THENCE S 85°02'37" E ON THE SOUTH LINE OF SAID JOEL FARLOW LANDS, A DISTANCE 246.01 FEET TO A POINT; THENCE S 85°10'21" EAST CONTINUING ON THE SOUTH LINE OF JOEL FARLOW LANDS, A DISTANCE OF 244.09 FEET TO THE SOUTHEAST CORNER OF JOEL FARLOW LANDS; THENCE N 35°05'12" E A DISTANCE OF 84.76 FEET TO **THE POINT OF BEGINNING B**EING A 5/8" REBAR SET WITH ALUMINUM CAP NO.1.

THENCE N 66°17'05" W A DISTANCE OF 26.37 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.2;
THENCE N 03°15'14" E A DISTANCE OF 345.19 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.3;
THENCE N 14°29'28" E A DISTANCE OF 328.67 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.4;
THENCE S 75°22'43" E A DISTANCE OF 147.26 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.5;
THENCE S 13°19'04" W A DISTANCE OF 513.36 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.6;
THENCE S 18°15'04" E A DISTANCE OF 424.65 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.7;
THENCE N 34°24'17" E A DISTANCE OF 241.75 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.8;
THENCE S 49°33'47" E A DISTANCE OF 157.98 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.9;
THENCE S 33°44'34" W A DISTANCE OF 211.61 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.10;
THENCE S 42°54'17" W A DISTANCE OF 161.62 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.11;
THENCE S 11°36'06" W A DISTANCE OF 790.02 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.12;
THENCE S 09°31'42" W A DISTANCE OF 1057.60 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.13 ON THE NORTH LINE OF LANDS NOW OR FORMERLY OWNED BY QUENTIN FARLOW (DB 1797 PG 870);
THENCE N 87°26'35" W, ON THE NORTH LINE OF SAID QUENTIN FARLOW LANDS, A DISTANCE OF 181.34 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.14;
THENCE N 11°14'35" E A DISTANCE OF 614.04 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.15;

THENCE N 07°07'48" E A DISTANCE OF 345.93 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.16;
THENCE N 15°38'05" E A DISTANCE OF 217.57 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.17;
THENCE N 10°44'50" E A DISTANCE OF 780.10 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.18;
THENCE N 18°15'04" W A DISTANCE OF 369.89 FEET TO THE POINT OF BEGINNING.

CONTAINING 519,589 SQUARE FEET OR 11.93 ACRES, MORE OR LESS.

CEDAR BRANCH CONSERVATION EASEMENT "B"

A PARCEL OF LAND TO BE USED FOR CONSERVATION EASEMENT PURPOSES LOCATED ON LANDS NOW OR FORMERLY OWNED BY TERRY AND SHARON FARLOW (GERALDINE A. FARLOW – LIFE ESTATE, TAX PIN 7725946466) AS RECORDED BOOK 2220 PAGE 1422, LOCATED IN NEW MARKET TOWNSHIP, RANDOLPH COUNTY, NORTH CAROLINA AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT A 5/8" REBAR SET WITH ALUMINUM CAP NO. 19 AT THE NORTHWEST CORNER OF LANDS NOW OR FORMERLY OWNED BY PAUL FARLOW (DB 1253 PG 732), SAI D POINT HAVING NORTH CAROLINA STATE PLANE COORDINATES (NAD 83) OF N:754509.71, E:1730550.64;

THENCE S 09°44'33" W, ON THE WEST LINE OF PAUL FARLOW LANDS, A DISTANCE OF 75.91 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO. 20;
THENCE N 50°32'30" W A DISTANCE OF 74.61 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.21;
THENCE N 69°31'49" W A DISTANCE OF 313.25 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.22;
THENCE N 87°43'06" W A DISTANCE OF 183.29 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.23;
THENCE N 11°36'06" E A DISTANCE OF 126.06 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.24;
THENCE S 87°40'22" E A DISTANCE OF 184.36 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.25;
THENCE S 69°01'47" E A DISTANCE OF 379.90 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.26;
THENCE S 41°27'23" E A DISTANCE OF 124.87 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.27 ON THE NORTH LINE OF SAID PAUL FARLOW LANDS;
THENCE N 76°26'10" W, ON THE NORTH LINE OF PAUL FARLOW LANDS, A DISTANCE OF 102.77 FEET TO THE point OF BEGINNING.

CONTAINING 73,887 SQUARE FEET OR 1.70 ACRES, MORE OR LESS.

CEDAR BRANCH CONSERVATION EASEMENT "C"

A PARCEL OF LAND TO BE USED FOR CONSERVATION EASEMENT PURPOSES LOCATED ON LANDS NOW OR FORMERLY OWNED BY TERRY AND SHARON FARLOW (GERALDINE A. FARLOW – LIFE ESTATE, TAX PIN 7725946466) AS RECORDED BOOK 2220 PAGE 1422, LOCATED IN NEW MARKET TOWNSHIP, RANDOLPH COUNTY, NORTH CAROLINA AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT A FOUND PIN AT THE NORTHWEST CORNER OF SAID FARLOW LANDS AND BEING THE NORTHEAST CORNER OF LANDS NOW OR FORMERLY OWNED BY RUTH FARLOW EST (DB 2419 PG 923) AND HAVING NORTH CAROLINA STATE PLANE COORDINATES (NAD 83) OF N:756819.44, E:1730108.22; THENCE S 86°18'05" E ON THE SOUTH LINE OF SAID JOEL FARLOW A DISTANCE 102.77 FEET TO **THE POINT OF BEGINNING B**EING A 5/8" REBAR SET WITH ALUMINUM CAP NO. 28.

THENCE S 86°18'05" E, ON THE SOUTH LINE OF LANDS OWNED BY JOSPEH NELSON (DB 2124 PG 159, DB 2214 PG 1881) A DISTANCE OF 595.33 FEET TO A FOUND STONE AT THE NORTHWEST CORNER OF LANDS NOW OR FORMERLY OWNED BY JOSPEH MILLIKAN (DB 2271 PG 5);
THENCE S 02°14'50" W, ON THE WEST LINE OF SAID MILLIKAN LANDS, A DISTANCE OF 868.99 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.30;
THENCE N 88°59'55" W A DISTANCE OF 67.04 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.31;
THENCE S 33°22'31" W A DISTANCE OF 649.71 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.32;
THENCE N 49°33'47" W A DISTANCE OF 157.98 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.33;
THENCE N 35°01'04" E A DISTANCE OF 716.22 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.34;
THENCE N 06°13'25" W A DISTANCE OF 419.31 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.35;
THENCE N 78°57'32" W A DISTANCE OF 96.22 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.36;
THENCE N 52°04'30" W A DISTANCE OF 287.40 FEET TO A 5/8" REBAR SET WITH ALUMINUM CAP NO.37;
THENCE N 22°05'00" W A DISTANCE OF 158.83 FEET TO THE POINT BEGINNING.

CONTAINING 335,774 SQUARE FEET OR 7.71 ACRES, MORE OR LESS.

NOTES:

1. THIS PLAT DOES NOT REPRESENT A BOUNDARY SURVEY OF THE PARENT TRACTS. THE PARENT TRACT BOUNDARIES ADJACENT TO THIS EASEMENT ARE NOT CHANGED BY THIS PLAT. BOUNDARY INFORMATION SHOWN HEREON WAS DERIVED FROM DEEDS AND MAPS OF RECORD IN RANDOLPH COUNTY AND MONUMENTATION FOUND IN THE FIELD.
2. DISTANCES SHOWN ARE HORIZONTAL GROUND DISTANCES IN U.S. SURVEY FEET UNLESS OTHERWISE NOTED.
3. AREA COMPUTED BY COORDINATE METHOD.
4. THE BASIS OF THE MERIDIANS AND COORDINATES FOR THIS PLAT IS THE NORTH CAROLINA STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM 1983 (NAD 83), BASED ON DIFFERENTIAL GPS OBSERVATIONS PERFORMED IN JUNE 2015.
5. DEED REFERENCES: AS SHOWN HEREON.
6. SUBJECT PROPERTIES KNOWN AS TAX NUMBER: AS SHOWN HEREON.
7. SUBJECT EASEMENT LIES WITHIN THE AREA DESIGNATED AS ZONE "X", BASED ON FEDERAL FLOOD INSURANCE RATE MAP 3710772500J EFFECTIVE JANUARY 2, 2008 AND MAP 3710773500J EFFECTIVE JANUARY 2, 2008.
8. NO UNDERGROUND UTILITY LOCATING PERFORMED DURING THE COURSE OF THIS SURVEY.
9. THE STATE PLANE COORDINATES FOR THIS PROJECT WERE PRODUCED WITH RTK GPS OBSERVATIONS. THE NETWORK POSITIONAL ACCURACY OF THE RTK DERIVED POSITIONAL INFORMATION IS 0.02 METER. HORIZONTAL POSITIONS ARE REFERENCED TO NAD 83 (2011). VERTICAL POSITIONS ARE REFERENCED TO NAVD88 (GEOID12B). COMBINED SCALE FACTOR = 0.99988912

OWNER CERTIFICATION

I HEREBY CERTIFY THAT I AM THE OWNER OF THE PROPERTY SHOWN AND DESCRIBED HEREON, WHICH IS LOCATED IN THE SUBDIVISION JURISDICTION OF THE COUNTY OF RANDOLPH AND THAT I HEREBY ADOPT THIS PLAN OF SUBDIVISION WITH MY FREE CONSENT AND ESTABLISH MINIMUM SETBACK LINES AS NOTED.

OWNER DATE 12-14-15

Sharon P. Farlow 12-14-15
OWNER DATE

Ruth Louise Farlow
OWNER DATE 12-14-15

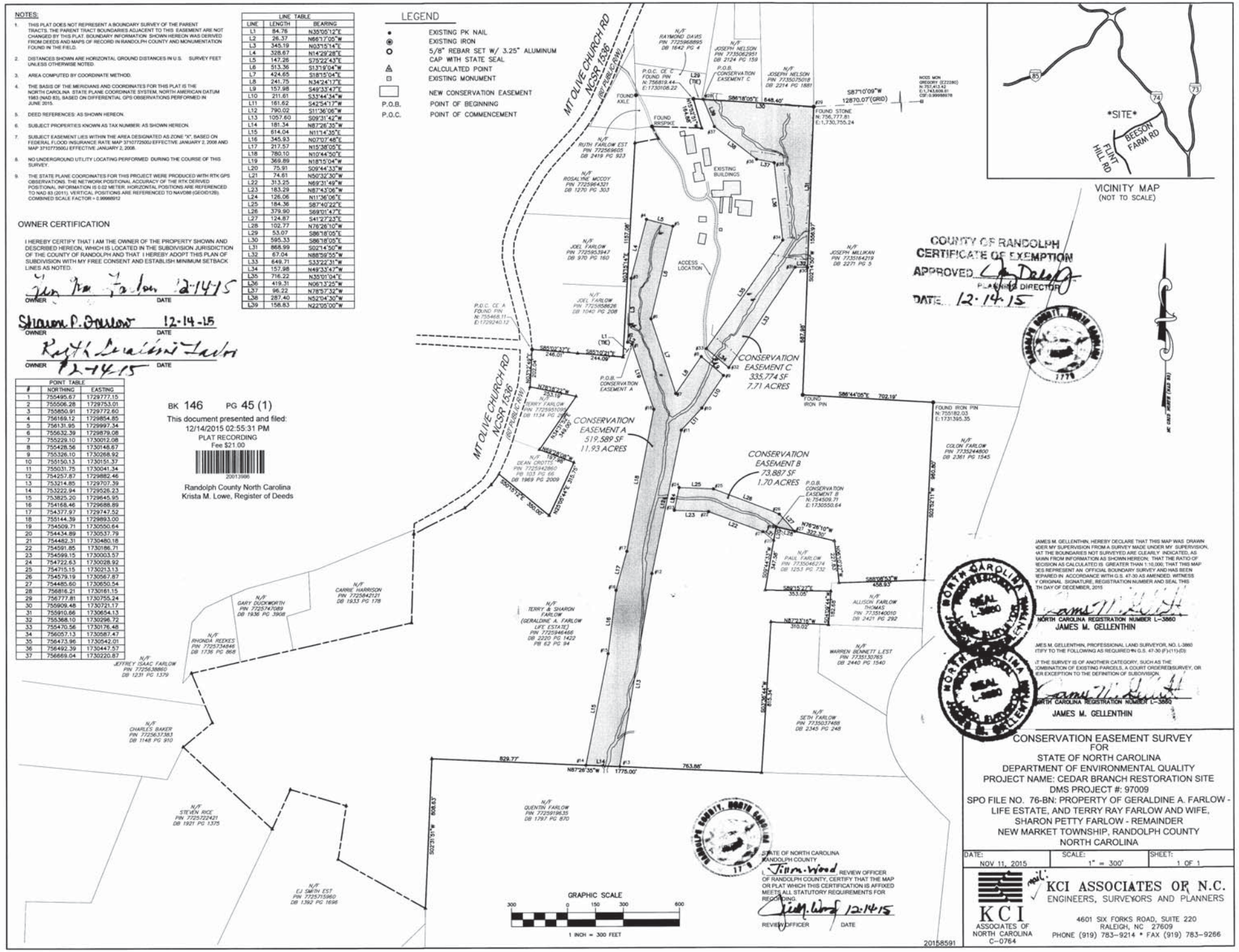
LINE TABLE		
LINE	LENGTH	BEARING
L1	84.76	N35°05'12"E
L2	26.37	N66°17'05"W
L3	345.19	N03°15'14"E
L4	328.67	N14°29'28"E
L5	147.28	S75°22'43"E
L6	513.36	S13°19'04"W
L7	424.65	S18°15'04"E
L8	241.75	N34°24'17"E
L9	157.98	S49°33'47"E
L10	211.61	S33°44'34"W
L11	161.62	S42°54'17"W
L12	790.02	S11°36'06"W
L13	1057.60	S09°31'42"W
L14	181.34	N87°26'35"W
L15	614.04	N11°14'35"E
L16	345.93	N07°07'46"E
L17	217.57	N15°38'05"E
L18	780.10	N10°44'50"E
L19	369.89	N18°15'04"W
L20	75.91	S09°44'33"W
L21	74.61	N50°32'30"W
L22	313.25	N69°31'49"W
L23	183.29	N87°43'06"W
L24	126.06	N11°36'06"E
L25	184.36	S87°40'22"E
L26	379.90	S69°01'47"E
L27	124.87	S41°27'23"E
L28	102.77	N76°26'10"W
L29	53.07	S86°18'05"E
L30	595.33	S86°18'05"E
L31	868.99	S02°14'50"W
L32	67.04	N88°59'55"W
L33	649.71	S33°22'31"W
L34	157.98	N49°33'47"W
L35	716.22	N35°01'04"E
L36	419.31	N06°37'25"W
L37	96.22	N78°57'32"W
L38	287.40	N52°04'30"W
L39	156.83	N22°05'00"W

POINT TABLE		
#	NORTHING	EASTING
1	755495.67	1729777.15
2	755506.28	1729753.01
3	755850.91	1729772.60
4	756169.12	1729854.85
5	756131.95	1729997.34
6	755632.39	1729879.08
7	755229.10	1730012.08
8	755428.56	1730148.67
9	755326.10	1730268.92
10	755150.13	1730151.37
11	755031.75	1730041.34
12	754257.87	1729882.46
13	753214.85	1729707.39
14	753222.94	1729526.23
15	753825.20	1729645.95
16	754168.46	1729688.89
17	754377.97	1729747.52
18	755144.39	1729893.00
19	754509.71	1730550.64
20	754434.89	1730537.79
21	754482.31	1730480.18
22	754591.85	1730186.71
23	754599.15	1730003.57
24	754722.63	1730028.92
25	754715.15	1730213.13
26	754579.19	1730567.87
27	754485.60	1730650.54
28	756816.21	1730161.15
29	756777.81	1730755.24
30	755909.48	1730721.17
31	755910.66	1730654.13
32	755368.10	1730286.72
33	755470.56	1730176.48
34	756057.13	1730587.47
35	756473.96	1730542.01
36	756492.39	1730447.57
37	756669.04	1730220.87

BK 146 PG 45 (1)
This document presented and filed:
12/14/2015 02:55:31 PM
PLAT RECORDING
Fee $21.00
20013986
Randolph County North Carolina
Krista M. Lowe, Register of Deeds

LEGEND

- EXISTING PK NAIL
- EXISTING IRON
- 5/8" REBAR SET W/ 3.25" ALUMINUM CAP WITH STATE SEAL
- CALCULATED POINT
- EXISTING MONUMENT
- NEW CONSERVATION EASEMENT
- P.O.B. POINT OF BEGINNING
- P.O.C. POINT OF COMMENCEMENT



VICINITY MAP
(NOT TO SCALE)

COUNTY OF RANDOLPH
CERTIFICATE OF EXEMPTION
APPROVED
PLANNING DIRECTOR
DATE 12-14-15

JAMES M. GELLENTHIN, HEREBY DECLARE THAT THIS MAP WAS DRAWN UNDER MY SUPERVISION FROM A SURVEY MADE UNDER MY SUPERVISION, THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED, AS DRAWN FROM INFORMATION AS SHOWN HEREON; THAT THE RATIO OF PRECISION AS CALCULATED IS GREATER THAN 1:10,000; THAT THIS MAP DOES REPRESENT AN OFFICIAL BOUNDARY SURVEY AND HAS BEEN PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER AND SEAL THIS 14TH DAY OF DECEMBER, 2015

NORTH CAROLINA REGISTRATION NUMBER L-3860
JAMES M. GELLENTHIN

JAMES M. GELLENTHIN, PROFESSIONAL LAND SURVEYOR, NO. L-3860 (TIFY TO THE FOLLOWING AS REQUIRED BY G.S. 47-30 (F)-(11)-(D):

IT THE SURVEY IS OF ANOTHER CATEGORY, SUCH AS THE COMBINATION OF EXISTING PARCELS, A COURT ORDERED SURVEY, OR OTHER EXCEPTION TO THE DEFINITION OF SUBDIVISION.

NORTH CAROLINA REGISTRATION NUMBER L-3860
JAMES M. GELLENTHIN

STATE OF NORTH CAROLINA
RANDOLPH COUNTY

I, Jimmy Wood, REVIEW OFFICER OF RANDOLPH COUNTY, CERTIFY THAT THE MAP OR PLAT WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

REVIEW OFFICER Jimmy Wood DATE 12-14-15

20158591

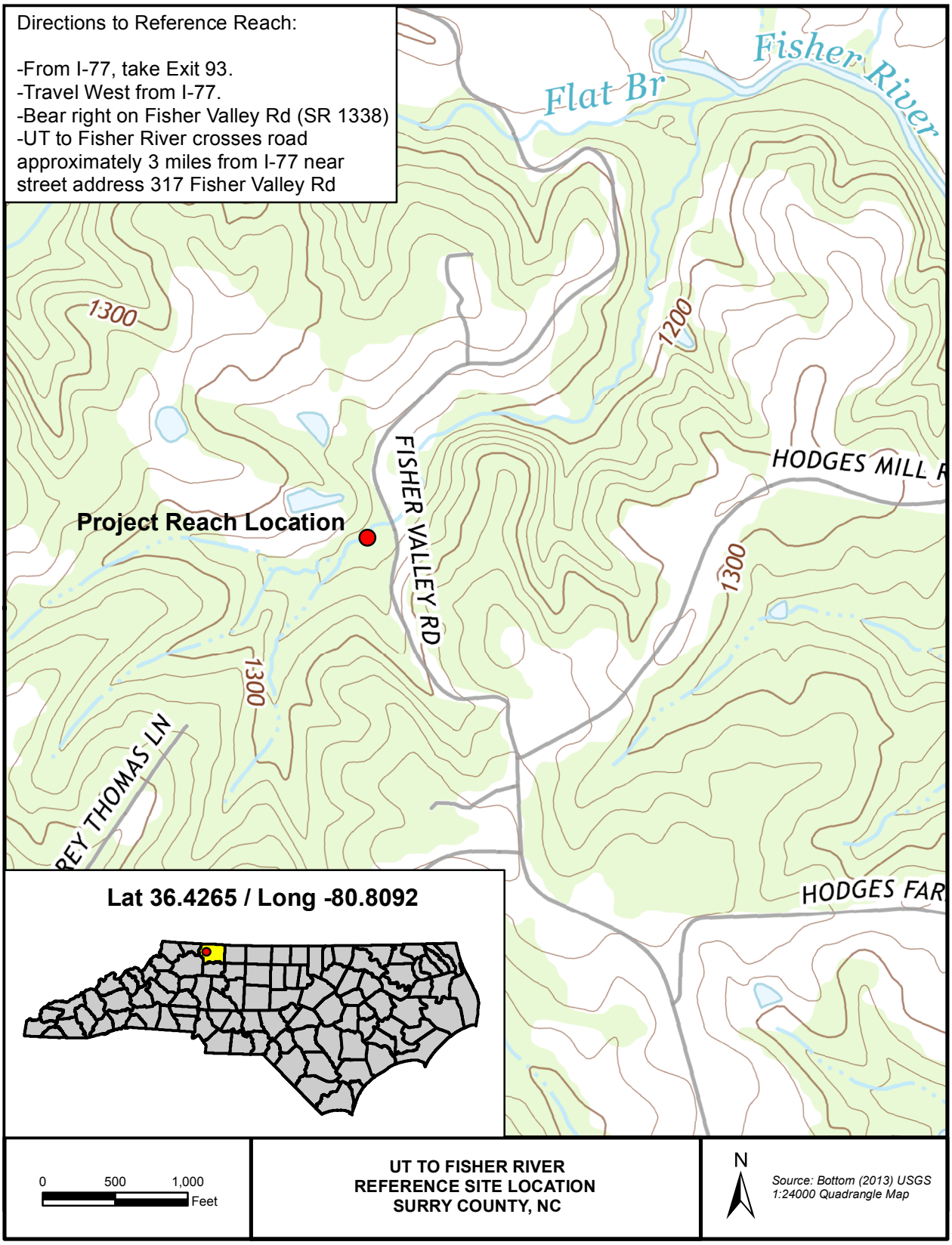
CONSERVATION EASEMENT SURVEY
FOR
STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENTAL QUALITY
PROJECT NAME: CEDAR BRANCH RESTORATION SITE
DMS PROJECT #: 97009
SPO FILE NO. 76-BN: PROPERTY OF GERALDINE A. FARLOW - LIFE ESTATE, AND TERRY RAY FARLOW AND WIFE, SHARON PETTY FARLOW - REMAINDER
NEW MARKET TOWNSHIP, RANDOLPH COUNTY
NORTH CAROLINA

DATE:	SCALE:	SHEET:
NOV 11, 2015	1" = 300'	1 OF 1

KCI ASSOCIATES OF NORTH CAROLINA C-0764
KCI ASSOCIATES OF N.C.
ENGINEERS, SURVEYORS AND PLANNERS
4601 SIX FORKS ROAD, SUITE 220
RALEIGH, NC 27609
PHONE (919) 783-9214 * FAX (919) 783-9266

Appendix B. Baseline Data and Information

Offsite Reference Data

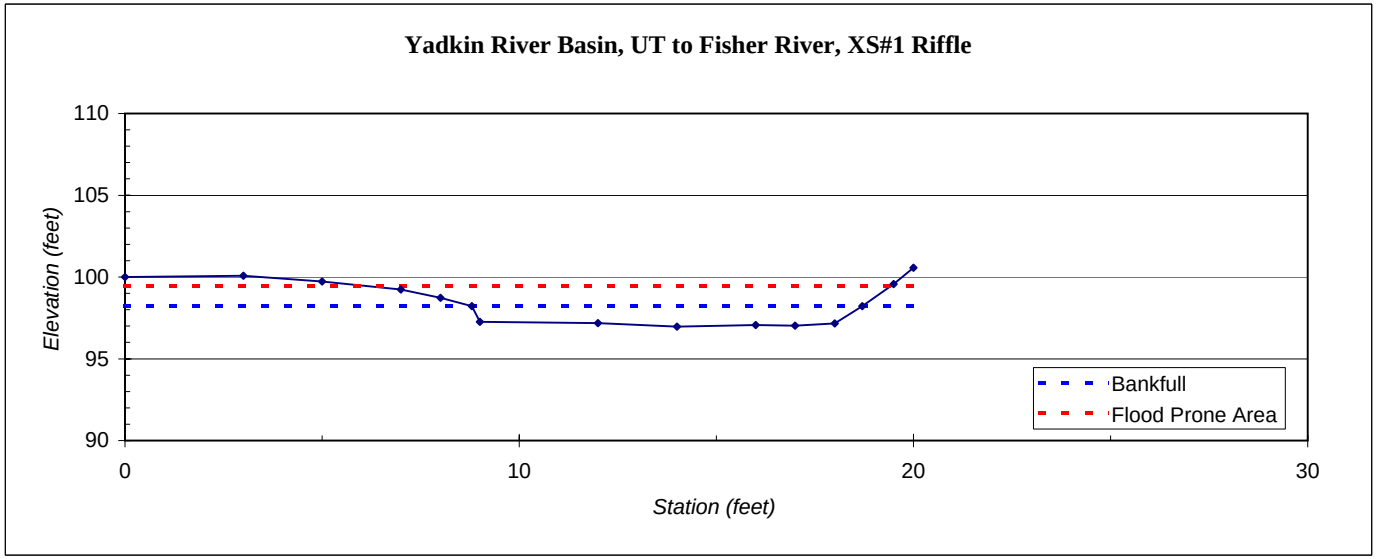

Directions to Reference Reach:
-From I-77, take Exit 93.
-Travel West from I-77.
-Bear right on Fisher Valley Rd (SR 1338)
-UT to Fisher River crosses road approximately 3 miles from I-77 near street address 317 Fisher Valley Rd
Flat Br
Fisher River
1300
1200
1300
1300
FISHER VALLEY RD
HODGES MILL R
Project Reach Location
REY THOMAS LN
HODGES FAR
Lat 36.4265 / Long -80.8092
0
500
1,000
Feet
UT TO FISHER RIVER
REFERENCE SITE LOCATION
SURRY COUNTY, NC
N
Source: Bottom (2013) USGS
1:24000 Quadrangle Map

River Basin:	Yadkin
Watershed:	UT to Fisher River
XS ID	XS#1 Riffle
Drainage Area (sq mi):	0.38
Date:	6/9/2005
Field Crew:	G. Mryncza, A. Spiller

Station	Rod Ht.	Elevation
0.0	2.22	100.00
3.0	2.15	100.07
5.0	2.50	99.72
7.0	2.98	99.24
8.0	3.49	98.73
8.8	4.00	98.22
9.0	4.96	97.26
12.0	5.03	97.19
14.0	5.25	96.97
16.0	5.16	97.06
17.0	5.20	97.02
18.0	5.06	97.16
18.7	4.00	98.22
19.5	2.65	99.57
20.0	1.66	100.56

SUMMARY DATA	
Bankfull Elevation:	98.22
Bankfull Cross-Sectional Area:	10.40
Bankfull Width:	10.00
Flood Prone Area Elevation:	99.47
Flood Prone Width:	13.10
Max Depth at Bankfull:	1.25
Mean Depth at Bankfull:	1.04
W / D Ratio:	9.6
Entrenchment Ratio:	1.30
Bank Height Ratio:	2.08
Slope (ft/ft):	0.013
Discharge (cfs)	42

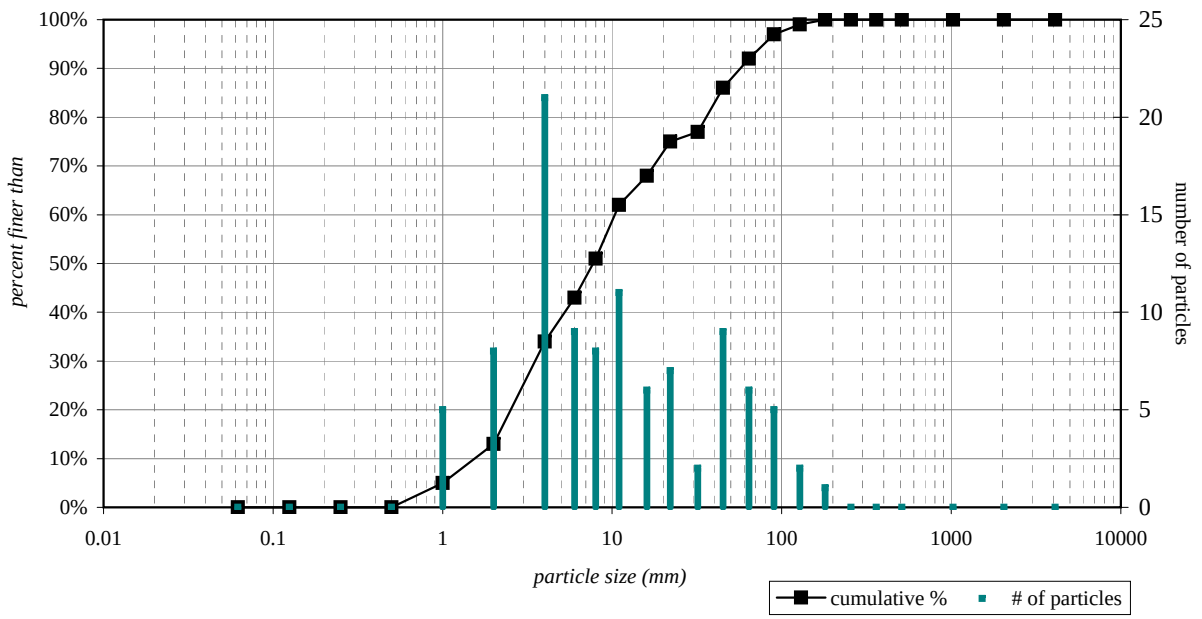
Stream Type:	B4c



Pebble Count

Material	Size Range (mm)		Count
silt/clay	0	0.062	**0**
very fine sand	0.062	0.13	**0**
fine sand	0.13	0.25	**0**
medium sand	0.25	0.5	**0**
coarse sand	0.5	1	**5**
very coarse sand	1	2	**8**
very fine gravel	2	4	**21**
fine gravel	4	6	**9**
fine gravel	6	8	**8**
medium gravel	8	11	**11**
medium gravel	11	16	**6**
coarse gravel	16	22	**7**
coarse gravel	22	32	**2**
very coarse gravel	32	45	**9**
very coarse gravel	45	64	**6**
small cobble	64	90	**5**
medium cobble	90	128	**2**
large cobble	128	180	**1**
very large cobble	180	256	**0**
small boulder	256	362	**0**
small boulder	362	512	**0**
medium boulder	512	1024	**0**
large boulder	1024	2048	**0**
very large boulder	2048	4096	**0**
		total particle count:	100

UT to Fsher River
Surry County, NC
Riffle #1 (Sta. 01+00)
Note:



bedrock		
clay hardpan		
detritus/wood		
artificial		
total count:	100	

based on sediment particles only	size percent less than (mm) D16	D35	D50	D65	D84	D95	particle size distribution gradation	geo mean	std dev
	2.208	4.18	7.7	13	42	79	4.5	9.6	4.3

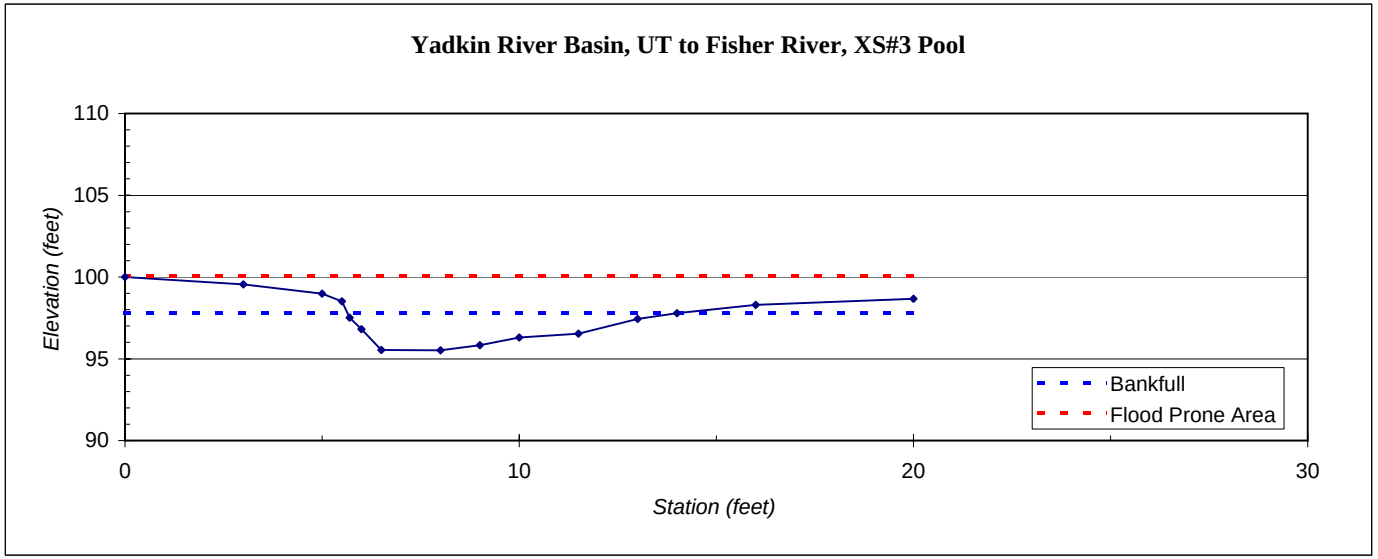
based on total count	percent by substrate type silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	0%	13%	79%	8%	0%	0%	0%	0%	0%

River Basin:	Yadkin
Watershed:	UT to Fisher River
XS ID	XS#3 Pool
Drainage Area (sq mi):	0.38
Date:	6/9/2005
Field Crew:	G. Mryncza, A. Spiller

Station	Rod Ht.	Elevation
0.0	1.33	100.00
3.0	1.78	99.55
5.0	2.35	98.98
5.5	2.82	98.51
5.7	3.81	97.52
6.0	4.52	96.81
6.5	5.79	95.54
8.0	5.82	95.51
9.0	5.50	95.83
10.0	5.02	96.31
11.5	4.80	96.53
13.0	3.90	97.43
14.0	3.55	97.78
16.0	3.03	98.30
20.0	2.66	98.67

SUMMARY DATA	
Bankfull Elevation:	97.78
Bankfull Cross-Sectional Area:	11.60
Bankfull Width:	8.35
Flood Prone Area Elevation:	100.05
Flood Prone Width:	
Max Depth at Bankfull:	2.27
Mean Depth at Bankfull:	1.39
W / D Ratio:	6.0
Entrenchment Ratio:	
Bank Height Ratio:	0.85
Slope (ft/ft):	0.001
Discharge (cfs)	52

Stream Type:	B4c

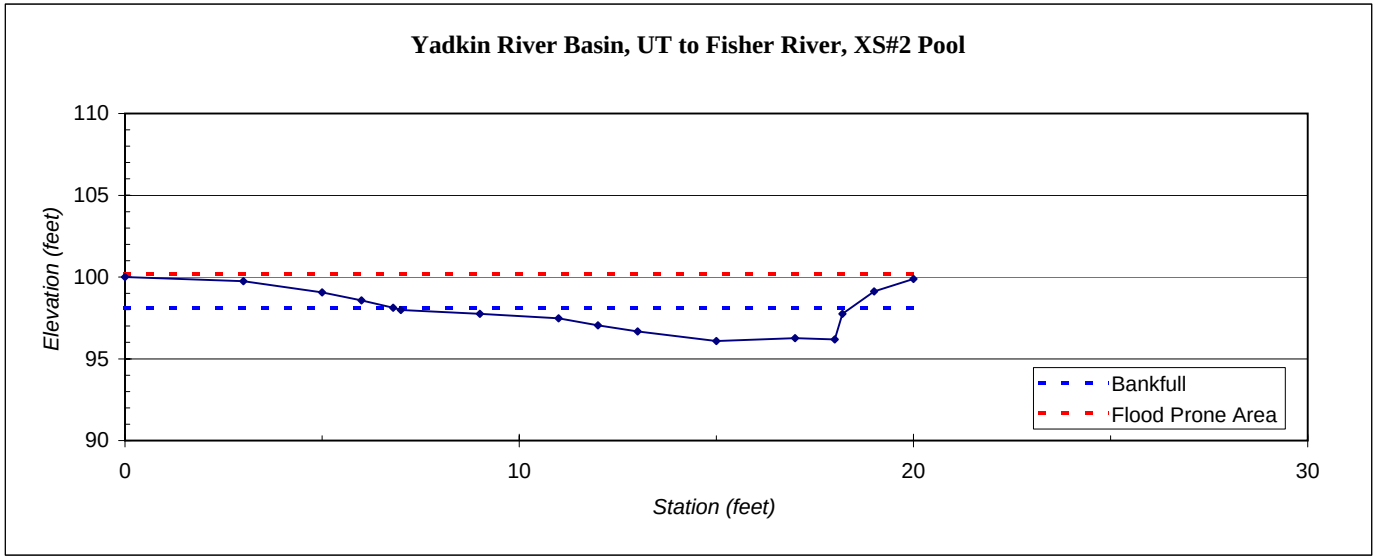


River Basin:	Yadkin
Watershed:	UT to Fisher River
XS ID	XS#2 Pool
Drainage Area (sq mi):	0.38
Date:	6/9/2005
Field Crew:	G. Mryncza, A. Spiller

Station	Rod Ht.	Elevation
0.0	2.68	100.00
3.0	2.94	99.74
5.0	3.61	99.07
6.0	4.10	98.58
6.8	4.56	98.12
7.0	4.70	97.98
9.0	4.94	97.74
11.0	5.21	97.47
12.0	5.64	97.04
13.0	6.00	96.68
15.0	6.59	96.09
17.0	6.42	96.26
18.0	6.50	96.18
18.2	4.93	97.75
19.0	3.56	99.12
20.0	2.80	99.88

SUMMARY DATA	
Bankfull Elevation:	98.12
Bankfull Cross-Sectional Area:	13.40
Bankfull Width:	11.62
Flood Prone Area Elevation:	100.15
Flood Prone Width:	
Max Depth at Bankfull:	2.03
Mean Depth at Bankfull:	1.15
W / D Ratio:	10.1
Entrenchment Ratio:	
Bank Height Ratio:	0.81
Slope (ft/ft):	0.001
Discharge (cfs)	56

Stream Type:	B4c

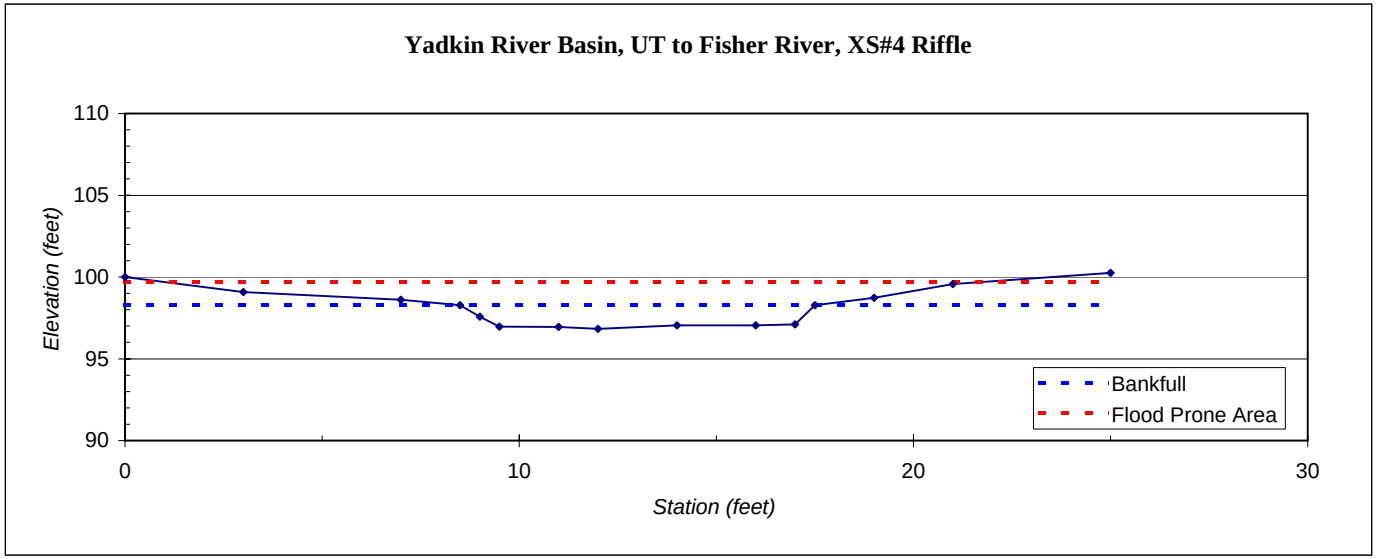


River Basin:	Yadkin
Watershed:	UT to Fisher River
XS ID	XS#4 Riffle
Drainage Area (sq mi):	0.38
Date:	6/9/2005
Field Crew:	G. Mryncza, A. Spiller

Station	Rod Ht.	Elevation
0.0	4.62	100.00
3.0	5.54	99.08
7.0	6.01	98.61
8.5	6.34	98.28
9.0	7.04	97.58
9.5	7.66	96.96
11.0	7.67	96.95
12.0	7.79	96.83
14.0	7.58	97.04
16.0	7.57	97.05
17.0	7.51	97.11
17.5	6.34	98.28
19.0	5.90	98.72
21.0	5.06	99.56
25.0	4.37	100.25

SUMMARY DATA	
Bankfull Elevation:	98.28
Bankfull Cross-Sectional Area:	10.70
Bankfull Width:	9.00
Flood Prone Area Elevation:	99.73
Flood Prone Width:	20.50
Max Depth at Bankfull:	1.45
Mean Depth at Bankfull:	1.19
W / D Ratio:	7.6
Entrenchment Ratio:	2.30
Bank Height Ratio:	1.00
Slope (ft/ft):	0.013
Discharge (cfs)	46

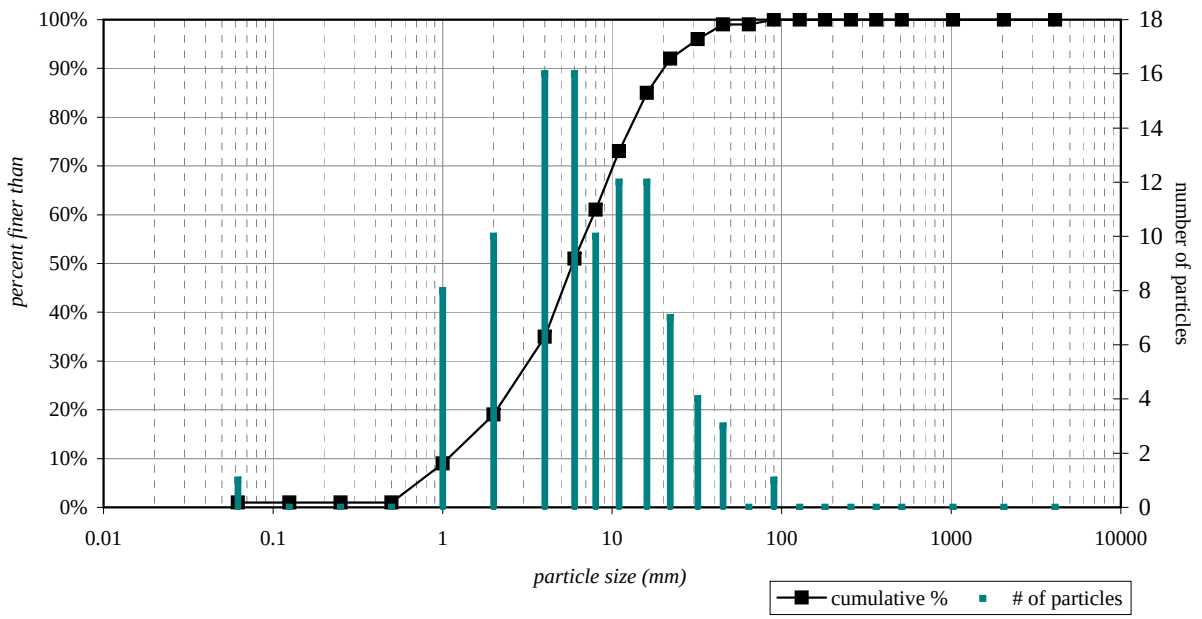
Stream Type:	B4c



Pebble Count

Material	Size Range (mm)		Count
silt/clay	0	0.062	**1**
very fine sand	0.062	0.13	**0**
fine sand	0.13	0.25	**0**
medium sand	0.25	0.5	**0**
coarse sand	0.5	1	**8**
very coarse sand	1	2	**10**
very fine gravel	2	4	**16**
fine gravel	4	6	**16**
fine gravel	6	8	**10**
medium gravel	8	11	**12**
medium gravel	11	16	**12**
coarse gravel	16	22	**7**
coarse gravel	22	32	**4**
very coarse gravel	32	45	**3**
very coarse gravel	45	64	**0**
small cobble	64	90	**1**
medium cobble	90	128	**0**
large cobble	128	180	**0**
very large cobble	180	256	**0**
small boulder	256	362	**0**
small boulder	362	512	**0**
medium boulder	512	1024	**0**
large boulder	1024	2048	**0**
very large boulder	2048	4096	**0**
	total particle count:		100

UT to Fsher River
Surry County, NC
Riffle #2 (Sta. 02+55)
Note:



bedrock		
clay hardpan		
detritus/wood		
artificial		
total count:	100	

based on sediment particles only	size percent less than (mm) D16	D35	D50	D65	D84	D95	particle size distribution gradation	geo mean	std dev
	1.625	4.00	5.8	9	16	29	3.1	5.0	3.1

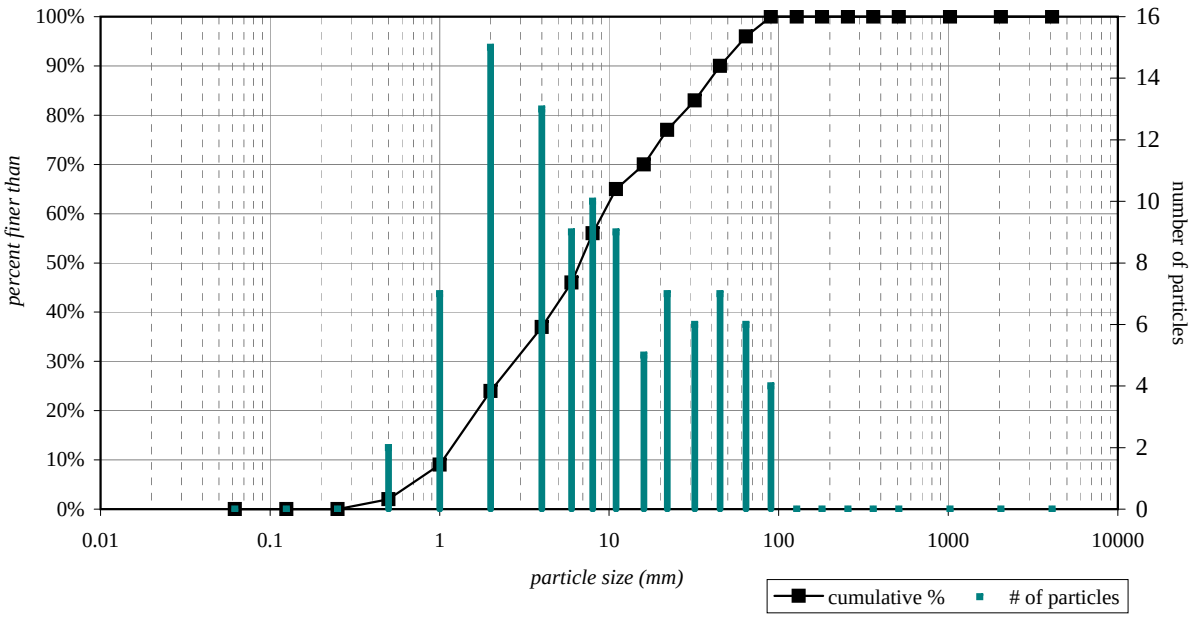
based on total count	percent by substrate type silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	1%	18%	80%	1%	0%	0%	0%	0%	0%

Pebble Count

Material	Size Range (mm)		Count
silt/clay	0	0.062	**0**
very fine sand	0.062	0.13	**0**
fine sand	0.13	0.25	**0**
medium sand	0.25	0.5	**2**
coarse sand	0.5	1	**7**
very coarse sand	1	2	**15**
very fine gravel	2	4	**13**
fine gravel	4	6	**9**
fine gravel	6	8	**10**
medium gravel	8	11	**9**
medium gravel	11	16	**5**
coarse gravel	16	22	**7**
coarse gravel	22	32	**6**
very coarse gravel	32	45	**7**
very coarse gravel	45	64	**6**
small cobble	64	90	**4**
medium cobble	90	128	**0**
large cobble	128	180	**0**
very large cobble	180	256	**0**
small boulder	256	362	**0**
small boulder	362	512	**0**
medium boulder	512	1024	**0**
large boulder	1024	2048	**0**
very large boulder	2048	4096	**0**
		total particle count:	100

UT to Fsher River
Surry County, NC

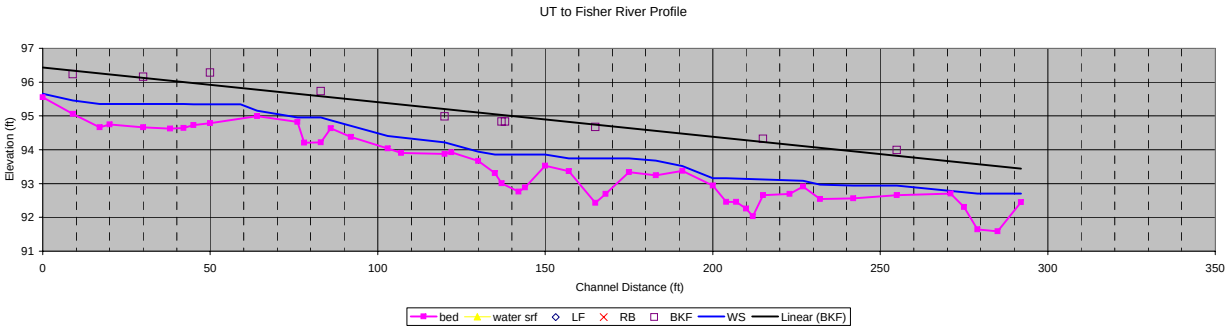
Note: **Reach Pebble Count**



bedrock		
clay hardpan		
detritus/wood		
artificial		
	total count:	100

based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	1.382	3.60	6.7	11	34	60	4.9	6.8	4.9

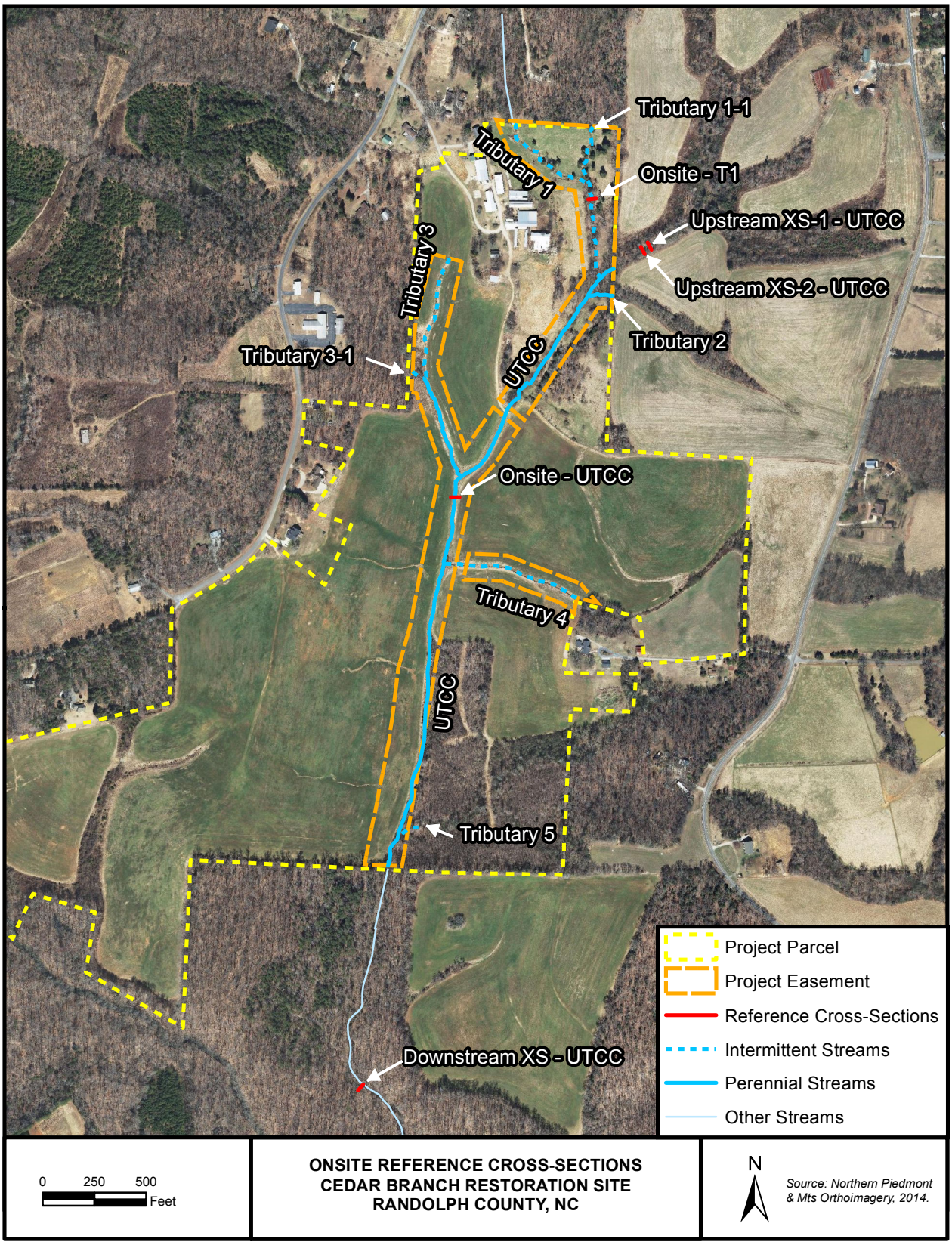
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	0%	24%	72%	4%	0%	0%	0%	0%	0%



Elevation BM: 100

notes	inc distance	station	BS	HI	FS TP	FS bed	depth water	FS LB	FS RB	FS BKF	FS WS	AZ azimuth	ELEV bed	ELEV water srf	ELEV LF	ELEV RB	ELEV BKF	ELEV WS
		5		100		4.45					4.34		95.55					95.66
	9	14		100		4.94				3.77	4.54		95.06				96.23	95.46
	8	22		100		5.34					4.65		94.66					95.35
	3	25		100		5.25							94.75					
	10	35		100		5.34				3.84	4.65		94.66				96.16	95.35
	8	43		100		5.38							94.62					
	4	47		100		5.36					4.65		94.64					95.35
	3	50		100		5.27					4.66		94.73					95.34
	5	55		100		5.21				3.72			94.79				96.28	
	9	64		100							4.66							95.34
	5	69	-0.53	99.47		4.48					4.32		94.99					95.15
	12	81		99.47		4.65					4.51		94.82					94.96
	2	83		99.47		5.26							94.21					
	5	88		99.47		5.25				3.74	4.51		94.22				95.73	94.96
	3	91		99.47		4.84					4.6		94.63					94.87
	6	97		99.47		5.09							94.38					
	11	108		99.47		5.43					5.06		94.04					94.41
	4	112		99.47		5.56							93.91					
	13	125		99.47		5.59				4.49	5.25		93.88				94.98	94.22
	18	143		99.47						4.64							94.83	
	-16	127		99.47		5.55							93.92					
	8	135		99.47		5.8					5.53		93.67					93.94
	5	140		99.47		6.16					5.61		93.31					93.86
	2	142		99.47		6.46				4.64			93.01				94.83	
	5	147		99.47		6.71							92.76					
	2	149		99.47		6.59					5.61		92.88					93.86
	6	155		99.47		5.94					5.61		93.53					93.86
	7	162		99.47		6.1					5.73		93.37					93.74
	8	170		99.47		7.04				4.8	5.73		92.43				94.67	93.74
	3	173		99.47		6.78							92.69					
	7	180		99.47		6.13					5.73		93.34					93.74
	8	188	-1.56	97.91		4.67					4.23		93.24					93.68
	8	196		97.91		4.53					4.39		93.38					93.52
	9	205		97.91		4.97					4.75		92.94					93.16
	4	209		97.91		5.45					4.75		92.46					93.16
	3	212		97.91		5.45							92.46					
	3	215		97.91		5.65							92.26					
	2	217		97.91		5.88							92.03					
	3	220		97.91		5.25				3.59			92.66				94.32	
	8	228		97.91		5.22							92.69					
	4	232		97.91		5					4.83		92.91					93.08
	5	237		97.91		5.37					4.94		92.54					92.97
	10	247		97.91		5.35					4.97		92.56					92.94
	13	260	2.46	100.37		7.71				6.38	7.43		92.66				93.99	92.94
	16	276		100.37		7.67							92.7					
	4	280		100.37		8.06							92.31					
	4	284		100.37		8.73					7.67		91.64					92.7
	6	290		100.37		8.78					7.67		91.59					92.7
	7	297		100.37		7.92					7.67		92.45					92.7

Onsite Reference Data

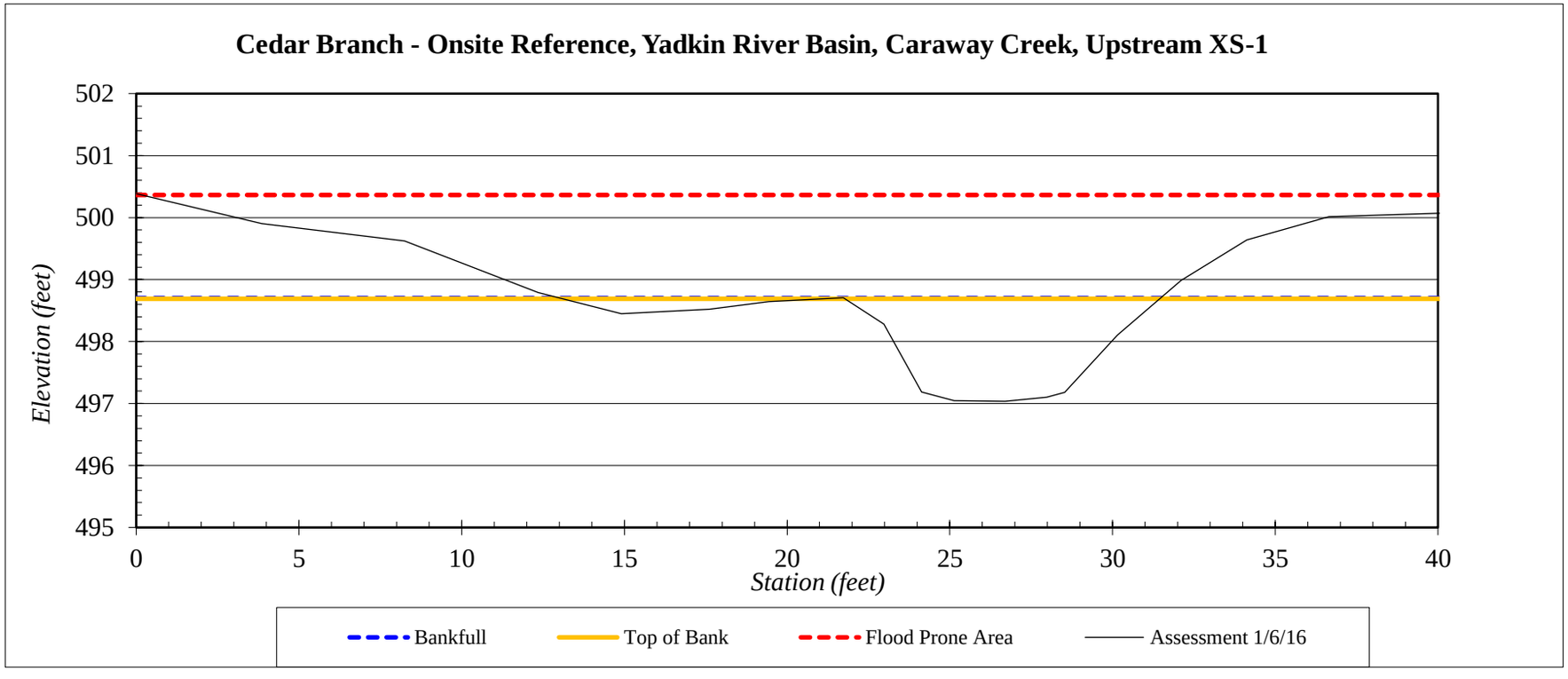

Tributary 1-1
Tributary 1
Onsite - T1
Upstream XS-1 - UTCC
Upstream XS-2 - UTCC
Tributary 2
Tributary 3
Tributary 3-1
UTCC
Onsite - UTCC
Tributary 4
UTCC
Tributary 5
Downstream XS - UTCC
Project Parcel
Project Easement
Reference Cross-Sections
Intermittent Streams
Perennial Streams
Other Streams
0 250 500
Feet
ONSITE REFERENCE CROSS-SECTIONS
CEDAR BRANCH RESTORATION SITE
RANDOLPH COUNTY, NC
N
Source: Northern Piedmont & Mts Orthoimagery, 2014.

Cross-Section Plots

River Basin:	Yadkin
Watershed:	Caraway Creek
XS ID	Upstream XS-1
Drainage Area (sq mi):	84 acres
Date:	1/6/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	500.39
3.9	499.90
8.2	499.62
12.3	498.79
14.9	498.45
17.6	498.52
19.4	498.64
21.7	498.70
23.0	498.28
24.1	497.19
25.1	497.04
26.7	497.04
28.0	497.10
28.5	497.18
30.1	498.10
32.1	498.99
34.1	499.64
36.6	500.01
40.1	500.07
45.9	500.22
49.3	500.32

SUMMARY DATA	
Bankfull Elevation:	498.70
Top of Bank Elevation:	498.69
Bankfull Cross-Sectional Area:	11.7
Bankfull Width:	18.2
Flood Prone Area Elevation:	500.36
Flood Prone Width:	49.0
Max Depth at Bankfull:	1.7
Mean Depth at Bankfull:	0.6
W / D Ratio:	9.0
Entrenchment Ratio:	5.1
Bank Height Ratio:	1.0

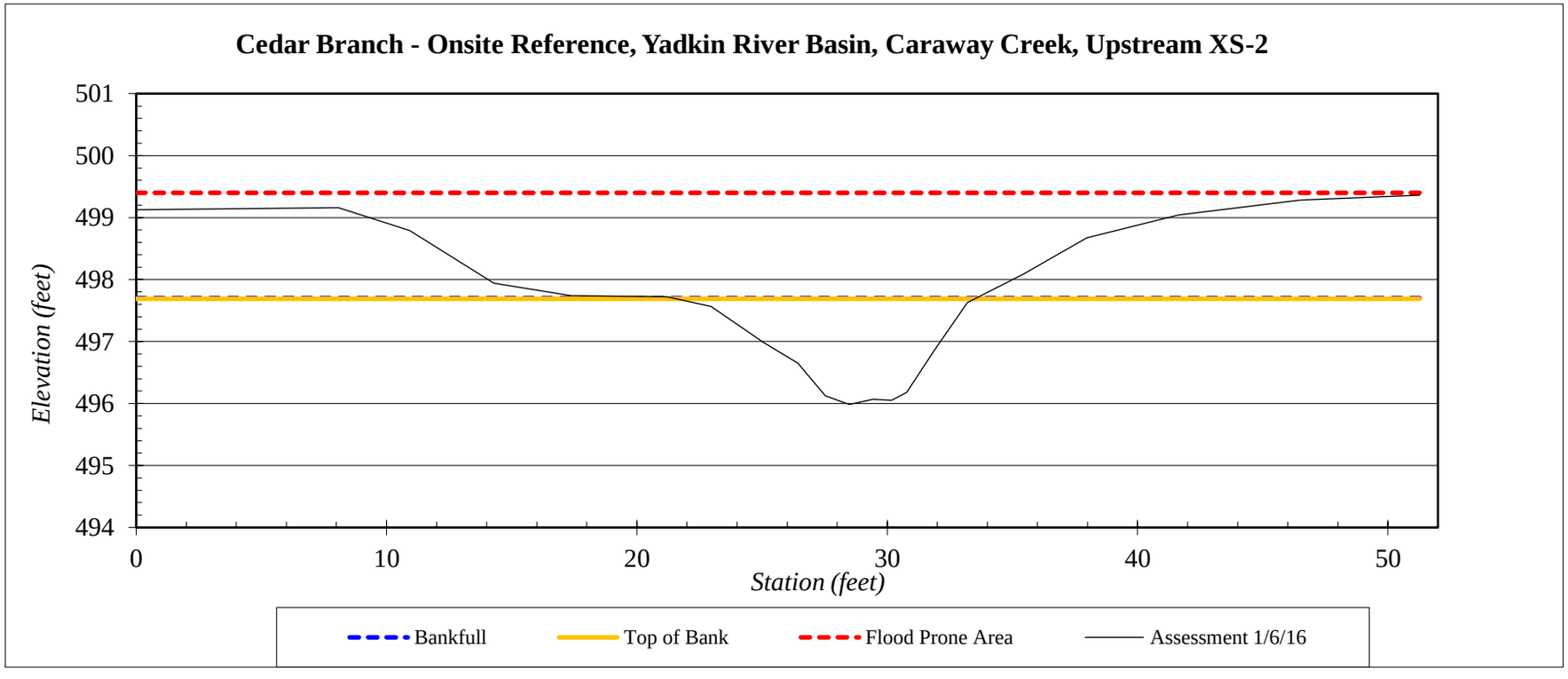


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Caraway Creek
XS ID	Upstream XS-2
Drainage Area (sq mi):	84 acres
Date:	1/6/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	499.13
8.1	499.16
10.9	498.79
14.3	497.94
17.4	497.74
21.2	497.72
23.0	497.56
25.0	496.99
26.4	496.65
27.5	496.13
28.5	495.98
29.4	496.07
30.2	496.05
30.8	496.18
31.8	496.83
33.2	497.63
35.5	498.09
38.0	498.67
41.6	499.04
46.5	499.28
51.3	499.36

SUMMARY DATA	
Bankfull Elevation:	497.70
Top of Bank Elevation:	497.69
Bankfull Cross-Sectional Area:	10.9
Bankfull Width:	12.1
Flood Prone Area Elevation:	499.40
Flood Prone Width:	50.0
Max Depth at Bankfull:	1.7
Mean Depth at Bankfull:	0.9
W / D Ratio:	13.4
Entrenchment Ratio:	>5
Bank Height Ratio:	1.0

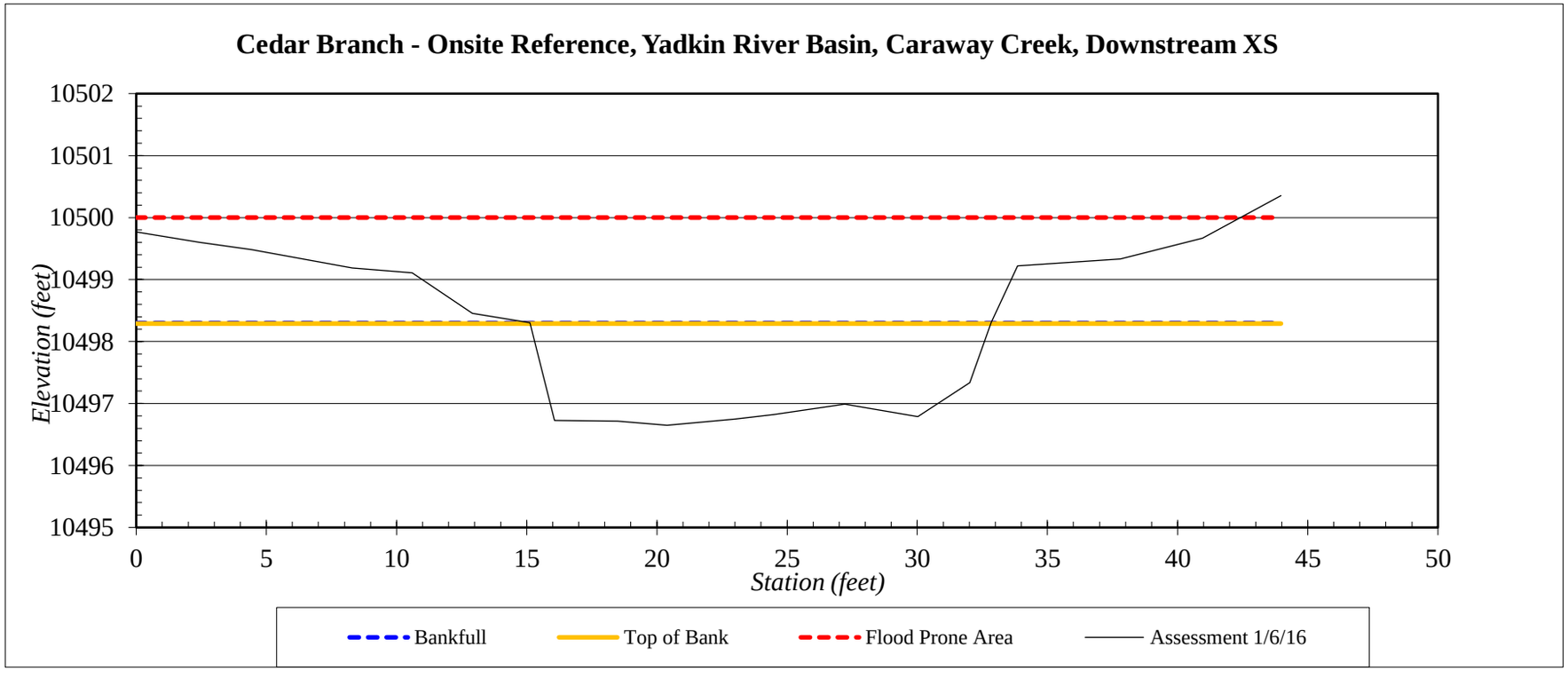


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Caraway Creek
XS ID	Downstream XS
Drainage Area (sq mi):	313 acres
Date:	1/6/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	10499.77
2.4	10499.60
4.4	10499.48
8.3	10499.19
10.6	10499.11
12.9	10498.46
15.1	10498.31
16.1	10496.73
18.5	10496.71
20.4	10496.65
23.0	10496.75
24.5	10496.82
27.2	10496.99
30.0	10496.79
32.0	10497.34
32.8	10498.31
33.8	10499.22
37.8	10499.33
41.0	10499.67
44.0	10500.35

SUMMARY DATA	
Bankfull Elevation:	10498.30
Top of Bank Elevation:	10498.29
Bankfull Cross-Sectional Area:	24.7
Bankfull Width:	17.7
Flood Prone Area Elevation:	10500.00
Flood Prone Width:	100.0
Max Depth at Bankfull:	1.7
Mean Depth at Bankfull:	1.4
W / D Ratio:	12.7
Entrenchment Ratio:	5.6
Bank Height Ratio:	1.0

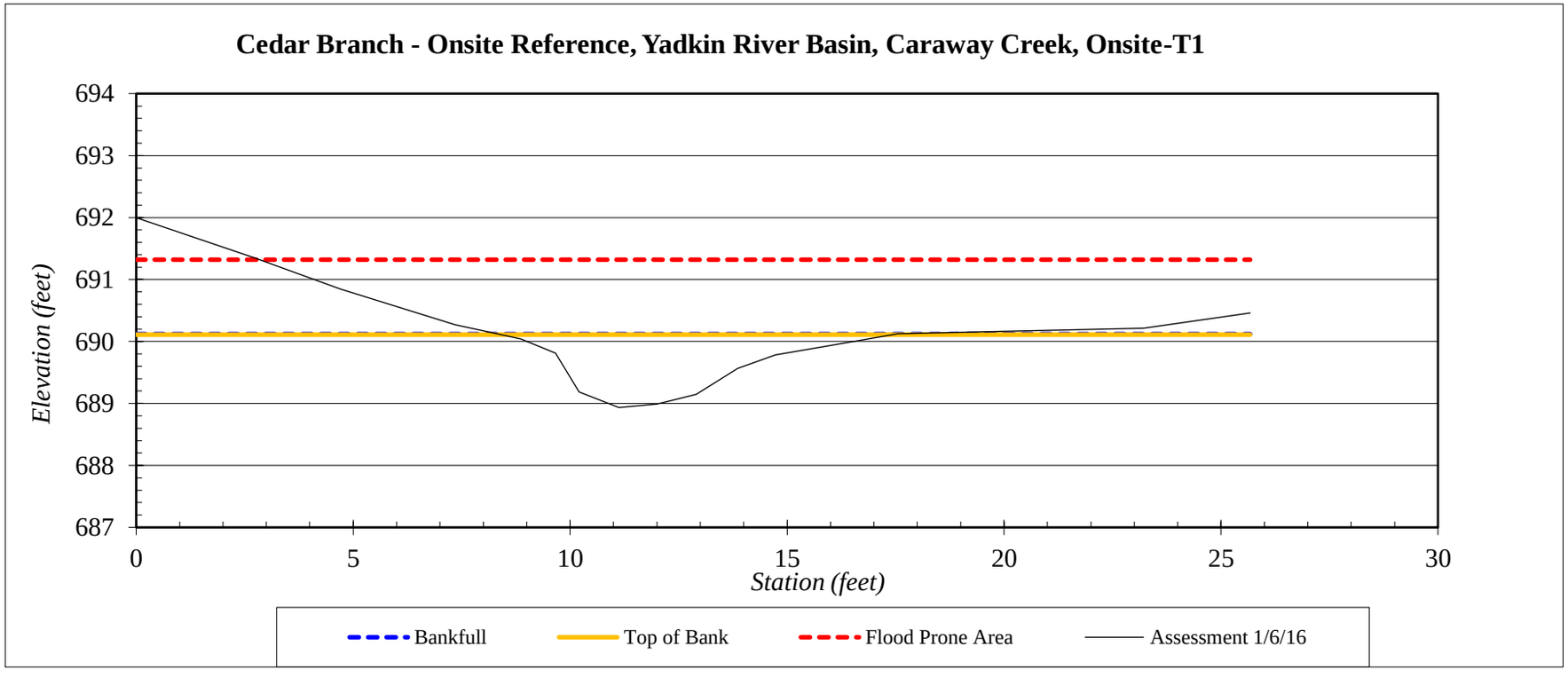


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Caraway Creek
XS ID	Onsite-T1
Drainage Area (sq mi):	25 acres
Date:	1/6/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	692.00
2.7	691.35
4.7	690.85
7.3	690.27
8.9	690.04
9.7	689.81
10.2	689.18
11.1	688.93
12.0	688.99
12.9	689.15
13.9	689.57
14.7	689.79
15.7	689.90
17.6	690.12
23.2	690.22
25.7	690.46

SUMMARY DATA	
Bankfull Elevation:	690.12
Top of Bank Elevation:	690.11
Bankfull Cross-Sectional Area:	5.0
Bankfull Width:	9.2
Flood Prone Area Elevation:	691.32
Flood Prone Width:	30.0
Max Depth at Bankfull:	1.2
Mean Depth at Bankfull:	0.5
W / D Ratio:	16.8
Entrenchment Ratio:	3.3
Bank Height Ratio:	1.0

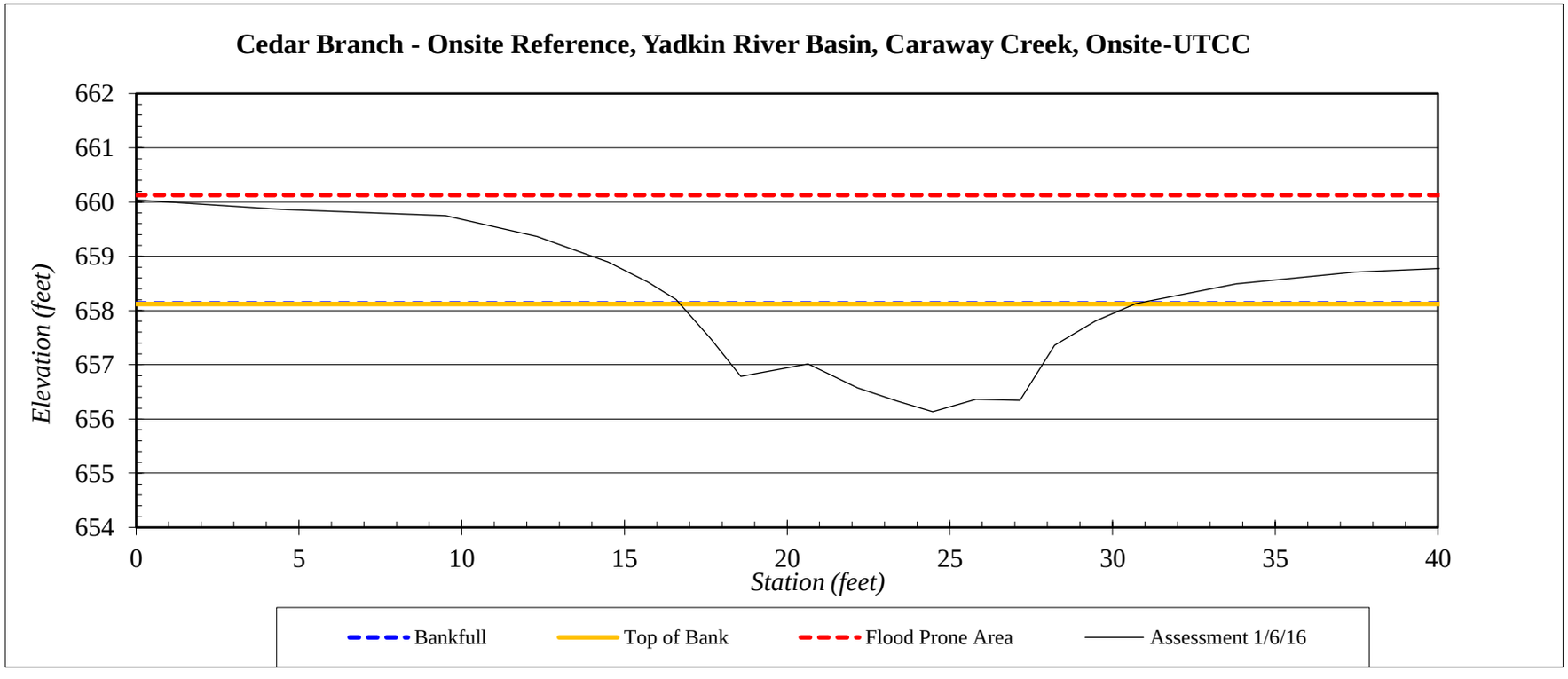


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Caraway Creek
XS ID	Onsite-UTCC
Drainage Area (sq mi):	178 acres
Date:	1/6/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	660.04
4.5	659.87
9.5	659.75
12.3	659.37
14.5	658.89
15.7	658.52
16.6	658.20
17.7	657.48
18.6	656.78
20.6	657.02
22.2	656.57
23.4	656.33
24.5	656.13
25.8	656.36
27.2	656.34
28.2	657.36
29.5	657.81
30.7	658.13
33.8	658.49
37.4	658.71
41.6	658.82
45.5	658.85

SUMMARY DATA	
Bankfull Elevation:	658.13
Top of Bank Elevation:	658.12
Bankfull Cross-Sectional Area:	17.0
Bankfull Width:	14.0
Flood Prone Area Elevation:	660.13
Flood Prone Width:	>50
Max Depth at Bankfull:	2.0
Mean Depth at Bankfull:	1.2
W / D Ratio:	11.5
Entrenchment Ratio:	3.6
Bank Height Ratio:	1.0



USACE Wetland Determination Forms

WA wet

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Cedar Branch City/County: Randolph Sampling Date: 8-26-15

Applicant/Owner: KCI State: NC Sampling Point: W-A wet

Investigator(s): J. Sullivan & T. Seolinger Section, Township, Range:

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): Slope (%): 2-3

Subregion (LRR or MLRA): P-136 Lat: 35.8253 Long: -79.9088 Datum: NAD83

Soil Map Unit Name: Wynott - Enon Complex NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? No (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 X No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- X 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)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): —
Water Table Present?	Yes ____	No X	Depth (inches): —
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): —

Wetland Hydrology Present? Yes X No ____

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: W-A wet

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix nigra	10	X	OBL
2. Platanus occidentalis	20	X	FACW
3. Baccharis halimifolia	5		FACW
4.			
5.			
6.			
7.			
	35 = Total Cover		
50% of total cover: 17.5	20% of total cover: 7		

Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Celtis occidentalis	10	X	FACU
2. Ligustrum sinense	10	X	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	20 = Total Cover		
50% of total cover: 10	20% of total cover: 4		

Herb Stratum (Plot size: 5 ft)			
1. Polygonum sp.	20	X	FACW
2. Cicuta maculata	20	X	OBL
3. Microstegium vimineum	20	X	FAC
4. Boehmeria cylindrica	10		FACW
5. Hydrophyllum canadense	20	X	FACU
6.			
7.			
8.			
9.			
10.			
11.			
	90 = Total Cover		
50% of total cover: 45	20% of total cover: 18		

Woody Vine Stratum (Plot size: 30 ft.)			
1. Ipomea sp.	10	X	FACU
2.			
3.			
4.			
5.			
	10 = Total Cover		
50% of total cover: 5	20% of total cover: 2		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 9 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 56% (A/B)

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 =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[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 or equal to 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 X No ___

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

SOIL

Sampling Point: W-A. wet

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 4/2	100					SL	
2-8	10YR 4/2	80	7.5YR 4/6	20	C	PL	SL	ox. rhiz.
8-12	2.5Y 6/2	60	10YR 6/8	35	C	PL/M	SL	
			7.5YR 5/6	5	C	PL/M		
12-15+	2.5Y 6/1	70	10YR 5/8	30	C	PL	L	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: 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)
- X 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)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

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

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

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

WA up

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Cedar Branch City/County: Randolph Sampling Date: 8/28/15

Applicant/Owner: KCI State: NC Sampling Point: WA - UP

Investigator(s): J. Sullivan + T. Seelinger Section, Township, Range:

Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): Slope (%): 5%

Subregion (LRR or MLRA): P-136 Lat: 35.925391 Long: -79.908909 Datum: NAD83

Soil Map Unit Name: Wyott - Enon complex NWI classification: —

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? No (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 X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ 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 X	Depth (inches): —
Water Table Present?	Yes ____	No X	Depth (inches): —
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): —

Wetland Hydrology Present? Yes ____ No X

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: wA-dry

Tree Stratum (Plot size: 30 ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. Juglans nigra	10	X	FACU
2. Juniperus virginiana	30	X	FACU
3. Platanus occidentalis	10	X	FACW
4.			
5.			
6.			
7.			
	50 = Total Cover		
50% of total cover: 25	20% of total cover: 10		

Sapling/Shrub Stratum (Plot size: 30 ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. Ligustrum sinensis	5	X	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	5 = Total Cover		
50% of total cover: 2.5	20% of total cover: 1		

Herb Stratum (Plot size: 5 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Cicuta maculata	10		OBL
2. Ambrosia artemisiifolia	20	X	FACU
3. Polygonum sp.	10		FACW
4. Cyperus strigosus	5		FACW
5. Microstegium vimineum	35	X	FAC
6. Hydrophyllum canadense	20	X	FACU
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		
50% of total cover: 50	20% of total cover: 20		

Woody Vine Stratum (Plot size: 30 ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. none			
2.			
3.			
4.			
5.			
	___ = Total Cover		
50% of total cover: ___	20% of total cover: ___		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 29% (A/B)

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 = ___

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[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 or equal to 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 ___ No X

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

SOIL Sampling Point: WA-dry

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 5/3	100					SL	
3-12+	2.5Y 7/4	95	10YR 6/8	5	C	PL	SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: 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)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

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

[3]Indicators 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** X

Remarks:

WB wet

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Cedar Branch City/County: Randolph Sampling Date: 8/28/15

Applicant/Owner: KCI State: NC Sampling Point: WB-wet

Investigator(s): J. Sullivan + T. Seplinger Section, Township, Range:

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): Slope (%): 2-3%

Subregion (LRR or MLRA): P-136 Lat: 35.8174 Long: -79.9115 Datum: NAD83

Soil Map Unit Name: Mecklenburg clay loam NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation X, Soil ____, or Hydrology ____ significantly disturbed? Yes Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? No (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 X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks: Wetland has been impacted by agricultural activities. Upland area is a corn field.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ 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)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): —
Water Table Present?	Yes X	No ____	Depth (inches): 6
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 6

Wetland Hydrology Present? Yes X No ____

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

Remarks:

WB1 – WB3 (flags not labeled)

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: WB - wet

Tree Stratum (Plot size: Entire)	Absolute % Cover	Dominant Species?	Indicator Status
1. none			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size: Entire)			
1. none			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	= Total Cover		
50% of total cover:	20% of total cover:		
Herb Stratum (Plot size: Entire)			
1. Sorghum halpense	15		FACU
2. Commelina communis	30	X	FAC
3. Boehmeria cylindrica	30	X	FACW
4. Cyperus strigosus	5		FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	80 = Total Cover		
50% of total cover: 40	20% of total cover: 16		
Woody Vine Stratum (Plot size: Entire)			
1. Ipomoea sp.	10	X	FACU
2.			
3.			
4.			
5.			
	10 = Total Cover		
50% of total cover: 5	20% of total cover: 2		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67% (A/B)

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 =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[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 or equal to 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 X No ___

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

Wetland is adjacent to corn field & disturbed stream.

SOIL Sampling Point: WB - WD

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 2	10YR 4/3	100					SL	
2 - 12+	10YR 5/1	90	5YR 4/6	10	C	PL	L	oxidized rhiz

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: 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)
- X 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)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

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

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

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Cedar Branch City/County: Randolph Sampling Date: 8/28/15

Applicant/Owner: KCI State: NC Sampling Point: WC-1wet

Investigator(s): J. Sullivan & T. Seelinger Section, Township, Range:

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): _____ Slope (%): 2-3

Subregion (LRR or MLRA): P-136 Lat: 35.9221 Long: -79.9112 Datum: NAD83

Soil Map Unit Name: Mecklenburg clay loam NWI classification: PFM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation X, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (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 X	No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X	No _____	
Wetland Hydrology Present?	Yes X	No _____	

Remarks: Wetland has been impacted by adjacent agricultural activities

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ 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)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): —
Water Table Present?	Yes _____	No X	Depth (inches): —
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): —

Wetland Hydrology Present? Yes X No _____

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: WC-wet

Tree Stratum (Plot size: Entire)	Absolute % Cover	Dominant Species?	Indicator Status
1. none			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Sapling/Shrub Stratum (Plot size:)			
1. none			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Herb Stratum (Plot size: Entire)			
1. Commelina communis	20	X	FAC
2. Polygonum sp.	20	X	FACW
3. Cyperus strigosus	10		FACW
4. Boehmeria cylindrica	5		FACW
5. Cicuta maculata	5		OBL
6.			
7.			
8.			
9.			
10.			
11.			
	60 = Total Cover		
50% of total cover: 30	20% of total cover: 12		

Woody Vine Stratum (Plot size: Entire)			
1. Impoea sp.	10	X	FACU
2.			
3.			
4.			
5.			
	10 = Total Cover		
50% of total cover: 5	20% of total cover: 2		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67% (A/B)

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 =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[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 or equal to 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 X No ___

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

SOIL Sampling Point: WC-wet

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 4/3	100					SL	
2-12+	2.5Y 5/2	90	7.5YR 4/6	10	C	PL	L	OXI. RIM

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: 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)
- X 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)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

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

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

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

WC up

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: Cedar Branch City/County: Randolph Sampling Date: WC - Up.

Applicant/Owner: KCI State: NC Sampling Point: 3/28/15 C

Investigator(s): J. Sullivan & T. Seelinger Section, Township, Range:

Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): Slope (%): 5-9%

Subregion (LRR or MLRA): P-136 Lat: 35.922152 Long: -79.91127 Datum: NAD83

Soil Map Unit Name: Mecklenburg clay loam NWI classification: —

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation X, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? NO (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 ____	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes ____ No X	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ 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 X	Depth (inches): —
Water Table Present?	Yes ____	No X	Depth (inches): —
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): —

Wetland Hydrology Present? Yes ____ No X

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: WC-UP

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 Ft.)			
1. none			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size: 30 Ft.)			
1. Fraxinus pennsylvanica	5	Y	FACW
2. Liquidambar styraciflua	5	X	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	10 = Total Cover		
50% of total cover: 5	20% of total cover: 2		
Herb Stratum (Plot size: 5ft)			
1. Cirsium vulgare	5		FACU
2. Solanum Carolinense	10	X	FACU
3. Solidago sp.	5		FACU
4. Rubus argutus	5		FACU
5. Taraxacum officinale	5		FACU
6.			
7.			
8.			
9.			
10.			
11.			
	30 = Total Cover		
50% of total cover: 15	20% of total cover: 6		
Woody Vine Stratum (Plot size: 30ft...)			
1. Ipomea sp.	30	X	FACU
2. Smilax rotundifolia	5		FAC
3.			
4.			
5.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

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 =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[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 or equal to 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 ___ No X

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

SOIL Sampling Point: WC-UP

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12+	5YR 4/6	100					CL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: 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)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

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

[3]Indicators 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** X

Remarks:

NC DWR Stream Identification Forms

NC DWQ Stream Identification Form Version 4.11

Date: 4-15-2015	**Project/Site:** Main stem	**Latitude:** 35.82387
Evaluator: Alex French	**County:** Randolph	**Longitude:** 79.908653
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 46	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 27)	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 = 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 = 12)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (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: 4-15-2015	**Project/Site:** Ti	**Latitude:** 35.825597
Evaluator: Alex French	**County:** Randolph	**Longitude:** 79.909605
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 20.5	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 10.5)	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 = 4)				
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 = 6)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (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: 4-15-2015	**Project/Site:** T1-1	**Latitude:** 35.825718
Evaluator: Alex French	**County:** Randolph	**Longitude:** 79.908744
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 22.5	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 11.5)	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 = 4.5)				
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 = 6.5)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (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: 4-15-2015	**Project/Site:** T2	**Latitude:** 35.82387
Evaluator: Alex French	**County:** Randolph	**Longitude:** 79.908653
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 40	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 18.5)	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 = 11)				
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 = 10.5)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (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: 4-15-2015	**Project/Site:** T3	**Latitude:** 35.823651
Evaluator: Alex French	**County:** Randolph	**Longitude:** 79.911185
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 21.5	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 10.5)	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 = 3)				
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. Macrobenthos (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: 4-15-2015	**Project/Site:** T3-1	**Latitude:** 35.822616
Evaluator: Alex French	**County:** Randolph	**Longitude:** 79.911603
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 23.5	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** *e.g. Quad Name:*

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	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 = 4)				
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 = 7.5)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (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: 4-15-2015	**Project/Site:** T3/T3-1 confluence	**Latitude:** 35.822232
Evaluator: Alex French	**County:** Randolph	**Longitude:** 79.911204
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 33.5	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 20)	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 = 8)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (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: 4-15-2015	**Project/Site:** T4	**Latitude:** 35.823793
Evaluator: Alex French	**County:** Randolph	**Longitude:** 79.908423
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 24.5	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 10.5)	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 = 8.5)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (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:

Jurisdictional Determination

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action Id. SAW-2003-21395 County: Randolph U.S.G.S. Quad: NC-GLENOLA

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owner:

Address: Terry Farlow
3258 Farlow Pines Drive
Sophia, NC 27350

Telephone Number: 336 861-1157

Size (acres)	20.6	Nearest Town	Sophia
Nearest Waterway	Caraway Creek	River Basin	Lower Yadkin
USGS HUC	03040103	Coordinates	Latitude: 35.8224818
			Longitude: -79.9095915

Location description: WILMINGTON Historical SiteBasin: YADKIN 03040100 Proposed Cedar Branch Restoration site located off of Mount Olive Church Road, adjacent to a tributary of Caraway Creek, west of Sophia, in Randolph County, North Carolina.

Indicate Which of the Following Apply:

A. Preliminary Determination

_ Based on preliminary information, there may be waters of the U.S. including wetlands on the above described project area . We strongly suggest you have this property inspected to determine the extent of Department of the Army (DA) jurisdiction. To be considered final, a jurisdictional determination must be verified by the Corps. This preliminary determination is not an appealable action under the Regulatory Program Administrative Appeal Process (Reference 33 CFR Part 331). If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also, you may provide new information for further consideration by the Corps to reevaluate the JD.

B. Approved Determination

_ There are Navigable Waters of the United States within the above described project area subject to the permit requirements of Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

X There are waters of the U.S. including wetlands on the above described project area subject to the permit requirements of Section 404 of the Clean Water Act (CWA)(33 USC § 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ We strongly suggest you have the waters of the U.S. including wetlands on your project area delineated. Due to the size of your property and/or our present workload, the Corps may not be able to accomplish this wetland delineation in a timely manner. For a more timely delineation, you may wish to obtain a consultant. To be considered final, any delineation must be verified by the Corps.

X The waters of the U.S. including wetlands on your project area have been delineated and the delineation has been verified by the Corps. We strongly suggest you have this delineation surveyed. Upon completion, this survey should be reviewed and verified by the Corps. Once verified, this survey will provide an accurate depiction of all areas subject to CWA jurisdiction on your property which, provided there is no change in the law or our published regulations, may be relied upon for a period not to exceed five years.

_ The waters of the U.S. including wetlands have been delineated and surveyed and are accurately depicted on the plat signed by the Corps Regulatory Official identified below on _____. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ There are no waters of the U.S., to include wetlands, present on the above described project area which are subject to the permit requirements of Section 404 of the Clean Water Act (33 USC 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ The property is located in one of the 20 Coastal Counties subject to regulation under the Coastal Area Management Act (CAMA). You should contact the Division of Coastal Management in Morehead City, NC, at (252) 808-2808 to determine their requirements.

Placement of dredged or fill material within waters of the US and/or wetlands without a Department of the Army permit may constitute a violation of Section 301 of the Clean Water Act (33 USC § 1311). If you have any questions regarding this determination and/or the Corps regulatory program, please contact **John Thomas at 919 554-4884 ext. 25**.

C. Basis For Determination: *Site includes tributaries of Caraway Creek which flows to the Yadkin River and on to the Atlantic Ocean.*

D. Remarks:

E. Attention USDA Program Participants

This delineation/determination has been conducted to identify the limits of Corps' Clean Water Act jurisdiction for the particular site identified in this request. The delineation/determination 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 request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

F. Appeals Information (This information applies only to approved jurisdictional determinations as indicated in B. above)

This correspondence constitutes an approved jurisdictional determination for the above described site. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and request for appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the following address:

US Army Corps of Engineers
South Atlantic Division
Attn: Jason Steele, Review Officer
60 Forsyth Street SW, Room 10M15
Atlanta, Georgia 30303-8801

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR part 331.5, and that it has been received by the Division Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by **12/19/2015**.

It is not necessary to submit an RFA form to the Division Office if you do not object to the determination in this correspondence.

Corps Regulatory Official: _____

Date: October 19, 2015

CC: Steve Stokes, KCI, Landmark Center II, Suite 220, 4601 Six Forks Road, Raleigh, NC 24609-9214

The Wilmington District is committed to providing the highest level of support to the public. To help us ensure we continue to do so, please complete our Customer Satisfaction Survey, located online at http://regulatory.usacesurvey.com/.

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: **Terry Farlow**	File Number: **SAW-2003-21395**	Date: October 19, 2015

Attached is:	See Section below
☐ INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
☐ PROFFERED PERMIT (Standard Permit or Letter of permission)	B
☐ PERMIT DENIAL	C
☐ APPROVED JURISDICTIONAL DETERMINATION	D
☒ PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits.aspx or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the district engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact: **District Engineer, Wilmington Regulatory Division, Attn: Andrea Hughes**	If you only have questions regarding the appeal process you may also contact: Mr. Jason Steele, Administrative Appeal Review Officer CESAD-PDO U.S. Army Corps of Engineers, South Atlantic Division 60 Forsyth Street, Room 10M15 Atlanta, Georgia 30303-8801 Phone: (404) 562-5137

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

_____ Signature of appellant or agent.	Date:	Telephone number:

For appeals on Initial Proffered Permits send this form to:

District Engineer, Wilmington Regulatory Division, Andrea Hughes,

For Permit denials, Proffered Permits and approved Jurisdictional Determinations send this form to:

Division Engineer, Commander, U.S. Army Engineer Division, South Atlantic, Attn: Mr. Jason Steele, Administrative Appeal Officer, CESAD-PDO, 60 Forsyth Street, Room 10M15, Atlanta, Georgia 30303-8801 Phone: (404) 562-5137

FIGURE 3. JURISDICTIONAL FEATURES
CEDAR BRANCH RESTORATION SITE
RANDOLPH COUNTY, NC

Source: NC OneMap Orthoimagery, 2014.

FHWA Categorical Exclusion Form

Categorical Exclusion Form for Division of Mitigation Services 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:	Cedar Branch Stream Restoration Site
County Name:	Randolph County, NC
EEP Number:	97009
Project Sponsor:	KCI Technologies, Inc.
Project Contact Name:	Tim Morris
Project Contact Address:	4601 Six Forks Rd, Suite 220, Raleigh, NC 27609
Project Contact E-mail:	tim.morris@kci.com
EEP Project Manager:	Matthew Reid

Project Description

For Official Use Only

Reviewed By:

10/6/2015
Date

DMS Project Manager

Conditional Approved By:

Date

For Division Administrator
FHWA

☐ **Check this box if there are outstanding issues**

Final Approval By:

10-5-15
Date

For Division Administrator
FHWA

Part 2: All Projects Regulation/Question	Response
Coastal Zone Management Act (CZMA)	
1. Is the project located in a CAMA county?	☐ Yes ☒ No
2. Does the project involve ground-disturbing activities within a CAMA Area of Environmental Concern (AEC)?	☐ Yes ☐ No ☒ N/A
3. Has a CAMA permit been secured?	☐ Yes ☐ No ☒ N/A
4. Has NCDCM agreed that the project is consistent with the NC Coastal Management Program?	☐ Yes ☐ No ☒ N/A
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)	
1. Is this a "full-delivery" project?	☒ Yes ☐ No
2. Has the zoning/land use of the subject property and adjacent properties ever been designated as commercial or industrial?	☐ Yes ☒ No ☐ 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?	☐ Yes ☒ No ☐ 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?	☐ Yes ☐ No ☒ N/A
5. As a result of a Phase II Site Assessment, are there known or potential hazardous waste sites within the project area?	☐ Yes ☐ No ☒ N/A
6. Is there an approved hazardous mitigation plan?	☐ Yes ☐ No ☒ 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?	☐ Yes ☒ No
2. Does the project affect such properties and does the SHPO/THPO concur?	☐ Yes ☐ No ☒ N/A
3. If the effects are adverse, have they been resolved?	☐ Yes ☐ No ☒ N/A
Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)	
1. Is this a "full-delivery" project?	☒ Yes ☐ No
2. Does the project require the acquisition of real estate?	☒ Yes ☐ No ☐ N/A
3. Was the property acquisition completed prior to the intent to use federal funds?	☐ Yes ☒ No ☐ 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?	☒ Yes ☐ No ☐ 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?	☐ Yes ☒ No
2. Is the site of religious importance to American Indians?	☐ Yes ☐ No ☒ N/A
3. Is the project listed on, or eligible for listing on, the National Register of Historic Places?	☐ Yes ☐ No ☒ N/A
4. Have the effects of the project on this site been considered?	☐ Yes ☐ No ☒ N/A
Antiquities Act (AA)	
1. Is the project located on Federal lands?	☐ Yes ☒ No
2. Will there be loss or destruction of historic or prehistoric ruins, monuments or objects of antiquity?	☐ Yes ☐ No ☒ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☒ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☒ N/A
Archaeological Resources Protection Act (ARPA)	
1. Is the project located on federal or Indian lands (reservation)?	☐ Yes ☒ No
2. Will there be a loss or destruction of archaeological resources?	☐ Yes ☐ No ☒ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☒ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☒ N/A
Endangered Species Act (ESA)	
1. Are federal Threatened and Endangered species and/or Designated Critical Habitat listed for the county?	☒ Yes ☐ No
2. Is Designated Critical Habitat or suitable habitat present for listed species?	☐ Yes ☒ No ☐ N/A
3. Are T&E species present or is the project being conducted in Designated Critical Habitat?	☐ Yes ☐ No ☒ N/A
4. Is the project "likely to adversely affect" the specie and/or "likely to adversely modify" Designated Critical Habitat?	☐ Yes ☐ No ☒ N/A
5. Does the USFWS/NOAA-Fisheries concur in the effects determination? (By virtue of no-response)	☐ Yes ☐ No ☒ N/A
6. Has the USFWS/NOAA-Fisheries rendered a "jeopardy" determination?	☐ Yes ☐ No ☒ 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?	☐ Yes ☒ No
2. Has the EBCI indicated that Indian sacred sites may be impacted by the proposed project?	☐ Yes ☐ No ☒ N/A
3. Have accommodations been made for access to and ceremonial use of Indian sacred sites?	☐ Yes ☐ No ☒ N/A
Farmland Protection Policy Act (FPPA)	
1. Will real estate be acquired?	☒ Yes ☐ No
2. Has NRCS determined that the project contains prime, unique, statewide or local important farmland?	☒ Yes ☐ No ☐ N/A
3. Has the completed Form AD-1006 been submitted to NRCS?	☒ Yes ☐ No ☐ N/A
Fish and Wildlife Coordination Act (FWCA)	
1. Will the project impound, divert, channel deepen, or otherwise control/modify any water body?	☒ Yes ☐ No
2. Have the USFWS and the NCWRC been consulted?	☒ Yes ☐ No ☐ 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?	☐ Yes ☒ No
2. Has the NPS approved of the conversion?	☐ Yes ☐ No ☒ N/A
Magnuson-Stevens Fishery Conservation and Management Act (Essential Fish Habitat)	
1. Is the project located in an estuarine system?	☐ Yes ☒ No
2. Is suitable habitat present for EFH-protected species?	☐ Yes ☐ No ☒ N/A
3. Is sufficient design information available to make a determination of the effect of the project on EFH?	☐ Yes ☐ No ☒ N/A
4. Will the project adversely affect EFH?	☐ Yes ☐ No ☒ N/A
5. Has consultation with NOAA-Fisheries occurred?	☐ Yes ☐ No ☒ N/A
Migratory Bird Treaty Act (MBTA)	
1. Does the USFWS have any recommendations with the project relative to the MBTA?	☐ Yes ☒ No
2. Have the USFWS recommendations been incorporated?	☐ Yes ☐ No ☒ N/A
Wilderness Act	
1. Is the project in a Wilderness area?	☐ Yes ☒ No
2. Has a special use permit and/or easement been obtained from the maintaining federal agency?	☐ Yes ☐ No ☒ N/A

Appendix C. Mitigation Work Plan Data and Analyses

Nutrient and Bacterial Reduction Estimates

Estimated Reduction in Total Nitrogen and Total Phosphorus From Cedar Branch Restoration Project

Cattle Exclusion (Grazing Pasture)

TN reduction (lbs/yr) = 51.04 (lbs/ac/yr) x Area (ac)
TP reduction (lbs/yr) = 4.23 (lbs/ac/yr) x Area (ac)

	Reduction (lbs/ac/year)	Acres	Total Reduction (lbs/year)
TN	51.04	7.6	387.9
TP	4.23	7.6	32.1

Nutrient Reduction from Buffer Adjacent to Agricultural Fields

TN reduction (lbs/yr) = 75.77 (lbs/ac/yr) x Area (ac)
TP reduction (lbs/yr) = 4.88 (lbs/ac/yr) x Area (ac)

	Reduction (lbs/ac/year)	Acres	Total Reduction (lbs/year)
TN	75.77	9.8	741.0
TP	4.88	9.8	47.7

Total Estimated Nitrogen and Phosphorus Reduction from Exclusion and Buffer

	Cattle Exclusion	Buffer	Total Reduction (lbs/year)
TN	387.904	741.0	**1128.9**
TP	32.148	47.7	**79.9**

Estimate of the Amount of Fecal Coliform Prevented from Entering Stream due to Livestock Exclusion at the Cedar Branch Restoration Project

1. Fecal from direct input

	# cows	Average Weight	Total Weight	AU=total/1000
An animal unit (AU) is one thousand pounds of livestock. Assume avg cow weighs 1500 lb.	20	1,500	30,000	30

Fecal Coliform Reduction from Direct Input (col) = 2.2×10^{11}(col/AU/day) x AU x 0.085

Fecal (col/AU/day)	AU	Percent	Total (col/day)	Total(col/year)	Total (half-year grazing)
2.200E+11	30	0.085	5.610E+11	2.048E+14	1.024E+14

2. Fecal from buffer filtering

Weighted Curve Number

Land Use / Hydrologic Soil Group	CN	Acres	Weighted CN
Pasture (Poor) / C	86	5.09	83.7
Pasture (Fair) / C	79	2.51	

Runoff - Q (inches)

P (annual rainfall in inches)	Weighted CN	S (inches)	Ia (inches)	Q (inches)
46.6	83.7	1.95	0.39	44.3

Fecal Coliform Reduction from Buffer Filtration (col) = Runoff's fecal coliform concentration (col/gal) x Runoff volume (Gal) x 0.85

Common Fecal Coliform	Fecal conc (col/gal)	Q (in)	Total acres	Volume (in-ac)	Vol (gal)	Fecal reduction (col/year)
Pastures under Continually Grazing Year-round	1,894,000					
Pastures Grazed for Half of Year	329,500	44.3	7.6	337.0	9,150,939	2.563E+11
Pastures Grazed for Two Months of Year	340,900					

Total Coliform Reduction

Direct Input Reduction	1.024E+14
Buffer Filtration	2.563E+11
Total (col/year)	**1.026E+14**

Existing Conditions

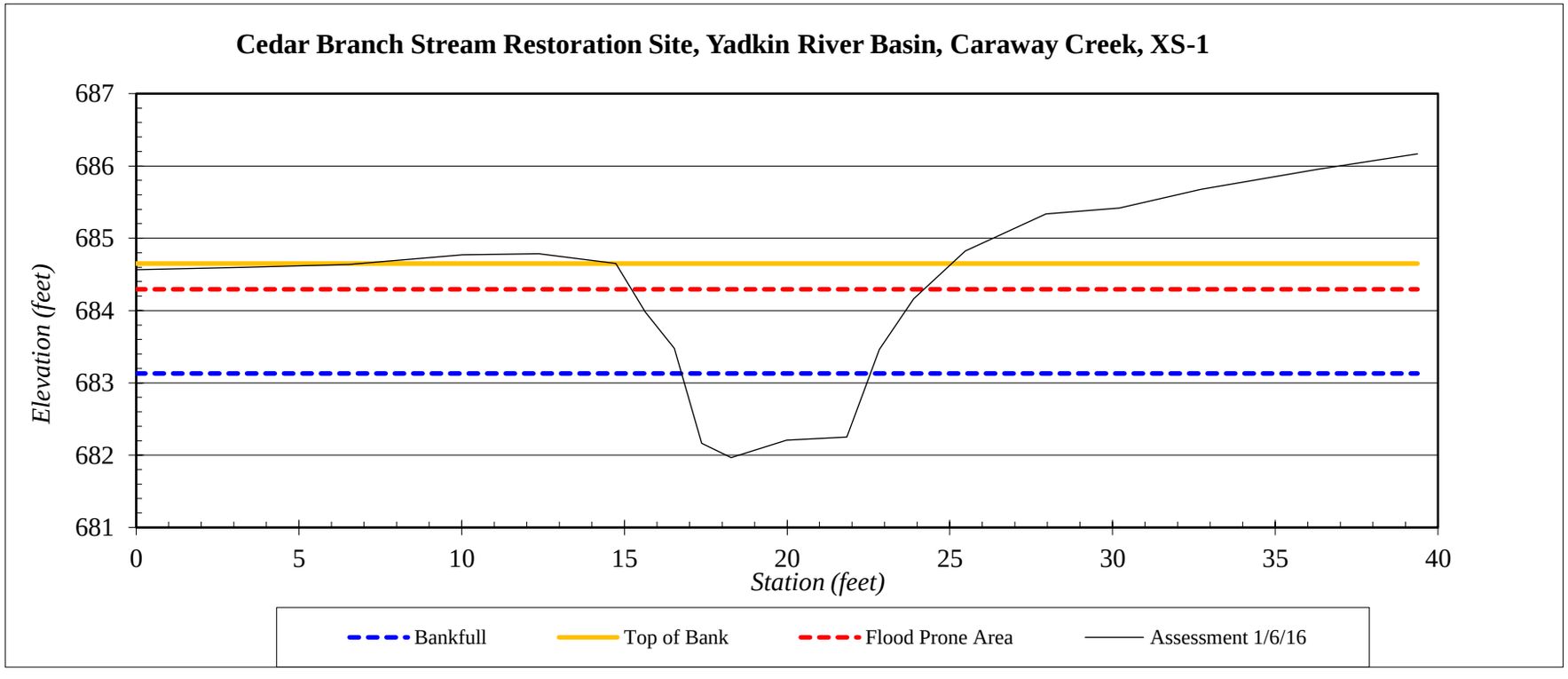
Cross-Sections

Cross-Section Plots

River Basin:	Yadkin
Watershed:	Caraway Creek
XS ID	XS-1
Drainage Area (sq mi):	16 acres
Date:	1/6/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	684.57
3.4	684.60
6.5	684.64
10.0	684.77
12.4	684.79
14.7	684.65
15.6	683.98
16.5	683.48
17.4	682.16
18.3	681.97
20.0	682.21
21.8	682.25
22.8	683.46
23.9	684.16
25.5	684.82
28.0	685.34
30.2	685.42
32.7	685.68
36.3	685.96
39.4	686.17

SUMMARY DATA	
Bankfull Elevation:	683.13
Top of Bank Elevation:	684.65
Bankfull Cross-Sectional Area:	5.0
Bankfull Width:	5.8
Flood Prone Area Elevation:	684.29
Flood Prone Width:	9.0
Max Depth at Bankfull:	1.2
Mean Depth at Bankfull:	0.9
W / D Ratio:	6.7
Entrenchment Ratio:	1.5
Bank Height Ratio:	2.3

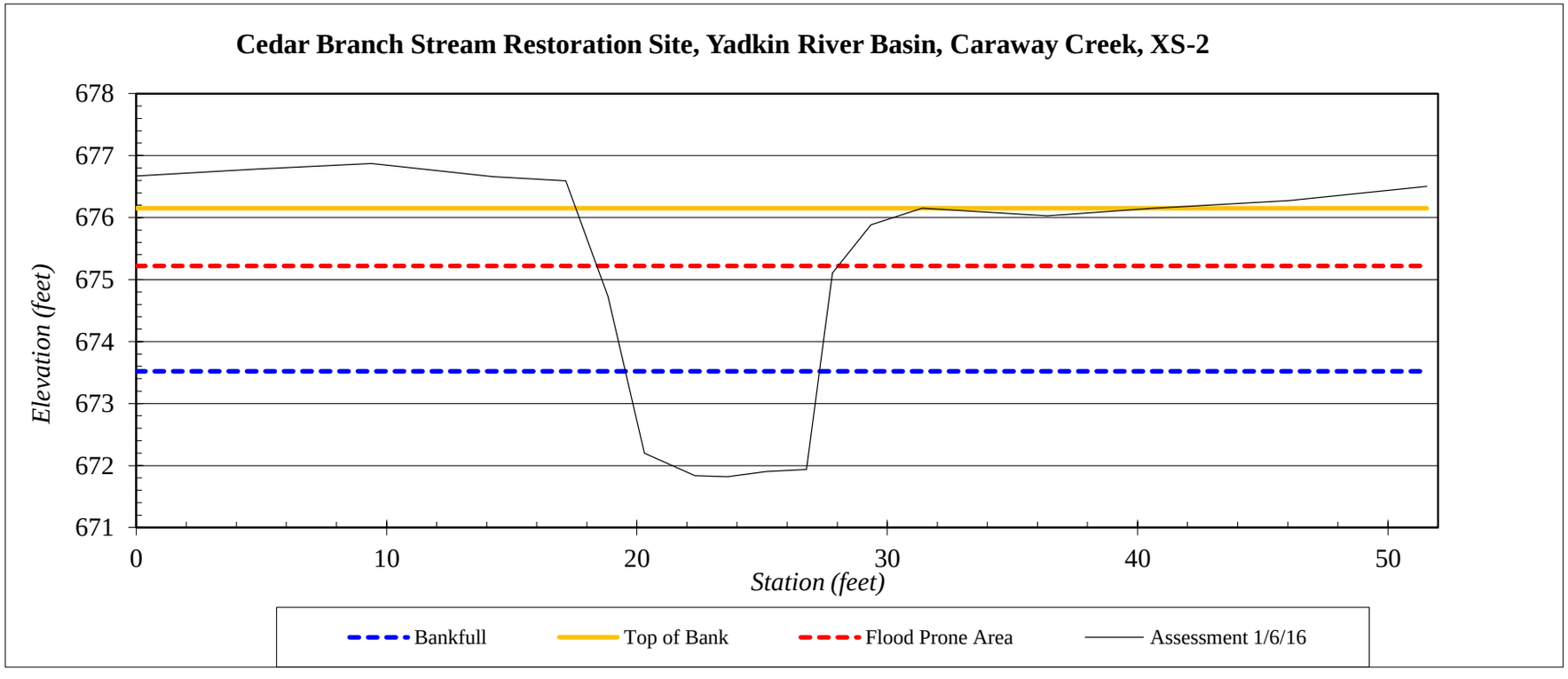


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Caraway Creek
XS ID	XS-2
Drainage Area (sq mi):	88 acres
Date:	1/6/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	676.67
4.8	676.79
9.4	676.87
14.2	676.66
17.2	676.59
18.8	674.72
20.3	672.20
22.3	671.84
23.6	671.82
25.2	671.90
26.8	671.93
27.8	675.10
29.3	675.88
31.4	676.15
36.4	676.03
40.7	676.15
46.0	676.27
51.6	676.51

SUMMARY DATA	
Bankfull Elevation:	673.52
Top of Bank Elevation:	676.15
Bankfull Cross-Sectional Area:	11.3
Bankfull Width:	7.8
Flood Prone Area Elevation:	675.22
Flood Prone Width:	9.6
Max Depth at Bankfull:	1.7
Mean Depth at Bankfull:	1.5
W / D Ratio:	5.3
Entrenchment Ratio:	1.2
Bank Height Ratio:	2.5

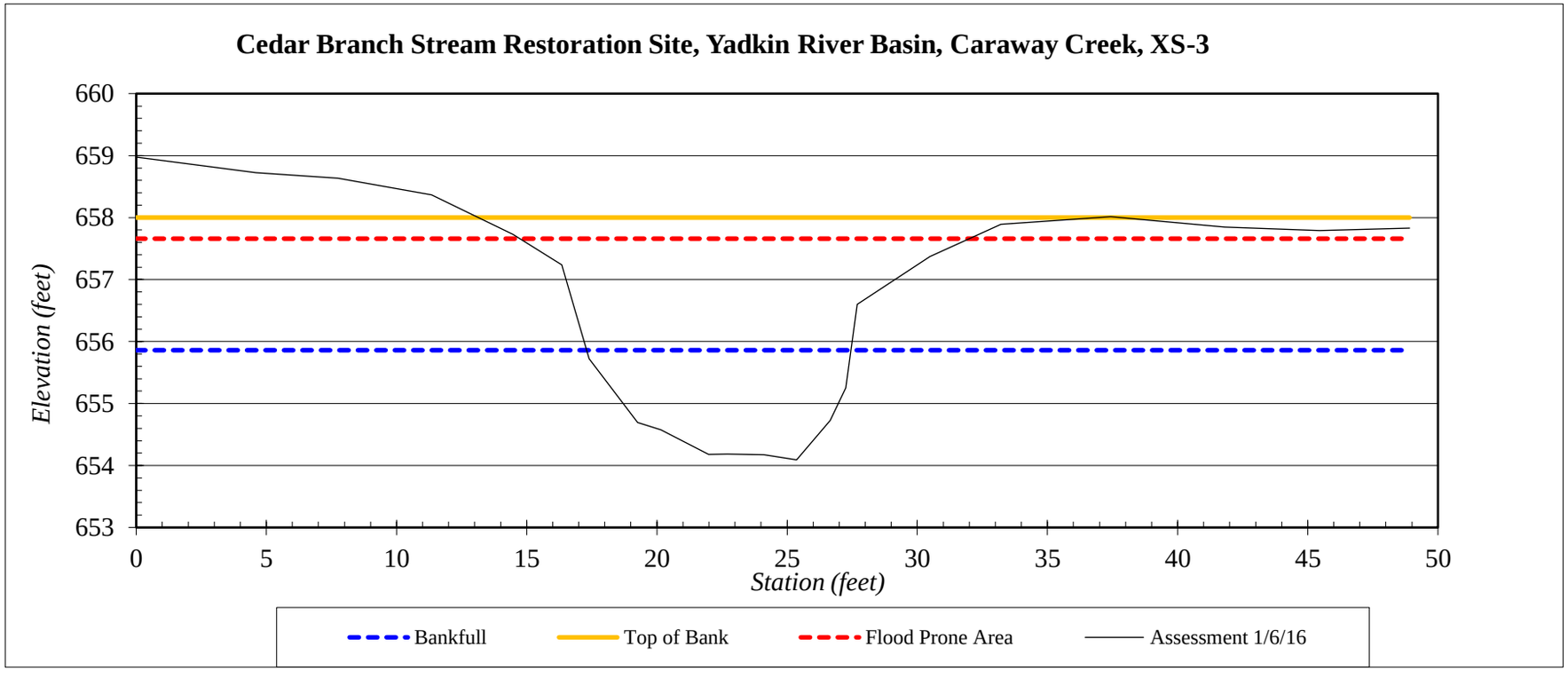


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Caraway Creek
XS ID	XS-3
Drainage Area (sq mi):	294 acres
Date:	1/6/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	658.98
4.6	658.72
7.8	658.64
11.3	658.36
14.5	657.73
16.3	657.24
17.4	655.72
19.3	654.70
20.1	654.58
22.0	654.18
22.7	654.18
24.1	654.17
25.4	654.09
26.7	654.73
27.3	655.25
27.7	656.60
30.5	657.37
33.2	657.89
37.4	658.02
41.8	657.85
45.5	657.79
48.9	657.83

SUMMARY DATA	
Bankfull Elevation:	655.86
Top of Bank Elevation:	658.00
Bankfull Cross-Sectional Area:	13.2
Bankfull Width:	10.1
Flood Prone Area Elevation:	657.66
Flood Prone Width:	17.0
Max Depth at Bankfull:	1.8
Mean Depth at Bankfull:	1.3
W / D Ratio:	7.8
Entrenchment Ratio:	1.7
Bank Height Ratio:	2.2

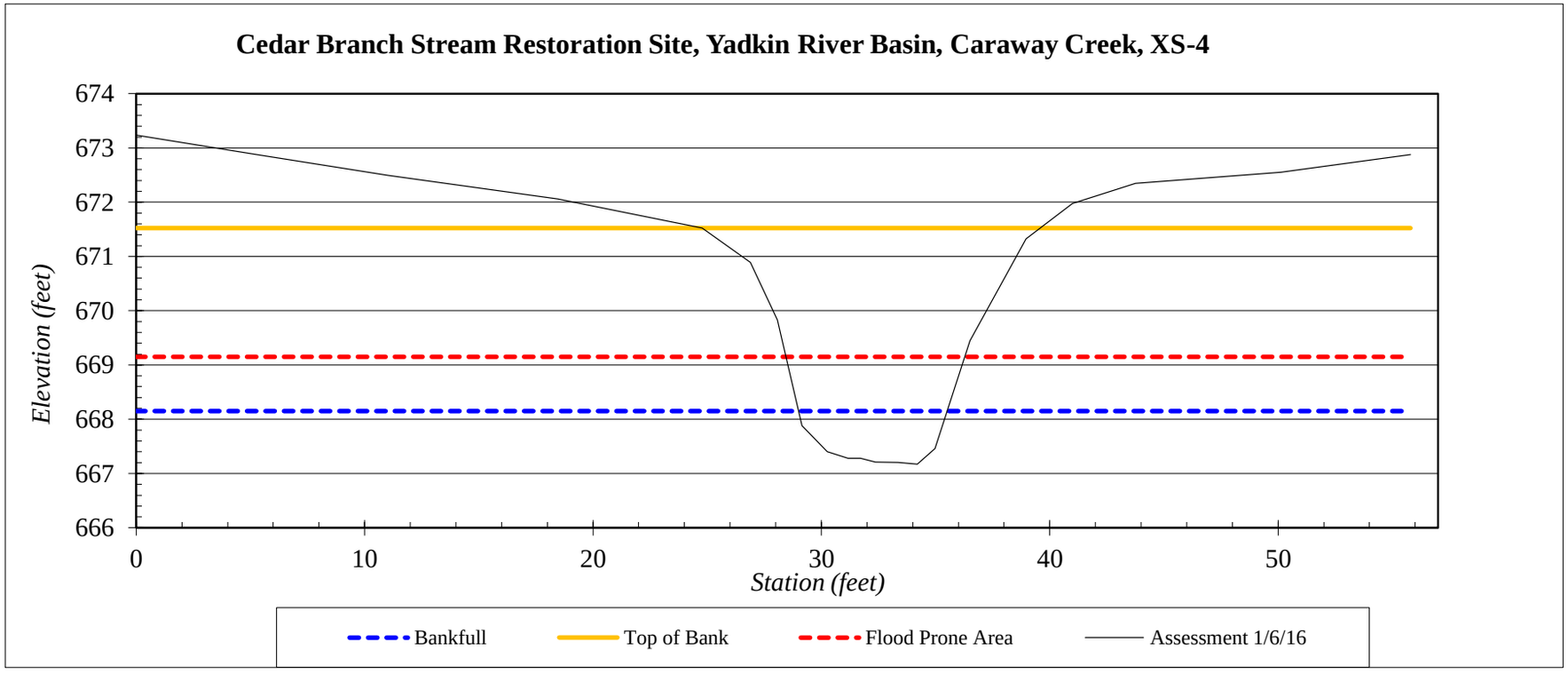


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Caraway Creek
XS ID	XS-4
Drainage Area (sq mi):	30 acres
Date:	1/6/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	673.24
5.1	672.89
11.0	672.49
18.5	672.06
24.8	671.52
26.9	670.89
28.1	669.83
29.1	667.88
30.3	667.40
31.2	667.28
31.7	667.28
32.4	667.21
33.4	667.20
34.2	667.17
35.0	667.46
36.5	669.45
39.0	671.33
41.0	671.98
43.8	672.35
50.1	672.55
55.8	672.88

SUMMARY DATA	
Bankfull Elevation:	668.15
Top of Bank Elevation:	671.52
Bankfull Cross-Sectional Area:	5.0
Bankfull Width:	6.5
Flood Prone Area Elevation:	669.15
Flood Prone Width:	7.8
Max Depth at Bankfull:	1.0
Mean Depth at Bankfull:	0.8
W / D Ratio:	8.5
Entrenchment Ratio:	1.2
Bank Height Ratio:	4.5

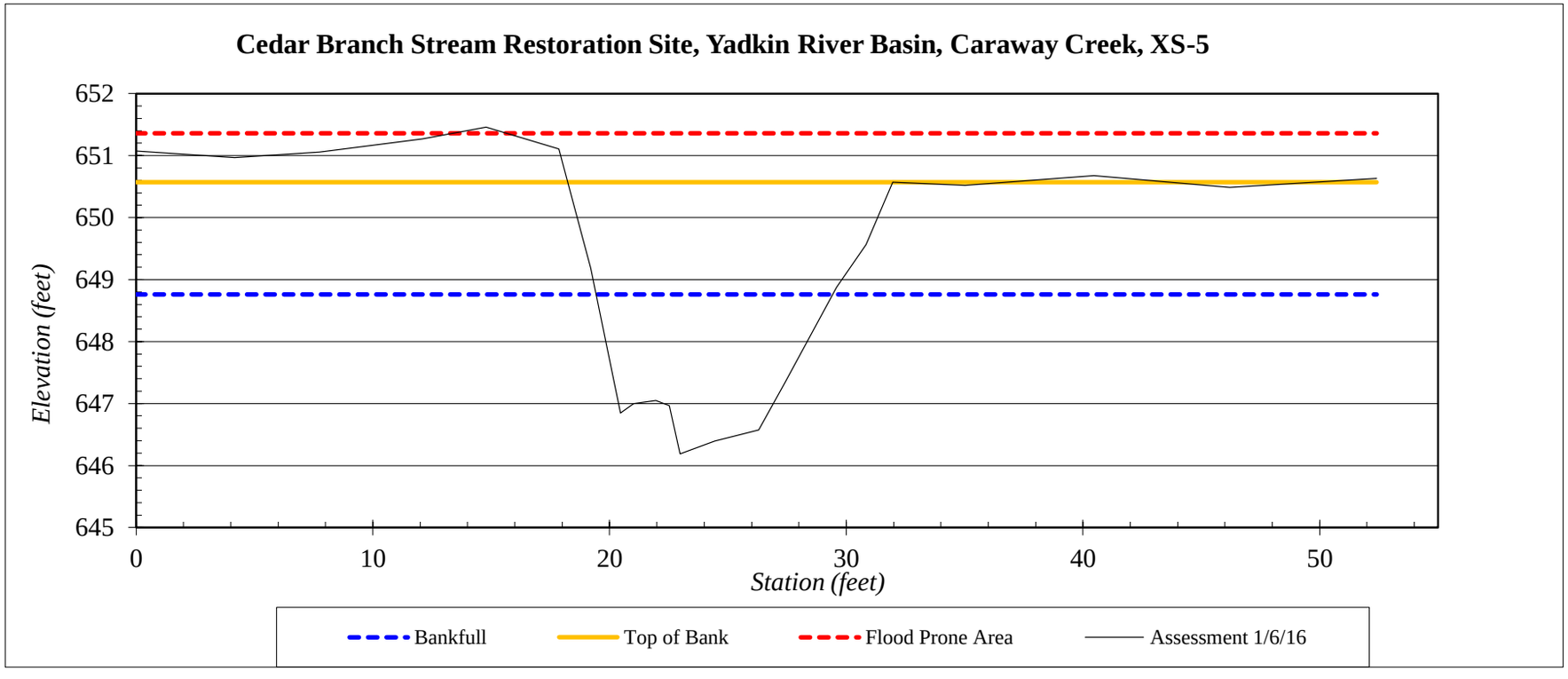


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Caraway Creek
XS ID	XS-5
Drainage Area (sq mi):	294 acres
Date:	1/6/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	651.08
4.2	650.97
7.7	651.05
12.1	651.27
14.8	651.46
17.9	651.11
19.2	649.19
20.5	646.85
21.0	647.00
22.0	647.05
22.5	646.96
23.0	646.19
24.4	646.40
26.3	646.57
27.4	647.34
29.6	648.87
30.8	649.56
32.0	650.57
35.0	650.52
40.5	650.68
46.2	650.49
52.4	650.63

SUMMARY DATA	
Bankfull Elevation:	648.76
Top of Bank Elevation:	650.57
Bankfull Cross-Sectional Area:	16.9
Bankfull Width:	10.0
Flood Prone Area Elevation:	651.36
Flood Prone Width:	>50
Max Depth at Bankfull:	2.6
Mean Depth at Bankfull:	1.7
W / D Ratio:	5.9
Entrenchment Ratio:	5.0
Bank Height Ratio:	1.7

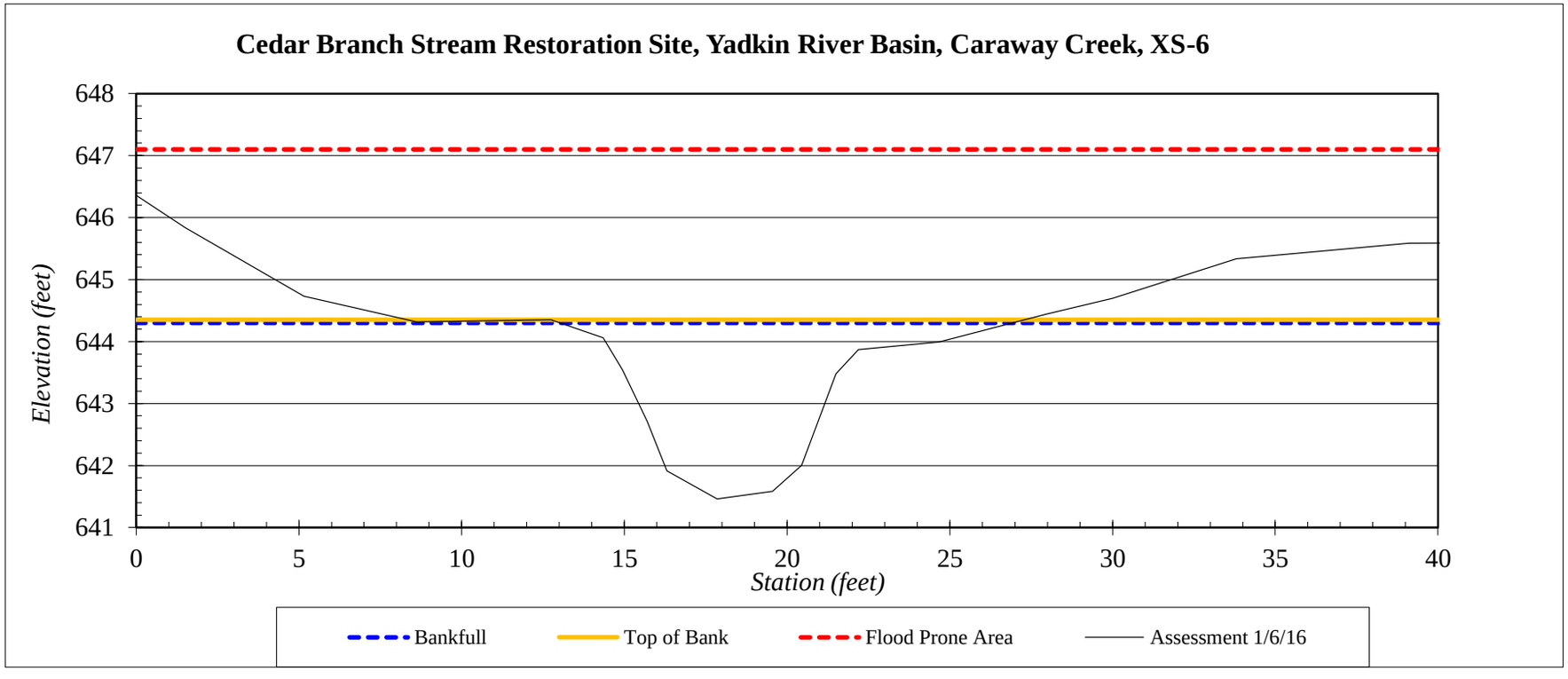


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Caraway Creek
XS ID	XS-6
Drainage Area (sq mi):	294 acres
Date:	1/6/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	646.36
1.5	645.84
5.2	644.73
8.6	644.32
12.7	644.35
14.3	644.06
14.9	643.54
15.7	642.71
16.3	641.91
17.8	641.46
19.6	641.59
20.4	642.01
21.5	643.48
22.2	643.87
24.7	643.99
28.0	644.44
30.0	644.70
33.8	645.34
39.1	645.58
44.6	645.60
48.7	645.64

SUMMARY DATA	
Bankfull Elevation:	644.30
Top of Bank Elevation:	644.35
Bankfull Cross-Sectional Area:	16.9
Bankfull Width:	13.9
Flood Prone Area Elevation:	647.10
Flood Prone Width:	>50
Max Depth at Bankfull:	2.8
Mean Depth at Bankfull:	1.2
W / D Ratio:	11.4
Entrenchment Ratio:	3.5
Bank Height Ratio:	1.0

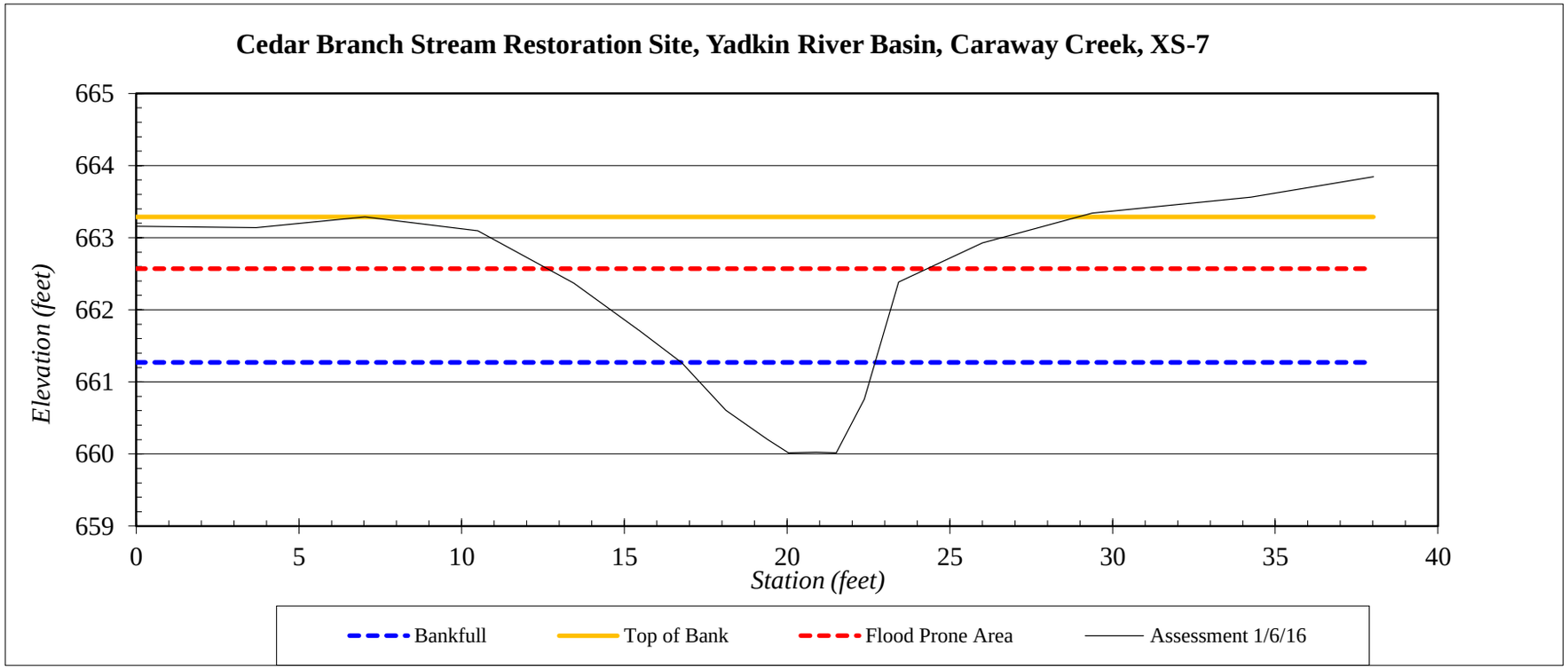


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Caraway Creek
XS ID	XS-7
Drainage Area (sq mi):	28 acres
Date:	1/6/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	663.16
3.7	663.14
7.0	663.29
10.5	663.10
13.4	662.37
15.5	661.70
16.8	661.27
18.1	660.61
19.4	660.20
20.0	660.02
20.9	660.02
21.5	660.01
22.4	660.76
23.4	662.38
26.0	662.93
29.4	663.34
34.3	663.56
38.0	663.85

SUMMARY DATA	
Bankfull Elevation:	661.27
Top of Bank Elevation:	663.29
Bankfull Cross-Sectional Area:	5.0
Bankfull Width:	6.0
Flood Prone Area Elevation:	662.57
Flood Prone Width:	11.3
Max Depth at Bankfull:	1.3
Mean Depth at Bankfull:	0.8
W / D Ratio:	7.1
Entrenchment Ratio:	1.3
Bank Height Ratio:	2.6

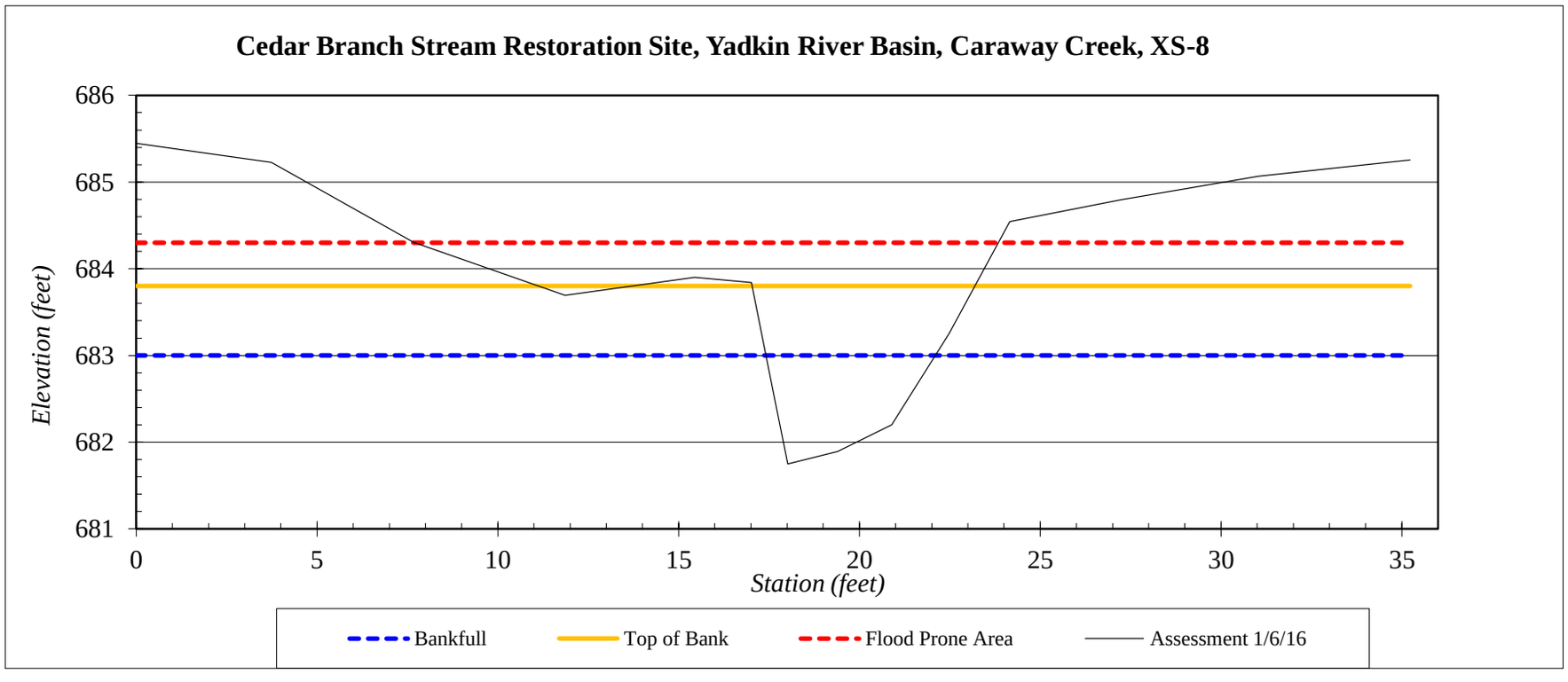


Cross-Section Plots

River Basin:	Yadkin
Watershed:	Caraway Creek
XS ID	XS-8
Drainage Area (sq mi):	7 acres
Date:	1/6/2016
Field Crew:	A. French, T. Seelinger

Station	Elevation
0.0	685.45
3.7	685.23
7.7	684.30
11.9	683.69
15.4	683.90
17.0	683.84
17.6	682.60
18.0	681.75
19.4	681.89
20.9	682.20
22.5	683.26
24.2	684.54
27.2	684.79
31.0	685.07
35.2	685.26

SUMMARY DATA	
Bankfull Elevation:	683.00
Top of Bank Elevation:	683.80
Bankfull Cross-Sectional Area:	3.9
Bankfull Width:	4.7
Flood Prone Area Elevation:	684.30
Flood Prone Width:	15.7
Max Depth at Bankfull:	1.3
Mean Depth at Bankfull:	0.8
W / D Ratio:	5.6
Entrenchment Ratio:	3.4
Bank Height Ratio:	1.6



Existing Conditions

Sediment Data

Point / Side BAR-BULK MATERIALS SAMPLE DATA: Size Distribution Analysis

Party: KOB, JS

Location: Cedar Branch

Date: 01-05-2016

Notes: Pavement sample 0-6 inches

SUB SAMPLES

	Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)		Sieve Size (mm)	
	< 1.0		1.0		2.0		4.0		8.0		16.0		31.5		63.0					
	Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)		Tare Weight (kg)	
	0.95		0.95		1.4		1.35		1.4		1.45		1.45		1.4					
	Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights		Sample Weights	
	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net
1	1.9	0.9	2.9	2.0	6.6	5.2	3.2	1.9	9.7	8.3	4.5	3.0	6.4	4.9	5.3	3.9				
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				
13																				
14																				
15																				
Net Wt. Total	0.9		2.0		5.2		1.9		8.3		3.0		4.9		3.9		0.0		0.0	**30.0**
% Grand Tot.	3.0%		6.5%		17.4%		6.2%		27.7%		10.0%		16.4%		12.9%		0.0%		0.0%	
Accum. % =<	3.0%	→	9.5%	→	26.9%	→	33.1%	→	60.8%	→	70.8%	→	87.1%	→	100.0%	→	100.0%	→	100.0%	

SURFACE MATERIALS DATA
(Two Largest Particles)

No.	Dia.	WT.
1	**110mm**	**1.55 kg**
2	**109mm**	**1.45 kg**

Bucket
+ Materials
Weight_____

Bucket
Tare
Weight_____

Materials
Weight_____
(Materials less than:
_____mm.)

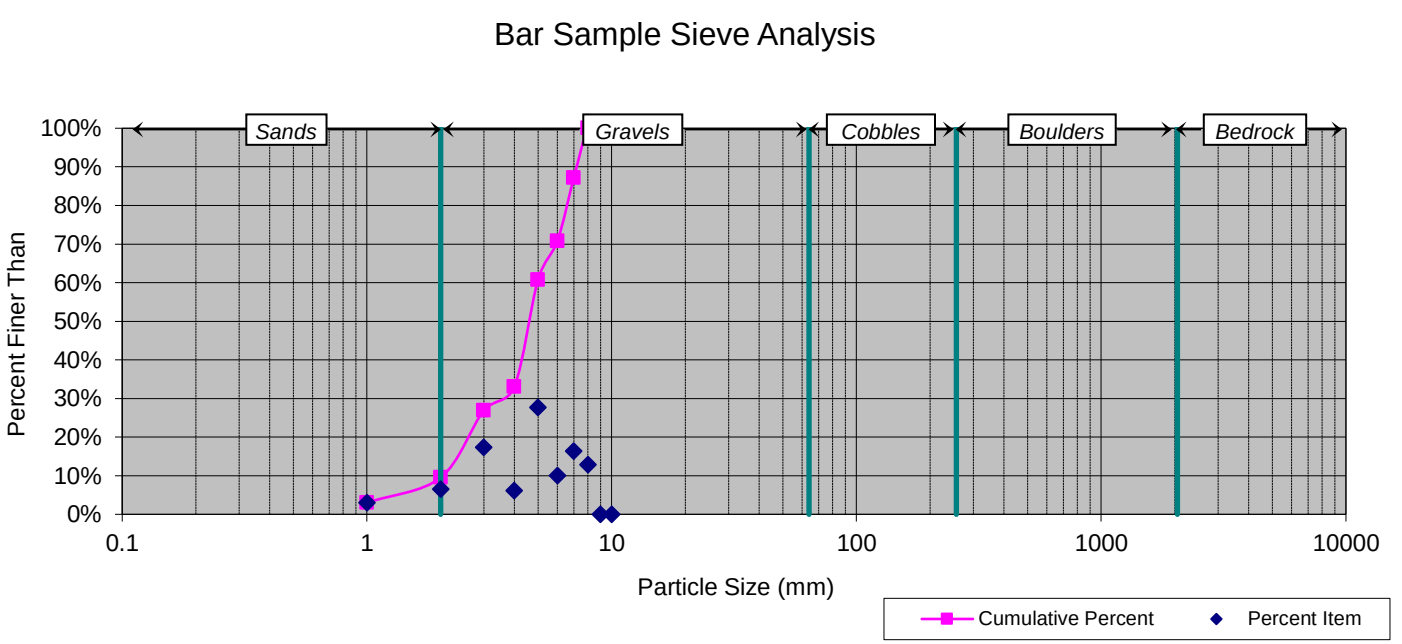
Be Sure to Add Separate Material Weights to Grand Total

GRAND TOTAL SAMPLE WEIGHT

NOTES										

Bar Sample Sieve Analysis			
Smallest Sieve Passed (mm)	Weight (oz)	% Item	Percent Finer Than
<1	0.9	3.0%	3.0%
1.0	2.0	6.5%	9.5%
2.0	5.2	17.4%	26.9%
4.0	1.9	6.2%	33.1%
8.0	8.3	27.7%	60.8%
16.0	3.0	10.0%	70.8%
31.5	4.9	16.4%	87.1%
63.0	3.9	12.9%	100.0%
0.0	0.0	0.0%	100.0%
0.0	0.0	0.0%	100.0%
Total:	30.0	100%	

Stream:	Cedar Branch Stream Restoration Site
Watershed:	
Location:	
Note:	Pavement Sample # 1 (0-6 inches)

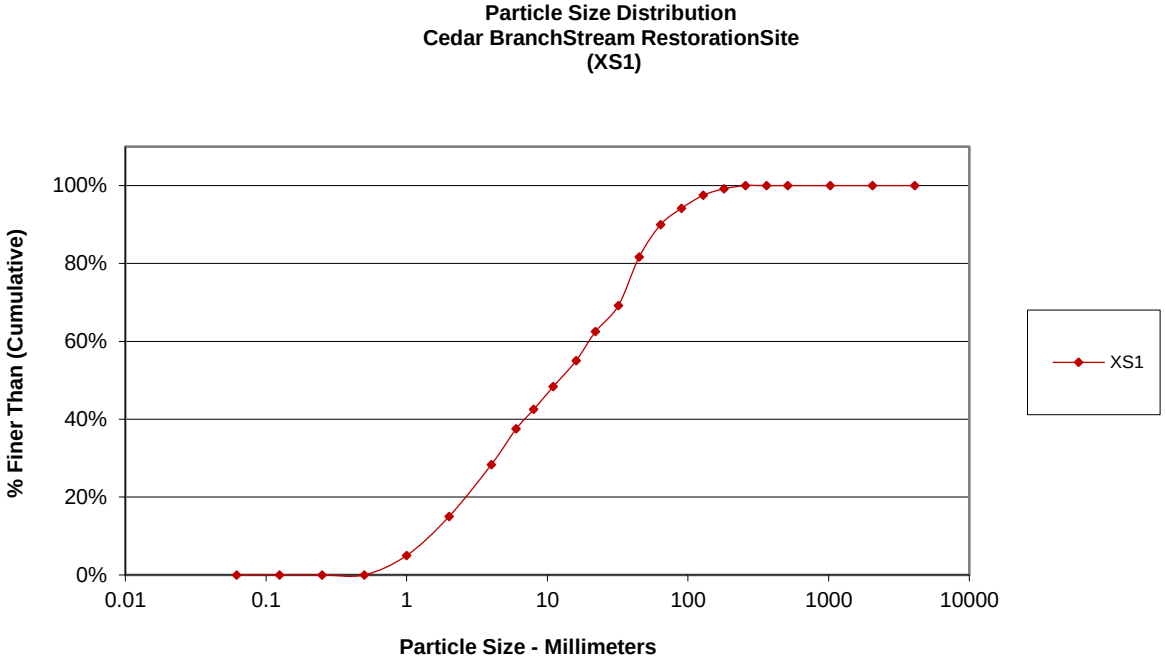


Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
1.3	4.2	6.1	27.7	48.1	0%	27%	73%	0%	---	---

Pebble Count Plots

Cross-Section 1			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	6
Very Coarse	1 - 2	S	12
Very Fine	2 - 4		16
Fine	4 - 5.7	G	11
Fine	5.7 - 8	R	6
Medium	8 - 11.3	A	7
Medium	11.3 - 16	V	8
Coarse	16 - 22.6	E	9
Coarse	22.6 - 32	L	8
Very Coarse	32 - 45	S	15
Very Coarse	45 - 64		10
Small	64 - 90	C	5
Small	90 - 128	O	4
Large	128 - 180	B	2
Large	180 - 256	L	1
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	120

Note:



Size (mm)	
D16	2.1
D35	5
D50	12
D65	25
D84	50
D95	98

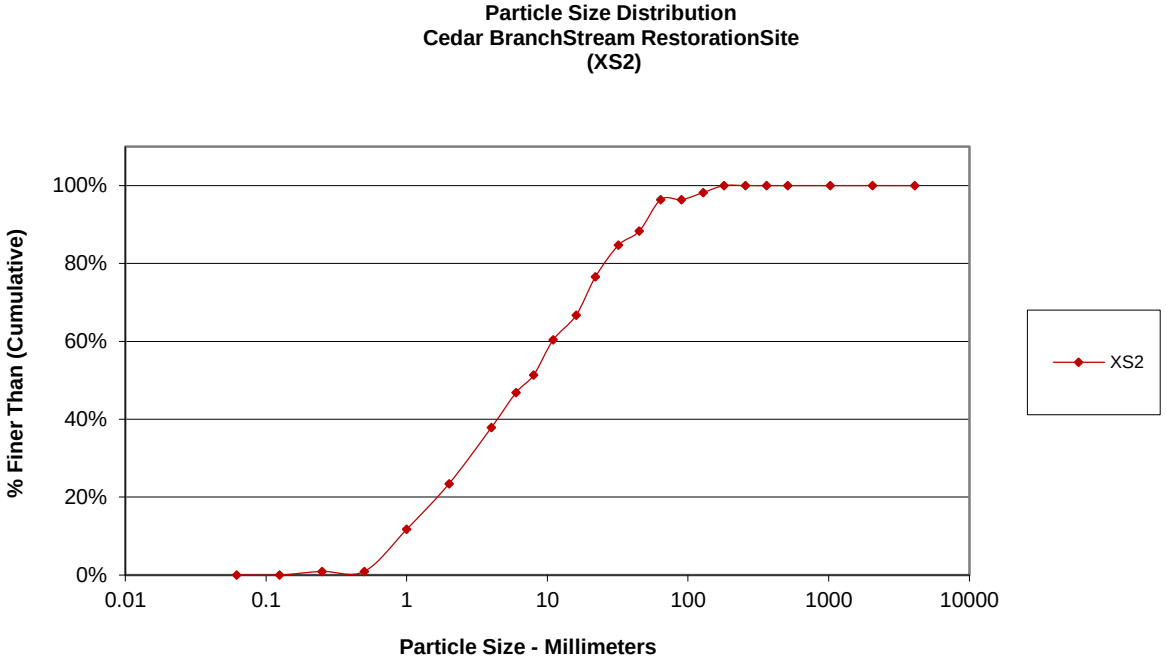
Size Distribution	
mean	10.2
dispersion	4.9
skewness	-0.10

Type	
silt/clay	0%
sand	15%
gravel	75%
cobble	10%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Pebble Count Plots

Cross-Section 2			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	1
Medium	.25 - .50	N	
Coarse	.50 - 1	D	12
Very Coarse	1 - 2	S	13
Very Fine	2 - 4		16
Fine	4 - 5.7	G	10
Fine	5.7 - 8	R	5
Medium	8 - 11.3	A	10
Medium	11.3 - 16	V	7
Coarse	16 - 22.6	E	11
Coarse	22.6 - 32	L	9
Very Coarse	32 - 45	S	4
Very Coarse	45 - 64		9
Small	64 - 90	C	
Small	90 - 128	O	2
Large	128 - 180	B	2
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	111

Note:



Size (mm)	
D16	1.3
D35	4
D50	7
D65	14
D84	31
D95	60

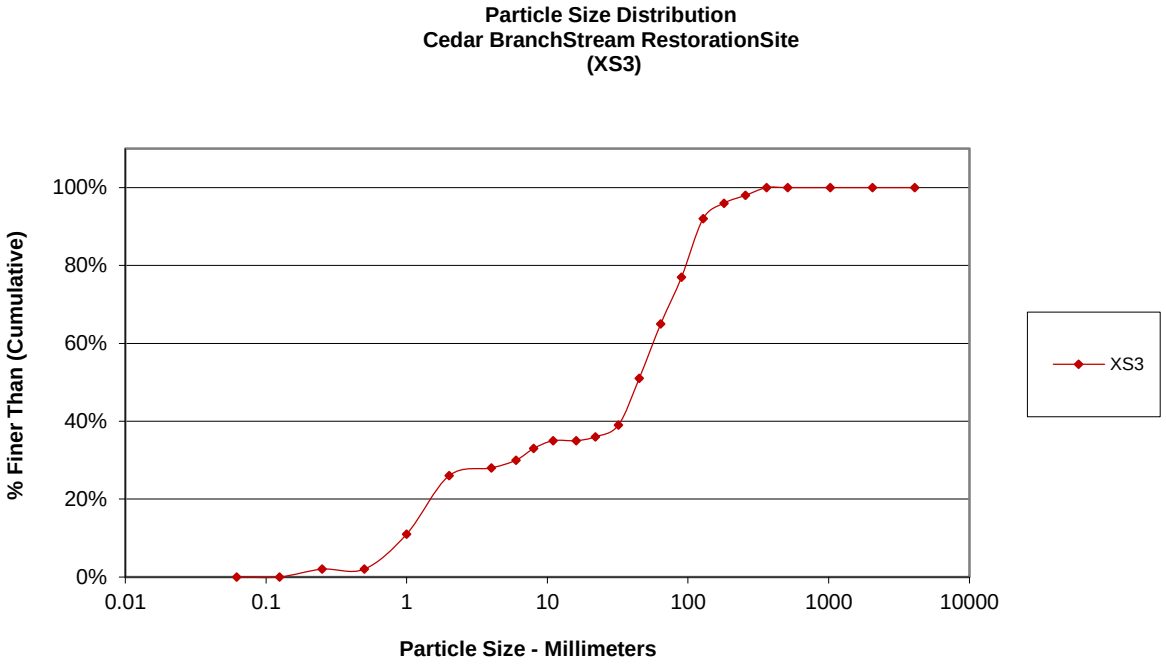
Size Distribution	
mean	6.3
dispersion	4.9
skewness	-0.09

Type	
silt/clay	0%
sand	23%
gravel	73%
cobble	4%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Pebble Count Plots

Cross-Section 3			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	2
Medium	.25 - .50	N	
Coarse	.50 - 1	D	9
Very Coarse	1 - 2	S	15
Very Fine	2 - 4		2
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	3
Medium	8 - 11.3	A	2
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	1
Coarse	22.6 - 32	L	3
Very Coarse	32 - 45	S	12
Very Coarse	45 - 64		14
Small	64 - 90	C	12
Small	90 - 128	O	15
Large	128 - 180	B	4
Large	180 - 256	L	2
Small	256 - 362	B	2
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



Size (mm)	
D16	1.3
D35	11
D50	44
D65	64
D84	110
D95	170

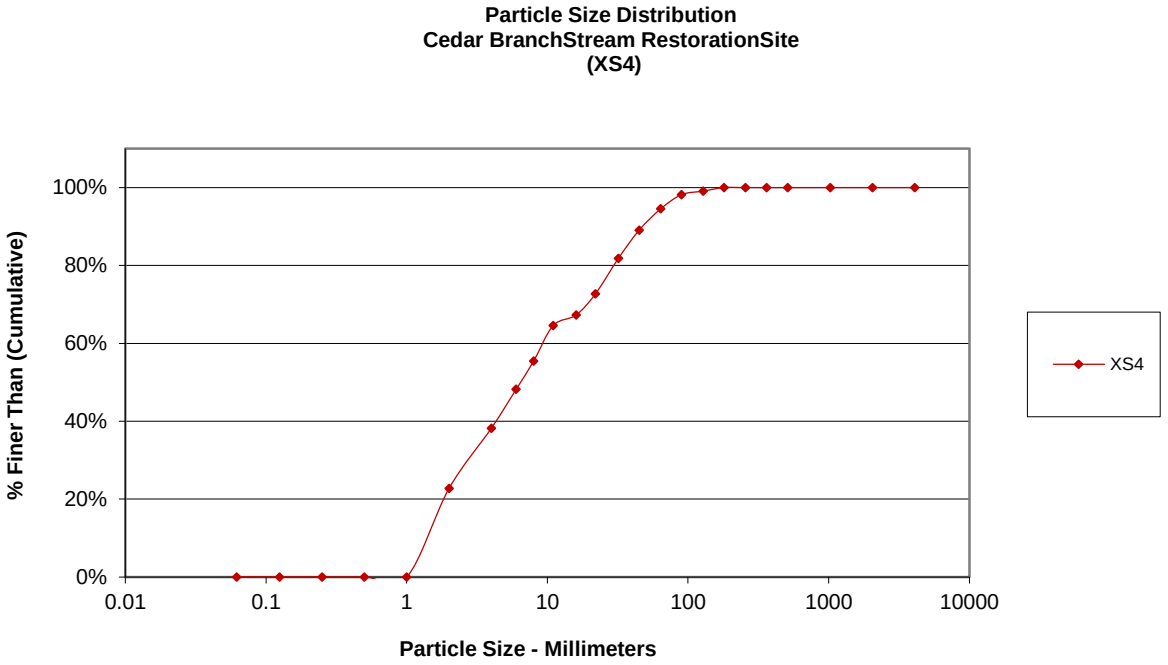
Size Distribution	
mean	12.0
dispersion	9.2
skewness	-0.59

Type	
silt/clay	0%
sand	26%
gravel	39%
cobble	33%
boulder	2%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Pebble Count Plots

Cross-Section 4			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	25
Very Fine	2 - 4		17
Fine	4 - 5.7	G	11
Fine	5.7 - 8	R	8
Medium	8 - 11.3	A	10
Medium	11.3 - 16	V	3
Coarse	16 - 22.6	E	6
Coarse	22.6 - 32	L	10
Very Coarse	32 - 45	S	8
Very Coarse	45 - 64		6
Small	64 - 90	C	4
Small	90 - 128	O	1
Large	128 - 180	B	1
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	110

Note:



Size (mm)	
D16	1.6
D35	4
D50	6.4
D65	12
D84	35
D95	67

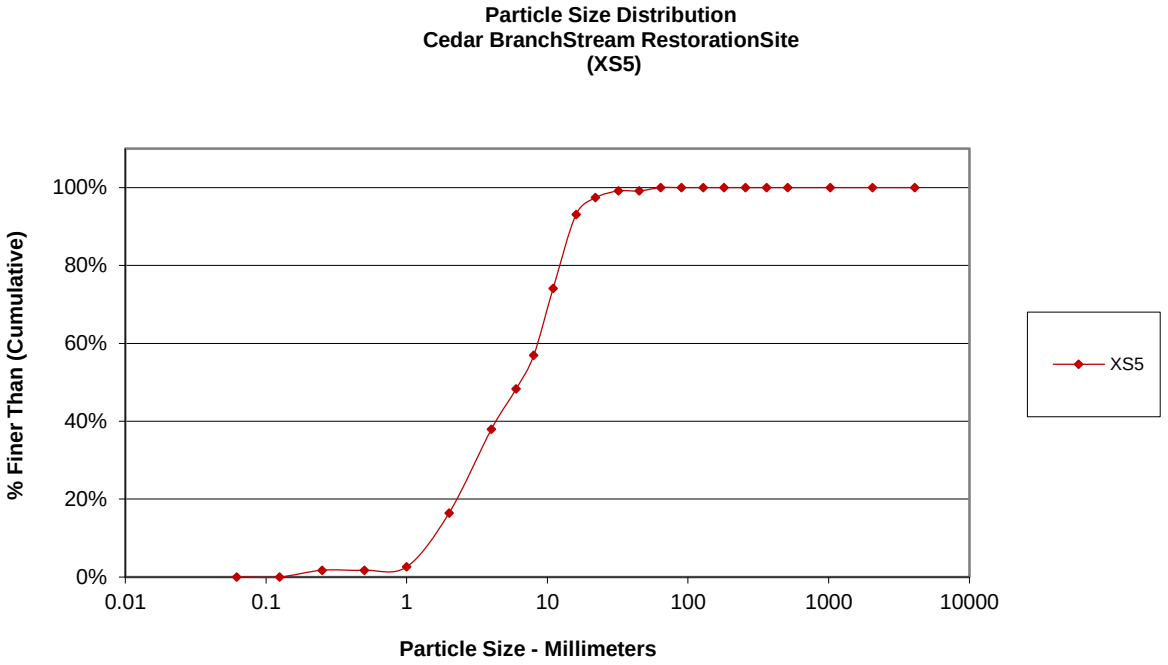
Size Distribution	
mean	7.5
dispersion	4.7
skewness	0.10

Type	
silt/clay	0%
sand	23%
gravel	72%
cobble	5%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Pebble Count Plots

Cross-Section 5			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	2
Medium	.25 - .50	N	
Coarse	.50 - 1	D	1
Very Coarse	1 - 2	S	16
Very Fine	2 - 4		25
Fine	4 - 5.7	G	12
Fine	5.7 - 8	R	10
Medium	8 - 11.3	A	20
Medium	11.3 - 16	V	22
Coarse	16 - 22.6	E	5
Coarse	22.6 - 32	L	2
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		1
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	116

Note:



Size (mm)	
D16	2.0
D35	3.6
D50	6.4
D65	9.3
D84	13
D95	18

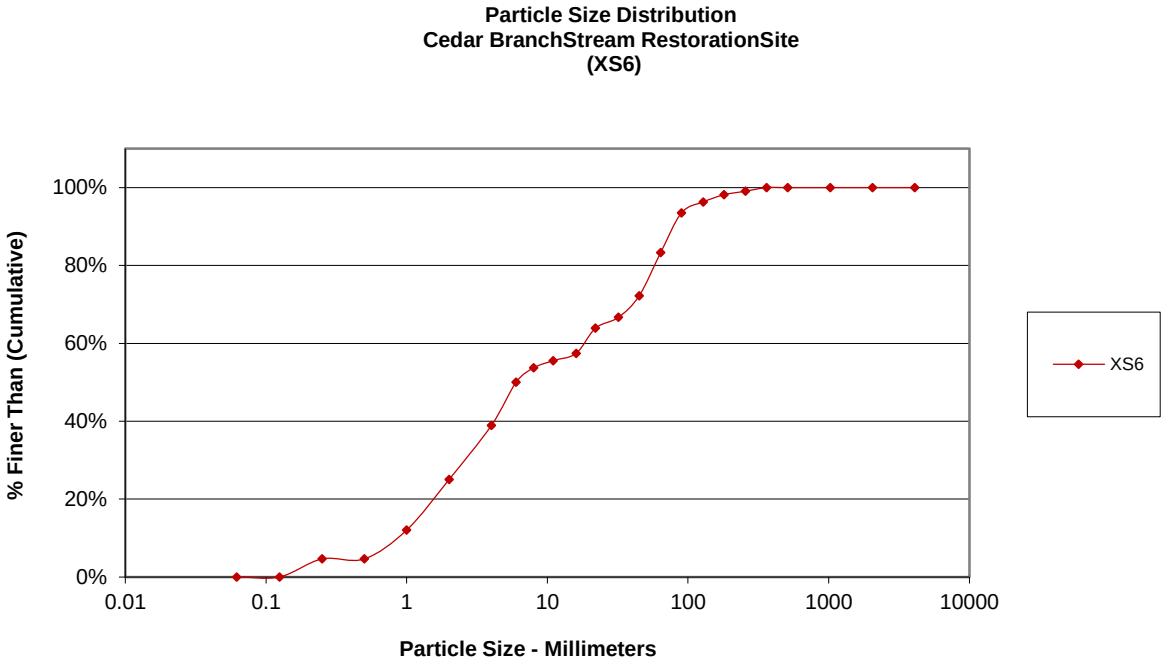
Size Distribution	
mean	5.1
dispersion	2.5
skewness	-0.24

Type	
silt/clay	0%
sand	16%
gravel	84%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Pebble Count Plots

Cross-Section 6			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	5
Medium	.25 - .50	N	
Coarse	.50 - 1	D	8
Very Coarse	1 - 2	S	14
Very Fine	2 - 4		15
Fine	4 - 5.7	G	12
Fine	5.7 - 8	R	4
Medium	8 - 11.3	A	2
Medium	11.3 - 16	V	2
Coarse	16 - 22.6	E	7
Coarse	22.6 - 32	L	3
Very Coarse	32 - 45	S	6
Very Coarse	45 - 64		12
Small	64 - 90	C	11
Small	90 - 128	O	3
Large	128 - 180	B	2
Large	180 - 256	L	1
Small	256 - 362	B	1
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	108

Note:



Size (mm)	
D16	1.2
D35	3.3
D50	6
D65	26
D84	65
D95	110

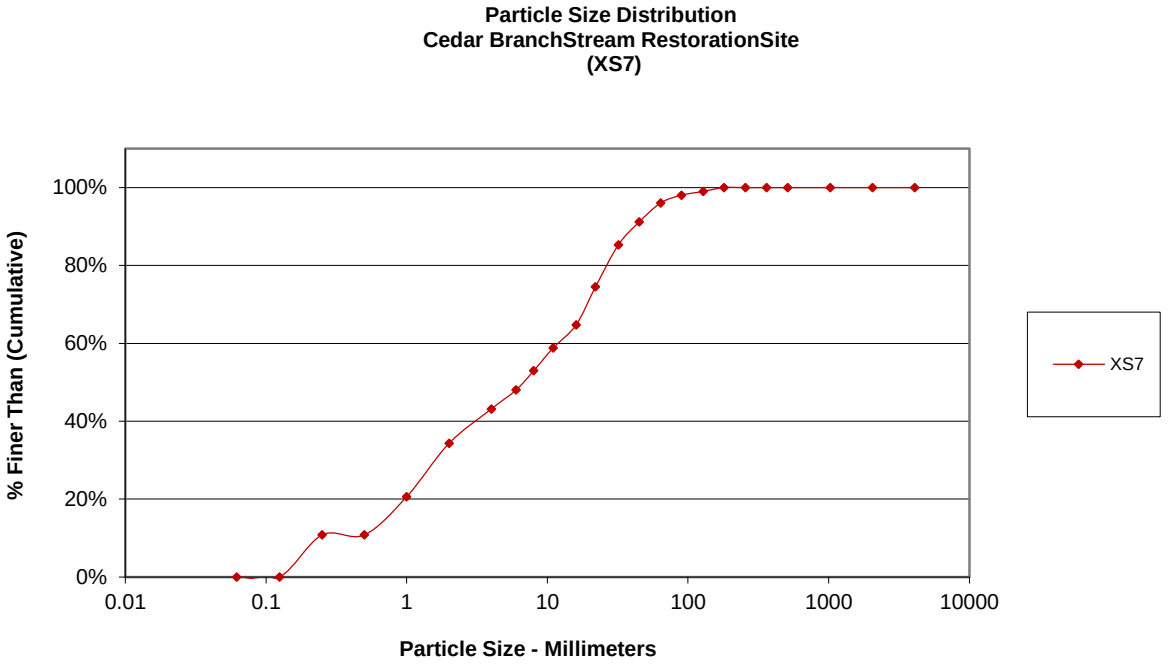
Size Distribution	
mean	8.8
dispersion	7.4
skewness	0.19

Type	
silt/clay	0%
sand	25%
gravel	58%
cobble	16%
boulder	1%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Pebble Count Plots

Cross-Section 7			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	11
Medium	.25 - .50	N	
Coarse	.50 - 1	D	10
Very Coarse	1 - 2	S	14
Very Fine	2 - 4		9
Fine	4 - 5.7	G	5
Fine	5.7 - 8	R	5
Medium	8 - 11.3	A	6
Medium	11.3 - 16	V	6
Coarse	16 - 22.6	E	10
Coarse	22.6 - 32	L	11
Very Coarse	32 - 45	S	6
Very Coarse	45 - 64		5
Small	64 - 90	C	2
Small	90 - 128	O	1
Large	128 - 180	B	1
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	102

Note:



Size (mm)	
D16	0.72
D35	2.1
D50	6.7
D65	16
D84	31
D95	59

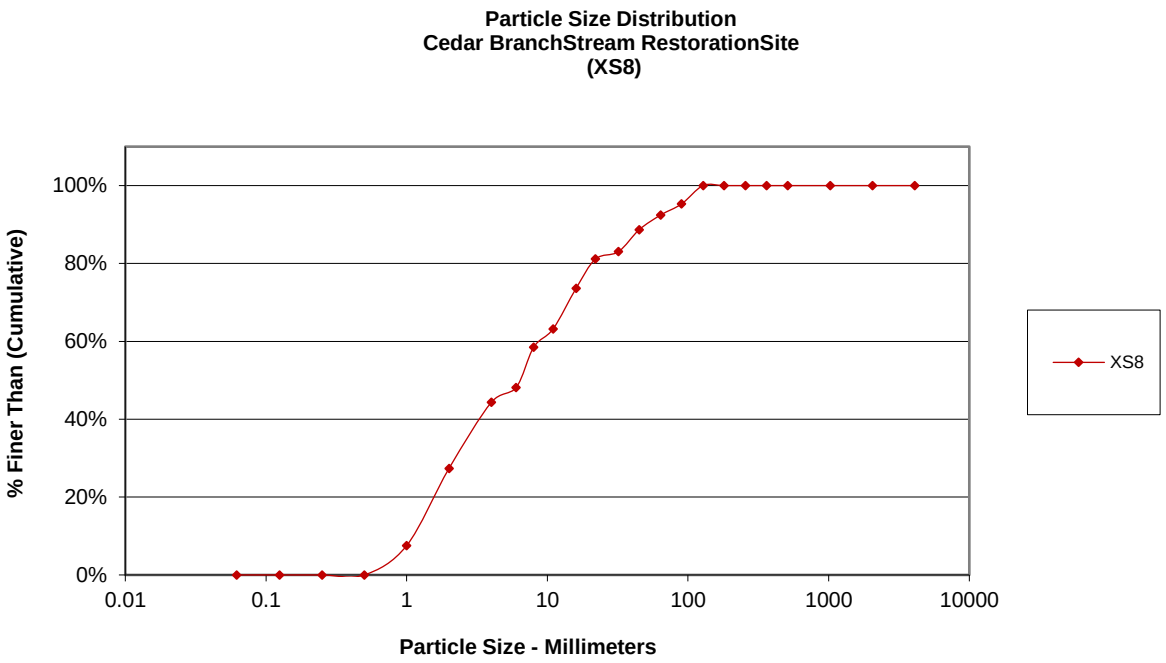
Size Distribution	
mean	4.7
dispersion	6.6
skewness	-0.19

Type	
silt/clay	0%
sand	34%
gravel	62%
cobble	4%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Pebble Count Plots

Cross-Section 8			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	8
Very Coarse	1 - 2	S	21
Very Fine	2 - 4		18
Fine	4 - 5.7	G	4
Fine	5.7 - 8	R	11
Medium	8 - 11.3	A	5
Medium	11.3 - 16	V	11
Coarse	16 - 22.6	E	8
Coarse	22.6 - 32	L	2
Very Coarse	32 - 45	S	6
Very Coarse	45 - 64		4
Small	64 - 90	C	3
Small	90 - 128	O	5
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	106

Note:



Size (mm)	
D16	1.3
D35	3
D50	6
D65	12
D84	34
D95	87

Size Distribution	
mean	6.6
dispersion	5.1
skewness	0.03

Type	
silt/clay	0%
sand	27%
gravel	65%
cobble	8%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Morphological Criteria Table

Morphological Criteria

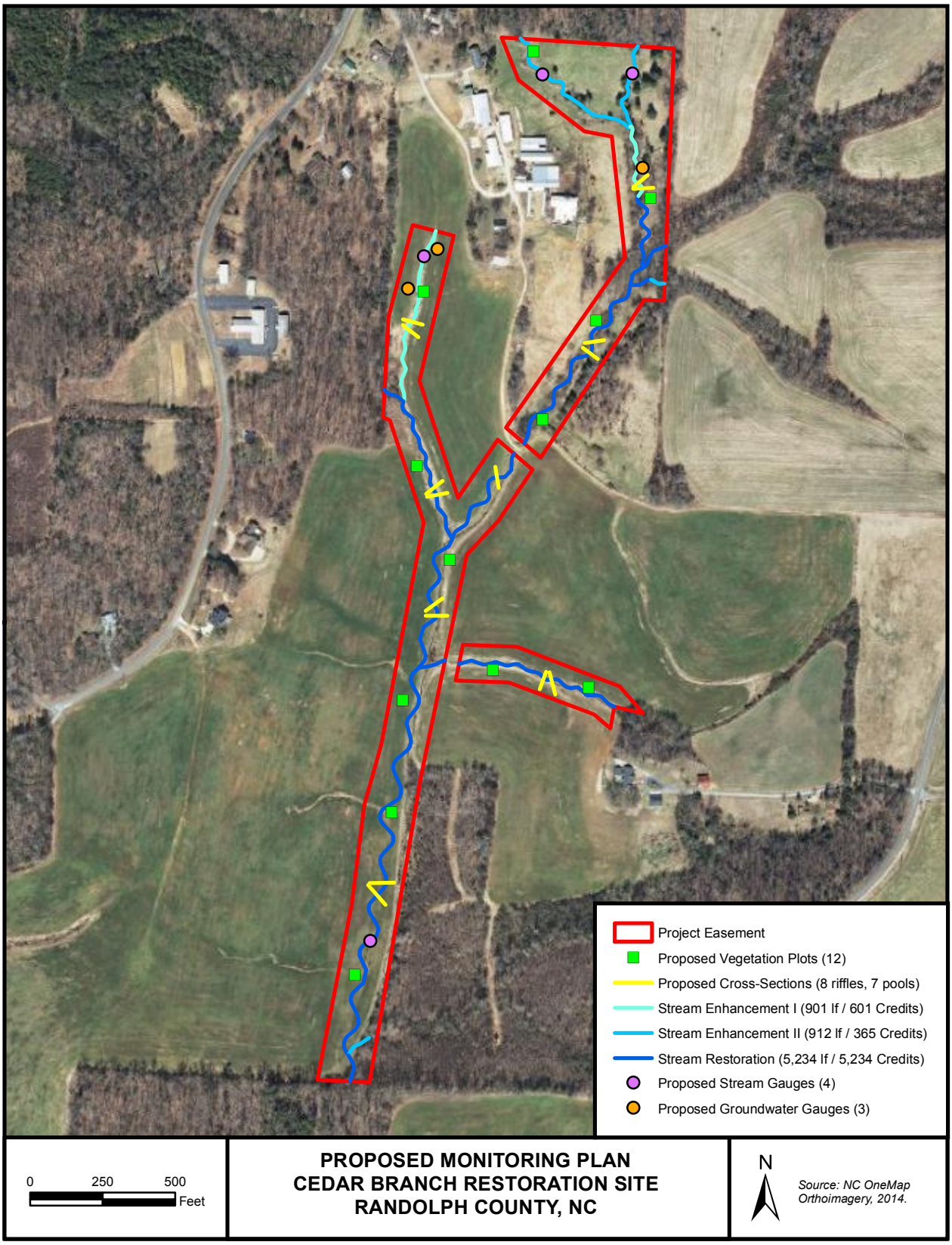
Variables		Existing Channel						Reference for UTCC	Restored Reaches							
		UTCC	T1	T2	T3	T4	T5	UTFR	UTCC-1	UTCC-2	UTCC-3	T1	T2	T3 & T3-1	T4	T5
Stream Type (Rosgen)		G4c - E4	G4	**	E4	G4	**	B4c	C4	C4	C4	C4b	C4	C4b	C4b	C4b
Drainage Area (mi^2)		0.45	0.05	0.03	0.04	0.05	0.05	0.38	0.22	0.28	0.41	0.05	0.03	0.04	0.05	0.05
Bankfull Width (W_{bkf}) (ft)		5.3 -- 11.4	5.8	**	6	6.5	**	9.0 -- 10.0	11.7	13.2	15.0	7.8	7.8	7.8	7.8	7.8
Bankfull Mean Depth (D_{bkf}) (ft)		1.2 -- 1.7	0.9	**	0.8	0.8	**	1.1 -- 1.2	1.0	1.0	1.1	0.6	0.6	0.6	0.6	0.6
Bankfull Cross-Sectional Area (A_{bkf}) (ft^2)		11.3 -- 16.9	5	**	5	5	**	10.4 -- 10.7	11.3	13.2	16.9	5.0	5.0	5.0	5.0	5.0
Width / Depth Ratio (W_{bkf} / D_{bkf})		5.3 -- 11.4	6.7	**	7.1	8.5	**	8.0 -- 10.0	12.1	13.2	13.2	12.1	12.1	12.1	12.1	12.1
Maximum Depth (d_{mbkf}) (ft)		1.7 -- 2.8	1.2	**	1.3	1	**	1.3 -- 1.5	1.5	1.5	1.7	1.0	1.0	1.0	1.0	1.0
Width of Flood Prone Area (W_{fpa}) (ft)		11.3 -- 48	9	**	11.3	17	**	13 -- 21	~ 90	~ 100	~ 105	~ 50	~ 30	~ 30	~ 30	~ 30
Entrenchment Ratio (ER)		1.2 - 3.5	1.5	**	1.9	1.2	**	1.3 -- 2.3	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2
Sinuosity (stream length/valley length) (K)		1.0	1.0	1.0	1.0	1.0	1.0	1.2	1.2	1.2	1.2	1.3	Na	Na	Na	Na
Dimension	Pool Mean Depth (ft)	*	*	*	*	*	**	1.2 -- 1.4	1.7	1.6	1.8	1.2	1.2	1.2	1.2	1.2
	Riffle Mean Depth (ft) (Dbkf)	1.2 -- 1.7	0.9	**	0.8	0.8	**	1.1 -- 1.2	1.0	1.0	1.1	0.6	0.6	0.6	0.6	0.6
	Pool Width (ft)	*	*	*	*	*	**	8.4 -- 11.6	16.4	18.5	20.9	10.9	10.9	10.9	10.9	10.9
	Riffle Width (ft)	7.8 -- 13.9	5.8	**	6	6.5	**	90. -- 9.9	11.7	13.2	15.0	7.8	7.8	7.8	7.8	7.8
	Pool XS Area (sf)	*	*	*	*	*	**	11.6 -- 13.4	27.1	30.1	38.3	12.9	12.9	12.9	12.9	12.9
	Riffle XS Area (sf)	11.3 -- 16.9	5	**	5	5	**	10.4 -- 10.7	11.3	13.2	16.9	5.0	5.0	5.0	5.0	5.0
	Pool Width / Riffle Width	*	*	*	*	*	**	0.8 -- 1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
	Pool Max Depth / D_{bkf}	*	*	*	*	*	**	2.1 -- 2.4	2.8	2.8	3.2	2.0	2.0	2.0	2.0	2.0
	Bank Height Ratio	1.0 -- 2.5	2.3	**	2.6	4.5	**	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Mean Bankfull Velocity (V) (fps)	5.2 -- 6.2	6.1	**	6.7	5.9	**	4.1 -- 4.5	4.5	4.7	5.1	4.9	4.0	5.8	5.2	4.5
	Bankfull Discharge (Q) (cfs)	63 -- 105	31	**	33	29	**	42 -- 46	50-55	60-65	85-90	20-25	20-25	25-30	25-30	20-25
Pattern	Radius of Curvature (Rc) (ft)	*	*	*	*	*	**	13 -- 42	25 - 35	30 -- 35	35 -- 45	15 -- 25	15 -- 25	15 -- 25	15 -- 25	25
	Belt Width (Wblt) (ft)	*	*	*	*	*	**	45	41 -- 54	46 -- 58	53 -- 74	29 -- 36	Na	Na	Na	Na
	Meander Length (Lm) (ft)	*	*	*	*	*	**	93 -- 136	101 -- 150	115 -- 155	153 -- 180	72 -- 80	Na	Na	Na	Na
	Radius of Curvature / Bankfull Width	*	*	*	*	*	**	1.3 -- 4.4	2.1 -- 3.0	2.3 -- 2.7	2.3 -- 3.0	1.9 -- 3.2	Na	Na	Na	Na
	Meander Width Ratio (Wblt / Wbkf)	*	*	*	*	*	**	4.5 -- 5.0	3.5 -- 4.6	3.5 -- 4.4	3.5 -- 4.9	3.7 -- 4.6	Na	Na	Na	Na
	Meander Length / Bankfull Width	*	*	*	*	*	**	9.0 -- 15.0	8.6 -- 12.8	8.7 -- 11.7	10.2 -- 12.0	9.2 -- 10.3	Na	Na	Na	Na
Profile	Valley slope	0.015	0.032	0.032	0.038	0.031	0.027	0.016	0.015	0.015	0.015	0.030	0.019	0.038	0.031	0.027
	Average water surface slope	0.015	0.031	0.031	0.037	0.031	0.027	0.013	0.013	0.013	0.013	0.025	0.017	0.035	0.028	0.021
	Riffle slope	0.0 -- 3.8	1.8	**	4	3.8	**	0.013 - 0.028	0.020 -- 0.037	0.020 -- 0.035	0.020 -- 0.035	0.025 -- 0.040	0.026 -- 0.027	0.025 - 0.042	0.030 -- 0.040	0.020 -- 0.030
	Pool slope	*	*	*	*	*	**	0 -- 0.001	0	0	0	0	0	0	0	0
	Pool to pool spacing	*	*	*	*	*	**	30 -- 59	50 -- 83	67 -- 91	79 -- 105	42 -- 51	38	32 -- 55	34 -- 48	41
	Pool length	*	*	*	*	*	**	3 -- 25	19 -- 42	20 -- 49	36 -- 61	8 -- 25	12 -- 17	11 -- 22	13 -- 19	15 -- 16
	Riffle Slope / Avg. Water Surface Slope	0.0 -- 0.39	0.58	**	1.1	1.2	**	1.0 -- 2.2	1.5 -- 2.9	1.5 -- 2.7	1.5 -- 2.7	1.0 -- 1.6	1.5 -- 1.6	0.7 -- 1.2	1.1 -- 1.4	0.7 -- 1.1
	Pool Slope / Avg. Water Surface Slope	*	*	*	*	*	**	0	0	0	0	0	0	0	0	0
	Pool to Pool Spacing / Bankfull Width	*	*	*	*	*	**	3.3 -- 6.0	4.3 -- 7.1	5.1 -- 6.9	5.3 -- 7.0	5.3 -- 6.5	4.9	4.1 -- 7.0	4.3 -- 6.1	5.3

* : no data shown for pools, radius of curvature or meanders in existing stream do to channelization / lack of bed diversity

** : no data collected for this reach

Na : not applicable for B type stream

Proposed Monitoring Plan



PROPOSED MONITORING PLAN
CEDAR BRANCH RESTORATION SITE
RANDOLPH COUNTY, NC

Appendix D. Project Plan Sheets

KCI JOB# : 20158591

CONTRACT #: 6598

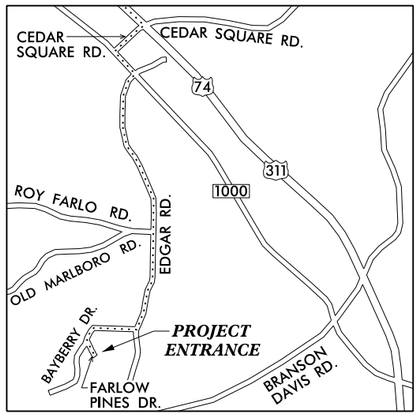
STATE	DMS PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
N.C.	97009	1	23

A	SUBMITTED FOR LAND QUALITY PERMIT	MARCH 2017
REVISIONS		

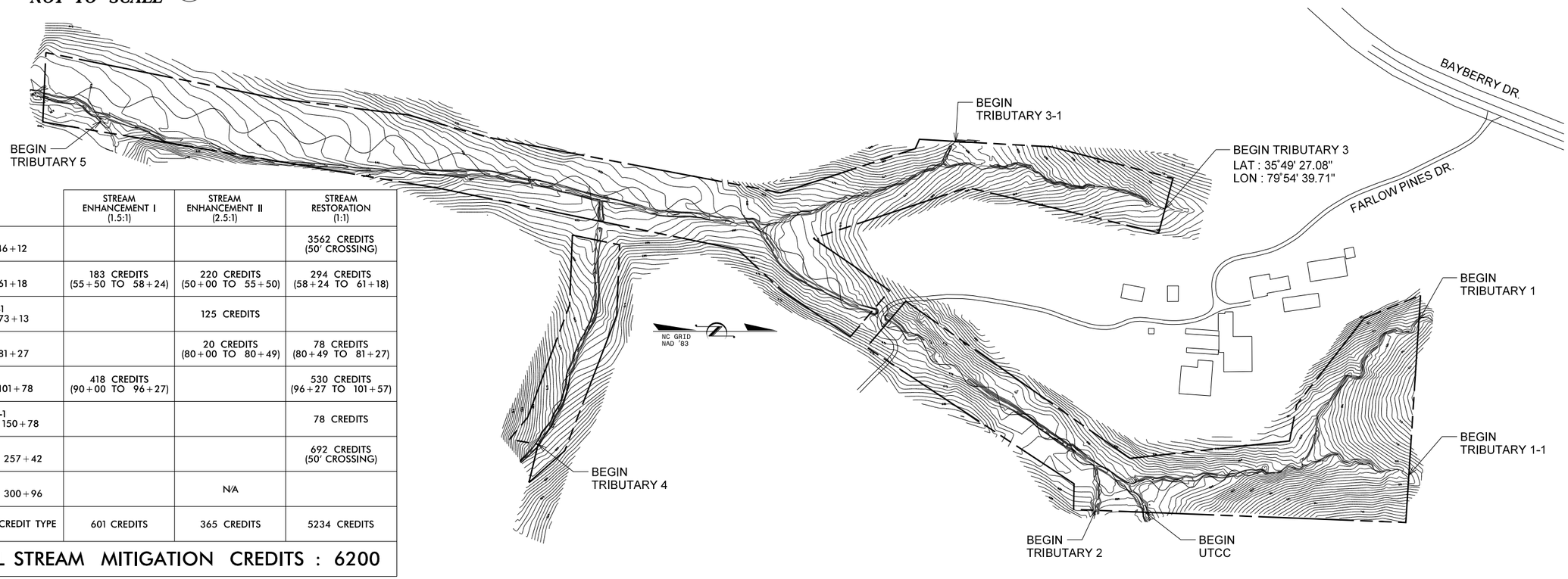
NCDEQ DIVISION OF MITIGATION SERVICES

CEDAR BRANCH STREAM RESTORATION SITE

RANDOLPH COUNTY, NORTH CAROLINA



VICINITY MAP
NOT TO SCALE



	STREAM ENHANCEMENT I (1.5:1)	STREAM ENHANCEMENT II (2.5:1)	STREAM RESTORATION (1:1)
UTCC 10+00 TO 46+12			3562 CREDITS (50' CROSSING)
TRIBUTARY 1 55+00 TO 61+18	183 CREDITS (55+50 TO 58+24)	220 CREDITS (50+00 TO 55+50)	294 CREDITS (58+24 TO 61+18)
TRIBUTARY 1-1 70+00 TO 73+13		125 CREDITS	
TRIBUTARY 2 80+00 TO 81+27		20 CREDITS (80+00 TO 80+49)	78 CREDITS (80+49 TO 81+27)
TRIBUTARY 3 90+00 TO 101+78	418 CREDITS (90+00 TO 96+27)		530 CREDITS (96+27 TO 101+57)
TRIBUTARY 3-1 150+00 TO 150+78			78 CREDITS
TRIBUTARY 4 250+00 TO 257+42			692 CREDITS (50' CROSSING)
TRIBUTARY 5 300+00 TO 300+96		N/A	
TOTALS PER CREDIT TYPE	601 CREDITS	365 CREDITS	5234 CREDITS

TOTAL STREAM MITIGATION CREDITS : 6200

DIRECTIONS TO SITE

From Raleigh, follow I-40 West. Meerge left to take the I-85 South. Take exit 113B and follow signs for 74 East/US 311 South. Take exit 79 for Cedar Square Road. Take a right onto Cedar Square Rd and then a quick left onto State Road 1009 and then a quick right onto Edgar Rd. Follow Edgar Rd for 3 miles then take a right onto Mt. Olive Church Rd. Follow for about a half mile then take a left onto Farlow Pines Drive. The site will be at the end of the gravel road.

INDEX OF SHEETS

LIMITS OF DISTURBANCE = 18.51 ACRES

Prepared in the Office of:

KCI ASSOCIATES OF NC
ENGINEERS•PLANNERS•ECOLOGISTS
SUITE 220 LANDMARK CENTER II
4601 SIX FORKS RD., RALEIGH, NC

Prepared for:
MATTHEW REID
DMS PROJECT MANAGER
LIN XU
DMS REVIEW COORDINATOR

Prepared by:
GARY M. MRYNCZA, PE
PROJECT ENGINEER
ALEX FRENCH
PROJECT DESIGNER

PROJECT ENGINEER
NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA
SIGNATURE: P.E.

GENERAL NOTES:

BEARINGS AND DISTANCES:
ALL BEARINGS ARE NAD 1983 GRID BEARINGS.
ALL DISTANCES AND COORDINATES SHOWN ARE HORIZONTAL (GROUND) VALUES.

UTILITY/SUBSURFACE PLANS:
NO SUBSURFACE PLANS ARE AVAILABLE ON THIS PROJECT. EXISTING UNDERGROUND UTILITIES HAVE NOT BEEN VERIFIED.
THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING A UTILITY LOCATOR AND ESTABLISHING THE EXACT LOCATION OF ANY
AND ALL EXISTING UTILITIES IN THE PROJECT REACH.

CONTROL POINTS

POINT	NORTHING	EASTING	ELEV
KCI#5	755366.41	1730226.86	667.68
KCI#10	756707.20	1730478.67	711.23
KCI#11	756146.00	1730544.57	694.53
KCI#12	756494.18	1730600.11	692.08
KCI#13	756406.21	1730654.21	694.70
KCI#14	756110.12	1730661.90	680.21
KCI#15	755981.55	1730569.27	680.73
KCI#16	755829.59	1730478.27	675.43
KCI#60	753336.65	1729563.95	635.82
KCI#61	753761.53	1729675.94	641.03
KCI#62	755625.54	1729907.38	687.14
KCI#63	755470.80	1729952.13	680.24
KCI#64	755119.17	1730063.07	663.17
KCI#65	753280.38	1729730.88	638.89
KCI#66	754260.03	1729739.70	650.45

PROJECT LEGEND:

Proposed Thalweg w/Approximate Bankfull Limits ..... 12+00 13+00

Proposed Step Pool .....

Proposed Riffle Enhancement .....

Proposed Riffle Grade Control .....

Proposed Riffle Cascade .....

Proposed Live Lift .....

Water Quality Treatment Area ..... WQT

Existing Channel to be Filled .....

Proposed Channel Block .....

Existing Tree Line .....

Minor Contour Line .....

Major Contour Line 720

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS

A	SUBMITTED FOR LAND QUALITY PERMIT	DESCRIPTION	DATE
			MARCH 2017

NCDEQ DIVISION OF MITIGATION SERVICES

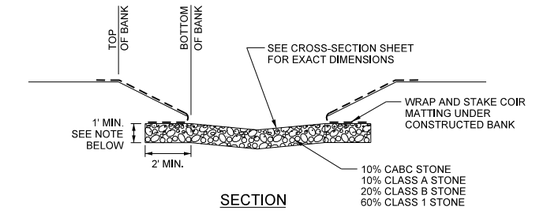
KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

CEDAR BRANCH
STREAM RESTORATION SITE

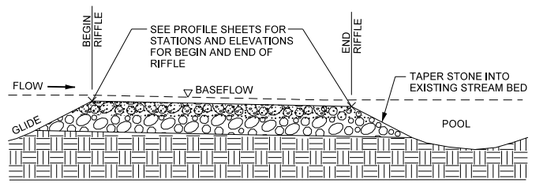
RANDOLPH COUNTY, NORTH CAROLINA

DATE: AUGUST 2016
SCALE: N.T.S.

GENERAL NOTES & PROJECT LEGEND



SECTION



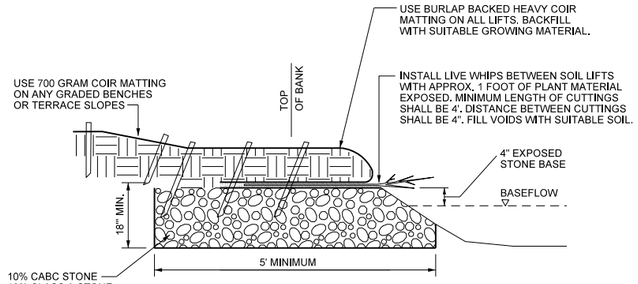
PROFILE

NOTE:

STONE INSTALLATION: START BY INSTALLING STONE MIXTURE, THEN ADD SURGE STONE TO FILL IN VOIDS. FINISH BY WASHING IN NATURAL STREAM MATERIAL TO OBTAIN FINAL GRADE.

RIFFLE GRADE CONTROL

SCALE: NTS



NOTE:
PER DISIGNERS DIRECTION, INTERSPERSE WITH WOOD CUTTINGS IF LIVE CUT TREES ARE AVAILABLE.

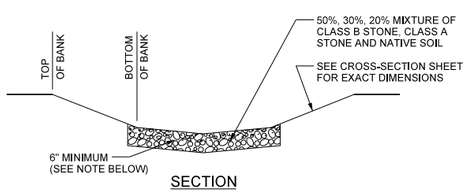
SECTION A-A

NOTE:

USE 1.5'x1"x2" WOODEN STAKES ON 1' CENTERS, STAKES SHALL HAVE A 'ROOFING' NAIL AT TOP TO KEEP FABRIC FROM SLIPPING OFF.

LIVE LIFT

SCALE: NTS



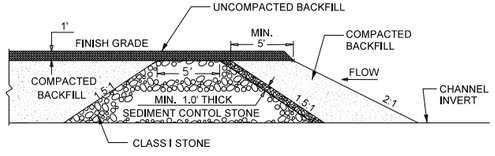
SECTION

NOTE:

START BY INSTALLING CLASS B STONE AND CLASS A STONE MIXTURE. FINISH BY WASHING IN NATURAL STREAM MATERIAL TO OBTAIN FINAL GRADE.

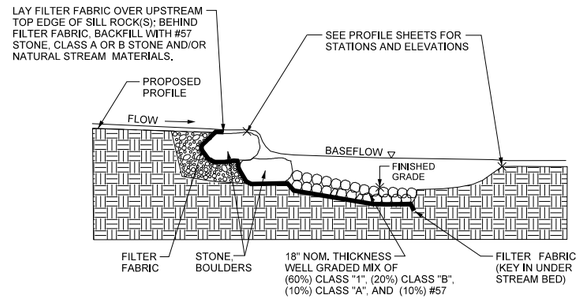
RIFFLE ENHANCEMENT

SCALE: NTS

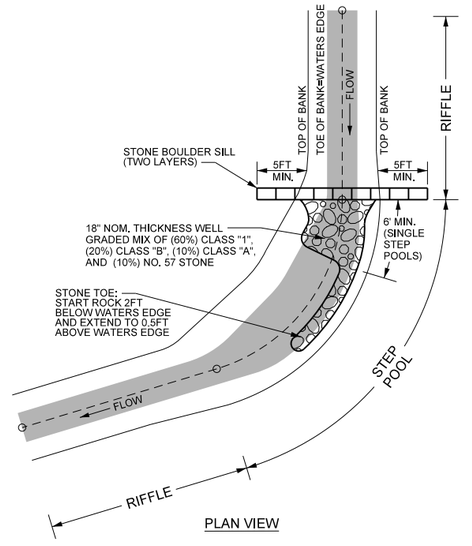


CHANNEL BLOCK

SCALE: NTS



PROFILE VIEW



PLAN VIEW

NOTES:

FOR DOUBLE STEP POOLS, CONTINUE ROCK MIXTURE FROM FIRST SILL ALL THE WAY TO THE SECOND SILL. DO NOT STOP AT THE 6FT MINIMUM AS SHOWN IN THE SINGLE STEP POOL PLAN VIEW.

BOULDERS SHOULD BE NATIVE STONES OR SHOT ROCK, ANGULAR AND OBLONG, WITH AN AXIS APPROXIMATELY 3' L x 2' W x 1.5' D.

BOULDER SILLS TO EXTEND 5' MINIMUM INTO STREAM BANKS FOR STEP POOL STRUCTURES.

STONE INSTALLATION: START BY INSTALLING STONE MIXTURE, THEN ADD SURGE STONE TO FILL IN VOIDS. FINISH BY WASHING IN NATURAL STREAM MATERIAL TO OBTAIN FINAL GRADE.

IF APPROVED BY DESIGNER, BOULDER SILLS CAN BE REPLACED WITH LIVE HARDWOOD LOGS FOUND ON SITE. LOGS MUST BE A MINIMUM OF 10" DIAMETER AND STACKED IN A TRIANGLE FORMATION. NAIL (WITH PLASTIC WASHER) FILTER FABRIC TO THE TOP LOG AND CONTINUE DOWN AND UNDER STRUCTURE AS SHOWN ON STEP POOL DETAIL.

LOG SILL

STEP POOL

SCALE: NTS

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

A	SUBMITTED FOR LAND QUALITY PERMIT			MARCH 2017
		DESCRIPTION	SYM.	DATE

REVISIONS

NCDEQ DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

CEDAR BRANCH
STREAM RESTORATION SITE

RANDOLPH COUNTY, NORTH CAROLINA

DATE: AUGUST 2016
SCALE: N.T.S.

DETAILS

SHEET 3 OF 23

NOTES:

-MATTING SHALL BE INSTALLED PRIOR TO THE INTRODUCTION OF WATER TO A STREAM SECTION.

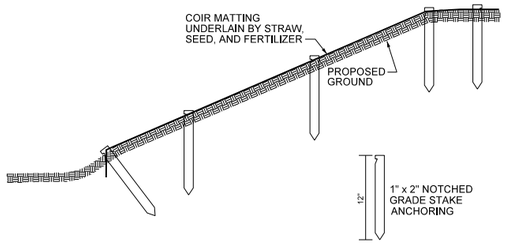
-ALL DISTURBED AREAS INSIDE FLOOD-PLAIN EXTENTS SHALL BE SEEDED DAILY.

-GROUND SHALL BE PREPARED AND SEED & FERTILIZER APPLIED ACCORDING TO PROJECT SPECIAL PROVISIONS.

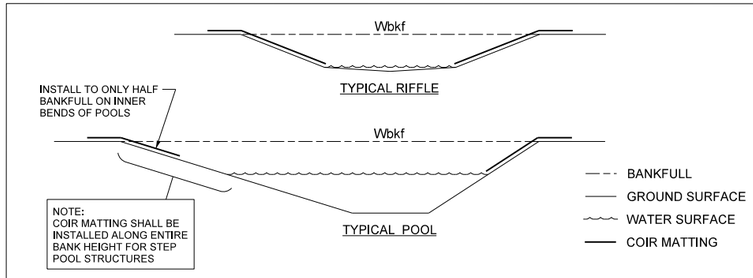
-MATTING SHALL BE INSTALLED ALONG BOTH SIDES OF NEW STREAM LENGTH.

-MATTING SHALL EXTEND FROM TOE OF SLOPE TO THE TOP OF BANK.

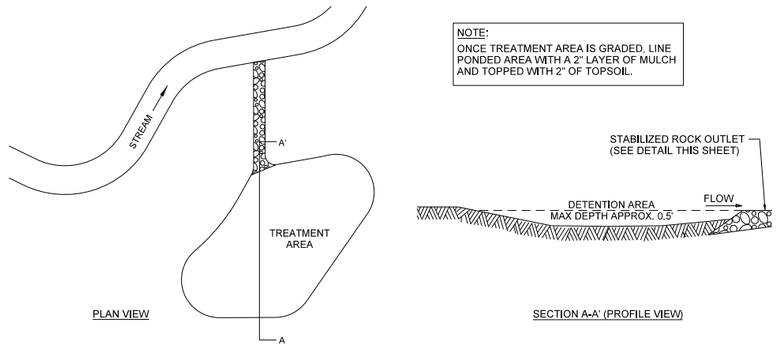
-MATTING SHALL BE APPLIED AND STAKED IN ACCORDANCE WITH PROJECT SPECIAL PROVISIONS.



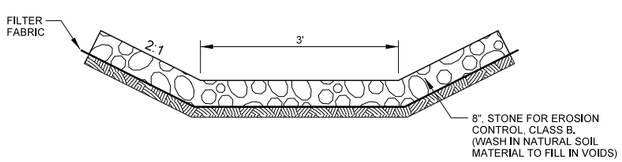
COIR MATTING
SCALE: NTS



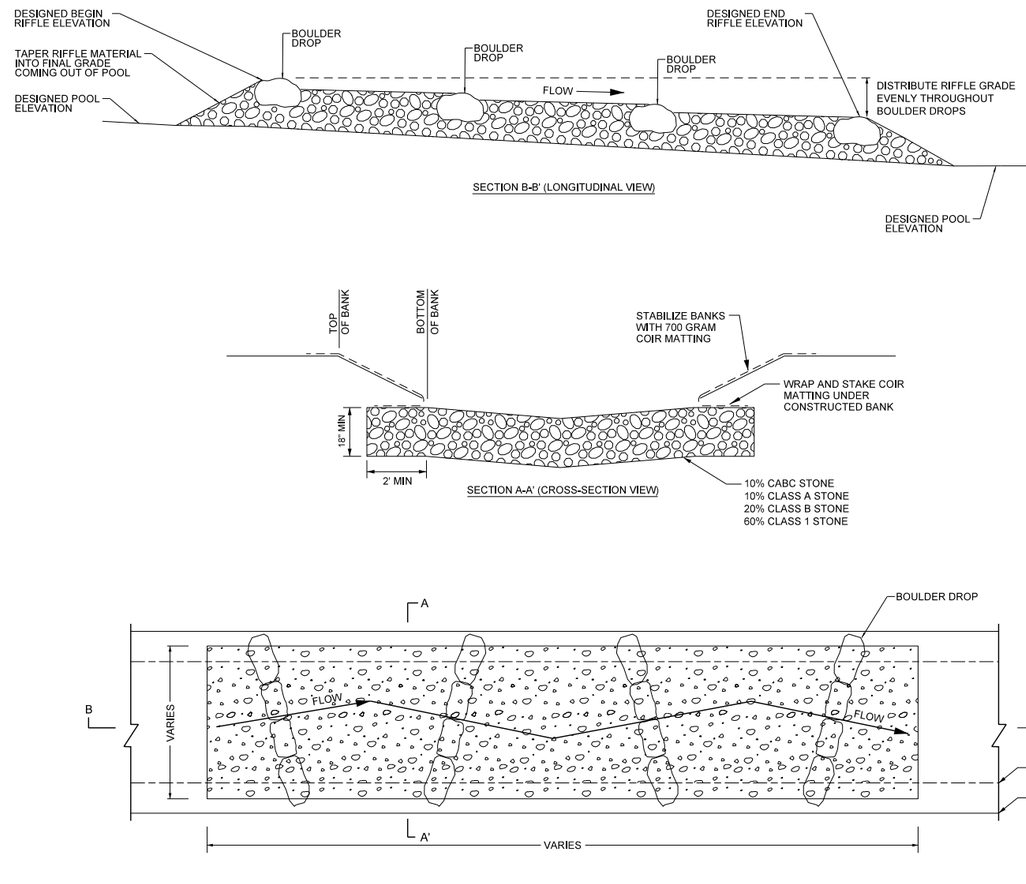
EXAMPLE COIR MATTING PLACEMENT
SCALE: NTS



WATER QUALITY TREATMENT AREA
SCALE: NTS



STABILIZED ROCK OUTLET
SCALE: NTS



NOTES:
WRAP AND STAKE COIR MATTING UNDER CONSTRUCTED BANK THROUGHOUT ENTIRE LENGTH OFF RIFFLE SECTIONS.

SEE CROSS-SECTION SHEET FOR EXACT DIMENSIONS.

CASCADING RIFFLE
SCALE: NTS

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS

NO.	DESCRIPTION	DATE
A	SUBMITTED FOR LAND QUALITY PERMIT	MARCH 2017

NCDEQ DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

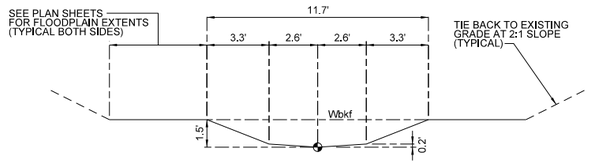
CEDAR BRANCH
STREAM RESTORATION SITE

RANDOLPH COUNTY, NORTH CAROLINA

DATE: AUGUST 2016
SCALE: N.T.S.

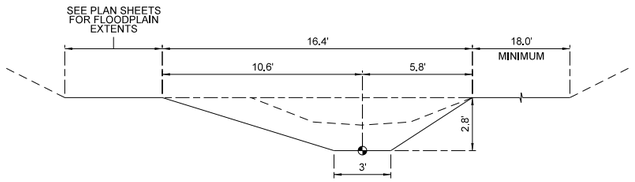
DETAILS

REACH : UTCC-1
STATION 10+00 TO 24+01
"C4" STREAM TYPE

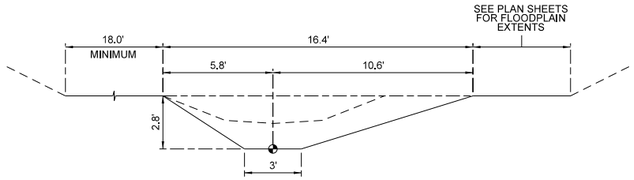


TYPICAL RIFFLE

= THALWEG LOCATION

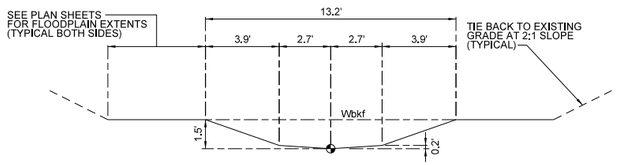


TYPICAL POOL - RIGHT MEANDER



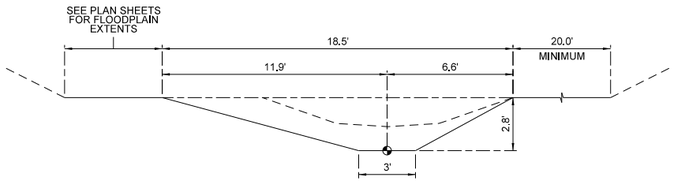
TYPICAL POOL - LEFT MEANDER

REACH : UTCC-2
STATION 24+01 TO 29+43
"C4" STREAM TYPE

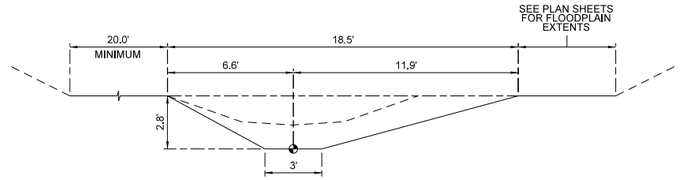


TYPICAL RIFFLE

= THALWEG LOCATION



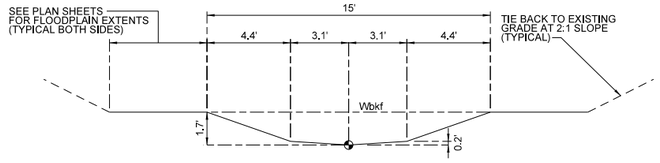
TYPICAL POOL - RIGHT MEANDER



TYPICAL POOL - LEFT MEANDER

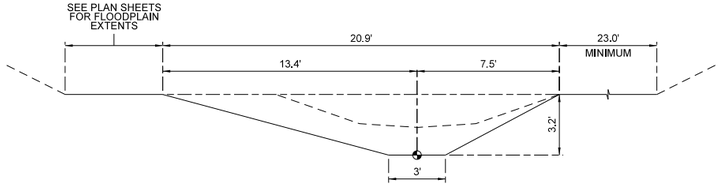
NOTE: THE DESIGN OF THE ENHANCEMENT I PORTIONS OF T1 AND T3 MAY BE ALTERED IN THE FIELD TO ENCOURAGE MORE HYDROLOGIC CONNECTION BETWEEN THE CHANNEL AND THE BANKFULL BENCH TO FACILITATE THE DEVELOPMENT OF FRINGE WETLANDS.

REACH : UTCC-3
STATION 29+43 TO 46+12
"C4" STREAM TYPE

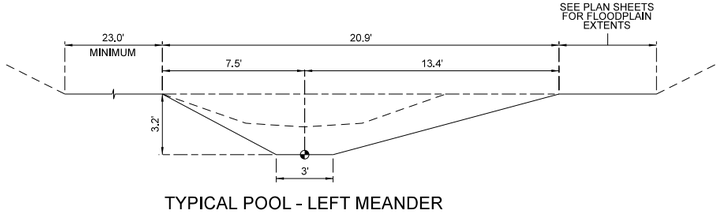


TYPICAL RIFFLE

= THALWEG LOCATION

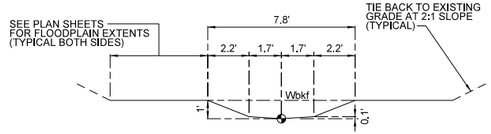


TYPICAL POOL - RIGHT MEANDER



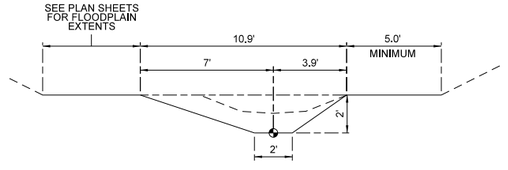
TYPICAL POOL - LEFT MEANDER

REACHES :
T1: STATION 55+50 TO 61+18
T2: STATION 80+00 TO 81+27
T3: STATION 90+00 TO 101+78
T3-1: STATION 150+00 TO 150+78
T4: STATION 250+00 TO 257+42
T5: STATION 300+00 TO 300+96
"C4b" STREAM TYPE

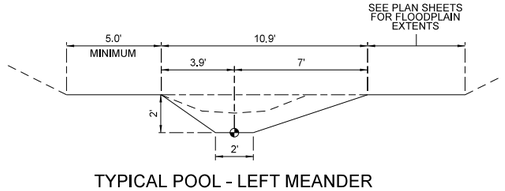


TYPICAL RIFFLE

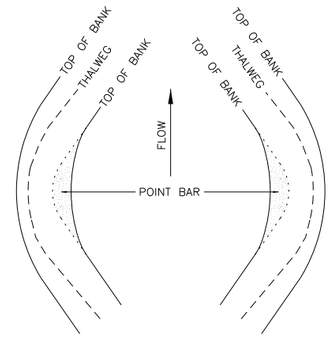
= THALWEG LOCATION



TYPICAL POOL - RIGHT MEANDER



TYPICAL POOL - LEFT MEANDER



LEFT MEANDER RIGHT MEANDER

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

–4′ –2′ 0′ 4′ 8′

GRAPHIC SCALE

REVISIONS			
NO.	DESCRIPTION	DATE
A	SUBMITTED FOR LAND QUALITY PERMIT	MARCH 2017

NCDEQ DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

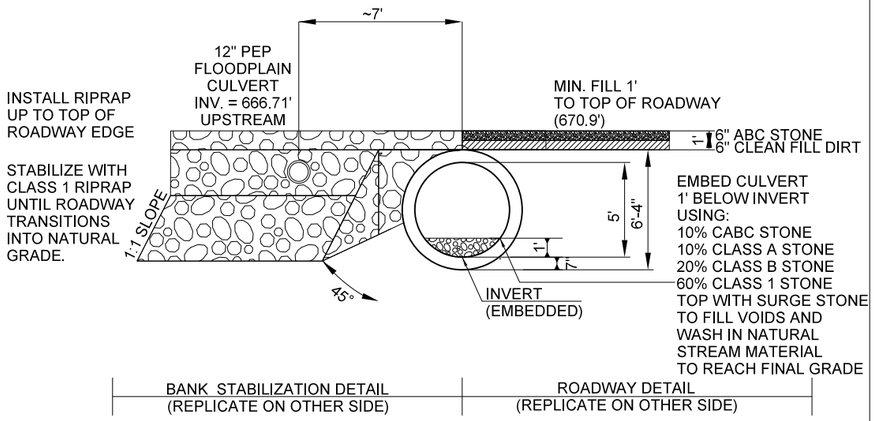
CEDAR BRANCH
STREAM RESTORATION SITE

RANDOLPH COUNTY, NORTH CAROLINA

DATE: AUGUST 2016
SCALE: SEE SHEET

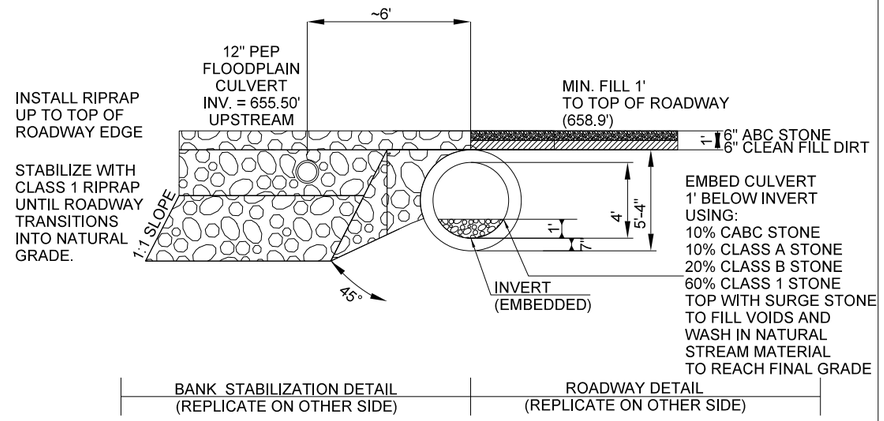
TYPICAL CROSS SECTIONS

CEDAR BRANCH
UTCC
STATION 19+49 (INV. 664.21' EMBEDDED)
TO STATION 19+73 (INV. 663.48' EMBEDDED)



UPSTREAM SECTION HDPE PIPE

CEDAR BRANCH
REACH T4
STATION 256+09 (INV. 653.19' EMBEDDED)
TO STATION 256+33 (INV. 652.48' EMBEDDED)



UPSTREAM SECTION HDPE PIPE

NOTES:

CULVERT THICKNESSES ASSUMED TO BE 7". ACTUAL THICKNESSES TO BE DETERMINED BY DESIGNER/FABRICATOR.

DESIGN FILL IS 1.0' AT ALL CULVERTS.

ALL CULVERTS ARE 24' LINEAR FEET;
NO WINGWALLS REQUIRED.

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

–4 –2 0 4 8
GRAPHIC SCALE

REVISIONS

NO.	DESCRIPTION	DATE
A	SUBMITTED FOR LAND QUALITY PERMIT	MARCH 2017

NCDEQ DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

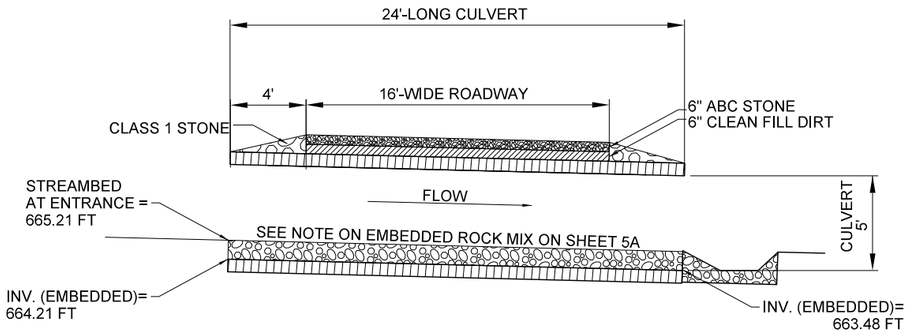
CEDAR BRANCH
STREAM RESTORATION SITE

RANDOLPH COUNTY, NORTH CAROLINA

DATE: AUGUST 2016
SCALE: SEE SHEET

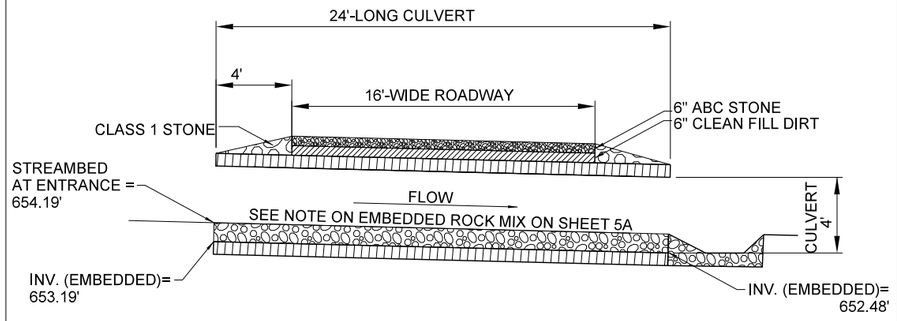
CULVERT
DETAIL

CEDAR BRANCH
UTCC
STATION 19+49 (INV. 664.21' EMBEDDED)
to STATION 19+73 (INV. 663.48' EMBEDDED)

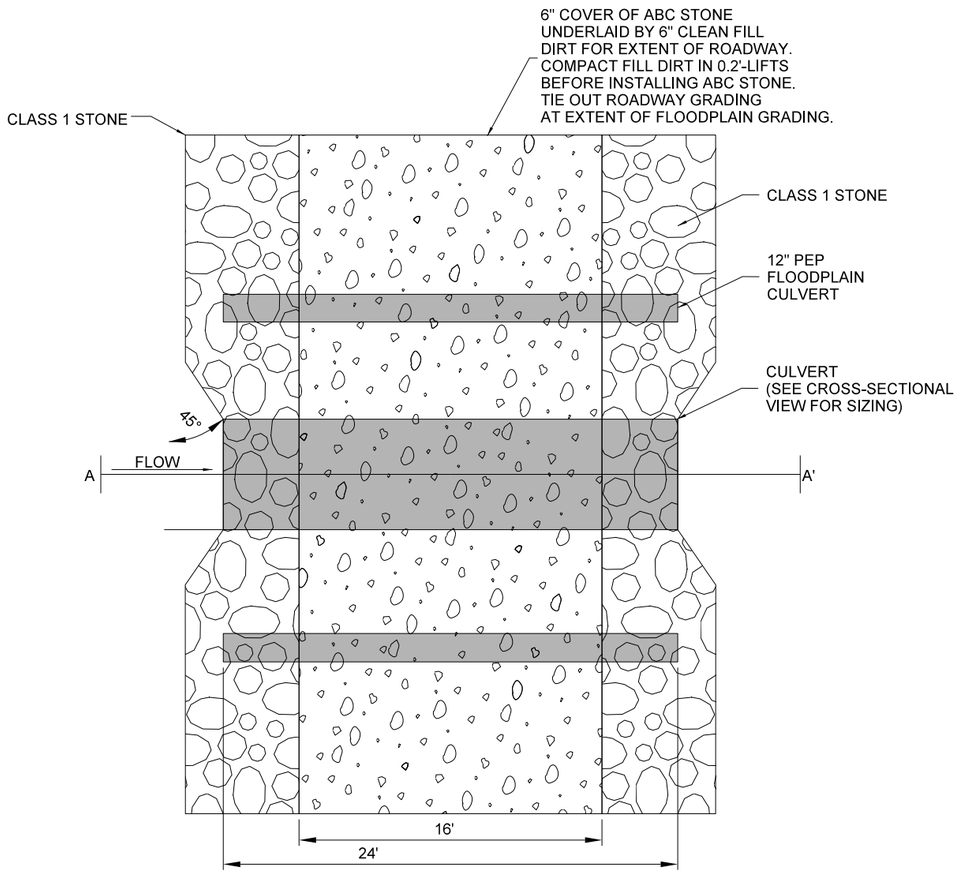


PROFILE A-A' THRU HDPE PIPE

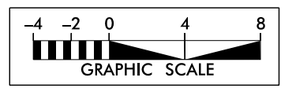
CEDAR BRANCH
T4
STATION 256+09 (INV. 653.19' EMBEDDED)
TO STATION 256+33 (INV. 652.48' EMBEDDED)



PROFILE A-A' THRU HDPE PIPE



PLAN VIEW (TYPICAL)
FOR CROSSING



NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS

NO.	DESCRIPTION	DATE
A	SUBMITTED FOR LAND QUALITY PERMIT	MARCH 2017

NCDEQ DIVISION OF MITIGATION SERVICES

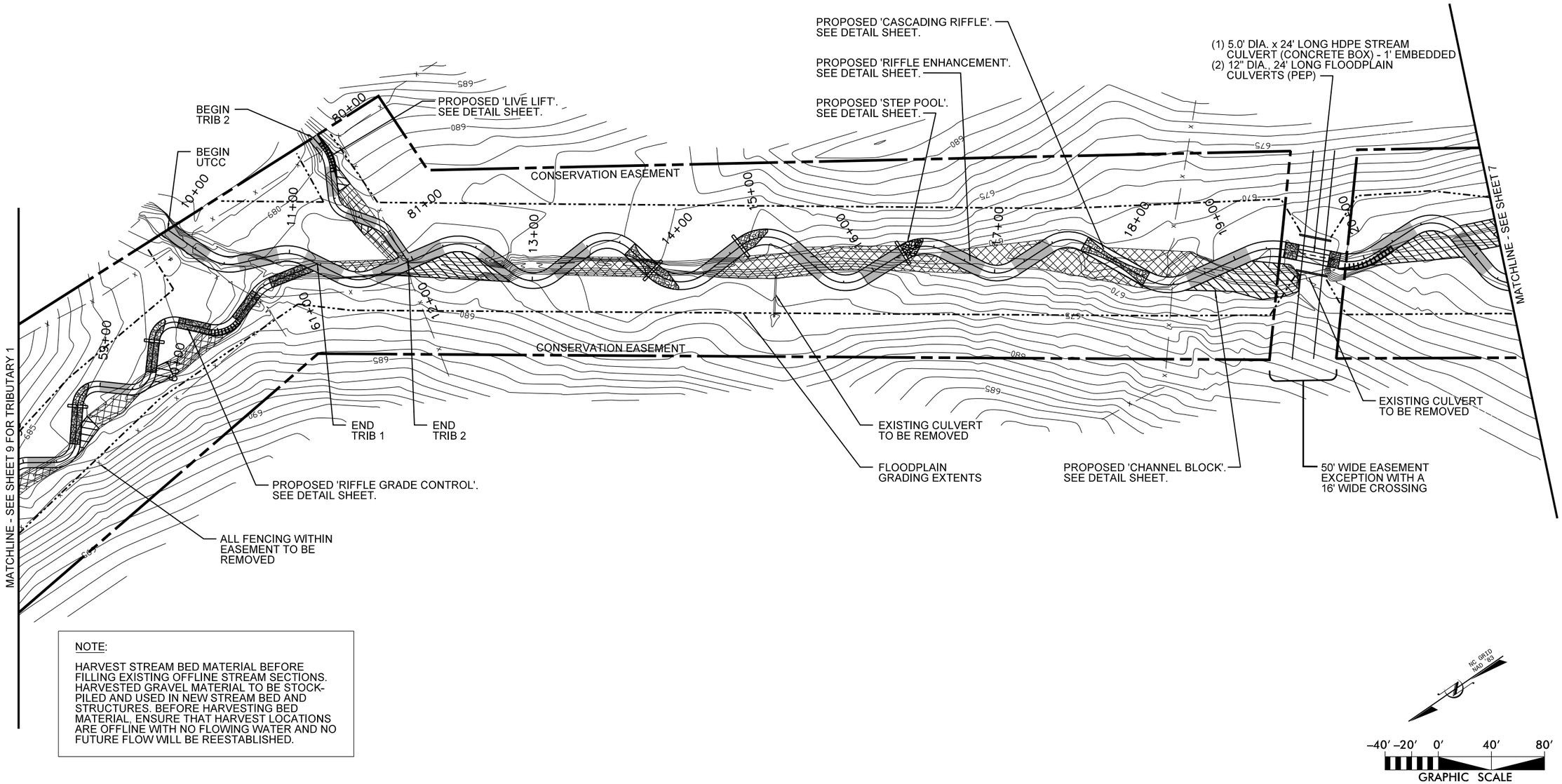
KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

CEDAR BRANCH
STREAM RESTORATION SITE
RANDOLPH COUNTY, NORTH CAROLINA

DATE: AUGUST 2016
SCALE: SEE SHEET

CULVERT
DETAIL

SHEET 5B OF 23



NOTE:

HARVEST STREAM BED MATERIAL BEFORE FILLING EXISTING OFFLINE STREAM SECTIONS. HARVESTED GRAVEL MATERIAL TO BE STOCK-PILED AND USED IN NEW STREAM BED AND STRUCTURES. BEFORE HARVESTING BED MATERIAL, ENSURE THAT HARVEST LOCATIONS ARE OFFLINE WITH NO FLOWING WATER AND NO FUTURE FLOW WILL BE REESTABLISHED.

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

A	SUBMITTED FOR LAND QUALITY PERMIT		MARCH 2017
SYM.	DESCRIPTION	REVISIONS	DATE

NCDEQ DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

CEDAR BRANCH
STREAM RESTORATION SITE

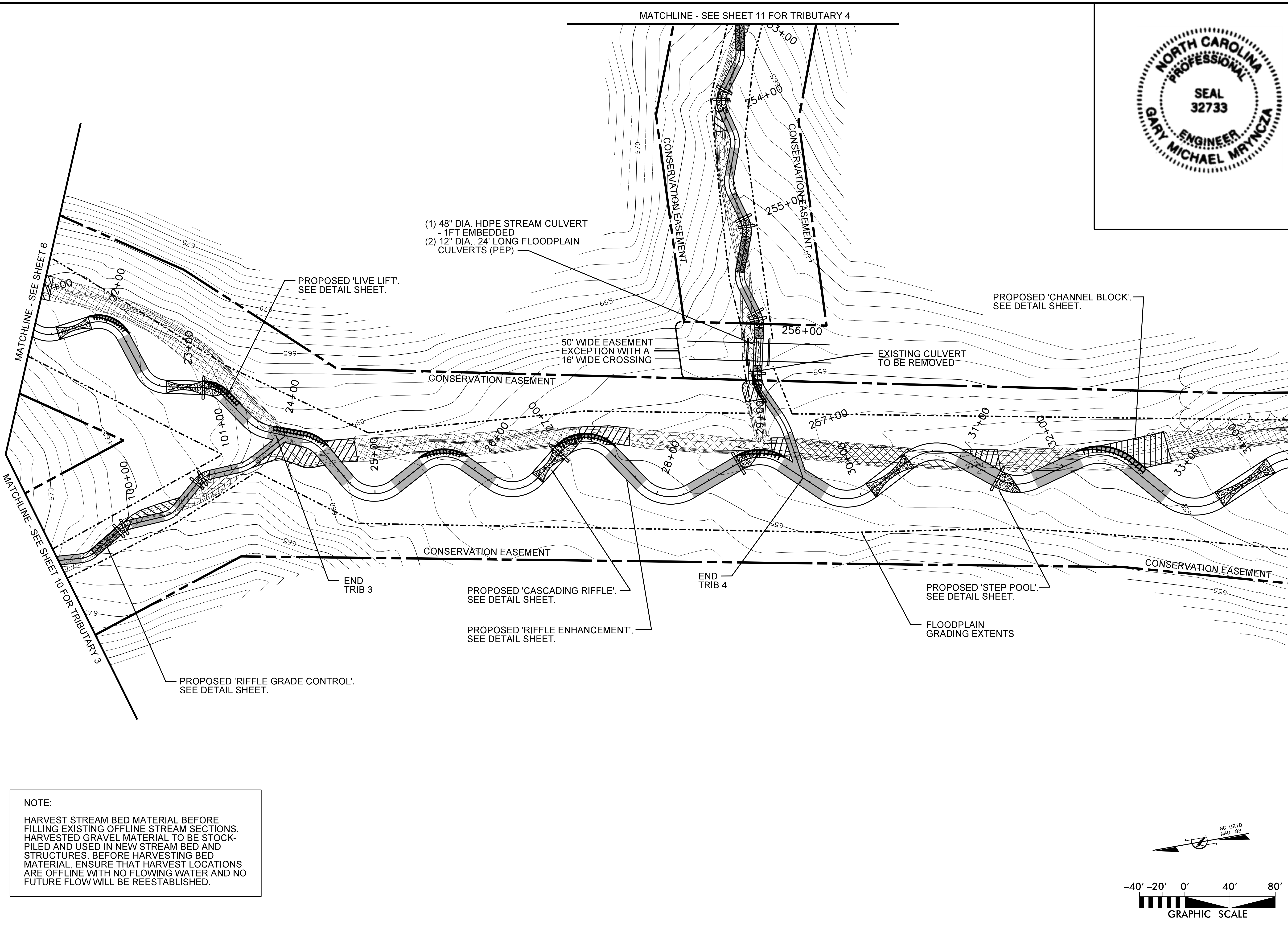
RANDOLPH COUNTY, NORTH CAROLINA

DATE: AUGUST 2016
SCALE: GRAPHIC

SITE PLAN

REACH: UTCC

SHEET 6 OF 23



NOTE:

HARVEST STREAM BED MATERIAL BEFORE FILLING EXISTING OFFLINE STREAM SECTIONS. HARVESTED GRAVEL MATERIAL TO BE STOCK-PILED AND USED IN NEW STREAM BED AND STRUCTURES. BEFORE HARVESTING BED MATERIAL, ENSURE THAT HARVEST LOCATIONS ARE OFFLINE WITH NO FLOWING WATER AND NO FUTURE FLOW WILL BE REESTABLISHED.

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 32733 GARY MICHAEL MRYNCZA

SYM.	DESCRIPTION	DATE
A	SUBMITTED FOR LAND QUALITY PERMIT	MARCH 2017

REVISIONS

NCDEQ DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

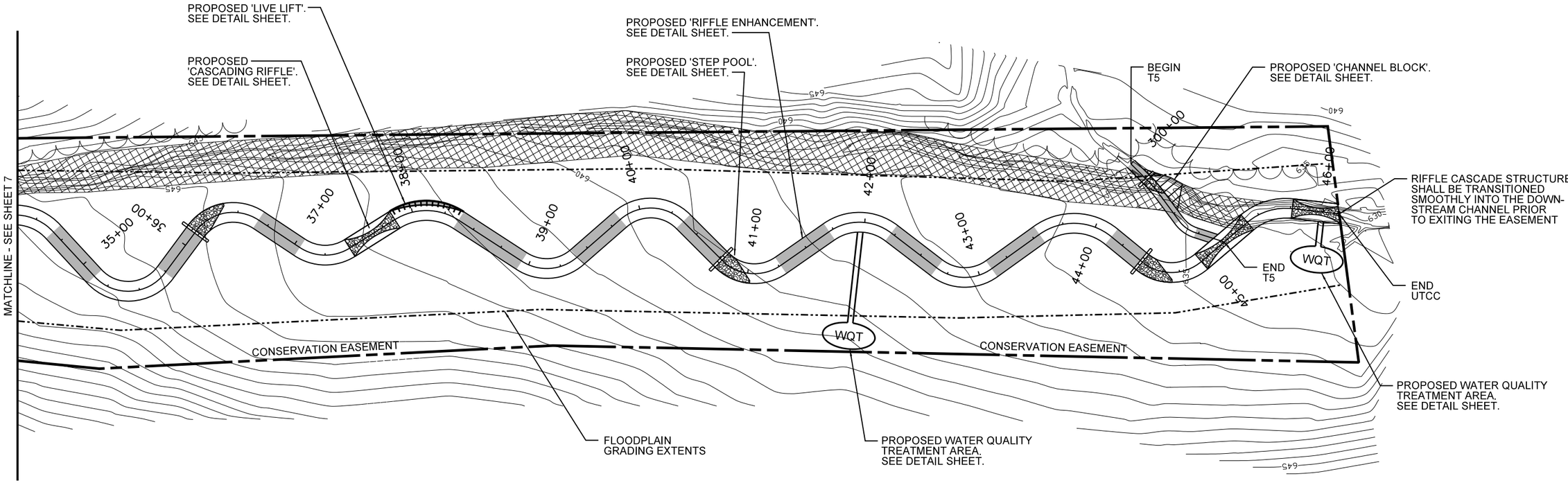
CEDAR BRANCH
STREAM RESTORATION SITE
RANDOLPH COUNTY, NORTH CAROLINA

DATE: AUGUST 2016
SCALE: GRAPHIC

SITE PLAN

REACH: UTCC

SHEET 7 OF 23



NOTE:

HARVEST STREAM BED MATERIAL BEFORE FILLING EXISTING OFFLINE STREAM SECTIONS. HARVESTED GRAVEL MATERIAL TO BE STOCK-PILED AND USED IN NEW STREAM BED AND STRUCTURES. BEFORE HARVESTING BED MATERIAL, ENSURE THAT HARVEST LOCATIONS ARE OFFLINE WITH NO FLOWING WATER AND NO FUTURE FLOW WILL BE REESTABLISHED.

NC GRID NAD '83

–40′ –20′ 0′ 40′ 80′

GRAPHIC SCALE

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS		
NO.	DESCRIPTION	DATE
A	SUBMITTED FOR LAND QUALITY PERMIT	MARCH 2017

NCDEQ DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

CEDAR BRANCH
STREAM RESTORATION SITE

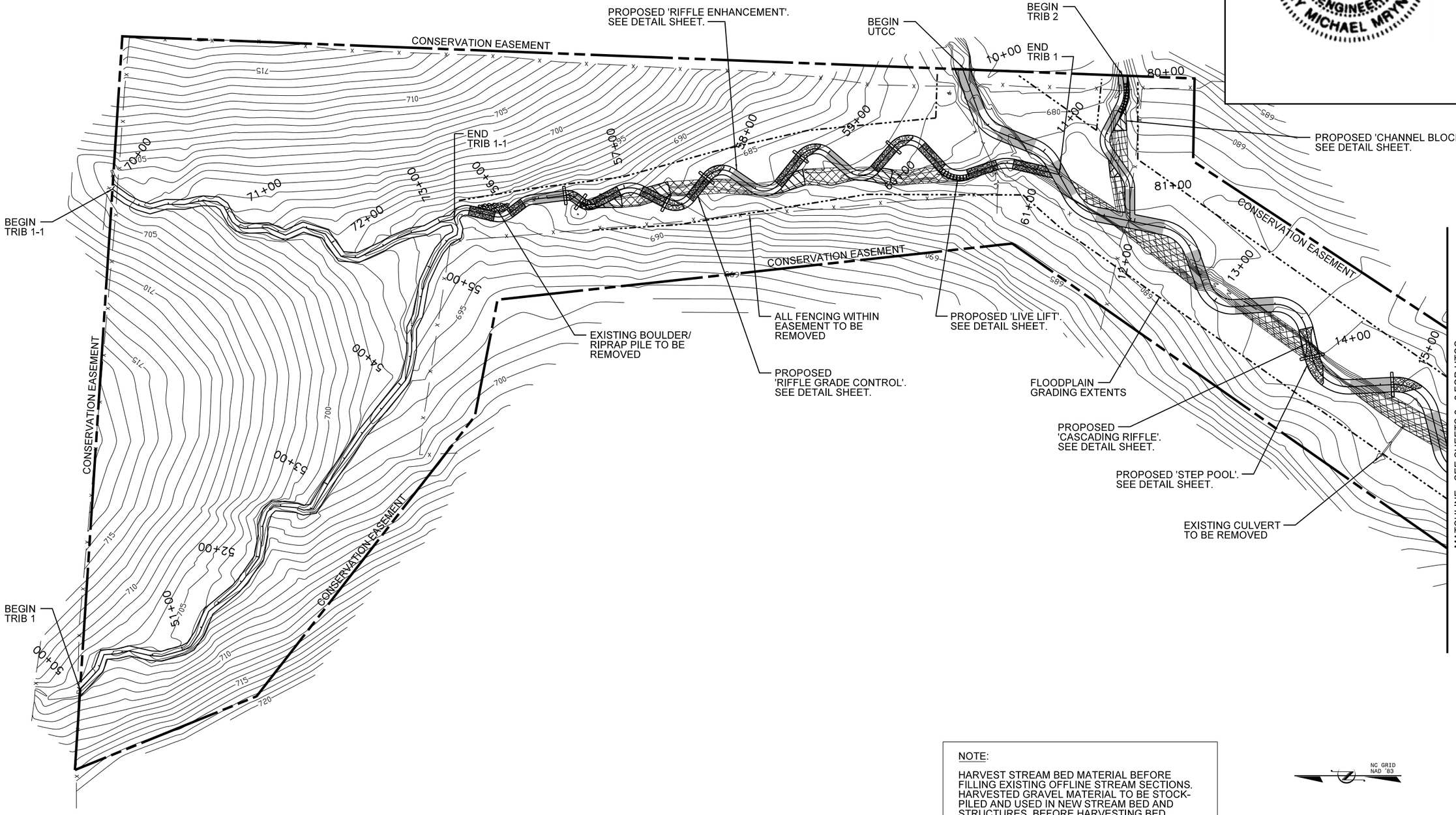
RANDOLPH COUNTY, NORTH CAROLINA

DATE: AUGUST 2016
SCALE: GRAPHIC

SITE PLAN

REACH: UTCC

SHEET 8 OF 23



NOTE:

HARVEST STREAM BED MATERIAL BEFORE FILLING EXISTING OFFLINE STREAM SECTIONS. HARVESTED GRAVEL MATERIAL TO BE STOCK-PILED AND USED IN NEW STREAM BED AND STRUCTURES. BEFORE HARVESTING BED MATERIAL, ENSURE THAT HARVEST LOCATIONS ARE OFFLINE WITH NO FLOWING WATER AND NO FUTURE FLOW WILL BE REESTABLISHED.

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS

	DESCRIPTION	DATE
A	SUBMITTED FOR LAND QUALITY PERMIT	MARCH 2017

NCDEQ DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

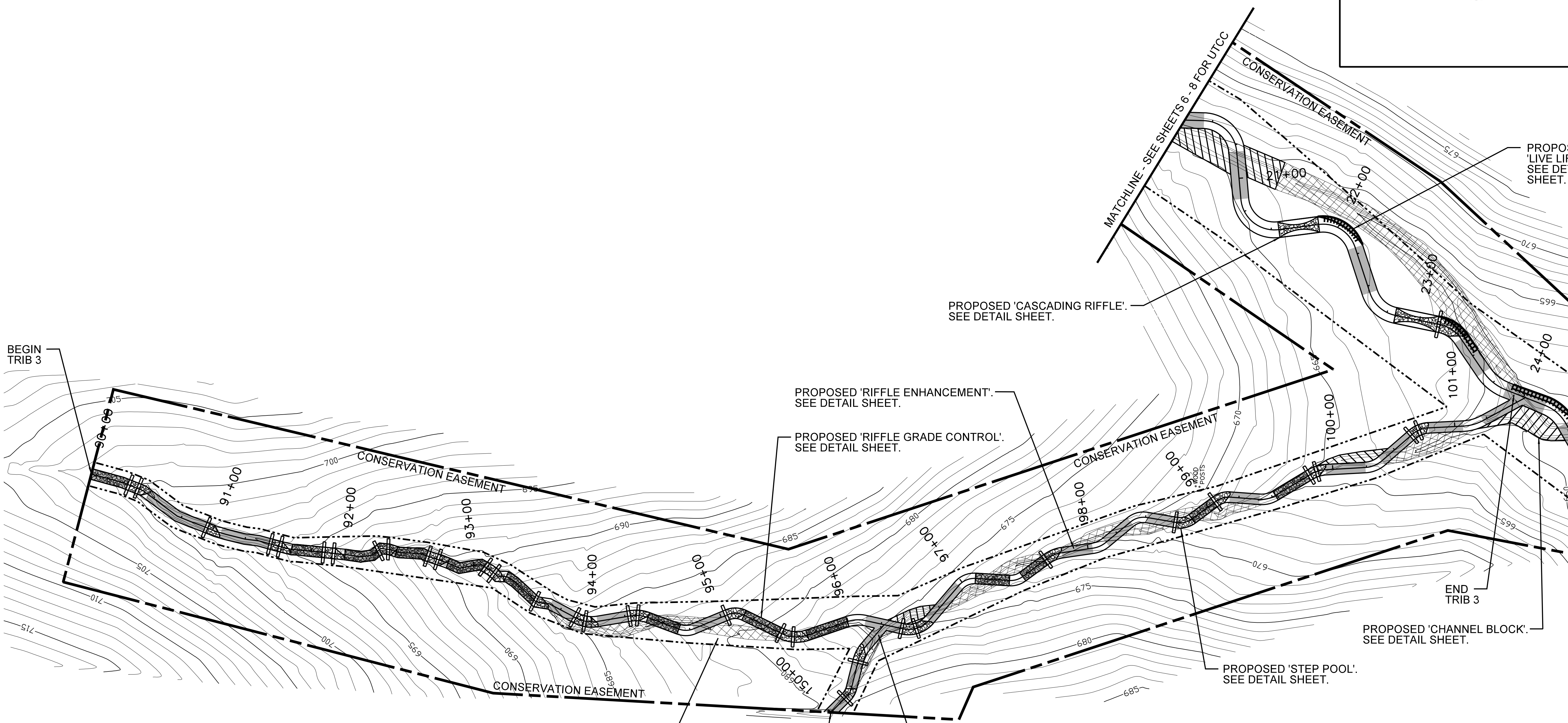
CEDAR BRANCH
STREAM RESTORATION SITE
RANDOLPH COUNTY, NORTH CAROLINA

DATE: AUGUST 2016
SCALE: GRAPHIC

SITE PLAN

REACH:
TRIB 1 & 1-1

SHEET 9 OF 23



NOTE:

HARVEST STREAM BED MATERIAL BEFORE FILLING EXISTING OFFLINE STREAM SECTIONS. HARVESTED GRAVEL MATERIAL TO BE STOCK-PILED AND USED IN NEW STREAM BED AND STRUCTURES. BEFORE HARVESTING BED MATERIAL, ENSURE THAT HARVEST LOCATIONS ARE OFFLINE WITH NO FLOWING WATER AND NO FUTURE FLOW WILL BE REESTABLISHED.

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 32733 GARY MICHAEL MRYNCZA

SYM.	DESCRIPTION	DATE
A	SUBMITTED FOR LAND QUALITY PERMIT	MARCH 2017

REVISIONS

NCDEQ DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

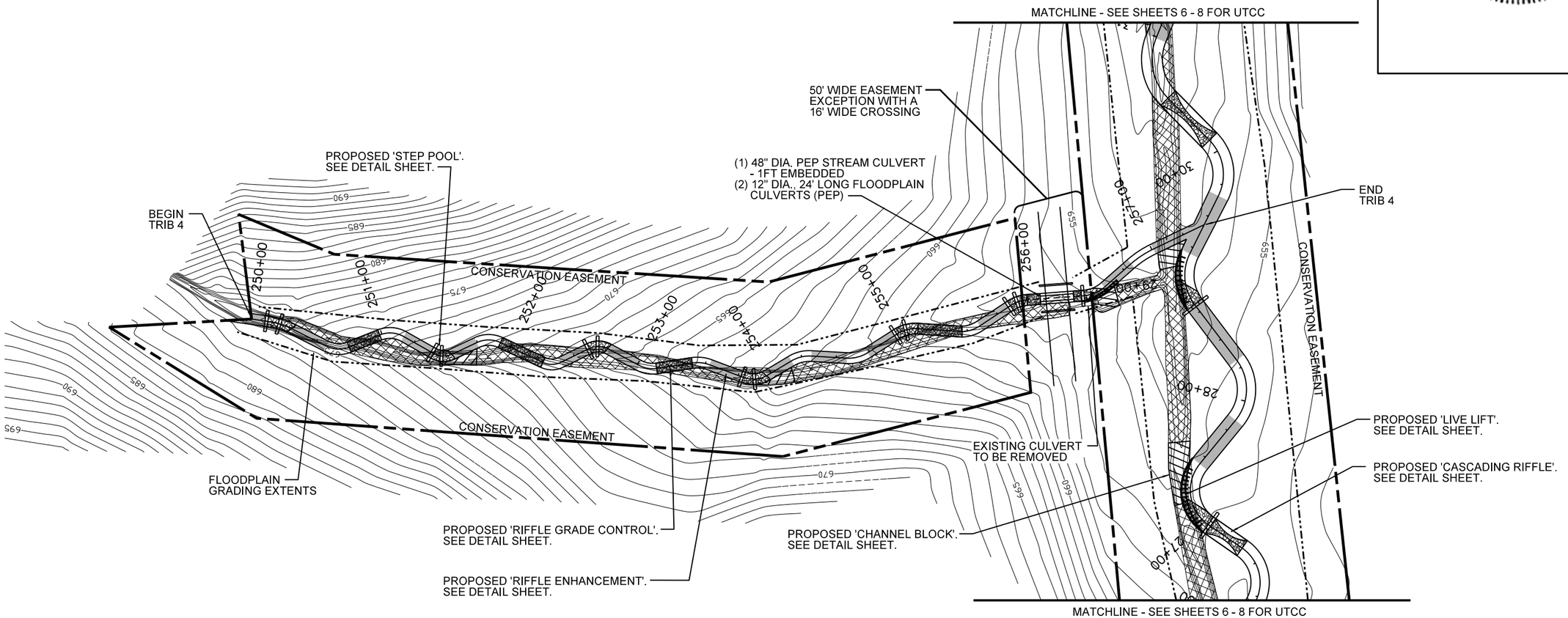
CEDAR BRANCH
STREAM RESTORATION SITE
RANDOLPH COUNTY, NORTH CAROLINA

DATE: AUGUST 2016
SCALE: GRAPHIC

SITE PLAN

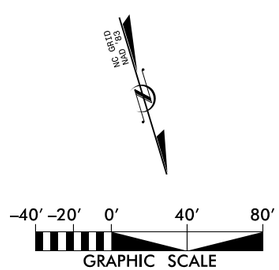
REACH: TRIB 3 & 3-1

SHEET 10 OF 23



NOTE:

HARVEST STREAM BED MATERIAL BEFORE FILLING EXISTING OFFLINE STREAM SECTIONS. HARVESTED GRAVEL MATERIAL TO BE STOCK-PILED AND USED IN NEW STREAM BED AND STRUCTURES. BEFORE HARVESTING BED MATERIAL, ENSURE THAT HARVEST LOCATIONS ARE OFFLINE WITH NO FLOWING WATER AND NO FUTURE FLOW WILL BE REESTABLISHED.



NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS

	DATE	DESCRIPTION	BY
A	MARCH 2017	SUBMITTED FOR LAND QUALITY PERMIT	SWL

NCDEQ DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

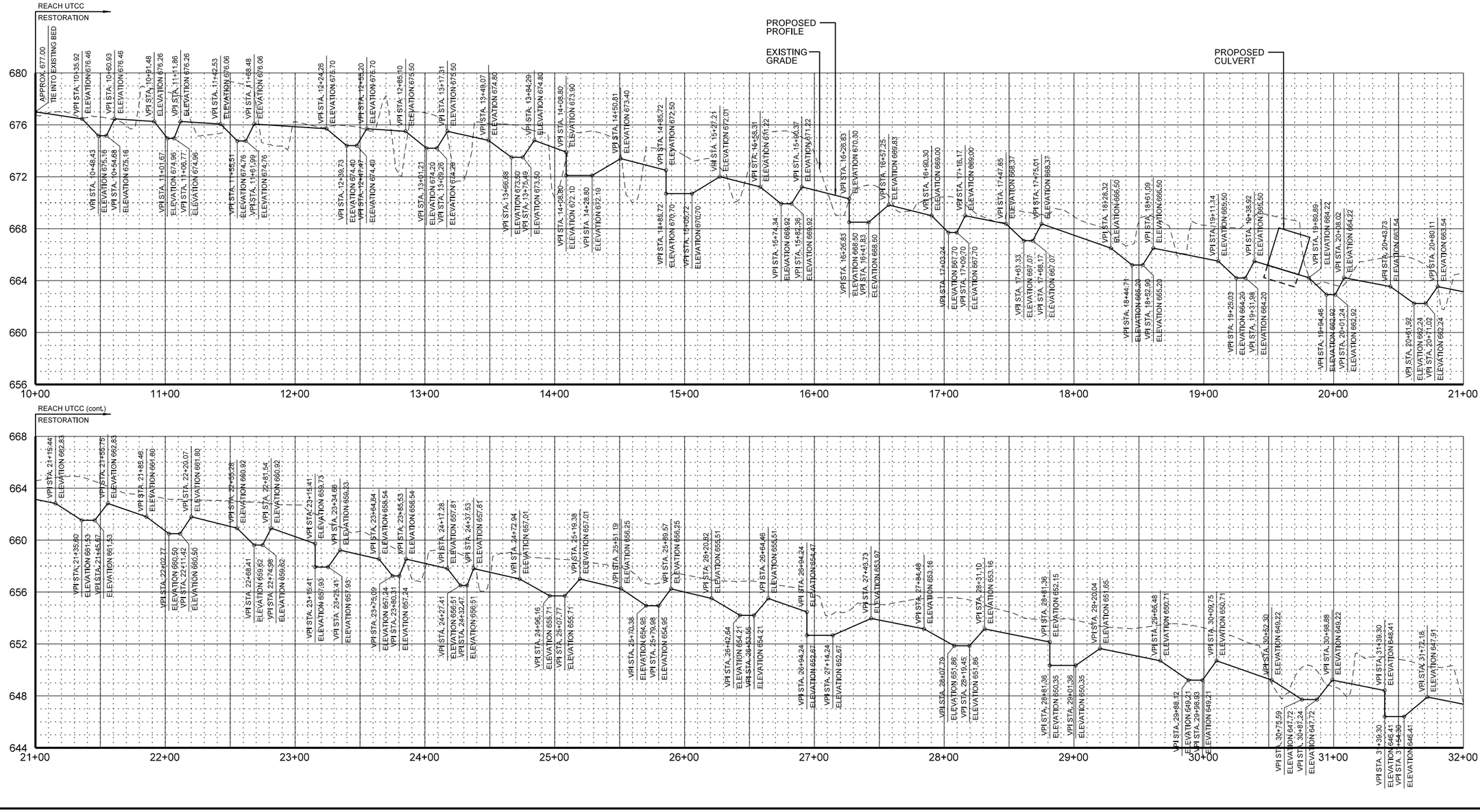
CEDAR BRANCH
STREAM RESTORATION SITE
RANDOLPH COUNTY, NORTH CAROLINA

DATE: AUGUST 2016
SCALE: GRAPHIC

SITE PLAN

REACH: TRIB 4

SHEET 11 OF 23



NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

	REVISIONS		
SYM.	DESCRIPTION	DATE	
A	SUBMITTED FOR LAND QUALITY PERMIT	MARCH 2017	

NCDEQ DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

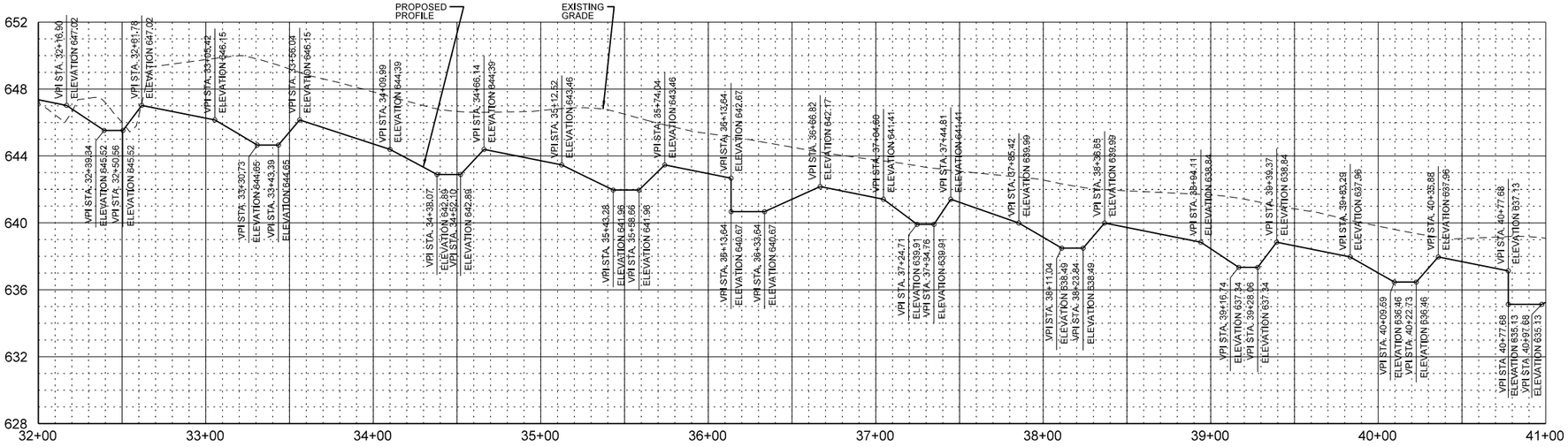
CEDAR BRANCH STREAM RESTORATION SITE

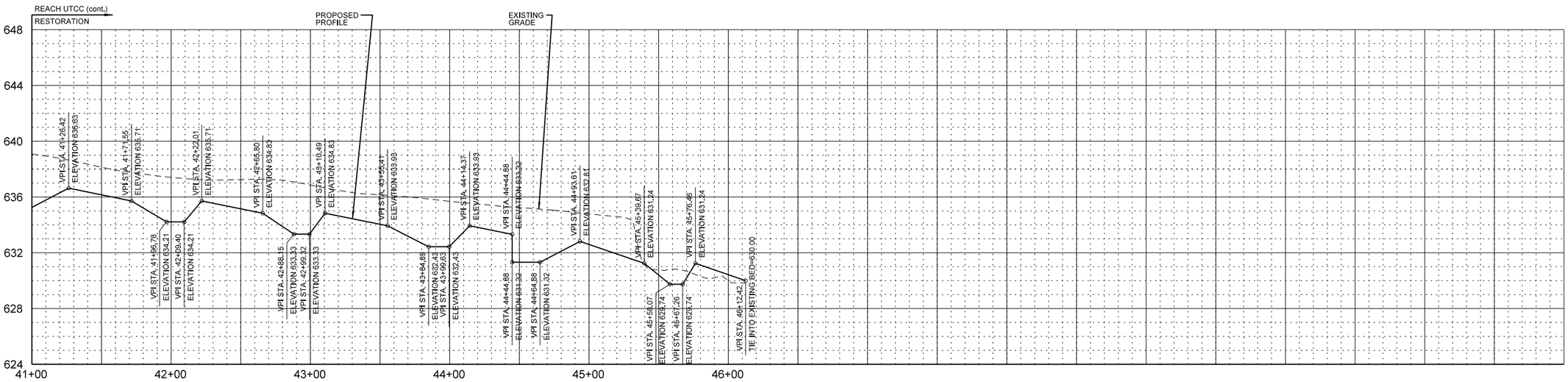
RANDOLPH COUNTY, NORTH CAROLINA

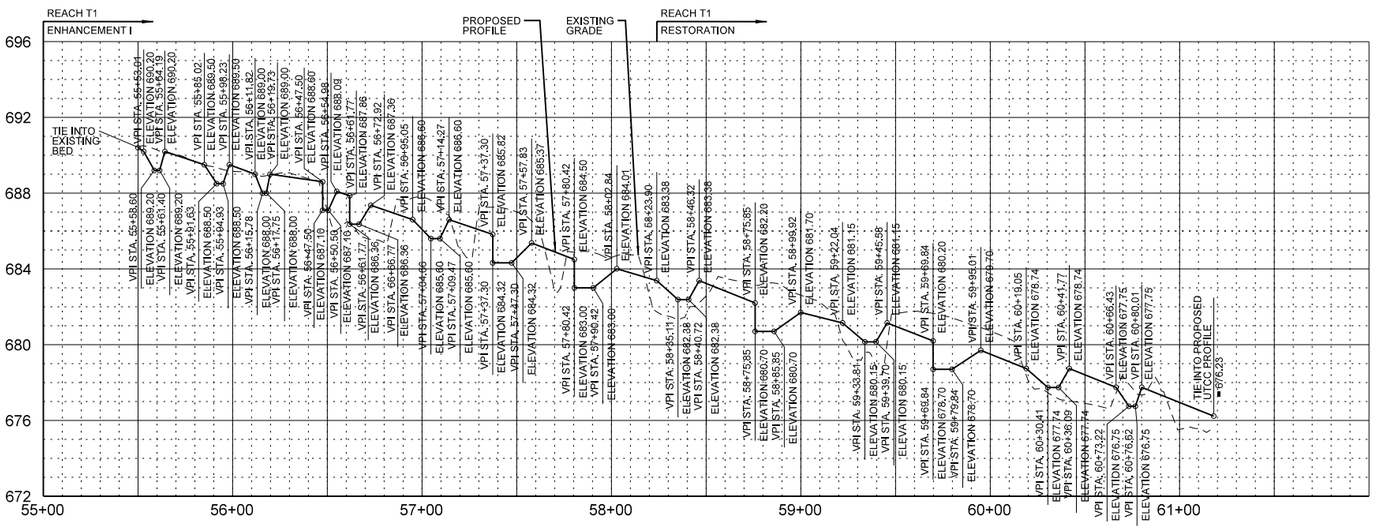
DATE: AUGUST 2016
SCALE: 1"=40'

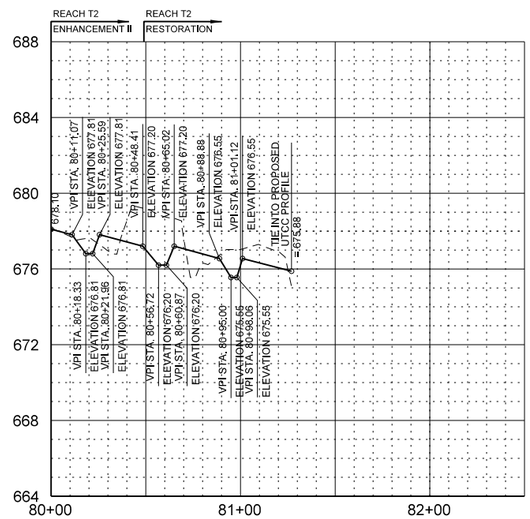
PROFILES

SHEET 12 OF 23









KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

	DESCRIPTION	DATE
A	SUBMITTED FOR LAND QUALITY PERMIT	MARCH 2017

REVISIONS

NCDEQ DIVISION OF MITIGATION SERVICES

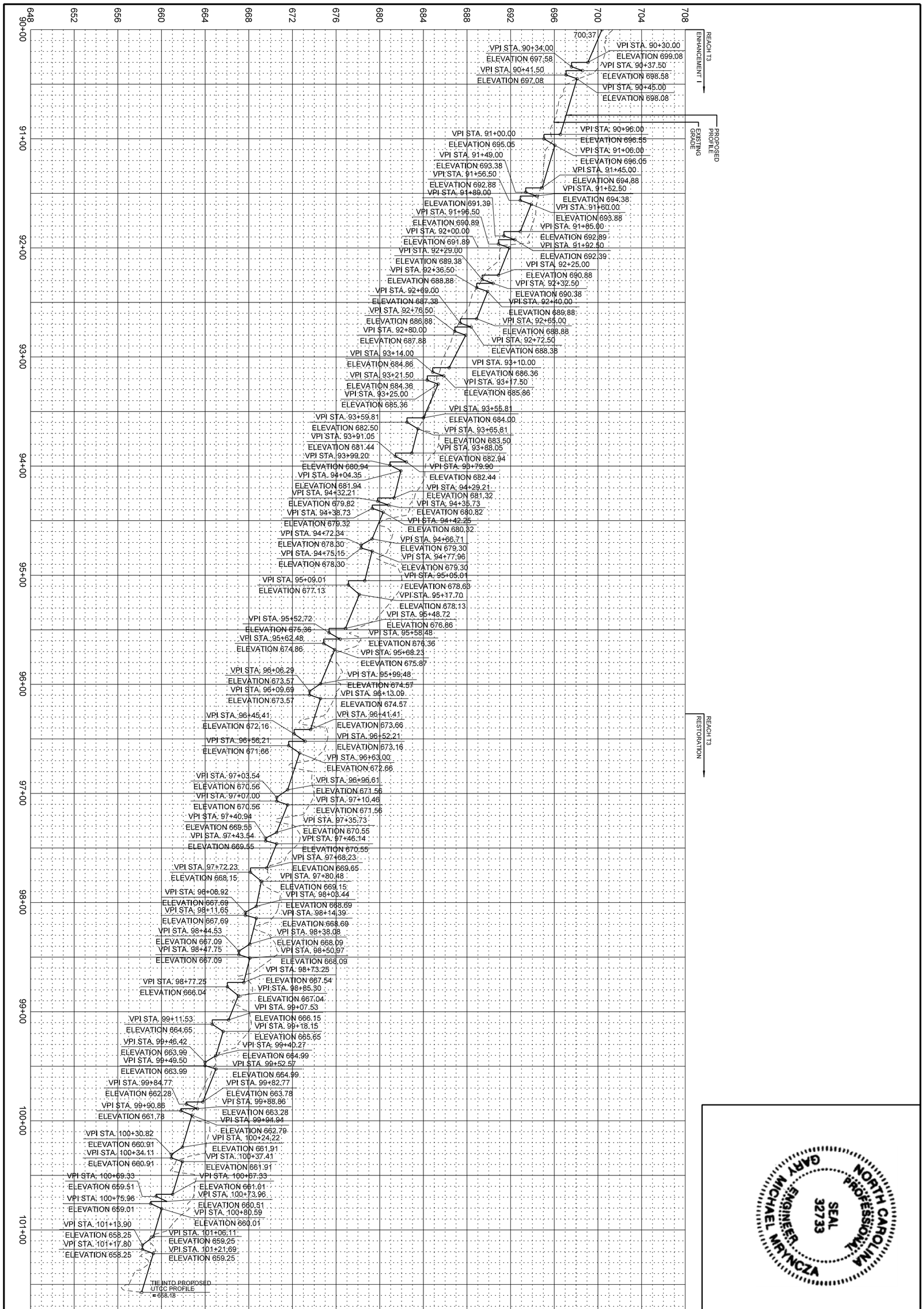
CEDAR BRANCH
STREAM RESTORATION SITE

RANDOLPH COUNTY, NORTH CAROLINA

DATE: AUGUST 2016
SCALE: 1"=40'

PROFILES

SHEET 13 OF 23



NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 32733 GARY MICHAEL MRYNCZA

SHEET 14 OF 23	PROFILES	SCALE: 1"=40'	DATE: AUGUST 2016

CEDAR BRANCH
STREAM RESTORATION SITE

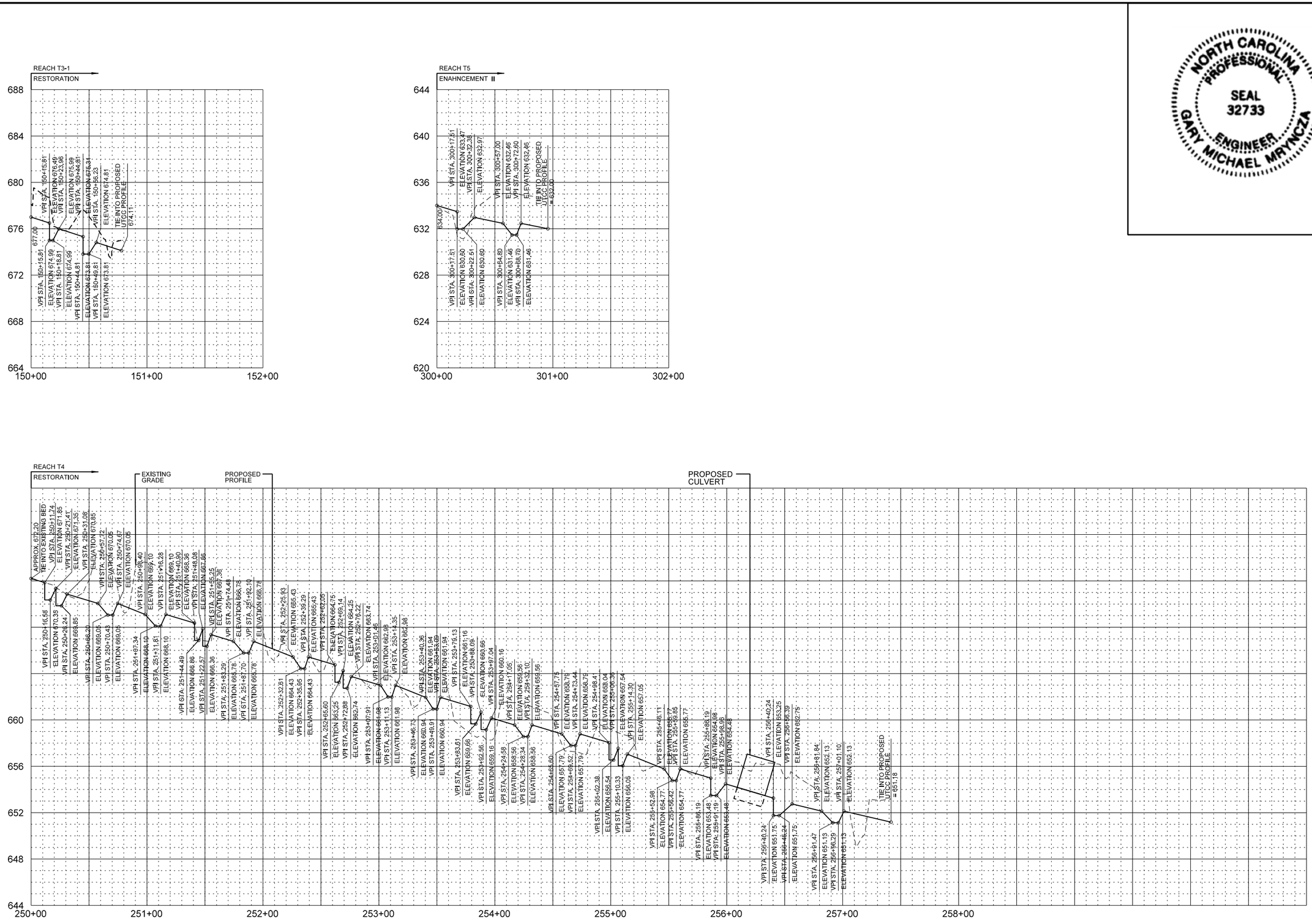
RANDOLPH COUNTY, NORTH CAROLINA

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

NCDEQ DIVISION OF MITIGATION SERVICES

SYM.	DESCRIPTION	DATE
A	SUBMITTED FOR LAND QUALITY PERMIT	MARCH 2017

REVISIONS



NORTH CAROLINA
PROFESSIONAL
SEAL
32733
ENGINEER
GARY MICHAEL MRYNCZA

REVISIONS

NO.	DESCRIPTION	DATE
A	SUBMITTED FOR LAND QUALITY PERMIT	MARCH 2017

NCDEQ DIVISION OF
MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

CEDAR BRANCH
STREAM RESTORATION SITE

RANDOLPH COUNTY, NORTH CAROLINA

DATE: AUGUST 2016
SCALE: 1"=40'

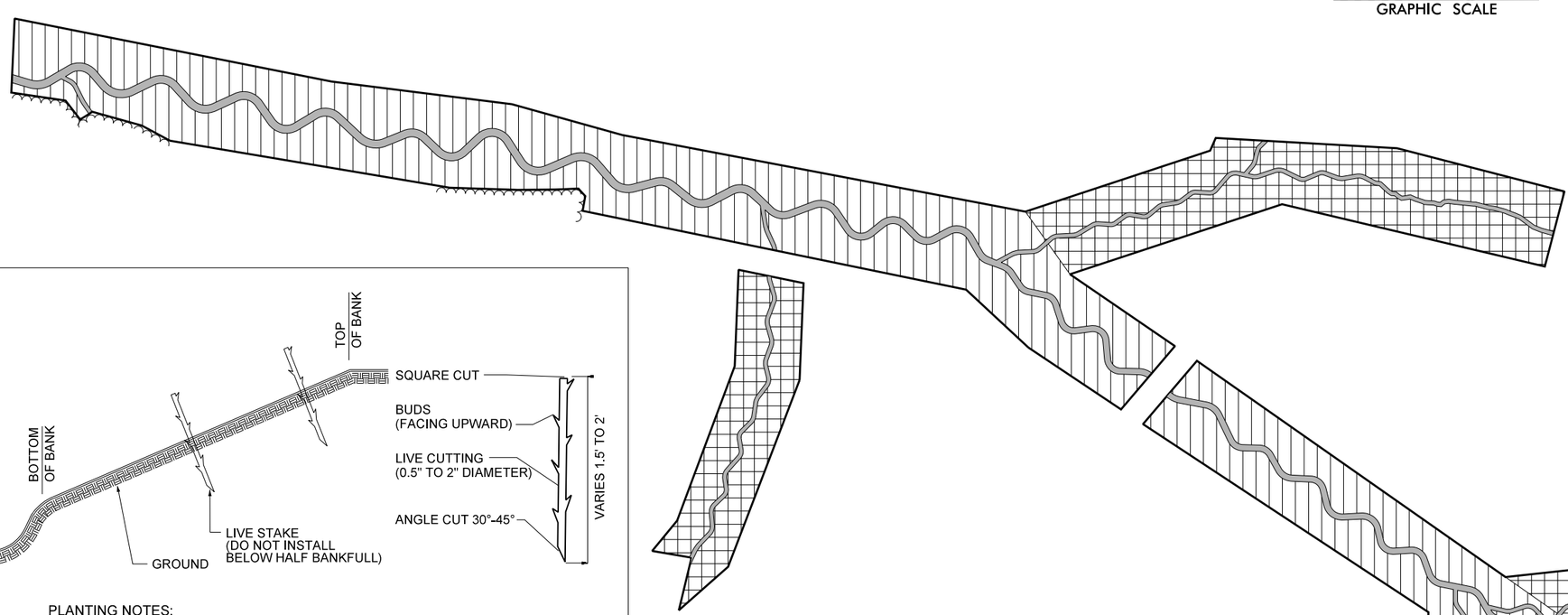
PROFILES

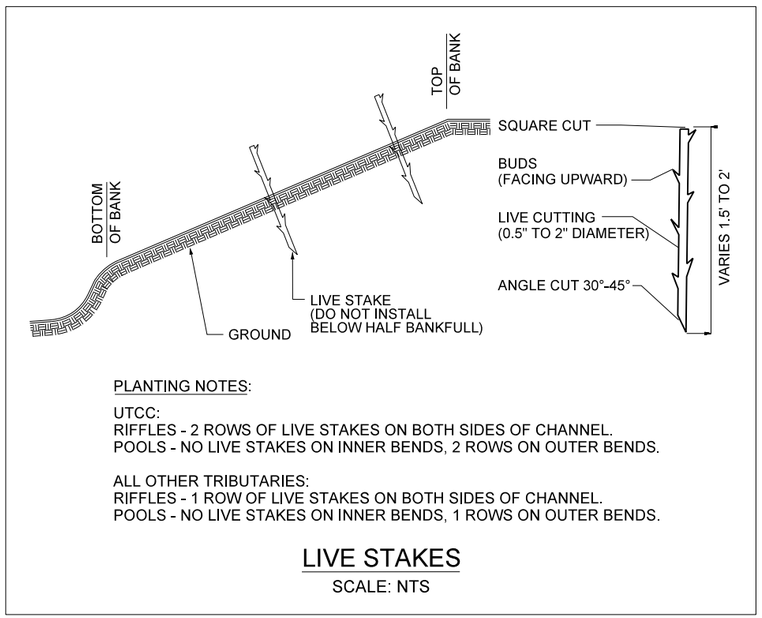
SHEET 16 OF 23

NC GRID
NAD '83

–130′ –65′ 0′ 130′ 260′

GRAPHIC SCALE





PLANTING NOTES:

UTCC:
RIFFLES - 2 ROWS OF LIVE STAKES ON BOTH SIDES OF CHANNEL.
POOLS - NO LIVE STAKES ON INNER BENDS, 2 ROWS ON OUTER BENDS.

ALL OTHER TRIBUTARIES:
RIFFLES - 1 ROW OF LIVE STAKES ON BOTH SIDES OF CHANNEL.
POOLS - NO LIVE STAKES ON INNER BENDS, 1 ROWS ON OUTER BENDS.

LIVE STAKES

SCALE: NTS

STREAM ZONE :

STREAM ZONE
LIVE STAKES: 1.5' TO 2' LENGTHS, 1/2' TO 2" DIAMETER,
PLANT AT 3' SPACING, RANDOM SPECIES PLACEMENT.

COMMON NAME	SCIENTIFIC NAME
BLACK WILLOW	SALIX NIGRA
SILKY WILLOW	SALIX SERICEA
SILKY DOGWOOD	CORNUS AMOMUM

NOTE: NO SINGLE LIVE STAKING SPECIES SHALL COMPOSE MORE THAN 40% OF THE TOTAL NUMBER OF LIVE STAKES TO BE INSTALLED.

RIPARIAN FOREST PLANTING:

PLANTING ZONE 1 = 10.5 ACRES

12" - 18" BARE ROOT MATERIAL
968 STEMS/ACRE (9' X 5' SPACING), RANDOM SPECIES PLACEMENT

COMMON NAME	SCIENTIFIC NAME	STATUS	% OF TOTAL	# OF PLANTS
RIVER BIRCH	BETULA NIGRA	FACW	20	2100
GREEN ASH	FRAXINUS PENNSYLVANICA	FACW	20	2100
SWAMP CHESTNUT OAK	QUERCUS MICHAUXII	FACW	20	2100
WILLOW OAK	QUERCUS PHELLOS	FAC	10	1050
AMERICAN SYCAMORE	PLATANUS OCCIDENTALIS	FACW	20	2100
YELLOW POPLAR	LIRIODENDRON TULIPIFERA	FACU	10	1050
				10,500

PLANTING ZONE 2 = 9.1 ACRES

12" - 18" BARE ROOT MATERIAL
968 STEMS/ACRE (9' X 5' SPACING), RANDOM SPECIES PLACEMENT

COMMON NAME	SCIENTIFIC NAME	STATUS	% OF TOTAL	# OF PLANTS
YELLOW POPLAR	LIRIODENDRON TULIPIFERA	FACU	20	1800
SOUTHERN RED OAK	QUERCUS FALCATA	FACU	25	2200
WILLOW OAK	QUERCUS PHELLOS	FAC	20	1800
WHITE OAK	QUERCUS ALBA	FACU	20	1800
AMERICAN PERSIMMON	DIOSPYROS VIRGINIANA	FAC	8	700
PIN OAK	QUERCUS PALUSTRIS	FACW	7	600
				8,900

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

	DATE	DESCRIPTION
A		SUBMITTED FOR LAND QUALITY PERMIT
		MARCH 2017

REVISIONS

NCDEQ DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

CEDAR BRANCH
STREAM RESTORATION SITE
RANDOLPH COUNTY, NORTH CAROLINA

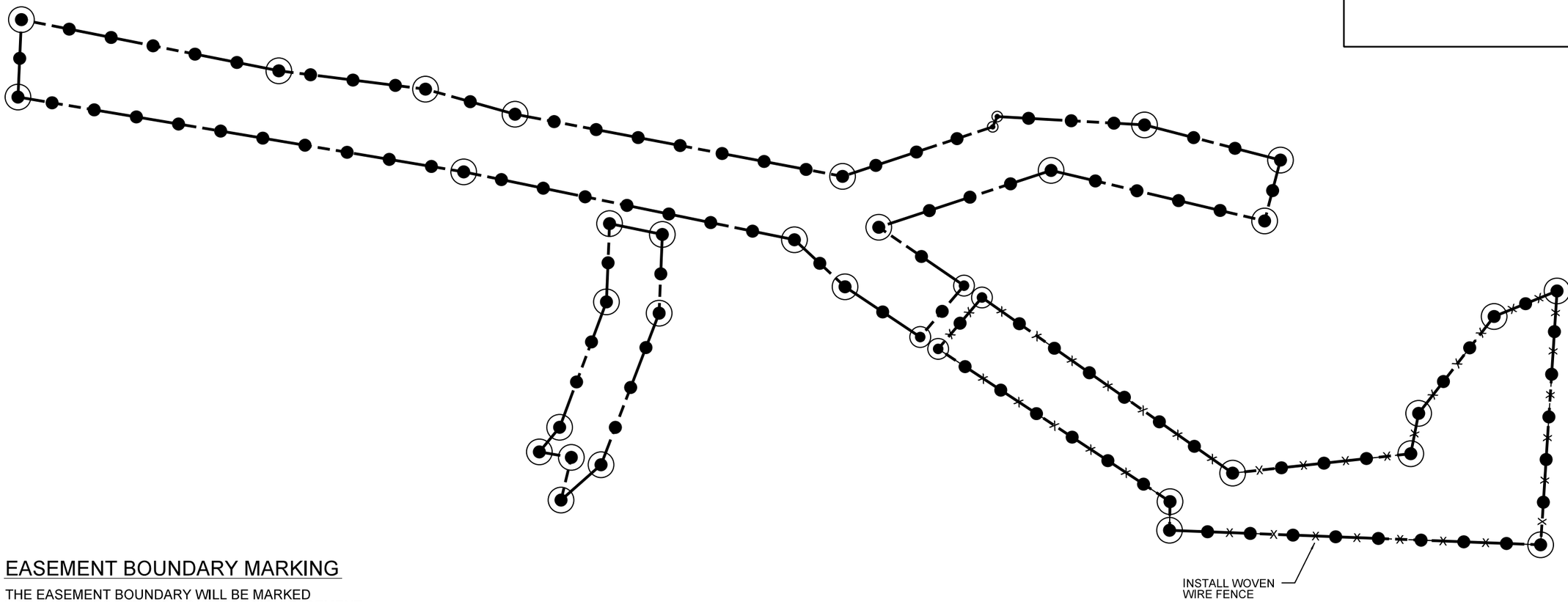
DATE: AUGUST 2016
SCALE: GRAPHIC

PLANTING PLAN

SHEET 16 OF 23

NC GRID
NAD '83

–130′ –65′ 0′ 130′ 260′
GRAPHIC SCALE



EASEMENT BOUNDARY MARKING

THE EASEMENT BOUNDARY WILL BE MARKED WITH METAL POSTS AND CONSERVATION EASEMENT SIGNS AT THE CORNERS AND AT A MINIMUM OF 100' INTERVALS ALONG THE BOUNDARY.

◉	5/8" REBAR 30" IN LENGTH WITH 3-1/4" ALUMINUM CAPS ON ALL EASEMENT CORNERS. CAPS SHALL MEET DMS SPECIFICATIONS (BERNSTEN RBD5325 IMPRINTED WITH NC STATE LOGO #B9087 OR EQUIVALENT). AFTER INSTALLATION, CAPS SHALL BE STAMPED WITH THE CORRESPONDING NUMBER.
●	6-FOOT TALL DURABLE WITNESS POST ALONG BOUNDARY OF CONSERVATION EASEMENT. POSTS SHALL BE MADE OF MATERIAL THAT WILL LAST A MINIMUM OF 20 YEARS. THE PROVIDER SHALL ATTACH A CONSERVATION EASEMENT SIGN TO EACH WITNESS POST AND PLACE ADDITIONAL SIGNS AT NO MORE THAN 100-FOOT INTERVALS ON BOUNDARY LINES.
— X —	INSTALL WOVEN WIRE FENCE

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS			
NO.	DESCRIPTION	DATE
A	SUBMITTED FOR LAND QUALITY PERMIT	MARCH 2017

NCDEQ DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

CEDAR BRANCH
STREAM RESTORATION SITE

RANDOLPH COUNTY, NORTH CAROLINA

DATE: AUGUST 2016
SCALE: GRAPHIC

BOUNDARY MARKING PLAN

SHEET 17 OF 23

NOTES:

1. IT IS THE INTENT OF THESE PLANS THAT AS SOON AS AN AREA OF GRADING IS COMPLETE IT SHALL BE STABILIZED IN ACCORDANCE WITH THE EROSION CONTROL PRACTICES DESCRIBED IN THESE PLANS.DUE TO THE ANTICIPATED DURATION AND SEQUENCE OF THE CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS REQUIRED TO MINIMIZE, AS MUCH AS POSSIBLE, THE AMOUNT OF THE AREA THAT IS DISTURBED AT ONE TIME.

2. THE CONTRACTOR SHALL EXERCISE EVERY REASONABLE PRECAUTION THROUGHOUT THE CONSTRUCTION OF THE PROJECT TO PREVENT EROSION AND SEDIMENTATION. EROSION CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE PROJECT PLANS, NORTH CAROLINA SEDIMENT AND EROSION CONTROL GUIDELINES AND AS DIRECTED BY THE DESIGNER.

3. ALL EXCAVATED MATERIAL SHALL BE STOCKPILED WITHIN THE LIMITS OF DISTURBANCE FOR LATER USE AS FILL MATERIAL. THE CONTRACTOR IS RESPONSIBLE FOR INSTALLING SILT FENCE AROUND THE STOCKPILE AREA(S) AND ANY TEMPORARY OR PERMANENT SPOIL AND TOPSOIL PILES TO PREVENT EROSION AND SEDIMENTATION.

4. IN THE EVENT OF A STORM, THE CONTRACTOR WILL BE RESPONSIBLE FOR REMOVAL OR PROTECTION OF ANY EQUIPMENT, TOOLS, MATERIALS OR OTHER ITEMS NEEDED TO COMPLETE THE WORK THAT COULD BE AFFECTED BY STORMWATER.

5. EACH SEDIMENT CONTROL DEVICE WILL BE REMOVED AFTER ALL WORK IN THE CORRESPONDING CONSTRUCTION PHASE HAS BEEN COMPLETED AND THE AREAS HAVE BEEN STABILIZED.

6. THE CONSTRUCTION ENTRANCES AND STAGING AREAS IDENTIFIED ON THE PLANS PROVIDE THE ONLY ACCESS POINTS INTO THE LIMITS OF DISTURBANCE. NO ADDITIONAL ACCESS POINTS SHALL BE USED WITHOUT APPROVAL OF THE DESIGNER.

7. SILT FENCE SHALL BE INSTALLED ON THE LOW SIDE OF ANY TEMPORARY OR PERMANENT SPOIL AND TOPSOIL PILES. THESE SPOIL PILES SHALL ALSO BE SEEDED AND MULCHED FOR VEGETATIVE STABILIZATION WITHIN 7 DAYS THAT THEY ARE CREATED. ALL SPOIL MATERIAL SHALL STAY ON THE SITE AND SHALL NOT BE REMOVED FROM THE SUBJECT PROPERTY.

8. ALL EROSION AND SEDIMENT CONTROL PRACTICES WILL BE CHECKED FOR STABILITY AND FUNCTIONAL OPERATION FOLLOWING EVERY RUNOFF PRODUCING RAIN EVENT AND/OR AT LEAST ONCE PER WEEK. ANY NEEDED MAINTENANCE OR REPAIRS SHALL BE MADE IMMEDIATELY TO MAINTAIN ALL MEASURES AS DESIGNED. ACCUMULATED SEDIMENT SHALL BE REMOVED FROM CONTROL MEASURES WHEN THEY REACH APPROXIMATELY 50% OF THEIR FUNCTIONAL CAPACITY. THESE MEASURES SHALL BE REPAIRED IF DISTURBED DURING MAINTENANCE. ALL SEEDED AREAS SHALL BE FERTILIZED, RESEEDED AND MULCHED, AS NECESSARY, TO PROMOTE THE ESTABLISHMENT OF VEGETATION COVER.

9. THE CONSTRUCTION MANAGER AND EROSION CONTROL CONTACT FOR THIS SITE IS TIM MORRIS. OFFICE PHONE - 919-783-9214 CELL PHONE - 919-793-6886

10. ALL EXCESS WASTE MATERIAL SHALL BE DISPOSED OF AT A PERMITTED FACILITY OR SITE (15A NCAC 04B .0110)

MAJOR ELEMENTS OF DWQ CONSTRUCTION GENERAL PERMIT

1) GROUND STABILIZATION		
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 3:1 OR FLATTER	14 DAYS	7-DAYS FOR SLOPES GREATER THAN 50 FEET IN LENGTH
ALL OTHER AREAS WITH SLOPES FLATTER THAN 4:1	14 DAYS	NONE (EXCEPT FOR PERIMETERS AND HQW ZONES)

2) BUILDING WASTES HANDLING
- NO PAINT OR LIQUID WASTES IN STREAM OR STORM DRAINS.
- DEDICATED AREAS FOR DEMOLITION, CONSTRUCTION AND OTHER WASTES MUST BE LOCATED 50' FROM STORM DRAINS AND STREAMS UNLESS NO REASONABLE ALTERNATIVES AVAILABLE.
- EARTHEN-MATERIAL STOCKPILES MUST BE LOCATED 50' FROM STORM DRAINS AND STREAMS UNLESS NO REASONABLE ALTERNATIVES AVAILABLE.
- CONCRETE MATERIALS MUST BE CONTROLLED TO AVOID CONTACT WITH SURFACE WATERS, WETLANDS, OR BUFFERS.

3) DISCHARGES TO FEDERALLY-LISTED WATERS
- REQUIREMENTS ARE THE SAME AS IN PREVIOUS PERMIT.
- THE PERMIT ALLOWS REDUCTION FROM THE 20 ACRE MINIMUM IF THE DIRECTOR OF DWQ DETERMINES THAT OTHER BMPS PROVIDE EQUIVALENT PROTECTION.

4) INSPECTIONS
- SAME WEEKLY INSPECTION REQUIREMENTS.
- SAME RAIN GAUGE & INSPECTIONS AFTER 0.5" RAIN EVENT.
- INSPECTIONS ARE ONLY REQUIRED DURING "NORMAL BUSINESS HOURS".
- INSPECTION REPORTS MUST BE AVAILABLE ON-SITE DURING BUSINESS HOURS UNLESS A SITE-SPECIFIC EXEMPTION IS APPROVED.
- RECORDS MUST BE KEPT FOR 3 YEARS AND AVAILABLE UPON REQUEST.
- ELECTRONICALLY-AVAILABLE RECORDS MAY BE SUBSTITUTED UNDER CERTAIN CONDITIONS.

5) IMPLEMENTATION OF NEW PERMIT CONDITIONS
- PROJECTS PERMITTED UNDER THE PREVIOUS PERMIT CAN CONTINUE TO FOLLOW THE PREVIOUSLY-PERMITTED CONDITIONS.
- COMPLETE APPLICATIONS RECEIVED PRIOR TO AUGUST 3, 2011 CAN FOLLOW CONDITIONS OF APPROVED APPLICATION.
- APPLICATIONS RECEIVED AFTER AUGUST 2, 2011 MUST COMPLY WITH NEW PERMIT CONDITIONS.

6) CONDITIONS IN EROSION & SEDIMENTATION CONTROL PLANS*
- DESIGNATION ON THE PLANS WHERE THE 7 AND 14-DAY GROUND STABILIZATION REQUIREMENTS OF THE NPDES PERMIT APPLY.
- DESIGNATION ON THE PLANS WHERE BASINS THAT COMPLY WITH THE SURFACE-WITHDRAWAL REQUIREMENTS OF THE NPDES PERMIT ARE LOCATED.

7) BUILDING WASTES HANDLING
- NO PAINT OR LIQUID WASTES IN STREAM OR STORM DRAINS
- DEDICATED AREAS FOR DEMOLITION, CONSTRUCTION AND OTHER WASTES LOCATED 50' FROM STORM DRAINS AND STREAMS UNLESS NO REASONABLE ALTERNATIVES ARE AVAILABLE.
- EARTHEN-MATERIAL STOCKPILES LOCATED 50' FROM STORM DRAINS UNLESS NO REASONABLE ALTERNATIVES AVAILABLE.
- CONCRETE MATERIALS MUST BE CONTROLLED TO AVOID CONTACT WITH SURFACE WATERS, WETLANDS, OR BUFFERS.

8) SEDIMENT BASINS
- OUTLET STRUCTURES MUST WITHDRAW FROM BASIN SURFACE UNLESS DRAINAGE AREA IS LESS THAN 1 ACRE.
- USE ONLY DWQ-APPROVED FLOCCULANTS.

SEDIMENTATION & EROSION CONTROL PLAN LEGEND

STREAM TO BE FILLED .....
SILT FENCE ..... SF
STRAW WADDLE ..... W
LIMITS OF DISTURBANCE ..... LOD
BRIDGE MAT STREAM CROSSING .....
ROCK SILT SCREEN .....
EXISTING TREELINE .....

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

TEMPORARY SEED MIX

THE CONTRACTOR SHALL UTILIZE THE FOLLOWING SEED/FERTILIZER MIX IN SEEDING ALL DISTURBED AREAS WITHIN THE PROJECT LIMITS:

SUMMER MIX (MAY 15 - AUGUST 15)
GERMAN MILLET..... SETARIA ITALICA ..... 20 LBS / ACRE
BROWNTOP MILLET.... UROCHLOA RAMOSA..... 20 LBS / ACRE

WINTER MIX (AUGUST 15 - MAY 15)
RYE GRAIN..... SECALE CEREALE..... 120 LBS / ACRE

PERMANENT SEED MIX

SUMMER MIX (MAY 15 -- AUGUST 15)

SPECIES	APPLICATION RATE (IN MIX) % OF MIX	LBS / ACRE
ORCHARDGRASS -- DACTYLIS GLOMERATA	5	1.5
BLUESTEM – ANDROPOGON GLOMERATUS	5	1.5
VIRGINIA WILDRYE -- ELYMUS VIRGINICUS	5	1.5
RIVER OATS -- CHASMANTHIUM LATIFOLIUM	5	1.5
PURPLE LOVE GRASS -- ERAGROSTIS SPECTABILIS	5	1.5
DEERTONGUE – PANICUM CLANDESTINUM	25	7.5
SWITCHGRASS -- PANICUM VIRGATUM	25	7.5
PEARL MILLET -- PENNISETUM GLAUCOMA	25	7.5
TOTALS	100	30

WINTER MIX (AUGUST 15 -- MAY 15)

SPECIES	APPLICATION RATE (IN MIX) % OF MIX	LBS / ACRE
ORCHARDGRASS – DACTYLIS GLOMERATA	5	1.5
BLUESTEM -- ANDROPOGON GLOMERATUS	5	1.5
VIRGINIA WILDRYE -- ELYMUS VIRGINICUS	5	1.5
RIVER OATS – CHASMANTHIUM LATIFOLIUM	5	1.5
PURPLE LOVE GRASS -- ERAGROSTIS SPECTABILIS	5	1.5
DEERTONGUE -- DICHANTHELIUM CLANDESTINUM	25	7.5
SWITCHGRASS – PANICUM VIRGATUM	25	7.5
RYE GRAIN -- SECALE CEREALE	25	7.5
TOTALS	100	30

NOTE:
ADD 10 LBS/ACRE OF RYE TO ABOVE MIXTURE FOR A TOTAL OF 30 LBS/ACRE

FERTILIZER..... 750 LBS / ACRE
LIMESTONE..... 2000 LBS / ACRE

FERTILIZER SHALL BE 10-10-10 ANALYSIS. UPON SOIL ANALYSIS A DIFFERENT RATIO OF FERTILIZER MAY BE USED.

SEEDBED PREPARATION
THE SEEDBED SHALL BE COMPRISED OF LOOSE SOIL AND NOT COMPACTED. THIS MAY REQUIRE MECHANICAL LOOSENING OF THE SOIL. SOIL AMENDMENTS SHOULD FOLLOW THE FERTILIZER AND LIMING DESCRIPTION IN THE ABOVE SECTIONS. FOLLOWING SEEDING, MULCHING SHALL FOLLOW THE BELOW APPLICATION METHODS AND AMOUNTS. AREAS CONTAINING SEVERE SOIL COMPACTION WILL BE SCARIFIED TO A DEPTH OF 8 INCHES.

MULCHING

SEEDED AREAS ARE TO BE PROTECTED BY SPREADING STRAW MULCH UNIFORMLY TO FORM A CONTINUOUS BLANKET (75% COVERAGE = 2 TONS/ACRE).

NOTE: FERTILIZER IS ONLY TO BE APPLIED ONCE. IF TEMPORARY SEED AND FERTILIZER IS APPLIED PRIOR TO PERMANENT SEED, THEN FERTILIZER SHALL NOT BE APPLIED WITH THE PERMANENT SEED.

A	SUBMITTED FOR LAND QUALITY PERMIT					MARCH 2017
					DESCRIPTION	DATE
	REVISIONS				SYM.	

NCDEQ DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SW FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

CEDAR BRANCH
STREAM RESTORATION SITE

RANDOLPH COUNTY, NORTH CAROLINA

DATE: AUGUST 2016
SCALE: N.T.S.

EROSION CONTROL PLAN

SEQUENCE OF CONSTRUCTION:

THE CONTRACTOR IS RESPONSIBLE FOR FOLLOWING THE SEQUENCE OF CONSTRUCTION IN ACCORDANCE WITH THE PLANS AND THE FOLLOWING PROVISIONS, AS DIRECTED BY THE DESIGNER. CONSTRUCTION SHALL PROCEED IN THE SPECIFIED MANNER UNLESS OTHERWISE DIRECTED OR APPROVED BY THE DESIGNER. THE FOLLOWING PROVISIONS, ALONG WITH THE INSTRUCTIONS CONTAINED IN THE PLANS, CONSTITUTE THE SEQUENCE OF CONSTRUCTION.

GENERAL SITE NOTES:

I. THE CONTRACTOR SHALL ONLY CONDUCT STREAM WORK, INCLUDING ALL IN-STREAM STRUCTURES, GRADING, STABILIZATION MEASURES, AND SEEDING, MULCHING, AND MATTING WORK, ON A SECTION OF STREAM THAT SHALL BE ENTIRELY COMPLETED WITHIN A SINGLE DAY. EACH SECTION OF COMPLETED STREAM MUST BE STABILIZED AND MATTED BEFORE FLOW CAN BE RETURNED INTO THE CHANNEL.

II. WHEN WORKING IN STREAMS WITH NO ACTIVE FLOW THE CONTRACTOR IS REQUIRED TO HAVE APPROPRIATELY SIZED PUMPS AND MATERIALS TO INSTALL AND MAINTAIN A TEMPORARY STREAM DIVERSION IN ANTICIPATION OF PENDING STORM EVENTS. WORKING IN A DRY CHANNEL DOES NOT PRECLUDE THE CONTRACTOR FROM HAVING TO COMPLY WITH NOTE I ABOVE.

III. UPON APPROVAL FROM THE DESIGNER, PHASES 2 THROUGH 10 MAY BE CONSTRUCTED IN A DIFFERENT SEQUENCE THAN INDICATED BELOW OR CONCURRENTLY.

IV. ALL CONSTRUCTION WORK SHALL BE DONE DURING PERIODS OF DRY WEATHER (15A NCAC 04B .0106.a.5)

PHASE 1: INITIAL SITE PREPARATION

A. IDENTIFY PROJECT BOUNDARY, LIMITS OF DISTURBANCE, SENSITIVE AREAS, STAGING AREAS, STABILIZED ENTRANCES, TEMPORARY CROSSINGS AND ACCESS POINTS WITH THE DESIGNER.
B. CONSTRUCT ENTRANCE AND STAGING AREAS AND THEIR ASSOCIATED SEDIMENT AND EROSION CONTROL DEVICES IN A MANNER TO SUPPORT EXECUTION OF THE RESTORATION IN PHASES AS INDICATED IN THE PLANS AND AS DIRECTED BY THE DESIGNER.

PHASE 2: STREAM REACH T1 - STA. 55+50 TO 61+18

A. COMPLETE CHANNEL WORK IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:
   i. ENSURE THAT ALL SEDIMENT AND EROSION CONTROL MEASURES HAVE BEEN INSTALLED ALONG EXISTING AND NEW CHANNEL AND ARE IN WORKING CONDITION.
   ii. ESTABLISH AN ISOLATED WORK AREA BY INSTALLING IMPERVIOUS DIKES AND TEMPORARY CHANNEL DIVERSION AND DIVERT FLOWS AROUND THE DESIGNATED WORK AREA. (LENGTH OF ISOLATED WORK AREA IS LEFT TO THE DISCRETION OF THE CONTRACTOR).
   iii. COMPLETE CHANNEL GRADING AS DIRECTED IN THE PLANS. INSTALL ANY BANK STABILIZATION TREATMENTS AND IN-STREAM STRUCTURES.
   iv. SEED AND MULCH COMPLETED WORK AREAS AND INSTALL STRAW WADDLES ALONG COMPETED STREAM BANKS.

PHASE 3: STREAM REACH UTCC - STA. 10+00 TO 32+15

A. COMPLETE CHANNEL WORK IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:
   i. ENSURE THAT ALL SEDIMENT AND EROSION CONTROL MEASURES HAVE BEEN INSTALLED ALONG EXISTING AND NEW CHANNEL AND ARE IN WORKING CONDITION.
   ii. ESTABLISH AN ISOLATED WORK AREA BY INSTALLING IMPERVIOUS DIKES AND TEMPORARY CHANNEL DIVERSION AND DIVERT FLOWS AROUND THE DESIGNATED WORK AREA. (LENGTH OF ISOLATED WORK AREA IS LEFT TO THE DISCRETION OF THE CONTRACTOR).
   iii. COMPLETE CHANNEL GRADING AS DIRECTED IN THE PLANS. THIS SECTION WILL TIE INTO THE EXISITING STREAM AT 32+15 TO BYPASS THE DOWNSTREAM OFFLINE SECTION (PHASE 4). INSTALL ANY BANK STABILIZATION TREATMENTS AND IN-STREAM STRUCTURES.
   iv. SEED AND MULCH COMPLETED WORK AREAS AND INSTALL STRAW WADDLES ALONG COMPETED STREAM BANKS.

PHASE 4: STREAM REACH UTCC - STA. 33+00 TO STA. 45+00 (OFFLINE SECTION)

A. COMPLETE CHANNEL WORK IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:
   i. INSTALL SEDIMENT AND EROSION CONTROL MEASURES ALONG EXISTING CHANNEL AS DEPICTED ON THE PLANS.
   ii. ESTABLISH AN ISOLATED WORK AREA BY INSTALLING IMPERVIOUS DIKES AND TEMPORARY CHANNEL DIVERSION AND DIVERT FLOWS AROUND THE DESIGNATED WORK AREA (LENGTH OF ISOLATED WORK AREA IS LEFT TO THE DISCRETION OF THE CONTRACTOR).
   iii. WORKING FROM DOWNSTREAM TO UPSTREAM, COMPLETE CHANNEL GRADING AND INSTALL ANY BANK STABILIZATION TREATMENTS OR STRUCTURES AS DIRECTED IN THE PLANS. THIS WILL ALLOW POSITIVE DRAINAGE OF THE NEW STREAM INTO THE EXISTING STREAM DURING CONSTRUCTION OF THE OFFLINE SECTION.
   iv. STOCKPILE SPOIL ALONG OLD STREAM FOR EASY FILL ONCE OFFLINE SECTION HAS BEEN COMPLETED.
   v. SEED AND MULCH COMPLETED WORK AREAS AND INSTALL STRAW WADDLES ALONG COMPETED STREAM BANKS.

PHASE 5: STREAM REACH UTCC - STA. 32+15 TO 33+00 (CONNECT FINISHED UPSTREAM TO OFFLINE SECTION)

A. COMPLETE CHANNEL WORK IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:
   i. ENSURE THAT ALL SEDIMENT AND EROSION CONTROL MEASURES HAVE BEEN INSTALLED AND ARE IN WORKING CONDITION.
   ii. ESTABLISH AN ISOLATED WORK AREA BY INSTALLING IMPERVIOUS DIKES AND TEMPORARY CHANNEL DIVERSION AND DIVERT FLOWS AROUND THE DESIGNATED WORK AREA.
   iii. CONNECT THE FINISHED UPSTREAM SECTION TO THE NEW OFFLINE SECTION BY FINISHING STREAM GRADING FROM STATION 32+15 TO 33+00 AND INSTALL ANY BANK STABILIZATION TREATMENTS OR STRUCTURES AS DIRECTED IN THE PLANS. THIS PHASE WILL INTRODUCE THE FLOW INTO THE NEW STREAM, BYPASSING THE OLD STREAM.
   iv. SEED AND MULCH COMPLETED WORK AREAS AND INSTALL STRAW WADDLES ALONG COMPETED STREAM BANKS.
   v. ONCE THE NEW OFFLINE SECTION HAS BEEN CONNECTED TO THE FINISHED UPSTREAM SECTION, AND ALL EROSION AND CONTROL STRUCTRES ARE IN PLACE, THE OLD (NOW OFFLINE) SECTION OF STREAM CAN BE FILLED. SEED AND MULCH ALL COMPLETED WORK AREAS.

PHASE 6: STREAM REACH T5 - STA. 300+00 TO 300+96

A. COMPLETE CHANNEL WORK IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:
   i. ENSURE THAT ALL SEDIMENT AND EROSION CONTROL MEASURES HAVE BEEN INSTALLED ALONG EXISTING AND NEW CHANNEL AND ARE IN WORKING CONDITION.
   ii. ESTABLISH AN ISOLATED WORK AREA BY INSTALLING IMPERVIOUS DIKES AND TEMPORARY CHANNEL DIVERSION AND DIVERT FLOWS AROUND THE DESIGNATED WORK AREA. (LENGTH OF ISOLATED WORK AREA IS LEFT TO THE DISCRETION OF THE CONTRACTOR).
   iii. COMPLETE CHANNEL GRADING AS DIRECTED IN THE PLANS. INSTALL ANY BANK STABILIZATION TREATMENTS AND IN-STREAM STRUCTURES.
   iv. SEED AND MULCH COMPLETED WORK AREAS AND INSTALL STRAW WADDLES ALONG COMPETED STREAM BANKS.

PHASE 7: STREAM REACH T2 - STA. 80+00 TO 81+27

A. COMPLETE CHANNEL WORK IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:
   i. ENSURE THAT ALL SEDIMENT AND EROSION CONTROL MEASURES HAVE BEEN INSTALLED ALONG EXISTING AND NEW CHANNEL AND ARE IN WORKING CONDITION.
   ii. ESTABLISH AN ISOLATED WORK AREA BY INSTALLING IMPERVIOUS DIKES AND TEMPORARY CHANNEL DIVERSION AND DIVERT FLOWS AROUND THE DESIGNATED WORK AREA. (LENGTH OF ISOLATED WORK AREA IS LEFT TO THE DISCRETION OF THE CONTRACTOR).
   iii. COMPLETE CHANNEL GRADING AS DIRECTED IN THE PLANS. INSTALL ANY BANK STABILIZATION TREATMENTS AND IN-STREAM STRUCTURES.
   iv. SEED AND MULCH COMPLETED WORK AREAS AND INSTALL STRAW WADDLES ALONG COMPETED STREAM BANKS.

PHASE 8: STREAM REACH T3 / 3-1 - STA. 90+00 TO 101+78 / 150+00 TO 150+78

A. COMPLETE CHANNEL WORK IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:
   i. ENSURE THAT ALL SEDIMENT AND EROSION CONTROL MEASURES HAVE BEEN INSTALLED ALONG EXISTING AND NEW CHANNEL AND ARE IN WORKING CONDITION.
   ii. ESTABLISH AN ISOLATED WORK AREA BY INSTALLING IMPERVIOUS DIKES AND TEMPORARY CHANNEL DIVERSION AND DIVERT FLOWS AROUND THE DESIGNATED WORK AREA. (LENGTH OF ISOLATED WORK AREA IS LEFT TO THE DISCRETION OF THE CONTRACTOR).
   iii. COMPLETE CHANNEL GRADING AS DIRECTED IN THE PLANS. INSTALL ANY BANK STABILIZATION TREATMENTS AND IN-STREAM STRUCTURES.
   iv. SEED AND MULCH COMPLETED WORK AREAS AND INSTALL STRAW WADDLES ALONG COMPETED STREAM BANKS.

PHASE 9: STREAM REACH T4 - STA. 250+00 TO 257+42

A. COMPLETE CHANNEL WORK IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:
   i. ENSURE THAT ALL SEDIMENT AND EROSION CONTROL MEASURES HAVE BEEN INSTALLED ALONG EXISTING AND NEW CHANNEL AND ARE IN WORKING CONDITION.
   ii. ESTABLISH AN ISOLATED WORK AREA BY INSTALLING IMPERVIOUS DIKES AND TEMPORARY CHANNEL DIVERSION AND DIVERT FLOWS AROUND THE DESIGNATED WORK AREA. (LENGTH OF ISOLATED WORK AREA IS LEFT TO THE DISCRETION OF THE CONTRACTOR).
   iii. COMPLETE CHANNEL GRADING AS DIRECTED IN THE PLANS. INSTALL ANY BANK STABILIZATION TREATMENTS AND IN-STREAM STRUCTURES.
   iv. SEED AND MULCH COMPLETED WORK AREAS AND INSTALL STRAW WADDLES ALONG COMPETED STREAM BANKS.

PHASE 10: STREAM REACH T5 - STA. 300+00 TO 300+96

A. COMPLETE CHANNEL WORK IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:
   i. ENSURE THAT ALL SEDIMENT AND EROSION CONTROL MEASURES HAVE BEEN INSTALLED ALONG EXISTING AND NEW CHANNEL AND ARE IN WORKING CONDITION.
   ii. ESTABLISH AN ISOLATED WORK AREA BY INSTALLING IMPERVIOUS DIKES AND TEMPORARY CHANNEL DIVERSION AND DIVERT FLOWS AROUND THE DESIGNATED WORK AREA. (LENGTH OF ISOLATED WORK AREA IS LEFT TO THE DISCRETION OF THE CONTRACTOR).
   iii. COMPLETE CHANNEL GRADING AS DIRECTED IN THE PLANS. INSTALL ANY BANK STABILIZATION TREATMENTS AND IN-STREAM STRUCTURES.
   iv. SEED AND MULCH COMPLETED WORK AREAS AND INSTALL STRAW WADDLES ALONG COMPETED STREAM BANKS.

PHASE 11: RIPARIAN BUFFER PLANTING

A. PHASE 11 CAN BE INITIATED AFTER THE STREAM WORK IS COMPLETED IN EACH SECTION OF THE PROJECT.
B. PLANTS SHALL BE PLANTED DURING THE DORMANT SEASON (NOVEMBER 17 - MARCH 17).
C. PREPARE AND PLANT BANK AND RIPARIAN VEGETATION IN ACCORDANCE WITH PLAN SHEET 16 AND AS DIRECTED BY THE DESIGNER.

PHASE 12: COMPLETION OF PROJECT SITE

A. REMOVE ALL REMAINING WASTE MATERIALS AND RESTORE THE REMAINING STAGING AND STOCKPILING AREAS AND CONSTRUCTION ENTRANCES TO THEIR PRIOR CONDITION. REMOVE TEMPORARY CROSSINGS AND INSTALL BANK STABILIZATION TREATMENTS, AND PLANT, SEED AND MULCH DISTURBED AREAS. SEED AND MULCH ALL DISTURBED AREAS UTILIZING THE SEED/MULCH MIXES SPECIFIED IN THE PLANS.

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS

	DESCRIPTION	DATE
A	SUBMITTED FOR LAND QUALITY PERMIT	MARCH 2017

NCDEQ DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

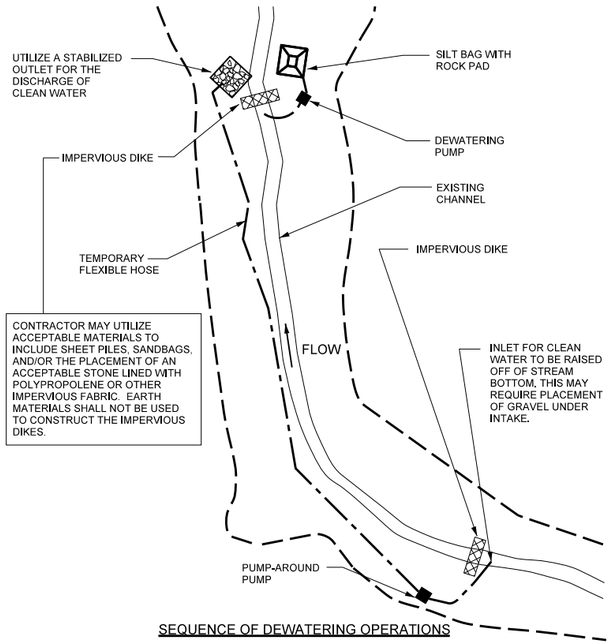
CEDAR BRANCH
STREAM RESTORATION SITE

RANDOLPH COUNTY, NORTH CAROLINA

DATE: AUGUST 2016
SCALE: N.T.S.

EROSION CONTROL PLAN

SHEET 19 OF 23



SEQUENCE OF DEWATERING OPERATIONS

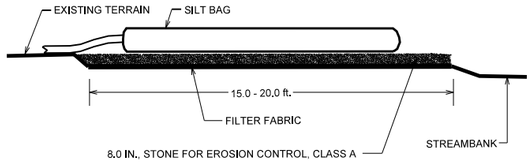
* ANY DEVIATION FROM ABOVE DEWATERING PLAN WILL REQUIRE DESIGNER APPROVAL.

1. INSTALL SILT BAGS(S) AND ROCK PAD(S).
2. INSTALL UPSTREAM PUMP AND TEMPORARY FLEXIBLE HOSE.
3. PLACE UPSTREAM IMPERVIOUS DIKE AND BEGIN PUMPING OPERATIONS FOR STREAM DIVERSION.
4. PLACE DOWNSTREAM IMPERVIOUS DIKE AND PUMPING APPARATUS. DEWATER ENTRAPPED AREA.
5. PERFORM REPAIR WORK IN ACCORDANCE WITH THE PLANS.
6. EXCAVATE ANY ACCUMULATED SILT AND DEWATER BEFORE REMOVAL OF IMPERVIOUS DIKES. REMOVE IMPERVIOUS DIKES, PUMPS, AND TEMPORARY FLEXIBLE HOSE (DOWNSTREAM IMPERVIOUS DIKES FIRST).
7. REMOVE SILT BAG(S) AND STABILIZE DISTURBED AREA WITH SEED AND MULCH.

EXAMPLE OF PUMP-AROUND OPERATION

SCALE: NTS

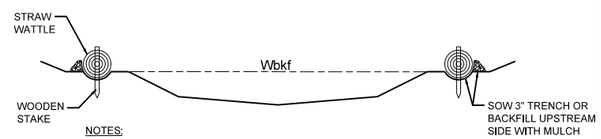
STILLING BASIN MAINTENANCE:
1. SEDIMENT BAGS SHALL BE REPLACED AND DISPOSED OF WHEN IT IS THREE-QUARTERS FULL OF SEDIMENT OR WHEN IT IS IMPRACTICAL FOR THE BAG TO FILTER THE SEDIMENT OUT AT A REASONABLE FLOW RATE.
2. ACCUMULATED SEDIMENT SHOULD BE DISPOSED OF IN A DESIGNATED DISPOSAL AREA.
3. SPENT BAGS SHOULD BE DISPOSED OF PROPERLY AND NOT BURIED.
4. GRAVEL PADS SHOULD BE CHECKED DAILY DURING USE TO ENSURE THAT GRAVEL HAS NOT BEEN WASHED AWAY OR BEEN CHOKED BY EXCESSIVE SEDIMENTATION.
5. REPLACE PAD WITH CLEAN GRAVEL, AS NEEDED.



NOTE: PROVIDE STABILIZED OUTLET DOWN BANK TO STREAM

SPECIAL STILLING BASIN (SILT BAG) WITH ROCK PAD

SCALE: NTS



NOTES:

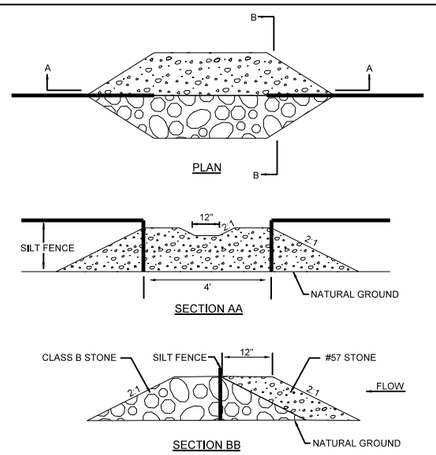
WATTLES SHALL BE INSTALLED ACCORDING TO THE MANUFACTURERS SPECIFICATIONS.

WATTLES SHALL BE INSTALLED ADJACENT TO THE TOP OF NEW CHANNEL BANKS.

ALL WADDLE JUNCTIONS SHALL BE OVERLAPPED AND STAKED TO ENSURE CONTINUOUS PROTECTION ALONG STREAM BANKS.

STRAW WATTLE DETAIL

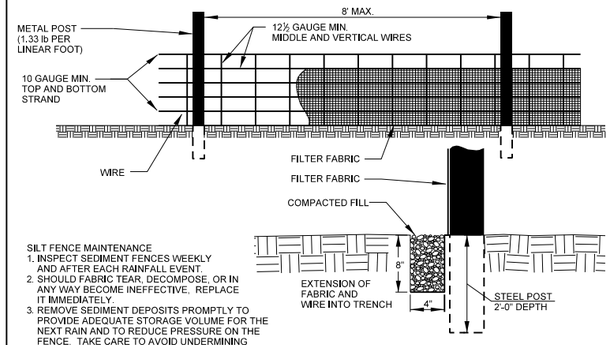
NOT TO SCALE



SILT FENCE ROCK OUTLET MAINTENANCE:
1. REMOVE SEDIMENT WHEN IT ACCUMULATES TO ONE-HALF THE DESIGN VOLUME.
2. CHECK STRUCTURE AND ABUTMENTS FOR EROSION, PIPING, OR ROCK DISPLACEMENT. REPAIR IMMEDIATELY.
3. REMOVE ROCK OUTLET WHEN CONTRIBUTING DRAINAGE AREA HAS BEEN PERMANENTLY STABILIZED, INSPECTED AND APPROVED. REMOVE ALL WATER AND SEDIMENT PRIOR TO REMOVING SCREEN. DISPOSE OF WASTE MATERIAL IN DESIGNATED DISPOSAL AREA.

TEMPORARY SILT FENCE ROCK OUTLET DETAIL

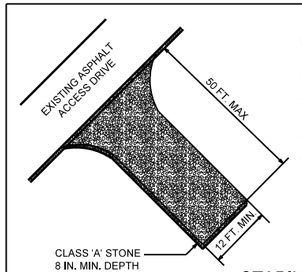
SCALE: NTS



SILT FENCE MAINTENANCE
1. INSPECT SEDIMENT FENCES WEEKLY AND AFTER EACH RAINFALL EVENT.
2. SHOULD FABRIC TEAR, DECOMPOSE, OR IN ANY WAY BECOME INEFFECTIVE, REPLACE IT IMMEDIATELY.
3. REMOVE SEDIMENT DEPOSITS PROMPTLY TO PROVIDE ADEQUATE STORAGE VOLUME FOR THE NEXT RAIN AND TO REDUCE PRESSURE ON THE FENCE. TAKE CARE TO AVOID UNDERMINING FENCE DURING CLEANOUT.
4. REMOVE ALL FENCING MATERIALS AND UNSTABLE SEDIMENT DEPOSITS AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED, INSPECTED AND APPROVED. BRING THE DISTURBED AREA TO GRADE AND STABILIZE AS SHOWN IN THE VEGETATION PLAN.

SILT FENCE DETAIL

SCALE: NTS

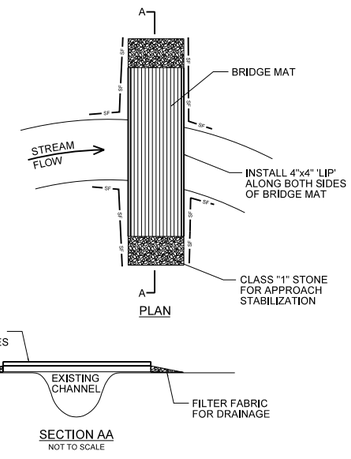


NOTES:
1. TURNING RADIUS SUFFICIENT TO ACCOMODATE LARGE TRUCKS SHALL BE PROVIDED.
2. ENTRANCE(S) SHOULD BE LOCATED TO PROVIDE FOR UTILIZATION BY ALL CONSTRUCTION VEHICLES.
3. MUST BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR DIRECT FLOW OF MUD ONTO STREETS. PERIODIC TOPDRESSING WITH STONE WILL BE NECESSARY.
4. ANY MATERIAL TRACKED ONTO THE ROADWAY MUST BE CLEANED UP IMMEDIATELY.
5. GRAVEL CONSTRUCTION ENTRANCE SHALL BE LOCATED AT ALL POINTS OF INGRESS AND EGRESS UNTIL SITE IS STABILIZED. FREQUENT CHECKS OF THE DEVICE AND TIMELY MAINTENANCE MUST BE PROVIDED.

STABILIZED CONSTRUCTION ENTRANCE DETAIL

SCALE: NTS

STREAM CROSSING MAINTENANCE:
1. INSPECT TEMPORARY CROSSING AFTER EACH RAINFALL EVENT FOR ACCUMULATION OF DEBRIS, BLOCKAGE, EROSION OF ABUTMENTS AND OVERFLOW AREAS, CHANNEL SCOUR, RIPRAP DISPLACEMENT, OR PIPING ALONG CULVERTS.
2. REMOVE DEBRIS, REPAIR AND REINFORCE DAMAGED AREAS IMMEDIATELY TO PREVENT FURTHER DAMAGE TO THE INSTALLATION.



1. BRIDGE LOCATIONS DEPICTED ON SITE PLANS ARE APPROXIMATE AND ARE SUBJECT TO CHANGE DEPENDING ON THE AREA THAT IS BEING WORKED UPON.
2. WIDTH OF EACH MAT IS DEPENDENT ON THE SIZE OF THE EQUIPMENT MEANT TO CROSS IT.
3. DISTANCE BETWEEN MATS IS DEPENDENT ON THE DISTANCE BETWEEN TRACKS ON THE EQUIPMENT MEANT TO CROSS IT.
4. APPROACH STABILIZATION, COMPOSED OF CLASS 1 STONE, WILL BE REQUIRED FOR EACH SECTION OF THE BRIDGE.

TEMPORARY BRIDGE MAT CROSSING

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS

	DESCRIPTION	DATE
A	SUBMITTED FOR LAND QUALITY PERMIT	MARCH 2017

NCDEQ DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

CEDAR BRANCH
STREAM RESTORATION SITE

RANDOLPH COUNTY, NORTH CAROLINA

DATE: AUGUST 2016
SCALE: N.T.S.

EROSION CONTROL PLAN

SHEET 20 OF 23

N/F
QUENTIN FARLOW
PIN 7725919635
DB 1797 PG 870

N/F
TERRY & SHARON
FARLOW
(GERALDINE FARLOW
LIFE ESTATE)
PIN 7725946466
DB 2220 PG 1422

N/F
DEAN CROTTS
PIN 7725942860
PB 103 PG 66
DB 1969 PG 2009

N/F
TERRY FARLOW
PIN 7725951095
DB 1134 PG 262

N/F
JOEL FARLOW
PIN 7725858626
DB 1040 PG 208

N/F
JOEL FARLOW
PIN 7725953947
DB 970 PG 160

N/F
ROSALYNE MCCOY
PIN 7725964321
DB 1270 PG 303

MT OLIVE CHURCH RD
NCSR 1536
(60' PUBLIC R/W)

CONSERVATION EASEMENT

BEGIN
TRIBUTARY 5

BEGIN
TRIBUTARY 3-1

FARLOW PINES DRIVE
(GRAVEL)

N/F
RUTH FARLOW EST
PIN 7725695605
DB 2419 PG 923

N/F
RAYMOND DAVIS
PIN 7725968895
DB 1642 PG 4

EXISITNG EARTHEN
ACCESS DRIVE

PROPOSED
STAGING AREA
(TYPICAL)

PROPOSED STABILIZED
CONSTRUCTION ENTRANCE

BEGIN
TRIBUTARY 1

N/F
JOSEPH NELSON
PIN 7735062951
DB 2124 PG 159

N/F
JOSEPH NELSON
PIN 7735075018
DB 2214 PG 1881

BEGIN
TRIBUTARY 1-1

BEGIN
TRIBUTARY 4

BEGIN
TRIBUTARY 2

BEGIN
UTCC

N/F
SETH FARLOW
PIN 7735037488
DB 2345 PG 248

N/F
PAUL FARLOW
PIN 7735046274
DB 1253 PG 732

N/F
WARREN BENNETT L.EST
PIN 7735130765
DB 2440 PG 1540

N/F
ALLISON FARLOW
THOMAS
PIN 7735140010
DB 2421 PG 292

N/F
COLON FARLOW
PIN 7735244800
DB 2361 PG 1545

N/F
JOSEPH MILLIKAN
PIN 7735164219
DB 2271 PG 5

NC GRID
NAD '83

–130′ –65′ 0′ 130′ 260′
GRAPHIC SCALE

NORTH CAROLINA
PROFESSIONAL
SEAL
32733
ENGINEER
GARY MICHAEL MRYNCZA

REVISIONS			
NO.	DESCRIPTION	DATE	
A	SUBMITTED FOR LAND QUALITY PERMIT	MARCH 2017	

NCDEQ DIVISION OF
MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

CEDAR BRANCH
STREAM RESTORATION SITE
RANDOLPH COUNTY, NORTH CAROLINA

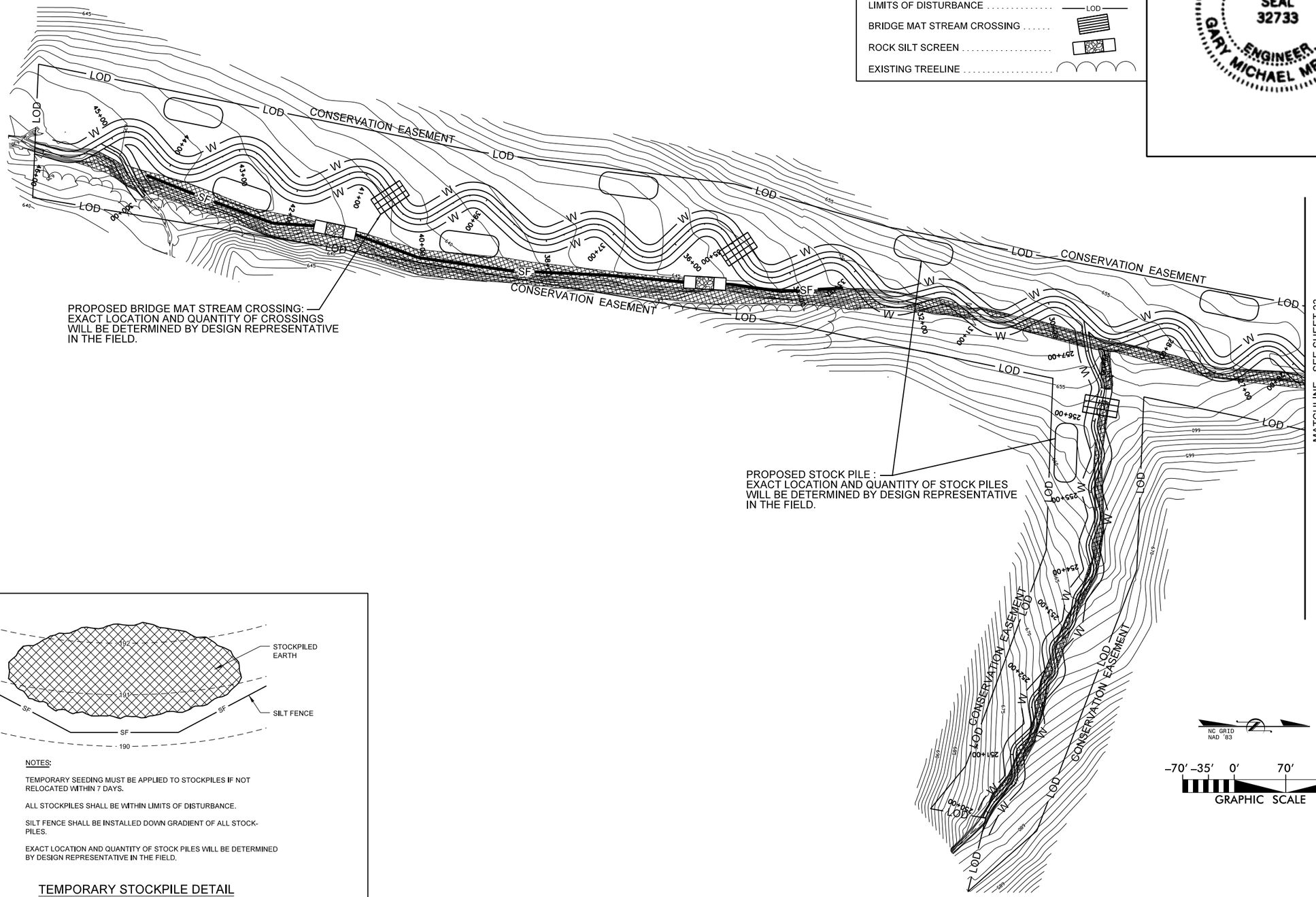
DATE: AUGUST 2016
SCALE: GRAPHIC

EROSION
CONTROL
PLAN
-OVERVIEW-

SHEET 21 OF 23

SEDIMENTATION & EROSION CONTROL PLAN LEGEND

- STREAM TO BE FILLED
- SILT FENCE — SF
- STRAW WADDLE — W
- LIMITS OF DISTURBANCE — LOD
- BRIDGE MAT STREAM CROSSING
- ROCK SILT SCREEN
- EXISTING TREELINE



PROPOSED BRIDGE MAT STREAM CROSSING: EXACT LOCATION AND QUANTITY OF CROSSINGS WILL BE DETERMINED BY DESIGN REPRESENTATIVE IN THE FIELD.

PROPOSED STOCK PILE : EXACT LOCATION AND QUANTITY OF STOCK PILES WILL BE DETERMINED BY DESIGN REPRESENTATIVE IN THE FIELD.

LIMITS OF DISTURBANCE = 18.51 ACRES

NOTES:

TEMPORARY SEEDING MUST BE APPLIED TO STOCKPILES IF NOT RELOCATED WITHIN 7 DAYS.

ALL STOCKPILES SHALL BE WITHIN LIMITS OF DISTURBANCE.

SILT FENCE SHALL BE INSTALLED DOWN GRADIENT OF ALL STOCK-PILES.

EXACT LOCATION AND QUANTITY OF STOCK PILES WILL BE DETERMINED BY DESIGN REPRESENTATIVE IN THE FIELD.

TEMPORARY STOCKPILE DETAIL
SCALE: NTS

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

A	SUBMITTED FOR LAND QUALITY PERMIT	MARCH 2017
	DESCRIPTION	DATE

REVISIONS

NCDEQ DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
460 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

CEDAR BRANCH
STREAM RESTORATION SITE
RANDOLPH COUNTY, NORTH CAROLINA

DATE: AUGUST 2016
SCALE: GRAPHIC

EROSION CONTROL PLAN

SHEET 22 OF 23

SEDIMENTATION & EROSION CONTROL PLAN LEGEND

- STREAM TO BE FILLED
- SILT FENCE — SF
- STRAW WADDLE — W
- LIMITS OF DISTURBANCE — LOD
- BRIDGE MAT STREAM CROSSING
- ROCK SILT SCREEN
- EXISTING TREELINE

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

MATCHLINE - SEE SHEET 22

CONSERVATION EASEMENT

LOD

W

SF

PROPOSED STOCK PILE : EXACT LOCATION AND QUANTITY OF STOCK PILES WILL BE DETERMINED BY DESIGN REPRESENTATIVE IN THE FIELD.

EXISTING GRAVEL ACCESS DRIVE

FARLOW PINES DRIVE ENDS

EXISITNG EARTHEN ACCESS DRIVE

PROPOSED STABILIZED CONSTRUCTION ENTRANCE

PROPOSED STAGING AREA (TYPICAL 4)

PROPOSED BRIDGE MAT STREAM CROSSING: EXACT LOCATION AND QUANTITY OF CROSSINGS WILL BE DETERMINED BY DESIGN REPRESENTATIVE IN THE FIELD.

NC GRID NAD '83

–70′ –35′ 0′ 70′ 140′

GRAPHIC SCALE

LIMITS OF DISTURBANCE = 18.51 ACRES

REVISIONS			
NO.	DESCRIPTION	BY	DATE
A	SUBMITTED FOR LAND QUALITY PERMIT	SYM.	MARCH 2017

NCDEQ DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

CEDAR BRANCH
STREAM RESTORATION SITE

RANDOLPH COUNTY, NORTH CAROLINA

DATE: AUGUST 2016
SCALE: GRAPHIC

EROSION CONTROL PLAN

SHEET 23 OF 23