

FINAL MITIGATION PLAN

Catbird Site
Davie County, North Carolina

Yadkin River Basin
HUC 03040101



DMS Project #: 100022
Contract #: 7186
USACE Action ID: SAW-2017-01506
DWR Project #20171039
RFP: 16-006993

Prepared for:

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

Prepared by:

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Raleigh, NC 27605
919-209-1052



January 2019

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.



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

December 14, 2018

Regulatory Division

Re: NCIRT Review and USACE Approval of the Catbird Mitigation Plan; SAW-2017-01506; NCDMS Project # 100022

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

Dear Mr. Baumgartner:

The purpose of this letter is to provide the North Carolina Division of Mitigation Services (NCDMS) with all comments generated by the North Carolina Interagency Review Team (NCIRT) during the 30-day comment period for the Catbird Mitigation Plan, which closed on December 14, 2018. These comments are attached for your review.

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

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

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

Sincerely,

Kim Browning
Mitigation Specialist
for Henry Wicker

Enclosures

Electronic Copies Furnished:

NCIRT Distribution List
Paul Wiesner – NCDMS



REPLY TO
ATTENTION OF:

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

CESAW-RG/Browning

November 30, 2018

MEMORANDUM FOR RECORD

SUBJECT: Catbird Site Mitigation Project - 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: Catbird Site, Davie County, NC

USACE AID#: SAW-2017-01506

NCDMS #: 100022

30-Day Comment Deadline: November 17, 2018

Mac Haupt, NCDWR:

1. DWR would caution the use of sod mats on projects in areas where active pasture was the past land use. RES in their discussion seemed cognizant of this, however, the on-site manager during construction would hopefully emphasize this to the construction firm.
2. Section 7-Performance Standards- please realize the 30 days of flow is only applicable to intermittent streams. Other perennial streams on site will be expected to have continuous flow.
3. DWR believes there may be flow issues below the crossing on DS-1, DWR recommends RES keep a close eye on that portion of the reach.
4. The design sheets need to show where the existing wetlands occur. Please provide a revised design sheet for this section (S3 ?), the whole set does not need to be revised.
5. DWR likes the format of the design sheets.
6. DWR likes the fact that RES is installing different and diverse bedform structures. In addition, DWR likes the revised typicals provided.

Kim Browning, USACE:

1. Section 7.1—The Entrenchment Ratio (ER) must be above 2.2 for all measured riffle cross-sections on a given reach (for C and E streams), not 1.4. Please correct this in Table 16, as well.
2. Please include a monitoring map which includes the location of veg plots, flow gauges, photo locations, and crest gauges, similar to sheet M1.
3. Even though there are no wetland credits being sought, and existing wetlands are fairly small, the restoration of reach DS2B appears to run through the two wetlands (WA and WB). There will be temporary impacts to these wetlands during construction, but it is anticipated that wetland function will improve from increased hydrology in these areas. It's recommended that a veg plot be placed in this area.
4. Section 7.2—Vegetation Success Criteria: Please add 260 stems per acre to year five.

5. I was unable to locate the Credit Release Schedule.
6. Since it's within the easement boundary, please provide a brief narrative of any maintenance required for the BMP at the top of reach DS1, if any.

Kim Browning
Mitigation Specialist
Regulatory Division

MEMORANDUM



302 Jefferson Street, Suite 110 Raleigh, North Carolina 27605 919.209.1052 tel. 919.829.9913 fax

TO: NCIRT and NCDMS

FROM: Brad Breslow - RES

DATE: January 16, 2019

**RE: Response to Catbird Site NCIRT Comments during 30-day Mitigation Plan Review
DMS Project ID No. 100022, Contract #7186, USACE Action ID #SAW-2017-01506**

Mac Haupt, NCDWR:

1. DWR would caution the use of sod mats on projects in areas where active pasture was the past land use. RES in their discussion seemed cognizant of this, however, the on-site manager during construction would hopefully emphasize this to the construction firm.
[RES agrees with this statement. The on-site manager during construction will also emphasize this to the construction firm.](#)
 2. Section 7-Performance Standards- please realize the 30 days of flow is only applicable to intermittent streams. Other perennial streams on site will be expected to have continuous flow.
[Understood – ‘Intermittent’ has been added to the last sentence in first paragraph of Surface Flow section.](#)
 3. DWR believes there may be flow issues below the crossing on DS-1, DWR recommends RES keep a close eye on that portion of the reach.
[RES will keep a close eye on this portion of the reach and will emphasize to the construction firm about installing clay plugs.](#)
 4. The design sheets need to show where the existing wetlands occur. Please provide a revised design sheet for this section (S3 ?), the whole set does not need to be revised.
[Sheet S3 has been revised to show existing wetlands, WA and WB.](#)
 5. DWR likes the format of the design sheets.
[Thanks!](#)
 6. DWR likes the fact that RES is installing different and diverse bedform structures. In addition, DWR likes the revised typicals provided.
[Thanks!](#)
-

Kim Browning, USACE:

1. Section 7.1—The Entrenchment Ratio (ER) must be above 2.2 for all measured riffle cross-sections on a given reach (for C and E streams), not 1.4. Please correct this in Table 16, as well. [Section 7.1 and Table 16 has been corrected to 2.2.](#)
 2. Please include a monitoring map which includes the location of veg plots, flow gauges, photo locations, and crest gauges, similar to sheet M1. [This has been included as Figure 11. Also, we realized there were far too many cross sections on the original monitoring sheet and both Sheet M1 and Figure 11 reflect these changes.](#)
 3. Even though there are no wetland credits being sought, and existing wetlands are fairly small, the restoration of reach DS2B appears to run through the two wetlands (WA and WB). There will be temporary impacts to these wetlands during construction, but it is anticipated that wetland function will improve from increased hydrology in these areas. It's recommended that a veg plot be placed in this area. [The previous veg plot on DS2-B has been moved up to be in the wetland area.](#)
 4. Section 7.2—Vegetation Success Criteria: Please add 260 stems per acre to year five. [This has been added to Section 7.2.](#)
 5. I was unable to locate the Credit Release Schedule. [It should have been there and apologies if it was not. It is in Appendix D of the Final Mitigation Plan.](#)
 6. Since it's within the easement boundary, please provide a brief narrative of any maintenance required for the BMP at the top of reach DS1, if any. [Because the BMP is within the easement and consists of brush and live stakes, there is no required or planned maintenance.](#)
-

M E M O R A N D U M



302 Jefferson Street, Suite 110 Raleigh, North Carolina 27605 919.209.1052 tel.
919.829.9913 fax

TO: North Carolina Division of Mitigation Services

FROM: Cara Conder - RES

DATE: October 9, 2018

RE: Response to Catbird Site Draft Mitigation Plan Comments DMS Project ID No. 10022, Contract #7186

BASELINE AND EXISTING CONDITIONS

- a) Page 4, last paragraph. Please clarify the sentence beginning “The channel has a moderate bedload and a moderate sediment supply.” What is moderate bedload? Is this reference to substrate size, bedload transport, or coarse sediment? The term “sediment supply” covers all the bases in this sentence. And the substrate is defined in the next sentence.

This section has been revised to incorporate the comment and has been replaced with:

“The project reaches convey an increased sediment load relative to reference conditions. This increased loading is a result of heavy agricultural and livestock practices and has produced a substrate dominated by coarse sand and fine gravel.”

- b) Page 5, paragraph 1. While Catbird lies in the Milton and Charlotte Belts, the specific unit underlying the project is gabbro, an intrusive rock likely part of the mafic-volcanic complexes, or the metagabbros. To find this, I used ARCGIS to overlay the site on the geology.

Geology paragraph has been re-written to more accurately portray USGS 1985 data.

- c) Page 5, land use, paragraph 2 and 3. These 2 paragraphs would be better placed in a section more relevant to the overall treatment of the site.

We kept paragraph 2 in Section 3.3 to address the future land use per the DMS Mitigation Plan Template and Guidance. Paragraph 3 was moved to section 6.4 Mitigation Summary.

- d) Page 9 (reach summaries). Discuss bedrock influence in the channel descriptions. Is future incision possible or does bedrock occur frequently enough to prevent ongoing incision?

This section has been revised to incorporate the comment.

FUNCTIONAL UPLIFT POTENTIAL

- a) Page 13, last paragraph. The reference to determination of credits in the first sentence need to be removed. The discussion of credits and function is not relevant to this mitigation plan. Sentence 2 and 3 referring to applying an ecosystem approach (and sentence 2, a functional based approach (at

the reach scale) are a bit overstated. Additionally, the functions RES is able to address directly from restoration are hydraulic and geomorphology, rather than, as stated, “have the greatest effect on.”
The first sentence of the paragraph was removed based on this comment. The rest of the paragraph was modified to address the concern of overstatements about the beneficial impacts of this restoration project.

Pages 14-16:

- b) Hydraulic. “Healthy” floodplain connectivity? Is the intent to improve/increase the frequency of floodplain access? And, please clarify the reference to stable base flow and instream structures in last sentence.

The intent is to improve/increase frequency of floodplain access. This paragraph was revised to respond to these comments.

- c) Geomorphology. What is not functioning in terms of wood and sediment? Input, output, storage? How will LWD transport and storage be “improved” by installation of instream structures? Is the gradient and bed material in these streams suitable for riffle-pool sequences, or step-pools? DMS does not agree that RES will achieve “dynamic equilibrium” and maximum geomorphic uplift. Please provide clarification.

The paragraph was revised per the comment.

- d) Physicochemical (not physiochemical) - global edit needed.

This edit was made.

- e) Biology. Macroinvertebrates are not difficult to measure, so please remove that statement.

Revisions were made to this sentence in response to the comment.

“As mentioned for the physicochemical stream function, it will be difficult to see measurable results of the functional uplift of the biological functions at a project scale during the monitoring phase of the project.”

- f) Page 16. Livestock removal statement does not belong in this section.

This sentence was removed in response to this comment.

MITIGATION PROJECT GOALS AND OBJECTIVES

Pages 17-18:

- a) Second bullet. Overbanks should be overbank and the word active before floodplain is redundant.

Revisions were made to this sentence in response to the comment.

- b) First bullet under objectives. The last part of the objective “based on...” is unnecessary.

The statement starting with “based on...” was removed.

- c) Will work on enhancement reaches (EII) include bank stabilization, constructed riffles, or woody materials? If not, please remove enhancement from those statements where full restoration is proposed.

Enhancement II reaches will not include these treatments and ‘enhancement’ has been removed from any applicable sentences where it should just be ‘restoration’.

- d) Objective for reducing BHR and increasing ER is implied and understood in objective 1. Recommend modifying or removing.

This objective was removed.

- e) Paragraph beginning ‘Limitations to achieving’ is unnecessary. Recommend removing.
This paragraph was removed.
- f) Please add ‘agricultural’ to the heading to emphasize that treatments will not require long-term maintenance.
‘Agricultural’ was added to the Best Management Practices heading.
- g) The BMP section includes information previously stated and explained in the document. Recommend that removal of cattle and the addition of fencing should be included in the goals/objective table rather than extensive explanation in this section.
The description on livestock removal and fencing installation was removed from the BMP section and included in the goals and objectives.
- h) Table 10 is good for relating goals, objectives and measurement. Why did RES choose to exclude performance standards measurements, e.g., BF events? See suggestions below and please comment.
The crest gauges are used to measure bankfull events. Flow gauges were added to the measurement methods. It was not the intention to exclude any measurements. We go into further detail about these and the connection to the performance standard measurements in Table 16.
- a. The functional parameter column includes variables meant to be measured that will not be applied to this project. Please remove this column. And, please remain realistic in stating the benefits of this restoration, that is, RES is only able to directly affect hydro, geomorph and hydraulics.
This column was removed and table revised.
 - b. Hydrology objective refers to the ag BMP has attenuating runoff. Is this BMP truly designed to achieve this attenuation? And how does RES intend to measure/monitor the integrity of runoff attenuation structure?
The ag BMP is designed to attenuate sediment loading, any flow attenuation is anticipated to be minimal. This statement was therefore removed from Hydrology and incorporated in the Geomorphology. RES will visually monitor the structure to ensure proper function. Livestakes were added to the BMP detail to prolong the functionality of the structure.
 - c. Geomorphology objective to improve pool spacing, percent riffles, etc suggest RES intends to explicitly measure these bedforms, so please remove if that is not the intent. And, stream walk is basically the same as visually monitoring, so please remove.
The project objective to improve bedform is achieved through the design and construction of the project. Improved pool spacing, and percent riffles will be confirmed with an as-built survey and annual visual inspection will ensure that the designed pool and riffle sequence remains intact. Stream walks was removed.
 - d. Biology and Physicochemical also include unmeasurable goals that need to be removed. If RES would like to leave these functions in the table, do not include a goal, objective, of measurement method. Instead, state that as expected benefits.
Language was added to the table for biology and physicochemical functions to make it clear that these are unmeasurable and the expected benefits were clarified.

- e. Vegetation plots and fencing cannot be used to address physicochemical and biology within this framework. Rather, state the goal and objective, i.e., plant buffer, and conduct veg plot surveys.

The physicochemical and biology sections of the table were revised.

- f. The justification for the delta in the functional ratings is not well defined. DMS suggests removal of this column. The intent is understood and appreciated although the execution is not clear.

This column was removed.

MITIGATION WORK PLAN

- a) Page 20. The reference discharge section refers to UT Hauser discharge. Is RES stating that the UT Hauser discharge was used as reference for design? Hauser Creek DA is much larger than this projects' streams. How will the UT Hauser be 'scaled' for this project?

The UT Hauser discharge was included to provide additional information about the reference reach but was not used to determine any design parameters. The reference riffle section was scaled to provide appropriate bankfull conveyance for the design channels. The resulting bankfull width was then used in correlation with the reference alignment and profile ratios to produce the proposed designs.

- b) Page 21. Design approach. This majority of this section is nonspecific and does not provide useful information until the reach specific paragraphs.

Nonspecific information/paragraphs removed from the design approach.

- c) Reach DS1. Is RES 'widening' the riparian area or simply planting wider buffers? And, what is the primary function of the ag BMP?

RES is widening the riparian buffer, not the area. The primary function of the ag BMP is to attenuate sediment loading. The reach description was revised to provide the requested information.

- d) Reach DS1, DS2-A, DS2-B. RES has listed, explained and emphasized the benefits of the project to water quality and habitat throughout the document: DMS suggests further reference be removed.

The additional emphasis on the benefits to water quality within the design reach descriptions has been removed to reduce redundancy.

- e) Reach DS2-B. Will shifting the channel to a new alignment provide appropriate morphology and floodplain connection? Please re-think this statement.

The statement was revised to respond to the comment. "Restoration activities will realign the existing channel to improve stability and floodplain connection. Rock and log structures will be used to provide vertical stability and improved bedform diversity. Log toe structures will be installed on the outside of certain meander bends to provide bank stability. The restoration of the riparian areas will include planting wider riparian buffers and excluding cattle."

- f) Page 23 Design Methods. Please remove this section.

The section was removed in response to the comment.

- g) Page 25-26. Shear stress approach. The shear stress being calculated is the average boundary shear stress. If RES needs to explain this concept, please include critical shear stress in the explanation and report boundary shear accurately.

This section was revised in response to the comment.

- h) The sediment size distribution reported in the morph table (fine gravel and sand) appear to be a magnitude smaller than the sediment sizes referenced in this section. Does RES intend to replace the bed material with larger gravel and cobble? Will the excavated material be large enough to use? If so, will this material be sustained over time?

RES does intend to replace the existing bed material with larger gravel and cobble. RES anticipates a significant portion of this material will come from offsite sources. RES does not anticipate adequate bedload to sustain appropriate bed material and the has therefore sized the proposed bed materials D_{50} to be immobile during bankfull flows.

- i) Table 15 (Mitigation Components). Total existing stream lengths for DS1 and DS2 do not reflect the preliminary JD lengths (see PJD, Appendix I). Please clarify.

The lengths in the preliminary JD were based on a GIS mapping analysis. The lengths in the Mitigation Plan are based on detailed topographic survey information and are more accurate.

- j) IRT meeting minutes (Appendix B) indicated a concern that P1 Restoration near the top of DS-1 may result in loss of seasonal stream flow. RES staff indicated they would base the design and channel origin on the JD and provide post construction flow monitoring to document flow conditions. Please include further discussion in the plan about how stream origin was determined on DS-1, and provide justification for the P1 approach given the intermittent flow and the concern about losing hydrology.

The stream origin is downstream of the confluence of two ephemeral channels and was confirmed by the USACE in the PJD.

The design reach section has been revised to include that DS1 will begin with Priority II restoration. RES has proposed a gradual transition from the existing channel bed profile and multiple channel plugs along the upstream portion of the reach to address hydrology concerns. The reach description was revised to address these concerns.

- k) IRT members also suggested monitoring water quality and/or benthics to document aquatic uplift in the upper end of DS1. Please comment on if/how the plan will address this suggestion.

While this was discussed by the IRT, RES did not think this was a directive that needed to be adhered to. After the meeting, RES explored the possibility of conducting monitoring at this site but determined it was too cost prohibitive due to the small size of the project.

PERFORMANCE STANDARDS

- a) RES state that a flow monitoring device will be placed near the top of DS-1 to document post-construction flow conditions. However, Plan Sheet M1 indicates the planned flow gauge located towards the lower end of DS-1. Please clarify or correct this apparent discrepancy.

Sheet M1 shows a flow gauge at the top of DS1 and a crest gauge at the lower end of DS1.

MONITORING PLAN

- a) Table 16. The functional category definition should not serve as a goal in this project and the monitoring requirements. Please make sure Table 10 and Table 16 do not contradict each other. And, the same comments for Table 10 apply to Table 16, e.g., outcomes (look like the goals from table 19), physicochemical and biology.

The Table was updated to reflect these suggestions.

Plan Sheets

- a) S1 - Culvert needs to be plotted accurately on profile.

Plan sheet has been corrected.

- b) D3 Rock Sill (Section A-A') - Recommend extending filter fabric above footer rock onto header rock.
Detail has been updated.
- c) D3 Brush Toe (Section A-A) - Consider adding an additional course of footer logs to be buried beneath the channel bed to reduce the potential for toe scour.
Detail notes have been added. Channel size at Catbird does not warrant log toes in addition to brush toe protection.
- d) D4 Floodplain Sill – Thank you for including this structure and for providing the detail. Add boulders as an alternate anchoring method if deemed appropriate.
Note added to detail.
- e) D5 Culvert Crossing Plan View – Due to frequent observations of perched sills at these type of culvert treatments please add a channel grade control feature downstream of the culvert outlet to prevent a perched sill.
Typical grade control structure is already called out on plan sheet S1 just downstream of culvert. No change made.
- f) D6 Rock Cross Vane Section A-A' - Extend filter fabric onto header.
Detail has been updated.
- g) E1 (Legend) - Indicates 'existing stream' as blue shading; however, in many locations the apparent stream widths shaded in blue are 50-60 feet wide. Please clarify what exactly does the blue represent, and edit the plan sheets/legend as necessary.
Blue shading has been removed throughout project.

Figures

- a) Figure 1, Vicinity Map: Add text boxes with leaders to call out the several sites shown on the figure.
This revision was made to the Figure 1.
- Figure 10:
- b) Mitigation work plan indicates that an agricultural BMP will be placed at the upper end of DS-1; please show this on the conceptual map.
This revision was made to the Figure 10.
 - c) Please indicate planned culvert crossing on the map.
This revision was made to the Figure 10.
 - d) Please show reach breaks more clearly to match up with the asset table; for example it is not shown where DS-2B starts, where DS-1 (above crossing?) and DS-1 (below crossing?) start and stop. Typically, there is a unique Reach ID assigned for each unique reach / approach combination. Suggest labelling reaches such as DS-1 (upper), DS-1 (lower), DS-2A, DS-2B (upper), DS-2B (middle), DS-2B (lower), or similar. This will make for easier database and asset tracking, credit release discussions, etc.
The labels in Figure 10 and the table in Figure 10 have been revised to more clearly designate where the reaches start and stop. The Table 15 has also been revised to correlate with this revision.

Appendices

Appendix B

- a) Please include the email thread with the IRT site visit meeting memo dated 9/29/2017. Specifically, email dated 10/6/17 from Paul Wiesner copied to RES, dating back to initial memo submittal email dated 10/2/2018, and including additional comments/concerns from IRT about the memo itself.

This has been added to Appendix B.

- b) Morphological Table – The proposed width to depth ratios are low which is consistent with E stream types as previously mentioned in the Mockingbird Project Comments. Please observe all available stability indicators during monitoring to minimize potential adaptive management requirements.

Riffle section W/D ratios were increased slightly. All proposed channel banks on riffle sections are now 2:1 or flatter.

Appendix G, Stream ID Forms

- c) Please provide sketches on the forms or a map showing locations where along each reach the forms were filled out

A map was provided in Appendix G to show the locations along each reach where the forms were filled out.

EXECUTIVE SUMMARY

The Catbird Site (the “Project”) is located in Davie County, North Carolina, approximately eight miles west of Clemmons and five miles northwest of Bermuda Run. Water quality stressors currently affecting the Project include livestock production, agricultural production, and lack of riparian buffer. The Project presents 2,223 linear feet of stream restoration and enhancement generating 2,081 Warm Stream Mitigation Units (SMU). A contracting meeting was held on 9/29/17 among RES, DMS, and IRT, and the meeting minutes can be found in Appendix B.

The Project is located in the Yadkin River Basin within Cataloging Unit 03040101, Target Local Watershed (TLW) 03040101160010, and NC Division of Water Resources (DWR) subbasin 03-07-02. The Project area includes two unnamed tributaries that eventually drain to the Yadkin River. The portion of the Yadkin River that includes the Project’s two tributaries has been assigned a Water Supply-IV classification (WS-IV) (NCDWQ 2011). WS-IV waters are sources of water supply for drinking, culinary, or food processing purposes where a WS-I, II or III classification is not feasible. These waters are also protected for Class C uses (NCDWQ 2011).

Consisting of cattle pastures and wooded areas, the Project’s total easement area is 6.52 acres within the overall drainage area of 53 acres. Grazing livestock have historically had access to all the stream reaches within the Project. The lack of riparian buffer vegetation, deep-rooted vegetation, and unstable channel characteristics have contributed to the degradation of stream banks throughout the Project area.

Goals for the Project include an increase to hydrological function and improving ecological function within the existing stream and riparian corridor, and to protect these features in perpetuity. These will be accomplished by returning the existing streams to stable conditions by constructing an E/C type stream with appropriate dimensions and pattern, reconnecting the channel to the floodplain, and bank stabilization throughout. In-stream structures such as log sills and brush toes will be installed for vertical stability and to improve habitat, where necessary. Buffer improvements will filter runoff from the surrounding pasture lands, thereby reducing nutrient and sediment loads to the channel. Livestock fence will be installed along the easement boundary. The widening and restoration of the riparian buffers will also provide wildlife corridors throughout the Project area. Benefits to be accrued from these activities include improved water quality and terrestrial and aquatic habitat.

The stream design approach for the Project is to combine the analog method of natural channel design with analytical methods to evaluate stream flows and hydraulic performance of the channel and floodplain. The analog method involves the use of a reference reach, or “template” stream, adjacent to, nearby, or previously in the same location as the design reach. The template parameters of the analog reach are replicated to create the features of the design reach. The analog approach is useful when watershed and boundary conditions are similar between the design and analog reaches (Skidmore et al., 2001). Hydraulic geometry was developed using analytical methods to identify the design discharge.

After completion of all construction and planting activities, the Project will be monitored on a regular basis throughout the seven-year post-construction monitoring period, or until performance standards are met. The Project will be transferred to the NCDEQ Stewardship Program. This party shall serve as conservation easement holder and long-term steward for the property and will conduct periodic inspection of the site to ensure that restrictions required in the conservation easement are upheld. Funding will be supplied by the responsible party on a yearly basis until such time an endowment is established.

Table of Contents

| | | |
|-----|---|----|
| 1 | PROJECT INTRODUCTION..... | 1 |
| 1.1 | Project Components | 1 |
| 1.2 | Project Outcomes | 1 |
| 2 | WATERSHED APPROACH..... | 2 |
| 2.1 | Site Selection..... | 2 |
| 3 | BASELINE AND EXISTING CONDITIONS..... | 4 |
| 3.1 | Watershed Summary Information | 4 |
| | Drainage Area and Land Cover | 4 |
| | Surface Water Classification | 4 |
| 3.2 | Landscape Characteristics | 4 |
| | Physiography and Topography | 4 |
| | Geology and Soils..... | 5 |
| | Existing Vegetation | 5 |
| 3.3 | Land Use – Historic, Current, and Future | 6 |
| 3.4 | Regulatory Considerations | 6 |
| | Federal Emergency Management Agency (FEMA)/ Hydrologic Trespass | 6 |
| | Environmental Screening and Documentation | 6 |
| | Threatened and Endangered Species | 7 |
| | Cultural Resources..... | 7 |
| 3.5 | Reach Summary Information | 8 |
| | Channel Classification..... | 8 |
| | Existing Channel Morphology..... | 8 |
| | Channel Stability Assessment..... | 9 |
| 3.6 | Existing Wetlands | 10 |
| 3.7 | Site Photographs | 11 |
| 4 | FUNCTIONAL UPLIFT POTENTIAL..... | 13 |
| 4.1 | Anticipated Functional Benefits and Improvements | 14 |
| | Hydrology | 14 |
| | Hydraulic | 14 |
| | Geomorphology | 14 |
| | Physicochemical | 14 |
| | Biology | 15 |
| 4.2 | Potential Constraints | 15 |
| 5 | MITIGATION PROJECT GOALS AND OBJECTIVES | 16 |
| | Agricultural Best Management Practices (BMPs)..... | 16 |
| 6 | MITIGATION WORK PLAN..... | 19 |
| 6.1 | Reference Stream | 19 |
| | Reference Watershed Characterization..... | 19 |
| | Reference Discharge..... | 19 |
| | Reference Channel Morphology..... | 19 |
| | Reference Channel Stability Assessment | 20 |
| | Reference Riparian Vegetation..... | 20 |
| 6.2 | Design Parameters..... | 20 |
| | Stream Restoration Approach..... | 20 |
| | Data Analysis..... | 21 |
| | Design Discharge..... | 22 |
| 6.3 | Vegetation and Planting Plan | 24 |
| | Plant Community Restoration..... | 24 |
| | On-Site Invasive Species Management | 25 |

| | |
|---|----|
| Soil Restoration | 25 |
| 6.4 Mitigation Summary | 25 |
| 6.5 Determination of Credits | 26 |
| 7 PERFORMANCE STANDARDS | 28 |
| 7.1 Stream Restoration Success Criteria | 28 |
| Bankfull Events | 28 |
| Cross Sections..... | 28 |
| Digital Image Stations | 28 |
| Surface Flow | 28 |
| 7.2 Vegetation Success Criteria | 28 |
| 8 MONITORING PLAN | 29 |
| 8.1 As-Built Survey..... | 29 |
| 8.2 Visual Monitoring | 29 |
| 8.3 Hydrology Events | 29 |
| 8.4 Cross Sections | 29 |
| 8.5 Vegetation Monitoring..... | 30 |
| 8.6 Scheduling/Reporting..... | 30 |
| 9 ADAPTIVE MANAGEMENT PLAN | 32 |
| 10 LONG-TERM MANAGEMENT PLAN..... | 33 |
| 11 REFERENCES | 34 |

List of Tables

| | |
|---|----|
| Table 1. Catbird Project Components Summary | 1 |
| Table 2. Project Parcel and Landowner Information | 3 |
| Table 3. Project Watershed Summary Information..... | 4 |
| Table 4. Mapped Soil Series | 5 |
| Table 5. Catbird Vegetation Plot Summary | 6 |
| Table 6. Regulatory Considerations..... | 7 |
| Table 7. Summary of Existing Channel Characteristics | 8 |
| Table 8. Summary of Stream Parameters..... | 8 |
| Table 9. Channel Stability Assessment Results | 9 |
| Table 10. Functional Benefits and Improvements | 18 |
| Table 11. Peak Flow Comparison..... | 22 |
| Table 12. Comparison of Allowable and Proposed Shear Stresses | 23 |
| Table 13. Comparison of Permissible and Proposed Velocities | 23 |
| Table 14. Proposed Plant List | 25 |
| Table 15. Catbird Site (ID-100022) - Mitigation Components..... | 27 |
| Table 16. Monitoring Requirements | 31 |

List of Charts

| | |
|---|----|
| Chart 1. Stream Functions Framework | 13 |
|---|----|

List of Figures

- Figure 1 – Vicinity Map
- Figure 2 – USGS Map
- Figure 3 – Landowner Map
- Figure 4 – Land-use Map
- Figure 5 – Soils Map
- Figure 6 – Historical Aerials Map
- Figure 7 – FEMA Map
- Figure 8 – Existing Conditions Map
- Figure 9 – National Wetlands Inventory Map
- Figure 10 – Conceptual Plan
- Figure 11 – Monitoring Map

Appendices

- Appendix A – Plan Sheets
- Appendix B – Data Analysis and Supplementary Information
- Appendix C – Site Protection Instrument
- Appendix D – Credit Release Schedule
- Appendix E – Financial Assurance
- Appendix F – Maintenance Plan
- Appendix G – DWR Stream Identification Forms
- Appendix H – USACE District Assessment Forms
- Appendix I – Wetland JD Forms and Maps
- Appendix J – Invasive Species Plan
- Appendix K – Approved FHWA Categorical Exclusion
- Appendix L – DMS Floodplain Requirements Checklist

1 PROJECT INTRODUCTION

1.1 Project Components

The Catbird Site (“Project”) is located within a rural watershed in Davie County, North Carolina approximately eight miles west of Clemmons and five miles northwest of Bermuda Run. The Project lies within the Yadkin River Basin, North Carolina Division of Water Resources (NCDWR) sub-basin 03-07-02 and United States Geological Survey (USGS) 14-digit hydrologic unit code (HUC) 03040101160010 (**Figure 1**). The Project proposes to restore 1,986 linear feet (LF), enhance 237 LF, and provide water quality benefit for 53 acres of drainage area.

The Project area is comprised of a 6.52-acre easement involving two unnamed tributaries, totaling 2,264 existing LF, which eventually drain into the Yadkin River. The stream mitigation components are summarized in **Table 1** and **Figure 10**. The Project is accessible from Spillman Road. Coordinates for the Project areas are as follow: 36.030644, -80.500865.

1.2 Project Outcomes

The streams proposed for restoration have been significantly impacted by livestock production, agricultural practices, and a lack of riparian buffer. Proposed improvements to the Project will help meet the river basin needs expressed in the 2009 Upper Yadkin Pee-Dee River Basin Restoration Priorities (RBRP) as well as ecological improvements to the riparian corridor within the easement.

Through stream restoration and enhancement, the Project presents 2,223 LF of proposed stream, generating 2,081 Warm Stream Mitigation Units (SMU) (**Table 1**). This mitigation plan is consistent with the September 29, 2017 Post Contract IRT Meeting Minutes and IRT response emails (**Appendix B**).

Table 1. Catbird Project Components Summary

| Mitigation Approach | Linear Feet | Ratio | Warm SMU |
|----------------------------|--------------------|--------------|-----------------|
| Restoration | 1,986 | 1 | 1,986 |
| Enhancement II | 237 | 2.5 | 94.8 |
| Total | 2,223 | | 2,080.8 |

2 WATERSHED APPROACH

The Project was selected based on its potential to support the objectives and goals of the DMS 2009 Upper Yadkin Pee-Dee RBRP. The Upper Yadkin Pee-Dee RBRP identified several restoration needs for the entire Yadkin River Basin, as well as for HUC 03040101. Thirteen counties are included in the Upper Yadkin River Basin, including the towns of Wilkesboro, Elkin, Yadkinville, and Winston-Salem. As of the 2000 census, approximately 660,000 people live in this area. The Project watershed was identified as a Target Local Watershed (TLW) (HUC 03040101160010, Turner and Hauser Creeks TLW), a watershed that exhibits both the need and opportunity for stream, wetland, and riparian buffer restoration. Approximately 39% of this TLW is agricultural lands and over 90% of the watershed is classified as water supply watershed (WSW) designated waters. More specifically, goals outlined in the 2009 RBRP for the watershed include:

1. *Restoration of water quality and aquatic habitat in impaired stream segments;*
2. *Protection of high-resource value waters, including HQW, ORW, and WSW designated waters and those containing large numbers of rare and endangered species (NHEOs);*
3. *Continuation of existing watershed restoration and protection initiatives and projects, including efforts funded by Clean Water Management Trust Fund (CWMTF), DWQ's 319 Program, NC EEP, Ag Cost Share Program (ACSP) and Community Conservation Assistance Program (CCAP);*
4. *Collaborative efforts with local resource agencies, land trusts and willing landowners to implement new stream, riparian buffer and wetland restoration, enhancement and preservation projects within TLWs;*
5. *Improved management of stormwater runoff (including the implementation of stormwater BMP projects), especially in urban and suburban areas contributing to downstream degradation of stream habitat and impairment of water quality; and*
6. *Implementation of agricultural BMPs in order to limit inputs of sediment, nutrients, and fecal coliform to streams from active farming operations.*

Approximately 240 miles of streams in this HUC are affected by habitat degradation, with primary stressors being erodible soils; sediment and erosion from road construction and agriculture; and stormwater flow off impervious surfaces (NCEEP, 2009). Nonexistent or degraded riparian buffers are a significant contributing factor to water quality impairment and habitat degradation in this watershed and the Project will help address these identified stressors as described in Section 2.1.

2.1 Site Selection

Currently the Project area has an absence of riparian buffers, bank erosion, sediment deposition, channel incision, cattle access the streams, and the historic land use has led to channelization. The Project will directly and indirectly address stressors identified in the RBRP by stabilizing eroding stream banks, reconnecting incised streams to their floodplains, reducing sediment and nutrient loads, and restoring forested buffers on the stream channels. Project-specific goals and objectives will be addressed further in **Section 5**. A project watershed map with the Project's drainage areas is shown on **Figure 2** and watershed planning priority boundaries are shown on **Figure 1**.

The Project will address three of the six goals outlined in the 2009 Upper Yadkin Pee-Dee RBRP. By establishing a conservation easement, WSW designated waters will be protected in perpetuity (RBRP Goal 2). Collaborative efforts have been made with local and willing landowners to implement new stream and enhancement projects within the Turner and Hauser Creeks TLW (03040101160010) (RBRP Goal 4), thereby addressing erosion, sedimentation, and habitat degradation issues due to current agricultural land-use. The Project will include the use of agricultural BMPs to limit inputs of sediment, nutrients, and fecal coliform to streams from active farming operations (RBRP Goal 6). Establishing riparian buffers, instream structures, and increasing bedform diversity will help address RBRP Goal 1, but achievement will not be quantified.

The land required for the construction, management, and stewardship of this Project includes portions of one parcel in Davie County with the following ownership in **Table 2 & Figure 3**. Once finalized, a copy of the land protection instrument will be included in **Appendix C**. The Division of Mitigation Services (DMS) Conservation Easement model template will be utilized to draft the site protection instruments. The landowner will be responsible for fence maintenance and repairs to exclude livestock from the conservation easement, and the conservation easement document will include the applicable language.

Table 2. Project Parcel and Landowner Information

| Owner of Record | PIN Or Tax Parcel ID# | Stream Reach |
|-----------------|------------------------------|--------------|
| Dwight Sparks | 5853633218 (Davie County) | All |

3 BASELINE AND EXISTING CONDITIONS

3.1 Watershed Summary Information

Drainage Area and Land Cover

The Project area is comprised of two unnamed tributaries that flow west to east, and eventually drain into the Yadkin River. The total drainage area for the Project is 53 acres (0.083 mi²); the drainage area of Reach DS1 is 26 acres (0.041 mi²) and Reach DS2 is 27 acres (0.042mi²). Primary land use within the drainage area consists of approximately 54% pasture, 16% forest, 14% residential, and 12% row crop. Impervious surface covers four percent of the drainage area (**Table 3 & Figure 4**). Historic and current land-use within the immediate Project area have allowed cattle direct access to the streams. These activities have negatively impacted both water quality and streambank stability along the Project streams.

Table 3. Project Watershed Summary Information

| | |
|--------------------------------------|-----------------------------|
| Level IV Ecoregion | 45b-Southern Outer Piedmont |
| River Basin | Yadkin |
| USGS Hydrologic Unit 8-digit | 03040101 |
| USGS Hydrologic Unit 14-digit | 03040101160010 |
| DWR Sub-basin | 03-07-02 |
| Project Drainage Area (acres) | 53 |
| Percent Impervious Area | 4% |

Surface Water Classification

The portion of the Yadkin River that includes the Project's two tributaries has been assigned a Water Supply-IV classification (WS-IV) (NCDWQ 2011). Waters classified as WS-IV are protected as water supplies. They provide water supply for drinking, culinary, or food processing purposes where a WS-I, II, or III classification is not feasible and are generally located in moderately to highly developed watersheds or Protected Areas. They are also protected for Class C uses. Class C waters are protected for uses such as secondary recreation, fishing, wildlife, fish consumption, aquatic life including propagation, survival and maintenance of biological integrity, and agriculture. Secondary recreation includes wading, boating, and other uses involving human body contact with water where such activities take place in an infrequent, unorganized, or incidental manner (NCDWQ 2011).

3.2 Landscape Characteristics

Physiography and Topography

The Project is located in the Southern Outer Piedmont Level IV ecoregion, which is characterized by lower elevations, less relief, and less precipitation than the Southern Inner Piedmont (Griffith et al. 2002). Elevations within the Piedmont physiographic region range from 300 to 1,500 feet above mean sea level; while elevations through the project watershed range from 729 to 836 feet. The valley along the project reaches transitions from confined valleys with slopes ranging from four percent to six percent to a moderately confined valley with a two percent slope.

The project reaches convey an increased sediment load relative to reference conditions. This increased loading is a result of heavy agricultural and livestock practices and has produced a substrate dominated by coarse sand and fine gravel.

Geology and Soils

According to geology data from the North Carolina Geologic Survey, published in 1985, the Project is within geologic map unit DOgb, occurring in the Charlotte and Milton belts. This map unit is associated with intrusive igneous type rocks of the Gabbro of Concord Plutonic Suite formation that formed between the Devonian and Ordovician periods within the Paleozoic Era between 399 and 479 million years ago. This formation is composed of Barber, Concord, Farmington, Mecklenburg, and Weddington intrusives.

Existing soil information from the Natural Resource Conservation Service (NRCS) shows the property is located within the Gaston-Mocksville-Mecklenburg soil association. This association is made of gently sloping to steep, well drained soils that have a loamy surface layer and a clayey or loamy subsoil with a low or moderate shrink-swell potential. They formed in material weathered from mafic and intermediate crystalline rocks on uplands. They are found on broad to narrow ridges and side slopes in the northeastern, central, and southwestern parts of the county.

The Davie County Soil Survey shows several mapping units across the Project. Map units include three soil series. The soil series found on the Project are described below and summarized in **Table 4**.

Project soils are mapped by the NRCS within the easement as Mocksville sandy loam, Oak level clay loam, and Tomlin clay loam (**Figure 5**). Mocksville sandy loam makes up approximately 62 percent of the easement and is well drained and found on hillslopes on ridges at 15 to 45 percent slopes. Tomlin clay loam (34 percent of the Project), and Oak Level clay loam (four percent of the Project), make up the rest of the easement and both are well drained, moderately eroded, and found on hillslopes on ridges at eight to 15 percent slopes. The surrounding upland soils are mapped as Tomlin clay loam and Oak Level clay loam. These soil types are typically moderately well to well drained soils. Both are found on slopes ranging between two to 15 percent.

Table 4. Mapped Soil Series

| Map Unit Symbol | Map Unit Name | Percent Hydric | Drainage Class | Hydrologic Soil Group | Landscape Setting |
|-----------------|-------------------------------------|----------------|----------------|-----------------------|----------------------|
| MsC | Mocksville sandy loam, 8-15% slopes | 0% | Well | B | Hillslopes on ridges |
| OkB2 | Oak level clay loam, 2-8% slopes | 0% | Well | C | Hillslopes on ridges |
| ToC2 | Tomlin clay loam, 8-15% slopes | 0% | Well | B | Hillslopes on ridges |

Existing Vegetation

Vegetation around the unbuffered reaches of the unnamed tributaries are primarily composed of herbaceous vegetation and scattered trees. In general, these riparian zones are disturbed due to regular land management activities. On June 14, 2018 two 100m² plots were surveyed along the floodplain of the Project to categorize the existing vegetation communities. Both reaches have been grazed by livestock, including the forested riparian areas, and thus lack a well-developed understory and shrub strata. Portions of DS2-B, while it lacks a well-developed understory and shrub strata, represent more natural community assemblages. For this reason, representative plots were surveyed along reach DS1 and DS2 (**Appendix B**). Within each vegetation plot, all trees greater than or equal to five inches (12.7 centimeters) diameter at breast height (DBH) were identified, measured, and used to calculate both basal area and stems per acre. Trees greater than or equal to 54 inches (137 centimeters) in height were used to quantify tree species diversity. Canopy species data

was calculated to quantify the existing natural community (Schafale, 2012) (Table 5). Shrub species and herbaceous species were also identified, and the percent cover was estimated.

Table 5. Catbird Vegetation Plot Summary

| Plot | Basal Area (m ² /ha) | Avg. DBH (cm) | Trees per Acre | Total Tree Species | Natural Community |
|------|---------------------------------|---------------|----------------|--------------------|--|
| 1 | 67.4 | 21.46 | 161.8 | 2 | Disturbed Piedmont Headwater Stream Forest |
| 2 | 0 | 0 | 0 | 0 | Pasture |
| AVG | 33.7 | 10.73 | 80.9 | 1 | |

Dominant canopy species within the forested riparian areas across the site included honey locust (*Gleditsia triacanthos*), eastern red cedar (*Juniperus virginiana*), and winged elm (*Ulmus alata*). Sub-canopy species included American holly (*Ilex oypaca*) and sawtooth blackberry (*Rubus argutus*). Invasive species were also found within the vegetation survey plots and in the vicinity of the site, including: multiflora rose (*Rosa multiflora*) and Japanese honeysuckle (*Lonicera japonica*).

3.3 Land Use – Historic, Current, and Future

Historic aerial imagery indicates that the Project has been used extensively for agricultural purposes, and that the location of the streams has not changed in over 50 years (Figure 6). The agricultural footprint shows minimal change over this time. The area remains in an agricultural community with some neighboring forested property. Several watershed characteristics, such as groundwater, vegetation, surface drainage, and potentially soil parameters have been modified. Livestock currently have access to all stream reaches and are actively degrading the channels, while riparian buffers are either very sparse, narrow or non-existent. Soil structure and surface texture have been altered from long-term active grazing.

The future land use for the Project area will include 6.52 acres of conservation easement that will be protected in perpetuity. The Project easement will have 2,223 linear feet of high functioning streams, a minimum 50-foot riparian buffer, and will exclude livestock with fencing. Outside the Project, the area will likely remain in agricultural use; however, proximity to the DMS Hauser Creek Site to the northwest of the Project and two proposed easements (Mockingbird Mitigation Site and Scout Mitigation Site), to the southwest and west across Spillman Road, will present compounded benefits to the local watershed.

3.4 Regulatory Considerations

Federal Emergency Management Agency (FEMA)/ Hydrologic Trespass

According to the North Carolina Floodplain Mapping Information System, streams on the Project do not lie within a 100-year floodplain (one percent annual chance of flooding); nor does it lie within a regulatory floodway (FEMA 2017) (Figure 7). No hydrologic trespass will be permitted to adjacent properties upstream or downstream of the project.

Environmental Screening and Documentation

To ensure that a project meets the “Categorical Exclusion” criteria, the Federal Highways Administration (FHWA) and NCDMS have developed a categorical exclusion (CE) checklist that is included as part of each mitigation project’s Environmental Resources Technical Report (ERTR). The CE Approval Form for the Catbird Project is included in Appendix K and was approved by DMS and FHWA in December 2017.

Threatened and Endangered Species

Plants and animals with a federal classification of endangered or threatened are protected under provisions of Sections 7 and 9 of the Endangered Species Act of 1973, as amended. The USFWS database (2017) lists two endangered species that may occur in proximity to the Project: Michaux’s sumac (*Rhus michauxii*) and Northern long-eared bat (*Myotis septentrionalis*). Species and species habitat listed in the USFWS database were inspected during the field investigation to determine whether they occur at the Project. No individual species or habitats were identified on site. Potential impacts to species and species habitat off site, downstream, and within the vicinity of the project were also considered. A letter was sent to the USFWS on October 20, 2017 requesting review and comment of possible issues with respect to threatened and endangered species on the Project. USFWS responded on November 20, 2017 and stated that besides the Northern long-eared bat (NLEB), there is no record of other federally protected species in the project vicinity. Incidental take of the NLEB is exempt, but the USFWS encourages to avoid tree cutting from May 15 – August 15 if possible. Documentation of this correspondence is included in **Appendix K**.

To comply with the NLEB 4(d) streamlined rule for federal agencies, the required consultation form was submitted by the FHWA to the USFWS as part of the CE process for NCDMS projects. Federally protected species met the Categorical Exclusion Criteria for FHWA and DMS projects and documentation is included in **Appendix K**.

The Fish and Wildlife Coordination Act requires consultation with state fish and wildlife agencies when “waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted...or otherwise controlled or modified.” A letter was sent to the North Carolina Wildlife Resources Commission (NCWRC) on October 20, 2017 requesting review and comment of possible issues with respect to fish and wildlife resources on the Project. A response was received on December 01, 2017 and NCWRC indicated that there are no records for any listed aquatic species in the vicinity of this Project. Documentation is included in **Appendix K**.

Cultural Resources

A review of the North Carolina State Historic Preservation Office GIS Web Service database revealed that there are no National Registered listings within a one-mile radius of the proposed Project area. No architectural structures or archeological artifacts have been observed or noted during preliminary surveys of the site for restoration purposes. RES received a letter from the NC State Historic Preservation Office (SHPO) on October 17, 2017 in response to the Project’s public notice that was posted on September 20, 2017. In the letter, SHPO stated that they had “conducted a review of the project and are aware of no historic resources which would be affected by the project.” Cultural Resources met the Categorical Exclusion Criteria for FHWA and DMS projects and documentation is included in **Appendix K**.

Table 6. Regulatory Considerations

| Regulation | Applicable? | Resolved? | Supporting Documentation |
|---|-------------|-----------|--------------------------|
| Waters of the United States - Section 404 | Yes | No | Appendix K |
| Waters of the United States - Section 401 | Yes | No | Appendix K |
| Endangered Species Act | Yes | Yes | Appendix K |
| National Historic Preservation Act | Yes | Yes | Appendix K |
| Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA) | No | N/A | N/A |
| FEMA Floodplain Compliance | No | N/A | Appendix L |
| Magnuson Stevens Act - Essential Fisheries Habitat | No | N/A | N/A |

3.5 Reach Summary Information

The Project area is comprised of a single easement area along two unnamed tributaries that eventually drain into the Yadkin River. The Project is split into three reaches (DS1, DS2-A, DS2-B) (**Figure 10**). Results of the preliminary data collections are presented in **Table 7**. Morphological parameters are located in **Appendix B**.

Table 7. Summary of Existing Channel Characteristics

| Reach | Drainage Area (ac) | A _{BKF} ¹ (ft ²) | Width (ft) | Mean Depth (ft) | Width:Depth Ratio | Bank Height Ratio | Entrenchment Ratio | Sinuosity | Slope (ft/ft) |
|-------|--------------------|--|------------|-----------------|-------------------|-------------------|--------------------|-----------|---------------|
| DS1 | 26 | 2.3-3.7 | 3.0-7.4 | 0.7 | 3.9-16.1 | 1.0 – 2.5 | 1.3 – 1.8 | 1.04 | 0.0305 |
| DS2-A | 12 | 1.1-3.3 | 3.8-6.6 | 0.4 | 12.9 | 2.5 – 6.0 | 1.3 – 1.5 | 1.04 | 0.0639 |
| DS2-B | 27 | 2.1-3.1 | 4.3-13.1 | 0.4 | 7.3-68.0 | 0.8 – 8.4 | 1.3 – 1.6 | 1.06 | 0.0383 |

¹A_{BKF}= cross-sectional area (measured at approximate bankfull stage as estimated using existing conditions data and NC Regional Curve equations where field indicators were not present)

Channel Classification

The streams have been classified as intermittent (DS1 and DS2-A) and perennial (DS2-B) streams using the NCDWR Stream Identification Form version 4.11 and are G- and F-stream types as classified using the Rosgen stream classification system (Rosgen, 1994). **Table 8** summarizes these stream parameters and the stream determination scores can be found in **Appendix G**. Stream determinations have been verified by the USACE.

Table 8. Summary of Stream Parameters

| Reach | Hydrology Status | Stream Determination Score | Reach Length (LF) | Rosgen Stream Classification |
|-------|------------------|----------------------------|-------------------|------------------------------|
| DS1 | Intermittent | 26.5 | 1,179 | G4 |
| DS2-A | Intermittent | 25 | 300 | F5b |
| DS2-B | Perennial | 34 | 1,051 | G5 |

Existing Channel Morphology

Reach DS1

Reach DS1 is a gravel channel that flows to the east and has moderate to high sediment load. This reach begins just downstream of the confluence of two ephemeral channels. The reach is severely incised and/or over widened, both laterally and vertically unstable and is impacted by cattle throughout. Bedrock does not currently influence the channel profile and is therefore not expected to arrest its current degradation. The riparian buffer is in poor condition and is a mix of young hardwoods, evergreens, scrubby vegetation, and pasture grasses.

Reach DS2-A

Reach DS2-A, an intermittent channel, flows in an easterly direction through an active pasture and has a moderate sediment load. Channel incision increases as the channel approaches the reach break with Reach DS2-B. The channel exhibits localized areas of vertical and lateral instability and the streambed is comprised of silt, sand, and gravel. Bedrock does not currently influence the channel profile and is therefore not expected to arrest its current degradation. The riparian buffer is in poor condition and is a mix of pasture grasses and some woody vegetation that lines the channel banks.

Reach DS2-B

DS2-B is an incised and degraded, coarse sand bed stream with a moderate to high sediment load. Livestock have direct access to the channel, and the resulting impacts have severely degraded the channel banks. Bedrock was observed providing grade control in one location along this reach; however, the majority of the reach does not contain bedrock and therefore continues to degrade. The riparian buffer is in poor condition with few mature trees located along the top of banks.

Channel Stability Assessment

A modified version of the channel stability assessment method (CSA) provided in “Assessing Stream Channel Stability at Bridges in Physiographic Regions” by Johnson (2006) was used to assess channel stability for the Project’s existing channels. This method may be rapidly applied on a variety of stream types in different physiographic regions having a range of bed and bank materials.

The original channel assessment method was designed to evaluate 13 stability indicators in the field. These parameters are: watershed characteristics (frequency of watershed disturbances such as agricultural activities, urbanization, etc.), flow habit, channel pattern, entrenchment/channel confinement, bed material, bar development, presence of obstructions/debris jams, bank soil texture and coherence, average bank angle, bank vegetation/protection, bank cutting, mass wasting/bank failure, and upstream distance to bridge. See **Appendix B** for a detailed description of the stability indicators. As this method was initially developed to assess stability at bridges, a few minor adjustments were made to remove indicators that contradict stability characteristics of natural channels in favor of providing hydraulic efficiency at bridges. First, the “channel pattern” indicator was altered such that naturally meandering channels scored low as opposed to straightened/engineered channels that are favorable for stability near bridges. Secondly, the last indicator, “upstream distance to bridge”, was removed from the assessment as bridges are not a focus of channel stability for this project. The 12 indicators were then scored in the field, and a rating of excellent, good, fair, or poor was assigned to each project reach based on the total score.

The channel assessment results (scores and ratings) for the Project are provided in **Table 9**. All three Project stream reaches received “Fair” ratings. Most Project streams were observed to have relatively high bank angles and many were found to be actively eroding. All the channels have been impacted by farming practices or livestock production, and most are slightly entrenched. These characteristics are reflected in the higher channel assessment scores for average bank angle and bank vegetation/protection. Most reaches also scored poorly for watershed characteristics since the surrounding land use is dominated by agriculture activities.

Table 9. Channel Stability Assessment Results

| | | DS1 | DS2-B | DS2-A |
|----|----------------------------------|-----|-------|-------|
| 1 | Watershed characteristics | 11 | 11 | 11 |
| 2 | Flow habit | 8 | 6 | 8 |
| 3 | Channel pattern | 4 | 4 | 4 |
| 4 | Entrenchment/channel confinement | 10 | 7 | 11 |
| 5 | Bed material | 9 | 7 | 6 |
| 6 | Bar development | 5 | 3 | 3 |
| 7 | Obstructions/debris jams | 5 | 2 | 2 |
| 8 | Bank soil texture and coherence | 7 | 7 | 7 |
| 9 | Average bank angle | 8 | 10 | 10 |
| 10 | Bank vegetation/protection | 10 | 7 | 9 |
| 11 | Bank cutting | 8 | 8 | 10 |

| | | | | |
|----|-----------------------------|-------------|-------------|-------------|
| 12 | Mass wasting/bank failure | 8 | 6 | 10 |
| 13 | Upstream distance to bridge | NA | NA | NA |
| | Score | 93 | 78 | 91 |
| | Rating* | Fair | Fair | Fair |

* Excellent (0 < Score <= 36), Good (36 < Score <= 72), Fair (72 < Score <= 108), Poor (108 < Score <= 144)

3.6 Existing Wetlands

A survey of existing wetlands was performed on October 3, 2017 and updated on February 15, 2018. Wetland boundaries were delineated using current methodology outlined in the 1987 U.S. Army Corps of Engineers Wetland Delineation Manual (Environmental Laboratory 1987). Soils were characterized and classified using the Field Indicators of Hydric Soils in the United States, Version 7.0 (USDA-NRCS 2010). Within the boundaries of the Project, two small jurisdictional wetlands are present (**Figure 8**). Wetlands WA and WB are approximately 0.01 and 0.03 acres, respectively, and occur in-line with stream reach DS2-A (**Figure 8**). They represent disturbed palustrine forest type wetlands and consist of saplings such as black willow (*Salix nigra*) and green ash (*Fraxinus pennsylvanica*), shrubs of sawtooth blackberry, and herbs such as common rush (*Juncus effuses*), broom sedge (*Carex scoparia*), and arrowleaf tearthumb (*Persicaria sagittata*). A preliminary jurisdictional determination (PJD) request was sent to the USACE on October 27, 2017 and a final PJD was received on March 1, 2018 (**Appendix I**).

The US Fish and Wildlife Service (USFWS) National Wetland Inventory Map (NWI) does not depict any additional wetland areas within the Project (**Figure 9**).

3.7 Site Photographs



DS1 – Looking Downstream (2/1/2018)



DS1 – Looking Upstream (2/1/2018)



DS1 – Looking Upstream (2/1/2018)



DS1 – Looking Downstream (2/1/2018)



DS1 – Looking Downstream (2/1/2018)



DS1 – Looking Upstream (2/1/2018)



DS2-A – Looking Upstream (2/1/2018)



DS2-A – Looking Upstream (2/1/2018)



DS2-B – Looking Upstream (2/1/2018)



DS2-B – Looking Downstream (2/1/2018)



DS2-B – Looking Upstream (2/1/2018)



DS2-B – Looking Downstream (2/1/2018)

4 FUNCTIONAL UPLIFT POTENTIAL

The Stream Functions Pyramid Framework (Harman et. al. 2012) uses stream functions to describe project objectives, existing condition assessments and monitoring, performance metrics, and design criteria. The Framework separates stream functions into five categories, ordered into a hierarchy, which communicate the interrelations among functions and illustrate the dependence of higher level functions (biology, physicochemical and geomorphology) on lower level functions (hydrology and hydraulics). Functions that affect the greatest number of other functions are illustrated at the base of the Pyramid, while functions that have the least effect on other functions are illustrated at the top. The Pyramid is illustrated below (**Chart 1**).

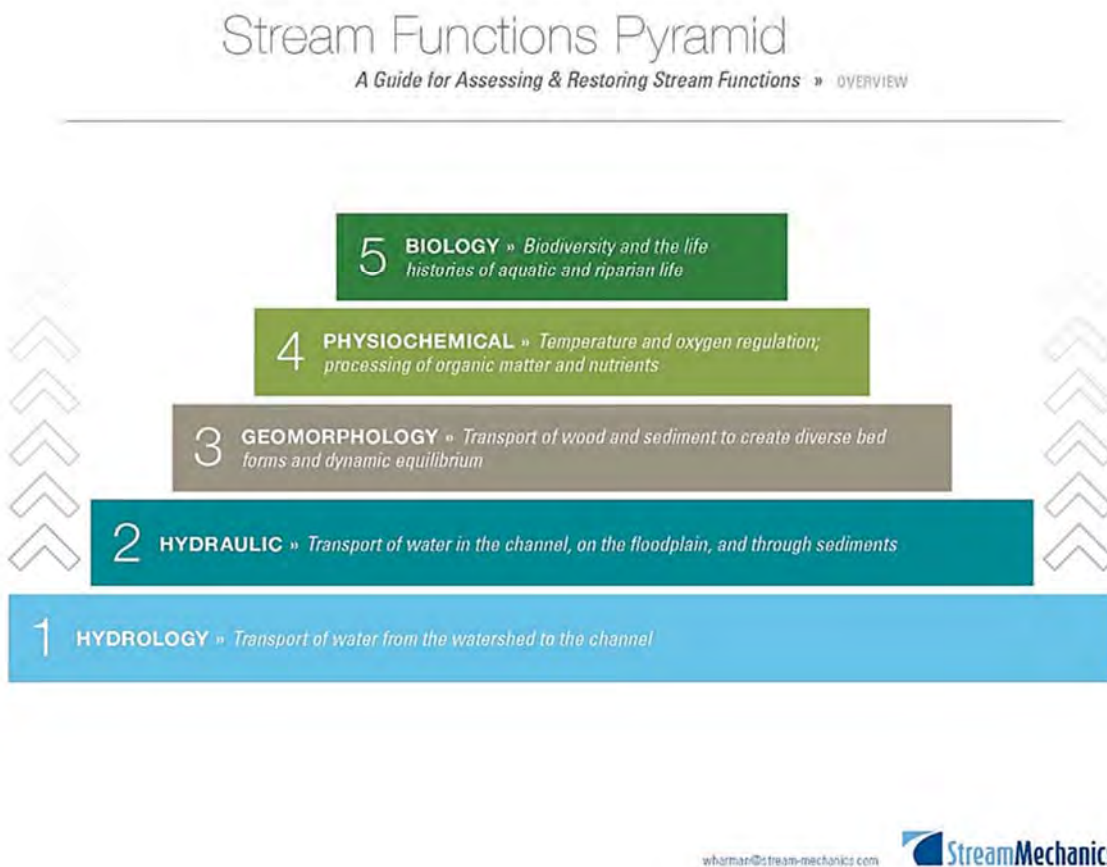


Chart 1. Stream Functions Framework

Fischenich (2006) found that the most critical functions include those that address hydrodynamic processes, sediment transport processes, stream stability and riparian buffer restoration. By addressing these fundamental functions and processes, a restored stream and riparian system are capable of supporting more dependent functions that typically require time to establish, such as diverse biological communities, chemical and nutrient processes, diverse habitats and improved water and soil quality. The objectives of this Project will address the most critical functional objectives that will allow for a more restored stream and riparian area over time.

A functional based approach broadens the reach-scale goals of a restoration project by contextualizing the functional uplift to the watershed scale. By applying an ecosystem restoration approach, the proposed

Project will provide localized ecological and water quality benefits that could in combination with other restoration projects within the watershed have beneficial impacts on the Yadkin River Basin. The restoration approach at the reach scale of this Project will benefit the hydraulic and geomorphology functions of the system, but could also benefit the upper-level functions (physicochemical and biology) over time and in combination with other restoration projects within the watershed. Anticipated functional benefits and improvements within the Project area, as based on the Function-Based Framework, are outlined in **Table 10**.

4.1 Anticipated Functional Benefits and Improvements

Hydrology

According to the Stream Functions Pyramid Framework, hydrology is defined as the transport of water from the watershed to the channel. The Project will locally address several historic hydrologic disturbances including deforestation and channelization; however, it is not anticipated that the Project will have a significant effect on hydrology at the watershed scale.

Hydraulic

The hydraulic function of the Pyramid is defined as transport of water in the channel, on the floodplain, and through sediments. The greatest potential uplift at the Project will be achieved through increasing floodplain connectivity throughout the Project. Reaches in the Project do not have functioning floodplain connectivity or stable flow dynamics. Reaches where floodplain connectivity is not-functioning or functioning-at-risk will be improved to functioning by reducing bank height ratios and increasing entrenchment ratios. Reaches in which stable flow dynamics are not-functioning or functioning-at-risk will be improved to functioning by constructing a new stable channel with adequate energy dissipation and grade control.

Geomorphology

Geomorphology, as defined within the Pyramid Framework, is the transport of wood and sediment to create bed forms and dynamic equilibrium. Sediment transport will be improved in reaches that are currently functioning-at-risk or not-functioning by reducing the excess sediment load entering the stream. This reduction will be achieved by establishing a functional buffer, constructing a sediment load attenuation structure upstream of Reach DS1, and constructing channels that maintain stable dimension, plan, and profile. Channel stability and bedform diversity will be improved in restoration reaches by installing a mix of rock and log structures to promote a natural combination of riffle-pool and step-pool sequences. Channel substrate will be supplemented by off-site material to ensure bed stability and habitat creation. Transport and storage of woody debris will be improved through increases in channel roughness from plantings and structures installation. Existing riparian vegetation is either functioning-at-risk or not-functioning in Project reaches. Therefore, riparian buffers will be planted out to a minimum of 50 feet to improve the riparian vegetation to functioning levels, while also providing terrestrial habitat. All of these functional parameters are interconnected and depend on each other, improving this wide range of parameters will result in long-term functional geomorphic uplift.

Physicochemical

The Pyramid Framework defines the physicochemical category as temperature and oxygen regulation and the processing of organic matter and nutrients. Although this Project would support the overarching goal in the Yadkin Pee-Dee River Basin Priorities to promote nutrient and sediment reduction in agricultural areas, it is difficult to measure nutrient and sediment reduction at this project level because they can be affected by so many variables. However, several restoration actions are known to help reduce nutrients and sediment even though they may not be measurable at the project level. These activities include filtering of runoff through buffer areas, the conversion of active farm fields to forested buffers, and improved denitrification and nutrient uptake through buffer zones. Additional benefits may also come from functional uplift of the

lower-level stream functions (hydraulics and geomorphology), which will reduce sediment and nutrients in the system through bank stabilization and reforestation. Temperature regulation will also be improved through the restoration of canopy tree species to the stream buffer areas. Oxygen regulation will occur through two actions: first, the temperature of the water directly impacts the amount of gas held by the water. Therefore, by planting the buffer to shade the channel, water temperature is decreased and dissolved oxygen is increased. Second, the drop structures placed in the stream create mixing zones where oxygen dissolves much faster than the standard exchange rate of oxygen to dissolved oxygen. The processing of organic matter will be improved once healthy riffles are shallow enough to catch twigs and branches that then retain leaves. Many of these physicochemical benefits occur slowly over time and are dependent on multiple variables within the stream ecosystem. Therefore, it is not practical or feasible to directly measure these parameters within the monitoring time frame of this project. With that said, it is logical to use existing riparian buffer and visual performance standards to demonstrate the positive correlation between geomorphic parameters and physicochemical parameters. For example, as riparian buffer trees grow, as represented in annual monitoring reports, it is anticipated that canopy cover is actively shading the stream channel and reducing water temperature. This is not a substitute for direct physicochemical monitoring, but it is a useful tool to help project the long-term benefits of the Project in terms of its functional uplift.

Biology

The highest category of the Pyramid is biology and is defined as the biodiversity and life histories of aquatic and terrestrial life, specifically referring to animals. As mentioned for the physicochemical stream function, it will be difficult to see measurable results of the functional uplift of the biological functions at a project scale during the monitoring time frame of the project. However, since the life histories of many species likely to benefit from stream and wetland restoration are depending on all the lower-level functions, the functional uplift from the hydraulic and geomorphic levels would likely have a positive effect on the biology over time and in combination with other projects within the watershed is anticipated. Again, there is no substitute for direct biological monitoring, but it is important to understand the hierarchy of the Stream Functions Pyramid Framework in order to help project long-term benefits of the Project, though only categories two and three (hydraulics and geomorphology) will be directly measured during the seven-year monitoring period.

4.2 Potential Constraints

There are no significant hydrologic or infrastructure constraints to the Project. No overhead or underground utility lines are present. One easement break for a culvert is proposed to facilitate landowner usage of the property. Any culvert maintenance will be the responsibility of RES through completion of monitoring. Once the Project has completed monitoring and the Project is closed out, the culvert will be the responsibility of the landowner(s).

No General Aviation or Commercial airports are located within five miles of the proposed project. The Project is located within five miles of two privately owned and operated airstrips. One privately owned public-use air transport facility (Sugar Valley Airport) is located approximately four miles south of the Project. While existing mature trees are generally not threatened, a tree survey has been conducted to design the mitigation measures and access to minimize impacts to significant specimen trees.

5 MITIGATION PROJECT GOALS AND OBJECTIVES

Through the comprehensive analysis of the Project's maximum functional uplift using the Stream Functions Pyramid Framework, specific, attainable goals and objectives will be realized by the Project. These goals clearly address the degraded water quality and nutrient input from farming that were identified as major watershed stressors in the 2009 Upper Yadkin Pee-Dee River RBRP. The Project will address outlined RBRP Goals 2, 4, and 6 (listed in **Section 2**).

The Project goals are:

- Improve water transport from watershed to the channel in a non-erosive manner in a stable channel;
- Improve flood flow attenuation on site and downstream by allowing for overbank flows and connection to the floodplain;
- Improve instream habitat;
- Reduce sediment, nutrient and fecal coliform inputs into stream system;
- Restore and enhance native floodplain vegetation;
- Indirectly support the goals of the 2009 Upper Yadkin Pee-Dee RBRP to improve water quality and to reduce sediment and nutrient loads; and
- Protect Water Supply Watersheds (WSW).

The Project objectives to address the goals are:

- Design and reconstruct stream channels sized to convey bankfull flows that will maintain a stable dimension, profile, and planform;
- Add in-stream structures and bank stabilization measures to protect restored streams;
- Install habitat features such as brush toes, constructed riffles, woody materials, and pools of varying depths to restored streams;
- Increase forested riparian buffers to at least 50 feet on both sides of the channel along the Project reaches with a hardwood riparian plant community;
- Install approximately 4,200 linear feet of livestock exclusion fencing along the easement boundary to ensure livestock will no longer have stream access;
- Implement one agricultural BMP structure in order to limit inputs of sediment, nutrients, and fecal coliform to streams from surrounding farming operations;
- Treat exotic invasive species; and
- Establish a permanent conservation easement on the Project that will exclude future livestock from stream channels and their associated buffers.

Anticipated functional uplift, benefits, and improvements within the Project area, as based on the Function Based Framework are outlined in **Table 10**.

Agricultural Best Management Practices (BMPs)

A suite of agricultural BMPs will be utilized for the Project to reduce direct effluent inputs, pollutant contamination, and sediment loading. The combination of the following agricultural BMPs: riparian buffer planting, bank stabilization, stream restoration, livestock exclusion, and livestock watering facilities, will ultimately lead to the functional uplift of the site, while still allowing livestock production to persist through the installation of alternative water sources.

The riparian buffer will be restored along all project reaches. Restored riparian buffers are established adjacent to and up-gradient from watercourses of water bodies to improve water quality. The main advantages of the restored riparian buffer will be to provide water quality treatment, erosion control, and

water temperature benefits. Moreover, there will be significant reductions in sedimentation, nutrient input, and fecal coliform input.

To account for eliminating livestock water access, landowners will be provided an alternate water source. A total of three watering facilities will be installed to provide high quality drinking water to livestock.

One agricultural sediment load attenuation structure will be installed at the top of DS1 where concentrated flow enters the conservation easement. The agricultural sediment load attenuation structure will be installed within the conservation easement so that the structure is protected. Catastrophic failure or maintenance of the structure is not anticipated as this structure will be installed in a low-gradient area, and the area proposed to diffuse flow will be well vegetated and matted.

Table 10. Functional Benefits and Improvements

| Level | Function | Goal | Objective | Measurement Method |
|-------|--|---|--|---|
| 1 | <u>Hydrology</u> <i>Transport of water from the watershed to the channel</i> | to transport water from the watershed to the channel in a non-erosive manner and maintain a stable water table in riparian wetlands | Convert land-use of streams and their headwaters from pasture to riparian forest Install one agricultural sediment load attenuation structure to limit inputs of sediment from surrounding farming operations coming into the reach (DS1) | Percent Project drainage area converted to riparian forest (indirect measurement) Visually monitor integrity of agricultural attenuation structure |
| 2 | <u>Hydraulic</u> <i>Transport of water in the channel, on the floodplain, and through the sediments</i> | to transport water in a stable non-erosive manner | Improve flood bank connectivity by reducing bank height ratios and increase entrenchment ratios | Cross sections Crest gauges Flow gauges Bank Height Ratio Entrenchment Ratio |
| 3 | <u>Geomorphology</u> <i>Transport of wood and sediment to create diverse bedforms and dynamic equilibrium</i> | to create a diverse bedform and stable channels that achieve healthy dynamic equilibrium and provide suitable habitat for life | Reduce erosion rates and channel stability to reference reach conditions Improve bedform diversity (pool spacing, percent riffles, etc.) Increase buffer width to 50 feet | As-built stream profile Cross sections Visual monitoring Vegetation plots |
| 4 | <u>Physicochemical</u> ^o <i>Temperature and oxygen regulation; processing of organic matter and nutrients</i> | to achieve appropriate levels for water temperature, dissolved oxygen concentration, and other important nutrients including but not limited to Nitrogen and Phosphorus through buffer planting and fencing | <u>Unmeasurable Objective/Expected Benefit</u> Establish native hardwood riparian buffer and exclude livestock. | Vegetation plots (indirect measurement) Established fencing and perpetual conservation easement (indirect measurement) |
| 5 | <u>Biology</u> * <i>Biodiversity and life histories of aquatic life histories and riparian life</i> | to achieve functionality in levels 1-4 to support the life histories of aquatic and riparian plants and animals through instream | <u>Unmeasurable Objective/Expected Benefit</u> Improve aquatic habitat through the installation of habitat features, construction of pools at varying depths, and planting the riparian buffer | As-Built Survey (indirect measurement) |

^o These categories are measured indirectly; *These categories are not quantifiably measured

6 MITIGATION WORK PLAN

6.1 Reference Stream

The restoration portions of the Project are currently characterized by agricultural and livestock practices. Physical parameters of the Project were used, as well as other reference materials, to determine the target stream type. The “Classification of the Natural Communities of North Carolina” was also used to narrow the potential community types that would have existed at the Project (Schafale, 2012). An iterative process was used to develop the final information for the Project design.

Targeted reference conditions included the following:

- Located within the physiographic region and ecoregion,
- Similar land use on site and in the watershed,
- Similar soil types on site and in the watershed,
- Ideal, undisturbed habitat – several types of woody debris present,
- Similar topography,
- Similar slope,
- Pattern common among Piedmont streams, and
- Minimal presence of invasive species.

Reference Watershed Characterization

The selected reference stream is an Unnamed Tributary (UT) to Hauser Creek on a closed out DMS mitigation site, located east of Farmington Road in Yadkin County, NC. It flows west to east (**Appendix B**). The reach that was surveyed and analyzed is approximately 200 feet long. The drainage area for this segment of UT to Hauser Creek is 0.05 square miles (29 acres). The land use in the watershed is characterized as mostly forested (80 percent) and cultivated row crops (19 percent). Site photographs of the reference stream are located in **Appendix B**.

The current State classification for this reference reach is WS-IV (NCDWQ 2012a). WS-IV waters are used as sources of water supply for drinking, culinary, or food processing purposes where a WS-I, II or III classification is not feasible.

Reference Discharge

Several hydrologic models/methods were used to develop a bankfull discharge along with indicators of bankfull stage for the reference site. Existing drainage area, land use, slope, roughness, and cross-sectional area were all factors considered when performing the calculations. Using a combination of Piedmont Regional Curves, in-house spreadsheet tools, and a project specific regional flood frequency analysis, the existing discharge for UT to Hauser Creek was calculated to be approximately 7 to 8 cubic feet per second (ft³/s). See **Section 6.2** for a more detailed description of the hydrologic analyses performed for this project.

Reference Channel Morphology

In comparison to the restoration reaches, reference reach UT to Hauser Creek is larger than the designed restoration reaches when comparing pattern, dimension and profile, which is the reason for using a scaling factor for the design. The scaling factor is based on the difference in bankfull width of the reference channel. The designed reach would then have the necessary dimensions of either a smaller or larger stream corresponding to differences in drainage area. Reach UT to Hauser Creek, the reach was typically 5.2 feet wide and 0.6 feet deep. The cross-sectional area was typically around 3.0 square feet with a width to depth ratio around 8.9.

Reference Channel Stability Assessment

The UT to Hauser Creek reference reach is stable and shows no evidence of incision or erosion in the portion that was surveyed and analyzed. The stream appears to maintain its slope and has sufficient amounts of vegetation to secure its banks. Riparian buffer widths exceed fifty feet on each side. The reference reach received a “Good” rating as the channel demonstrates a stable meandering pattern and a well-vegetated riparian buffer.

Reference Riparian Vegetation

The UT to Hauser Creek reference reach riparian community is characteristic of a Piedmont Alluvial Forest. Basal areas for the plots were 12.5 m²/hectare (ha) and 49.6m²/ha and stems per acre was 81 for both plots. Dominant canopy species across the reference reach included sweetgum (*Liquidambar styraciflua*), tulip-poplar (*Liriodendron tulipefera*), American beech (*Fagus grandifolia*), pignut hickory (*Carya glabra*), eastern redcedar, green ash, red maple (*Acer rubrum*), and boxelder (*Acer negundo*). Sub-canopy species included musclewood (*Carpinus caroliniana*), sourwood (*Oxydendron arboreum*), and sawtooth blackberry. Invasive species were also found within the vegetation survey plots and in the vicinity of the reach, including: multiflora rose and Japanese honeysuckle.

6.2 Design Parameters

Stream Restoration Approach

The Project will include Priority I and II Restoration and Enhancement Level II. Stream restoration will incorporate the design of a single-thread meandering channel, with parameters based on data taken from reference sites, published empirical relationships, regional curves developed from existing project streams, and NC Regional Curves. Analytical design techniques will also be a crucial element of the project and will be used to determine the design discharge and to verify the design as a whole. Conceptual plan views are provided in **Figure 10**.

The Project has been broken into the following design reaches:

Reach DS1– Priority I and II Restoration is proposed for Reach DS1. The upstream portion of this reach will require Priority II floodplain excavation as the profile transitions from the existing entrenched channel to the proposed Priority I channel at the downstream end. To reduce the potential of lost hydrology the transition from Priority II to Priority I will take place of several hundred feet and will include multiple channel plugs. Both in-line and offline restoration is proposed, and locations will be driven by valley constraints. In-stream structures such as rock sills, log sills and cross vanes will be installed for vertical stability and to improve bedform diversity. The restoration of the riparian areas will include planting wider riparian buffers and excluding cattle. An agricultural BMP will be installed at the upper end of the reach to provide sediment load attenuation from the adjacent pasture.

Reach DS2-A – Enhancement Level II is proposed for Reach DS2-A. Enhancement activities will include livestock exclusion and riparian buffer plantings. Livestock fencing will follow current NRCS specifications.

Reach DS2-B – A combination of Priority I Restoration and Enhancement Level II is proposed for Reach DS2-B. Restoration activities will realign the existing channel to improve stability and floodplain connection. Rock and log structures will be used to provide vertical stability and improved bedform diversity. Log toe structures will be installed on the outside of certain meander bends to provide bank stability. The restoration of the riparian areas will include planting wider riparian buffers and excluding cattle. The Enhancement Level II portion of the reach contains a diverse channel bed profile, and this

portion of the reach does contain localized areas of bank erosion caused by hoof shear. The Enhancement of this reach will involve livestock exclusion and buffer planting.

Typical Design Sections

Typical cross sections for riffles and pools are shown on the design plan sheets in **Appendix A**. The cross-section dimensions were developed for the two design reaches by using an in-house spreadsheet described in **Section 6.2** of this report. The cross sections were altered slightly to facilitate constructability; however, the cross-sectional area, width to depth ratio, and side slopes were preserved. Typical pool sections include pools located on straight reaches and pools on meander bends.

Meander Pattern

The design plans showing the proposed channel alignment are provided in **Appendix A**. The meander pattern was derived directly from the analog reach and was altered in some locations to provide variability in pattern, to avoid on site constraints, to follow the valley pattern, and to make the channel more constructible. The morphologic parameters summarized in the **Appendix B** were applied wherever these deviations occurred.

Longitudinal Profiles

The design profiles are presented in **Appendix A**. These profiles extend throughout the entire project for the proposed channel alignment. The profiles were designed using the analog reach bed features that were sized with the scaling factors. The bed slopes and bankfull energy gradients were determined for each design reach based on the existing valley slope and the sinuosity of the design reach. Log and rock structures will be utilized in the design to control grade, divert flows, and provide additional habitat diversity and stability.

In-Stream Structures

Structures will be incorporated into the channel design to provide additional stability and improve aquatic habitat. Native materials and vegetation will be used for revetments and grade control structures where applicable. Additionally, rock structures will be utilized intermittently along Reaches DS1 and DS2-B to provide increased stability and habitat. Typical structures that will protect the channel bed and/or banks will include riffle grade controls and log vanes.

Woody debris will be placed throughout the channel at locations and at a frequency that is similar to those observed in the analog reaches. Woody habitat features installed will include dead brush, root wads, brush toes, and log vanes. To provide additional bank stability, sod mats harvested on site will be installed along stream banks during construction if and when feasible. Sod mats will only be harvested and used if comprised of appropriate vegetation. The use of sod mats that include aggressive turf grasses will be avoided. Sod mats are natural sections of vegetation taken from the banks when they were cut during construction and are about nine inches thick. Before installation, proposed banks are graded lower than specified to accommodate the thickness of the mat. The mats are placed on top of the bank to act as a natural stabilizer of native species, and they grow much faster than the combination of coir fiber matting and seeding. Other bank stability measures include the installation of live stakes, log sills, brush toes, log vanes, and log toes. Typical details for proposed in-stream structures and revetments are in **Appendix A**.

Data Analysis

Stream Hydrologic Analysis

Hydrologic evaluations were performed for the design reaches using multiple methods to determine and validate the design bankfull discharge and channel geometry required to provide regular floodplain inundation. The use of various methods allows for comparison of results and eliminates reliance on a single

model. Peak flows (**Table 11**) and corresponding channel cross sectional areas were determined for comparison to design parameters using the following methods:

- Regional Flood Frequency Analysis,
- AutoCAD’s Hydraflow Hydrographs, and
- NC and VA Regional Curves for the Rural Piedmont.

Regional Flood Frequency Analysis

A flood frequency analysis was completed for the study region using historic gauge data on all nearby USGS gauges with drainage areas less than 6,400 acres (10 mi²) which passed the Dalrymple homogeneity test (Dalrymple, 1960). This is a subset of gauges used for USGS regression equations. Regional flood frequency equations were developed for the 1.1-, 1.5-, and 2-year peak discharges based on the gauge data. Discharges were then computed for the design reach. These discharges were compared to those predicted by the discharge regional curve and USGS regional regression 2-year discharge equations.

AutoCAD’s Hydraflow Express

Hydraflow Express was used to simulate the rainfall-runoff process and establish peak flows for the watersheds. This model was chosen over the U.S. Army Corps of Engineers model HEC-HMS because it allows the user to adjust the peak shape factor. Rainfall data reflecting both a 384 and 484 peak shape factor were used along with a standard Type II distribution, and NRCS hydrology (time of concentrations and runoff curve numbers), to simulate the rainfall-runoff process.

Regional Curve Regression Equations

The North Carolina Piedmont regional curves by Harman et al. (1999) and Doll et al. (2002) and the Virginia Rural Piedmont regional curves by Lotspeich (2009) for discharge were used to predict the bankfull discharge for the Project. The NC regional curves predicted flows that are similar to those predicted by the 1.1-year flood frequency, while the VA curves are much lower, closer to the flows predicted by the Hydraflow Hydrographs. The regional curve equations for NC discharges by Doll et al. (2002):

- (1) $Q_{bkf}=89.04*(DA)^{0.73}$ (Harman et al., 1999)
- (2) $Q_{bkf}=91.62*(DA)^{0.71}$ (Doll et al., 2002)
- (3) $Q_{bkf}= 43.895*(DA)^{0.9472}$ (Lotspeich, 2009)

Where Q_{bkf} =bankfull discharge (ft³/s) and DA=drainage area (mi²).

Table 11. Peak Flow Comparison

| Reach | Drainage Area (Ac) | FFQ Q _{1.1} | FFQ Q _{1.5} | NC Regional Curve Q (1) | NC Regional Curve Q (2) | VA Regional Curve Q (3) | Hydraflow Q ₁ | Hydraflow Q ₂ | Design Q |
|-------|--------------------|----------------------|----------------------|-------------------------|-------------------------|-------------------------|--------------------------|--------------------------|----------|
| DS1 | 26 | 14 | 21 | 9 | 9 | 2 | 4 | 8 | 5-7 |
| DS2-B | 27 | 15 | 22 | 9 | 10 | 2 | 6 | 11 | 7 |

Design Discharge

Based upon the hydrologic analyses described above, design discharges were selected that fall between the model results for the 1-year and 2-year Hydraflow Hydrographs analysis for each reach. The selected flows for the restoration reaches are 5-7 ft³/s for DS1 and 7 ft³/s for DS2-B. These discharges will provide frequent inundation of the adjacent floodplain.

Sediment Transport Analysis

An erosion and sedimentation analysis was performed to confirm that the restoration design creates a stable gravel bed channel that neither aggrades nor degrades over time. Typically, sediment transport is assessed to determine a stream's ability to move a specific grain size at specified flows. Various sediment transport equations are applied when estimating entrainment for sand and gravel bed streams found in the Piedmont. The US Army Corps of Engineers (USACE) report, *Stability Thresholds for Stream Restoration Materials* (Fischenich, 2001), was used to obtain permissible shear stresses and velocities. Data found in this document was obtained from multiple sources using different testing conditions. The following methods and published documents were utilized during the sediment transport analysis:

- Permissible Shear Stress Approach, and
- Permissible Velocity Approach.

Shear Stress Approach

Shear stress is a commonly used tool for assessing channel stability. Allowable channel shear stresses are a function of bed slope, channel shape, flows, bed material (shape, size, and gradation), cohesiveness of bank materials, vegetative cover, and incoming sediment load. The shear stress approach compares calculated shear stresses to those found in the literature.

Critical shear stress is the shear stress required to initiate motion of the channels median particle size (D_{50}).

Table 12. Comparison of Allowable and Proposed Shear Stresses

| Reach | Proposed Bed Shear Stress at Bankfull Stage (lbs/ft ²) | Existing Critical Shear Stress (lbs/ft ²) | Allowable Shear Stress ¹ | | |
|-------|--|---|--------------------------------------|-------------------------------|-----------------------------------|
| | | | Coarse Gravel (lbs/ft ²) | Cobble (lbs/ft ²) | Vegetation (lbs/ft ²) |
| DS1 | 0.69 | 0.25 | 0.33 to 0.67 | 0.67 to 2.0 | 0.7 to 0.1.7 |
| DS2-B | 0.84 - 0.87 | 0.04 | 0.33 to 0.67 | 0.67 to 2.0 | 0.7 to 0.1.7 |

¹(Fischenich, 2001)

Review of the above table shows that the proposed bed shear stresses for the Project design reaches are above the critical shear stress of the existing channel material. Therefore, all proposed riffles will be supplemented with a substrate mix that has a critical shear stress greater than the proposed bed shear stress at bankfull.

Velocity Approach

Published data are readily available that provide entrainment velocities for different bed and bank materials. A comparison of calculated velocities to these permissible velocities is a simple method to aid in the verification of channel stability. **Table 13** compares the proposed velocities calculated using Manning's equation with the permissible velocities.

Table 13. Comparison of Permissible and Proposed Velocities

| Reach | Manning's "n" Value | Design Velocity (ft/s) | Proposed Bed Material | Permissible Velocity ¹ (ft/sec) |
|-------|---------------------|------------------------|-------------------------|--|
| DS1 | 0.05 | 2.3 | Coarse gravel to cobble | 2.5 - 6 |
| DS2-B | 0.05 | 2.5 - 2.6 | Coarse gravel to cobble | 2.5 - 6 |

¹(Fischenich, 2001)

Sediment Supply

In addition to the stability assessment, a qualitative analysis of sediment supply was performed by characterizing watershed conditions. A combination of field reconnaissance and windshield surveys, existing land use data, and historical aerial photography were analyzed to assess existing and past watershed conditions to determine if any changes occurred that would significantly impact sediment supply. As discussed in **Section 3.3**, the land use throughout the site has changed little since 1960. Much of the project area has been used primarily for agricultural purposes over the past 60 years. Most of the existing stream channels are unforested. Land use has remained relatively constant within this rural watershed, and significant land disturbing activities are not anticipated for the future.

There are several areas of instability and erosion along the channels, which appear to be a result of historic cattle activity and agricultural activities occurring up to and along channel banks and not from watershed activities. It is anticipated that sediment supply from agricultural land adjacent to the project will decrease as buffers are enhanced and widened and flows from existing agricultural ditches are diffused before entering the proposed channel.

6.3 Vegetation and Planting Plan

Plant Community Restoration

The restoration of the plant communities is an important aspect of the restoration Project. The selection of plant species is based on what was observed at the reference reach, species present in the forest surrounding the restoration Project, and what is typically native to the area. Several sources of information were used to determine the most appropriate species for the restoration project. The reference stream is located within a disturbed Piedmont Alluvial Forest. Dominant species included sweetgum, red maple, tulip poplar, American beech, pignut hickory, eastern red cedar, green ash, and boxelder. The reference site was chosen due to the stability of the channel, the physical structure of the forest community, and to evaluate stream habitat.

A Piedmont Alluvial Forest will be the target community along the Project reaches. The target community will be used for the planting areas within the Project, shown in **Appendix A**. The plant species list has been developed and can be found in **Table 14**. Species with high dispersal rates are not included because of local occurrence, adjacent seed sources, and the high potential for natural regeneration. The high dispersal species include red maple and sweetgum.

The restoration of plant communities along the Project will provide stabilization and diversity. For rapid stabilization of the stream banks (primarily outside meanders), silky dogwood (*Cornus amomum*) and black willow (*Salix nigra*) were chosen for live stakes along the restored channel because of their rapid growth patterns and high success rates. Willows grow at a faster rate than the species planted around them, and they stabilize the stream banks. Willows will also be quicker to contribute organic matter to the channel. When the other species are bigger, the black willows will slowly stop growing or die out because the other species would outgrow them and create shade that the willows do not tolerate. The live stake species will be planted along the outside of the meander bends three feet from the top of bank, creating a three-foot section along the top of bank. The live stakes will be spaced one per linear foot with alternate spacing vertically.

It is anticipated that the vegetation planting/replanting will be conducted between November 15 and March 15, per the October 2016 USACE/NCIRT monitoring guidance. If the Project completes construction after March 15, but before May 31, the site will be planted immediately following construction so that there is 180 days prior to the initiation of the first year of monitoring.

Table 14. Proposed Plant List

| Bare Root Planting Tree Species | | | | |
|--|--------------------|---------------------|------------------|---------------------------------------|
| Species | Common Name | Spacing (ft) | Unit Type | % of Total Species Composition |
| <i>Quercus nigra</i> | Water Oak | 9X6 | Bare Root | 15 |
| <i>Quercus phellos</i> | Willow Oak | 9X6 | Bare Root | 15 |
| <i>Betula nigra</i> | River birch | 9X6 | Bare Root | 15 |
| <i>Platanus occidentalis</i> | American Sycamore | 9X6 | Bare Root | 15 |
| <i>Quercus rubra</i> | Northern Red Oak | 9X6 | Bare Root | 10 |
| <i>Fraxinus pennsylvanica</i> | Green Ash | 9X6 | Bare Root | 10 |
| <i>Liriodendron tulipifera</i> | Yellow Poplar | 9X6 | Bare Root | 10 |
| <i>Diospyros virginiana</i> | Persimmon | 9X6 | Bare Root | 5 |
| <i>Nyssa sylvatica</i> | Black Gum | 9X6 | Bare Root | 5 |

| Live Staking and Live Cuttings Bundle Tree Species | | |
|---|--------------------|---------------------------------------|
| Species | Common Name | % of Total Species Composition |
| <i>Salix nigra</i> | Black willow | 60 |
| <i>Cornus ammomum</i> | Silky dogwood | 40 |

On-Site Invasive Species Management

Treatment for invasive species will be required within all grading limits associated with stream restoration. Invasive species will require different and multiple treatment methods, depending on plant phenology and the location of the species being treated (Appendix J). All treatment will be conducted as to maximize its effectiveness and reduce chances of detriment to surrounding native vegetation. Treatment methods will include mechanical (cutting with loppers, clippers, or chain saw) and chemical (foliar spray, cut stump, and hack and squirt techniques). Plants containing mature, viable seeds will be removed from the Project and properly disposed. All herbicide applicators will be supervised by a certified ground pesticide applicator with a North Carolina Department of Agriculture and Consumer Services (NCDA&CS) license and adhere to all legal and safety requirements according to herbicide labels, and NC and Federal laws. Management records will be kept on the plant species treated, type of treatment employed, type of herbicide used, application technique, and herbicide concentration and quantities used. These records will be included in all reporting documents.

Soil Restoration

After construction activities, the subsoil will be scarified and any compaction will be deep tilled before the topsoil is placed back over the Project. Any topsoil that is removed during construction will be stockpiled and placed over the Project during final soil preparation. This process should provide favorable soil conditions for plant growth. Rapid establishment of vegetation will provide natural stabilization for the Project.

6.4 Mitigation Summary

Natural channel design techniques have been used to develop the restoration designs described in this document. The combination of the analog and analytical design methods was determined to be appropriate for this Project because the watershed is rural, the causes of disturbance are known and have been abated,

and there are minimal infrastructure constraints. The original design parameters were developed from the measured analog/reference reach data and applied to the subject stream. The parameters were then analyzed and adjusted through an iterative process using analytical tools and numerical simulations of fluvial processes. The designs presented in this report provide for the restoration of natural Piedmont gravel-bed channel features and stream bed diversity to improve benthic habitat. The proposed design will allow flows that exceed the design bankfull stage to spread out over the floodplain.

A large portion of the existing stream will be filled using material excavated from the restoration channel. However, multiple segments will be left partially filled to provide habitat diversity and flood storage. Native woody material will be installed throughout the restored reach to reduce bank stress, provide grade control, and increase habitat diversity.

Forested riparian buffers of at least 50 feet on both sides of the channel will be established along the Project reaches. An appropriate riparian plant community (Piedmont Alluvial Forest) will be established to include a diverse mix of species. The plant species list has been developed and can be found in **Table 14**. Although there is one planting zone, certain targeted species will be planted in the appropriate target community location. Replanting of native species will occur where the existing buffer is impacted during construction. Replanting of native species will occur where the existing buffer is impacted during construction.

A combination of agricultural BMPs will be used on site; riparian buffer planting, bank stabilization, stream restoration, livestock exclusions, and livestock watering facilities. This combination of BMPs will ultimately lead to the functional uplift of the site by minimizing sedimentation, nutrient input, and fecal coliform input from ongoing livestock and agricultural production outside of the conservation easement. Additionally, installation of one agricultural runoff attenuation structure will regulate upstream runoff coming into DS1.

Due to the nature of the project, complete avoidance of stream and wetland impacts is not possible. Proposed stream impacts, including stream relocation and culverts, will be replaced on site. Wetland impacts associated with restoration and enhancement efforts will only temporarily impact wetlands and will provide an overall increase in wetland function with the addition of native trees and shrubs along the stream banks, and restored hydrology. All stream impacts will be accounted for in the Pre-Construction Notification (PCN) form.

6.5 Determination of Credits

Mitigation credits presented in **Table 15** are projections based upon site design (**Figure 10**). Upon completion of site construction, the project components and credits data will only be revised to be consistent with the as-built condition if there is a large discrepancy. Any deviation from the mitigation plan post approval, including adjustments to credits, will require a request for modification. This will be approved by the USACE.

Table 15. Catbird Site (ID-100022) - Mitigation Components

| Project Component (reach ID) | Wetland Position and Hydro Type | Existing Footage | Stationing | Mitigation Plan Footage | As-Built Footage | Restoration Level | Approach Priority Level | Mitigation Ratio (X:1) | Mitigation Credits | Notes/Comments |
|------------------------------|---------------------------------|------------------|---------------|-------------------------|------------------|-------------------|-------------------------|------------------------|--------------------|---|
| DS1 (Upper) | | 300 | 1+19 to 4+07 | 288 | TBD | R | P2 | 1:1 | 288.0 | Channel restoration, riparian planting, livestock exclusion (Stream crossing: STA 4+07 to STA 4+37) |
| DS1 (Lower) | | 668 | 4+37 to 10+98 | 661 | TBD | R | P1/P2 | 1:1 | 661.0 | Channel restoration, riparian planting, livestock exclusion |
| DS2-A | | 78 | 0+92 to 1+70 | 78 | TBD | EII | - | 2.5:1 | 31.2 | Riparian planting, livestock exclusion |
| DS2-B (Upper) | | 515 | 1+70 to 6+96 | 526 | TBD | R | P1/P2 | 1:1 | 526.0 | Channel restoration, riparian planting, livestock exclusion |
| DS2-B (Middle) | | 181 | 6+96 to 8+55 | 159 | TBD | EII | - | 2.5:1 | 63.6 | Riparian planting, livestock exclusion |
| DS2-B (Lower) | | 522 | 8+55 to 13+66 | 511 | TBD | R | P1 | 1:1 | 511.0 | Channel restoration, riparian planting, livestock exclusion |
| No Wetland Mitigation | | | | | | | | | | |

Length and Area Summations by Mitigation Category

| Restoration Level | Stream (linear feet) | Riparian Wetland (acres) | | Non-riparian Wetland (acres) |
|-------------------|----------------------|--------------------------|--------------|------------------------------|
| | | Riverine | Non-Riverine | |
| Restoration | 1,986 | | | |
| Enhancement | | | | |
| Enhancement I | | | | |
| Enhancement II | 237 | | | |
| Creation | | | | |
| Preservation | | | | |
| High Quality Pres | | | | |

Overall Assets Summary

| Asset Category | Overall Credits |
|-------------------|-----------------|
| Stream | 2,080.8 |
| RP Wetland | NA |
| NR Wetland | NA |

7 PERFORMANCE STANDARDS

The success criteria for the Project will follow the 2016 USACE Wilmington District Stream and Wetland Compensatory Mitigation Update and subsequent agency guidance. Specific success criteria components are presented below.

7.1 Stream Restoration Success Criteria

Bankfull Events

Four bankfull flow events must be documented within the seven-year monitoring period. The bankfull events must occur in separate years. Otherwise, the stream monitoring will continue until four bankfull events have been documented in separate years. Crest gauges will be installed on DS1 and DS2-B.

Cross Sections

There should be little change in as-built cross sections. If changes do take place, they should be evaluated to determine if they represent a movement toward a less stable condition (for example down-cutting or erosion) or are minor changes that represent an increase in stability (for example settling, vegetative changes, deposition along the banks, or decrease in width/depth ratio). Cross sections shall be classified using the Rosgen stream classification method, and all monitored cross sections should fall within the quantitative parameters defined for channels of the design stream type. Bank height ratio shall not exceed 1.2, and the entrenchment ratio shall be above 2.2 within restored riffle cross sections (for C and E streams). Channel stability should be demonstrated through a minimum of four bankfull events documented in the seven-year monitoring period.

Digital Image Stations

Digital images will be used to subjectively evaluate channel aggradation or degradation, bank erosion, success of riparian vegetation, and effectiveness of erosion control measures. Longitudinal images should not indicate the absence of developing bars within the channel or an excessive increase in channel depth. Lateral images should not indicate excessive erosion or continuing degradation of the banks over time. A series of images over time should indicate successional maturation of riparian vegetation.

Surface Flow

Stream restoration reaches will be monitored to document intermittent or seasonal surface flow. This will be accomplished through direct observation and the use of hydraulic pressure transducers with data loggers. Intermittent reaches must demonstrate a minimum of 30 consecutive days of flow.

RES will provide post construction flow monitoring near the top of DS1 to document flow conditions.

7.2 Vegetation Success Criteria

Specific and measurable success criteria for plant density within the riparian buffers on the Project will follow IRT Guidance. The interim measures of vegetative success for the Project will be the survival of at least 320 planted three-year old trees per acre at the end of Year 3, 260 trees per acre with an average height of seven feet at the end of Year 5, and the final vegetative success criteria will be 210 trees per acre with an average height of ten feet at the end of Year 7. Volunteer trees will be counted, identified to species, and included in the yearly monitoring reports, but will not be counted towards the success criteria of total planted stems. Moreover, any single species can only account for up to 50 percent of the required number of stems within any vegetation plot. Any stems in excess of 50 percent will be shown in the monitoring table but will not be used to demonstrate success.

8 MONITORING PLAN

Annual monitoring data will be reported using the DMS Monitoring Report Template dated June 2017 and NC IRT monitoring template. The monitoring report shall provide a project data chronology that will facilitate an understanding of project status and trends, research purposes, and assist in decision making regarding project close-out. Monitoring reports will be prepared annually and submitted to DMS. Monitoring of the Project will adhere to metrics and performance standards established by the USACE's April 2003 Wilmington District Stream Mitigation Guidelines and the NC IRT's October 2016 Wilmington District Stream and Wetland Compensatory Mitigation Update. **Table 16** outlines the links between project objectives and treatments and their associated monitoring metrics and performance standards within the context of functional uplift based on the Stream Functions Pyramid Framework. **Figure 11** is a monitoring map with locations for vegetation plots, flow gauges, and crest gauges.

8.1 As-Built Survey

An as-built survey will be conducted following construction to document channel size, condition, and location. The survey will include a complete profile of thalweg, water surface, bankfull, and top of bank to compare with future geomorphic data. Longitudinal profiles will not be required in annual monitoring reports unless requested by USACE. Stream channel stationing will be marked with stakes placed near the top of bank every 200 feet.

8.2 Visual Monitoring

Visual monitoring of all mitigation areas will be conducted a minimum of twice per monitoring year by qualified individuals. The visual assessments will include vegetation density, vigor, invasive species, and easement encroachments. Visual assessments of stream stability will include a complete streamwalk and structure inspection. Digital images will be taken at fixed representative locations to record each monitoring event, as well as any noted problem areas or areas of concern. Results of visual monitoring will be presented in a plan view exhibit with a brief description of problem areas and digital images. Photographs will be used to subjectively evaluate channel aggradation or degradation, bank erosion, success of riparian vegetation, and effectiveness of erosion control measures. Longitudinal photos should indicate the absence of developing bars within the channel or an excessive increase in channel depth. Lateral photos should not indicate excessive erosion or continuing degradation of the banks over time. A series of photos over time should indicate successional maturation of riparian vegetation.

8.3 Hydrology Events

Crest gauges will be installed to document the occurrence of bankfull events. A minimum of one gauge will be installed on each tributary that is greater than 1,000 feet in length, with one gauge required for every 5,000 feet of length on each tributary and a maximum of five gauges per tributary. Reaches with Priority 1 Restoration (designed to reconnect the stream to its floodplain), gauges will be capable of tracking the frequency and duration of overbank events. Where restoration or enhancement activities are proposed for intermittent streams, monitoring gauges should be installed to track the frequency and duration of stream flow events.

8.4 Cross Sections

Permanent cross sections will be installed at a minimum of one per 20 bankfull widths with half in pools and half in riffle on all Restoration and Enhancement I reaches. Morphological data will be measured and recorded for all cross-sections; however, only riffle cross sections will include bank height ratio and entrenchment ratio measurements. Cross sections will be monitored in Years 1, 2, 3, 5, and 7.

8.5 Vegetation Monitoring

Vegetation monitoring plots will be a minimum of 0.02 acres in size and cover a minimum of two percent of the planted area. There will be five plots within the planted area (5.40 acres). Plots will be a mixture of fixed and random plots, with four fixed plots and one random plot. Planted area indicates all area in the easement that will be planted with trees. Existing wooded areas are not included in the planted area. The following data will be recorded for all trees in the fixed plots: species, height, planting date (or volunteer), and grid location. For random plots, species and height will be recorded for all woody stems. The location (GPS coordinates and orientation) of the random plots will be identified in the annual monitoring reports. Vegetation will be planted and plots established at least 180 days prior to the initiation of the first year of monitoring. Monitoring will occur in Years 1, 2, 3, 5, and 7 between July 1st and leaf drop. Invasive and noxious species will be monitored so that none become dominant or alter the desired community structure of the Project. If necessary, RES will develop a species-specific treatment plan.

8.6 Scheduling/Reporting

A baseline monitoring report and as-built drawings documenting stream restoration activities will be developed within 60 days of the planting completion on the Project. The report will include all information required by DMS mitigation plan guidelines, including elevations, photographs and sampling plot locations, gauge locations, and a description of initial species composition by community type. The report will also include a list of the species planted and the associated densities. Baseline vegetation monitoring will include species, height, date of planting, and grid location of each stem. The baseline report will follow DMS As-Built Baseline Monitoring Report Template June 2017, USACE guidelines, and the October 2017 Mitigation Credit Calculation Memo.

The monitoring program will be implemented to document system development and progress toward achieving the success criteria. The restored stream morphology will be assessed to determine the success of the mitigation. The monitoring program will be undertaken for seven years or until the final success criteria are achieved, whichever is longer.

Monitoring reports will be prepared in the fall of each year of monitoring and submitted to DMS. The monitoring reports will include all information and be in the format required by USACE.

Table 16. Monitoring Requirements

| Level | Treatment | Objective | Monitoring Metric | Performance Standard |
|--|---|--|--|---|
| 1 <i>Hydrology</i> | Convert land-use of Project reaches from pasture to riparian forest | Improve the transport of water from the watershed to the Project reaches in a non-erosive way | NA | NA |
| | Install one agricultural sediment load attenuation structure to limit inputs of sediment from surrounding farming operations coming into the reach (DS1) | | Visually monitor integrity of runoff attenuation structure: Performed semiannually <i>(indirect measurement)</i> | Identify and document instability and/or flaws to the structure |
| 2 <i>Hydraulic</i> | Reduce bank height ratios and increase entrenchment ratios by reconstructing channels to mimic reference reach conditions | Improve flood bank connectivity by reducing bank height ratios and increase entrenchment ratios | Crest gauges and/or pressure transducers: Inspected semiannually | Four bankfull events occurring in separate years |
| | | | Cross sections: Surveyed in Years 1, 2, 3, 5 and 7 | At least 30 days of continuous flow each year |
| | | | | Entrenchment ratio shall be above 2.2 within restored reaches (C and E) |
| Bank height ratio shall not exceed 1.2 | | | | |
| 3 <i>Geomorphology</i> | Establish a riparian buffer to reduce erosion and sediment transport into project streams. Establish stable banks with livestakes, erosion control matting, and other in stream structures. | Reduce erosion rates and channel stability to reference reach conditions | As-built stream profile | NA |
| | | | Cross sections: Surveyed in Years 1, 2, 3, 5 and 7 | Entrenchment ratio shall be no less than 2.2 within restored reaches |
| | | Visual monitoring | Bank height ratio shall not exceed 1.2 | |
| | | Visual monitoring: Performed at least semiannually | Identify and document significant stream problem areas; i.e. erosion, degradation, aggradation, etc. | |
| | | Vegetation plots: Surveyed in Years 1, 2, 3, 5 and 7 | MY 1-3: 320 trees/acre MY 5: 260 trees/acre (7 ft. tall) MY 7: 210 trees/acre (10 ft. tall) | |
| 4 <i>Physicochemical</i> | Exclude livestock from riparian areas with exclusion fence or conservation easement, and plant a riparian buffer | <u>Unmeasurable Objective/Expected Benefit</u> Establish native hardwood riparian buffer and exclude livestock. | Vegetation plots: Surveyed in Years 1, 2, 3, 5 and 7 <i>(indirect measurement)</i> | MY 1-3: 320 trees/acre MY 5: 260 trees/acre (7 ft. tall) MY 7: 210 trees/acre (10 ft. tall) |
| | | | Visual assessment of established fencing and conservation signage: Performed at least semiannually <i>(indirect measurement)</i> | Inspect fencing and signage. Identify and document any damaged or missing fencing and/or signs |

9 ADAPTIVE MANAGEMENT PLAN

In the event the mitigation site or a specific component of the mitigation site fails to achieve the necessary performance standards as specified in the mitigation plan, the sponsor shall notify the members of the IRT and work with the IRT to develop contingency plans and remedial actions.

10 LONG-TERM MANAGEMENT PLAN

The site will be transferred to the NCDEQ Stewardship Program (or 3rd party if approved). This party shall serve as conservation easement holder and long-term steward for the property and will conduct periodic inspection of the site to ensure that restrictions required in the conservation easement are upheld. Funding will be supplied by the responsible party on a yearly basis until such time an endowment is established. The NCDEQ Stewardship Program is developing an endowment system within the nonreverting, interest-bearing Conservation Lands Conservation Fund Account. The use of funds from the Endowment Account will be governed by North Carolina General Statute GS 113A-232(d)(3). Interest gained by the endowment fund may be used for the purpose of stewardship, monitoring, stewardship administration, and land transaction costs, if applicable.

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

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Figures List

Figure 1 – Vicinity Map

Figure 2 – USGS Map

Figure 3 – Landowner Map

Figure 4 – Land-use Map

Figure 5 – Soils Map

Figure 6 – Historical Conditions Map

Figure 7 – FEMA Map

Figure 8 – Existing Conditions Map

Figure 9 – National Wetlands Inventory Map

Figure 10 – Conceptual Plan

Figure 11 – Monitoring Map

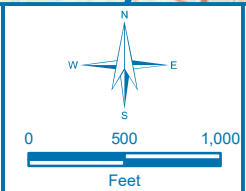
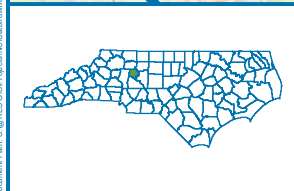
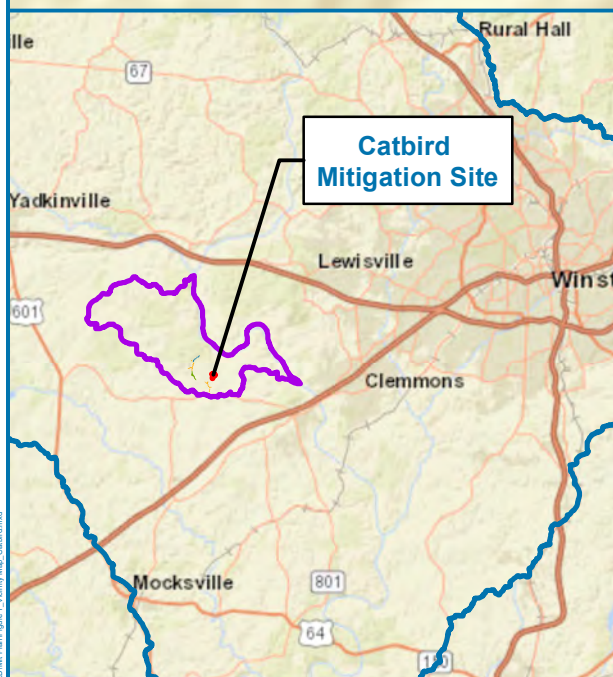
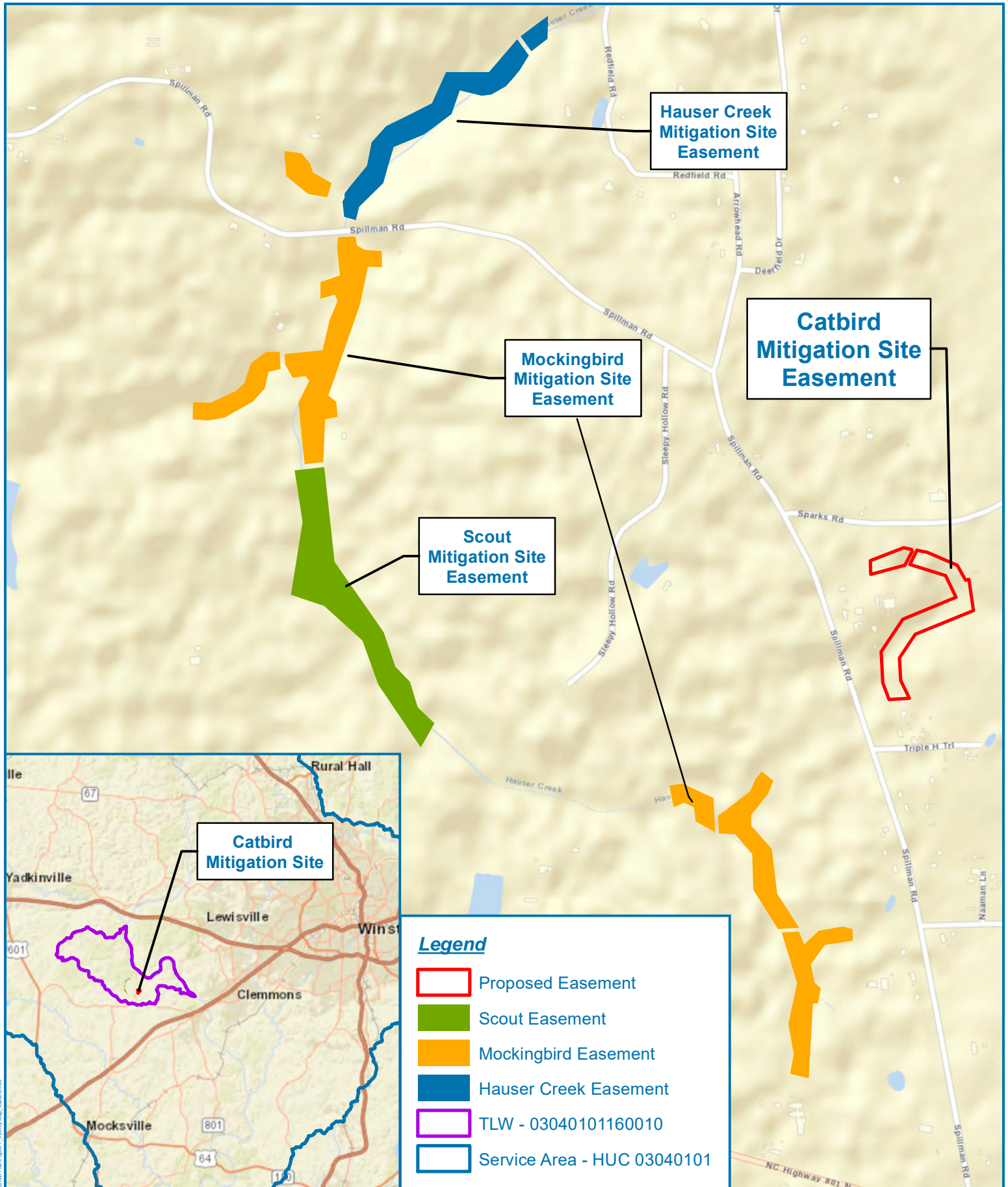
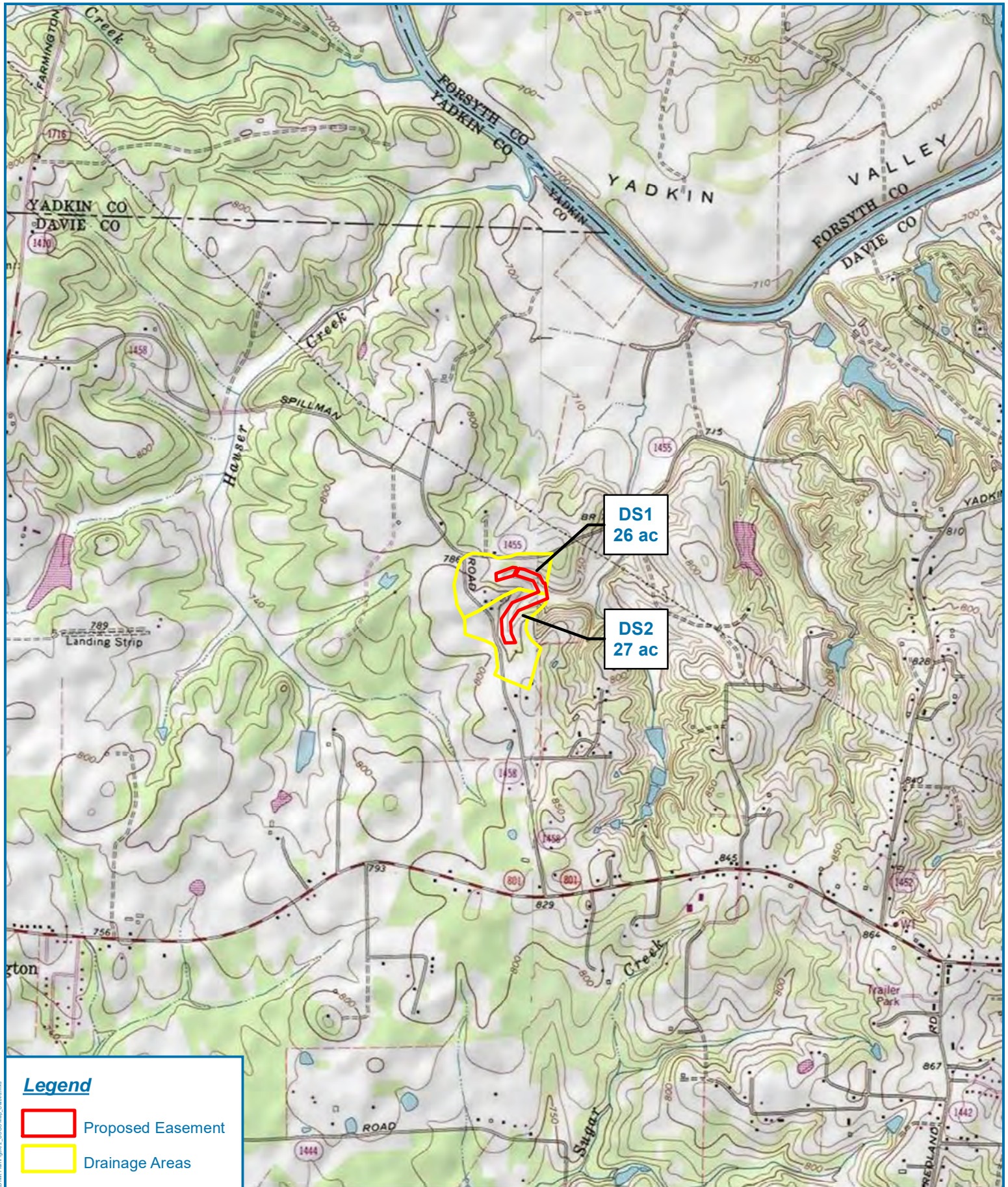


Figure 1 - Vicinity Map
Catbird Mitigation Site
 Davie County, North Carolina

Date: 12/14/2018
 Drawn by: SCF
 Checked by: MDE
 1 inch = 1,000 feet



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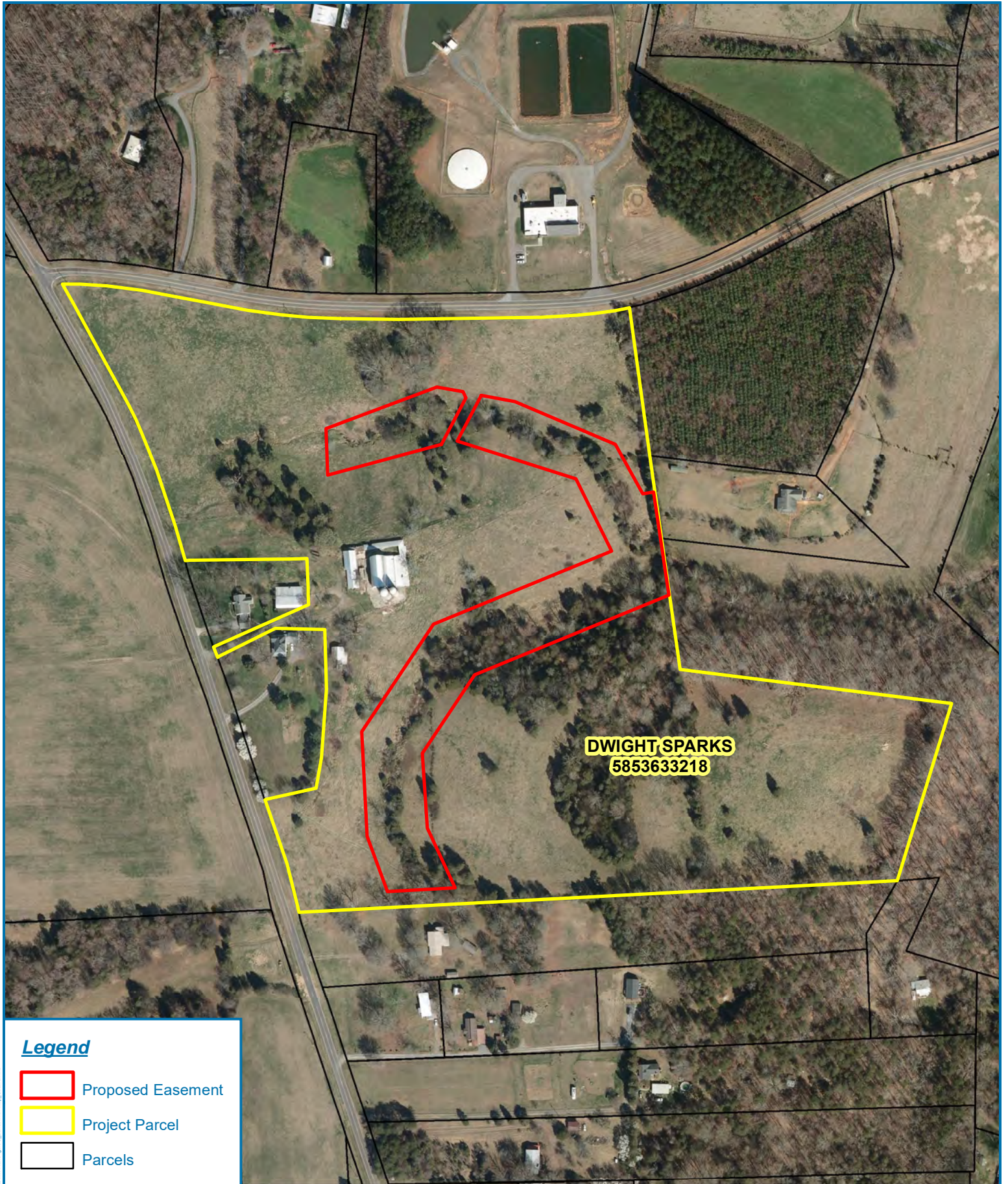
Legend

- Proposed Easement
- Drainage Areas

Figure 2 - USGS Map
Catbird Mitigation Site
 Davie County, North Carolina

Date: 12/14/2018
 Drawn by: SCF
 Checked by: MDE
 1 inch = 2,000 feet





Legend

- Proposed Easement
- Project Parcel
- Parcels

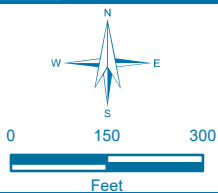
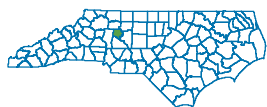


Figure 3 - Landowner Map
Catbird Mitigation Site
 Davie County, North Carolina

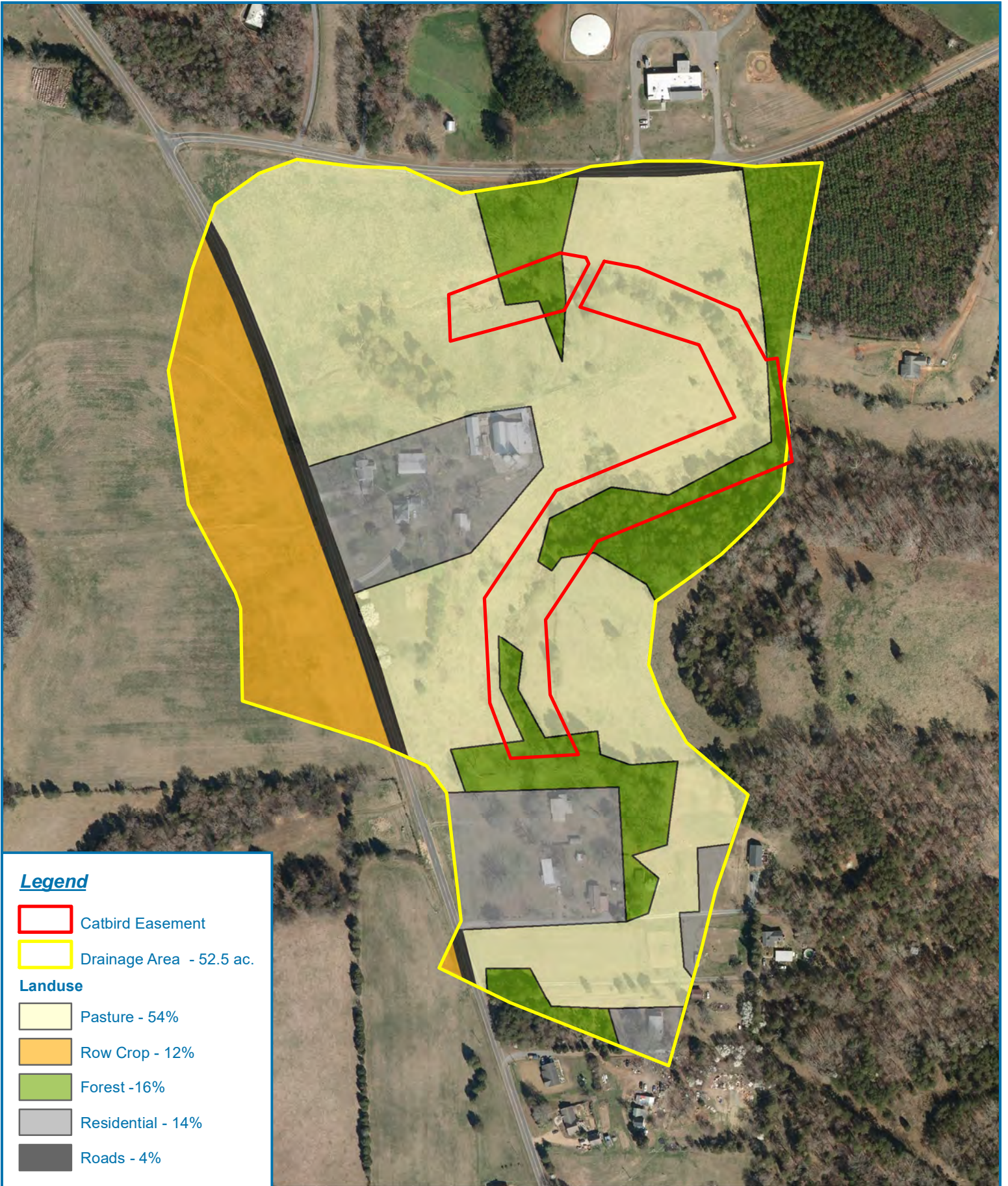
Date: 12/14/2018

Drawn by: SCF

Checked by: MDE

1 inch = 300 feet





Legend

- Catbird Easement
- Drainage Area - 52.5 ac.

Landuse

- Pasture - 54%
- Row Crop - 12%
- Forest - 16%
- Residential - 14%
- Roads - 4%

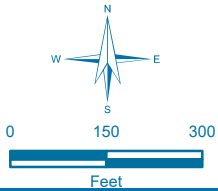


Figure 4 - Landuse Map
Catbird Mitigation Site
 Davie County, North Carolina

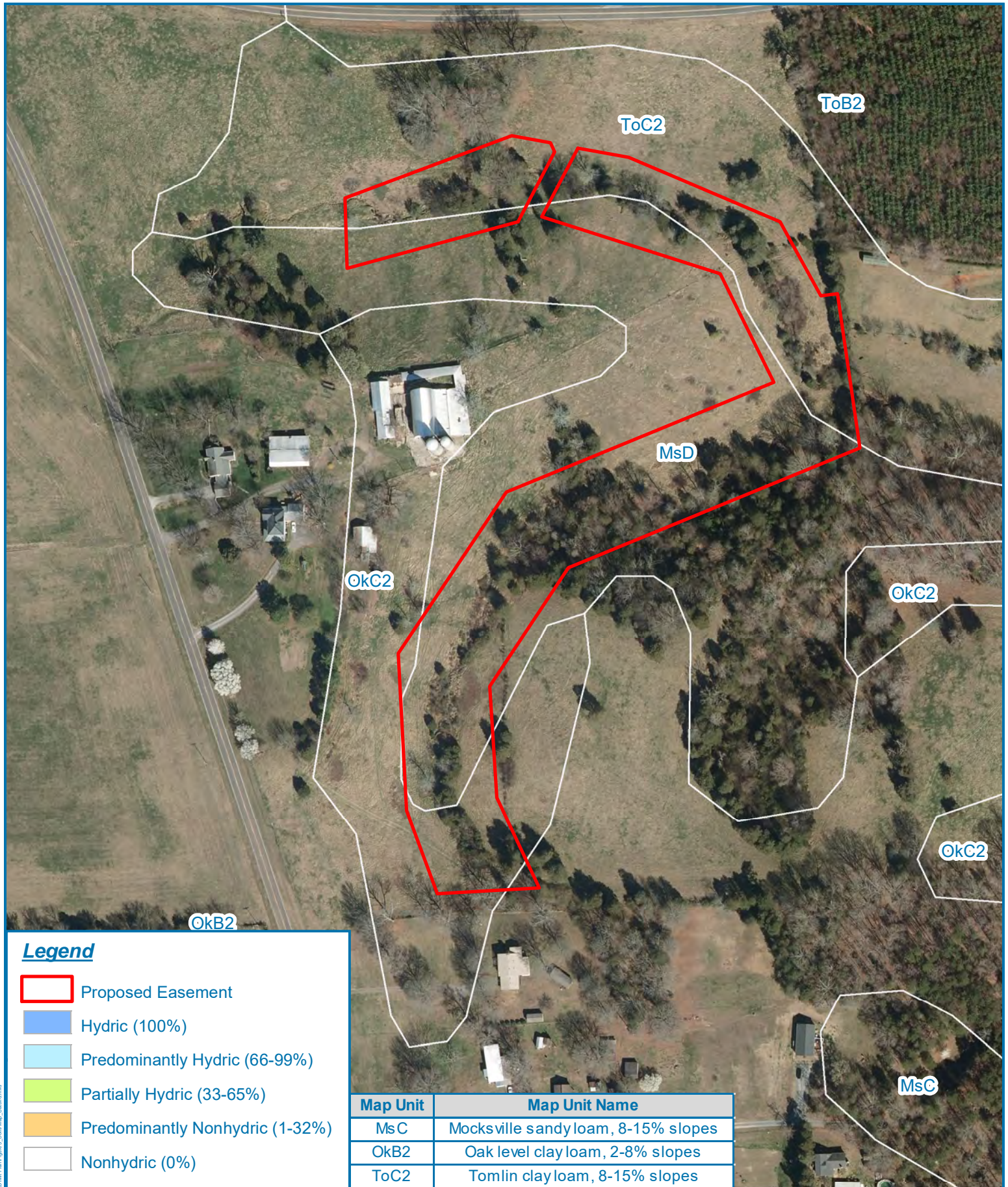
Date: 12/14/2018

Drawn by: MDD

Checked by: CSC

1 inch = 300 feet





Legend

- Proposed Easement
- Hydric (100%)
- Predominantly Hydric (66-99%)
- Partially Hydric (33-65%)
- Predominantly Nonhydric (1-32%)
- Nonhydric (0%)

| Map Unit | Map Unit Name |
|----------|-------------------------------------|
| MsC | Mocksville sandy loam, 8-15% slopes |
| OkB2 | Oak level clay loam, 2-8% slopes |
| ToC2 | Tomlin clay loam, 8-15% slopes |

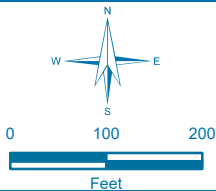
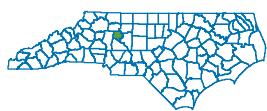


Figure 5 - Soils Map
Catbird Mitigation Site
 Davie County, North Carolina

Date: 12/14/2018

Drawn by: SCF

Checked by: MDE

1 inch = 200 feet

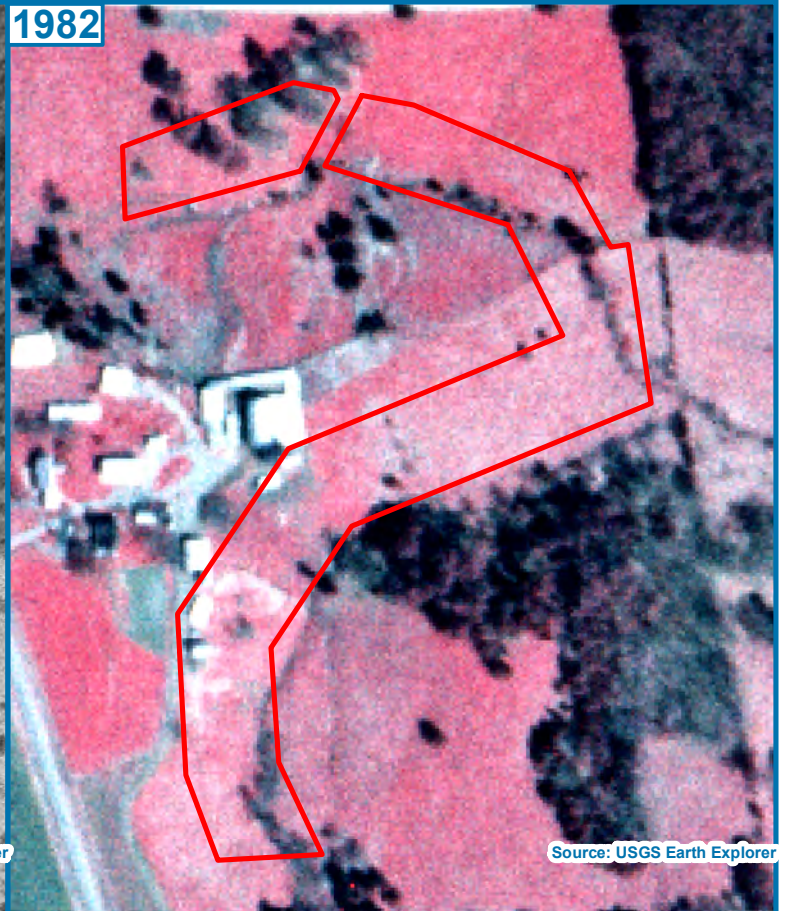


1963



Source: USGS Earth Explorer

1982



Source: USGS Earth Explorer

1993



Source: NCOneMap

2006



Source: NCOneMap

Legend

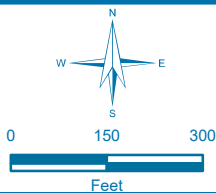
 Proposed Easement

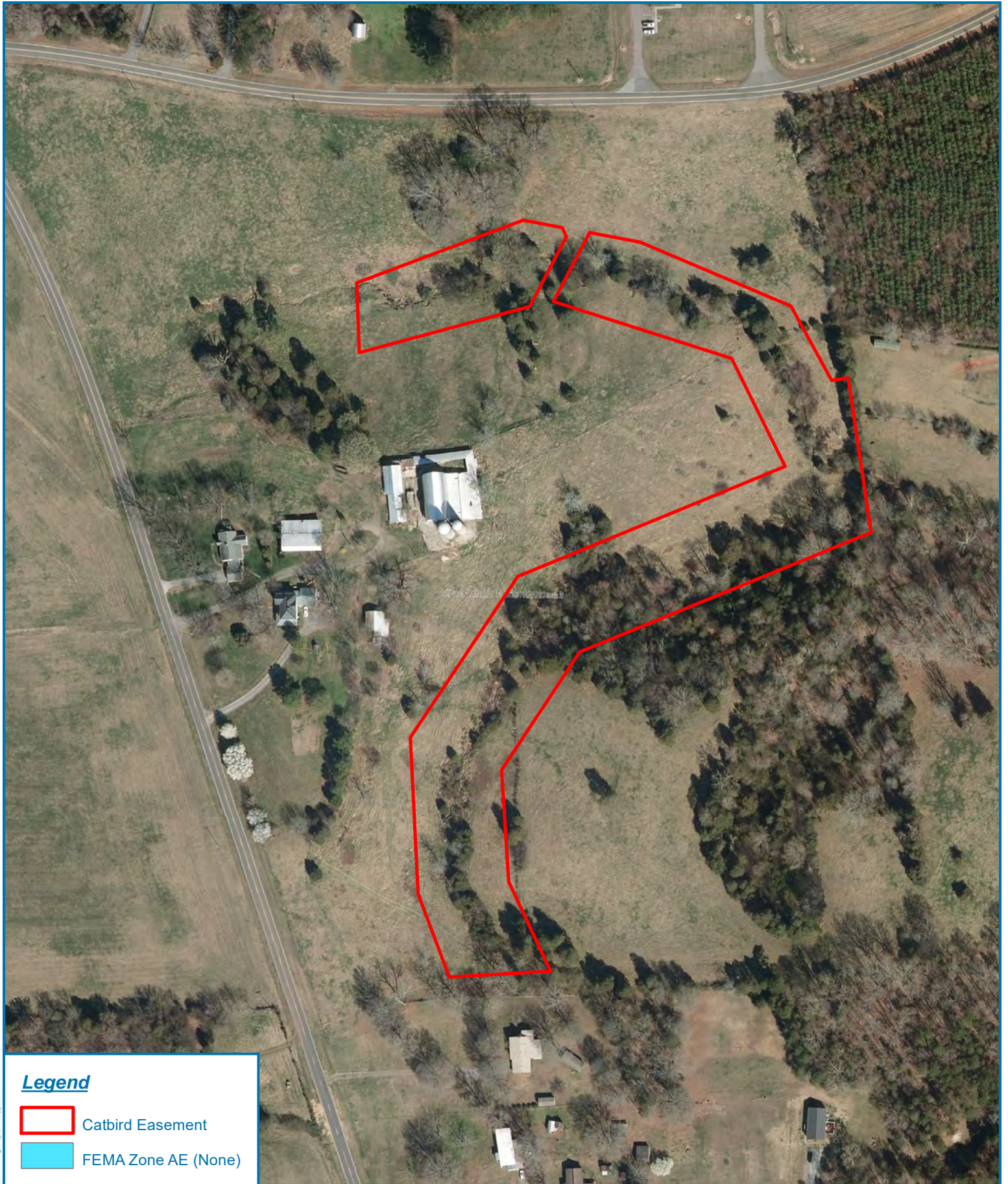
Figure 6 - Historical Imagery Map
Catbird Mitigation Site
 Davie County, North Carolina

Date: 12/14/2018



Drawn by: SCF

1 inch = 300 feet





Legend

-  Catbird Easement
-  FEMA Zone AE (None)

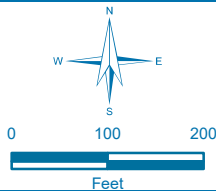


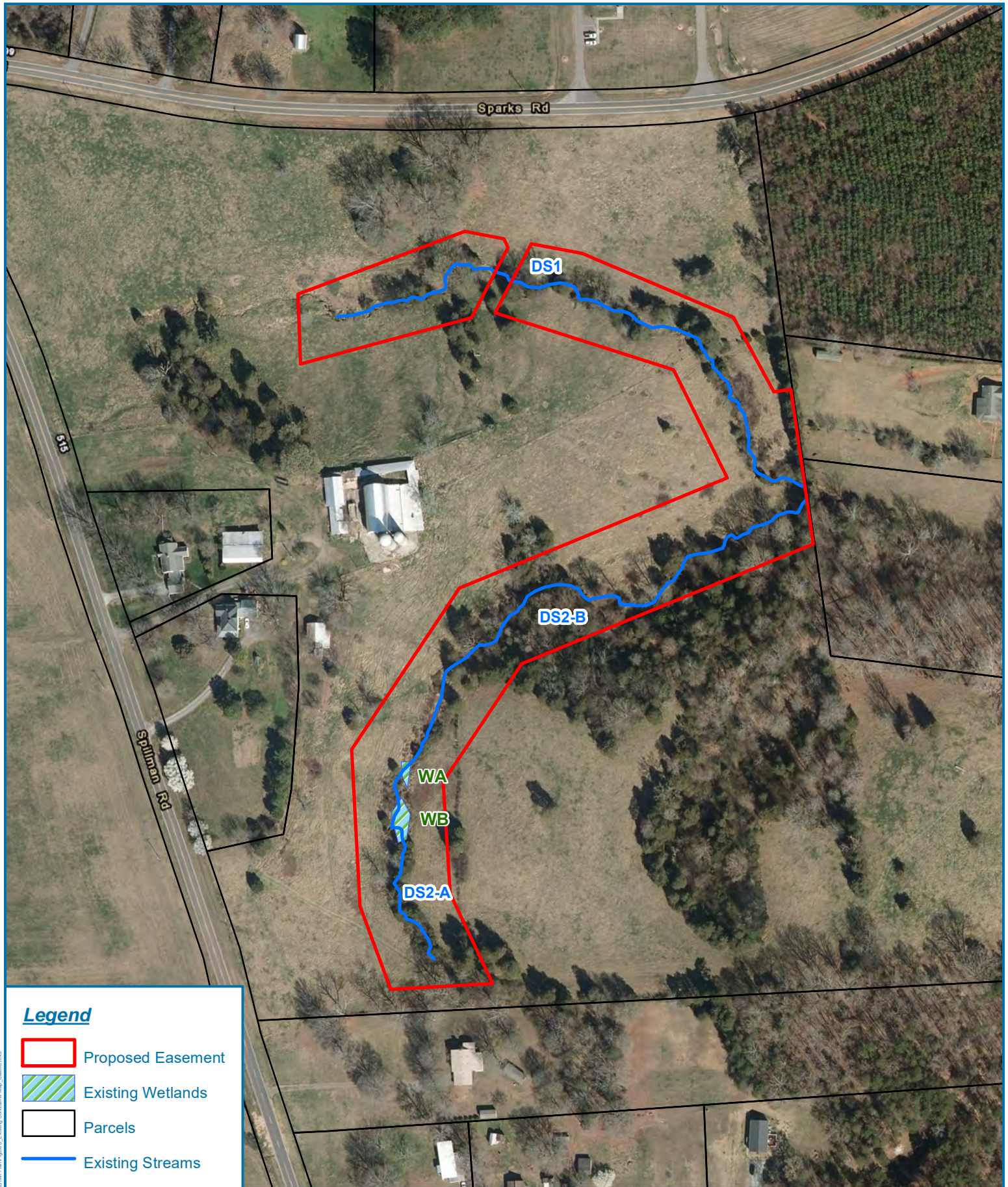
Figure 7 - FEMA Map
Catbird Mitigation Site
 Davie County, North Carolina

Date: 12/14/2018



Drawn by: SCF

1 inch = 200 feet





Legend

-  Proposed Easement
-  Existing Wetlands
-  Parcels
-  Existing Streams

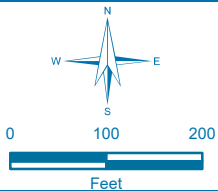


Figure 8 - Existing Conditions Map
Catbird Mitigation Site
 Davie County, North Carolina

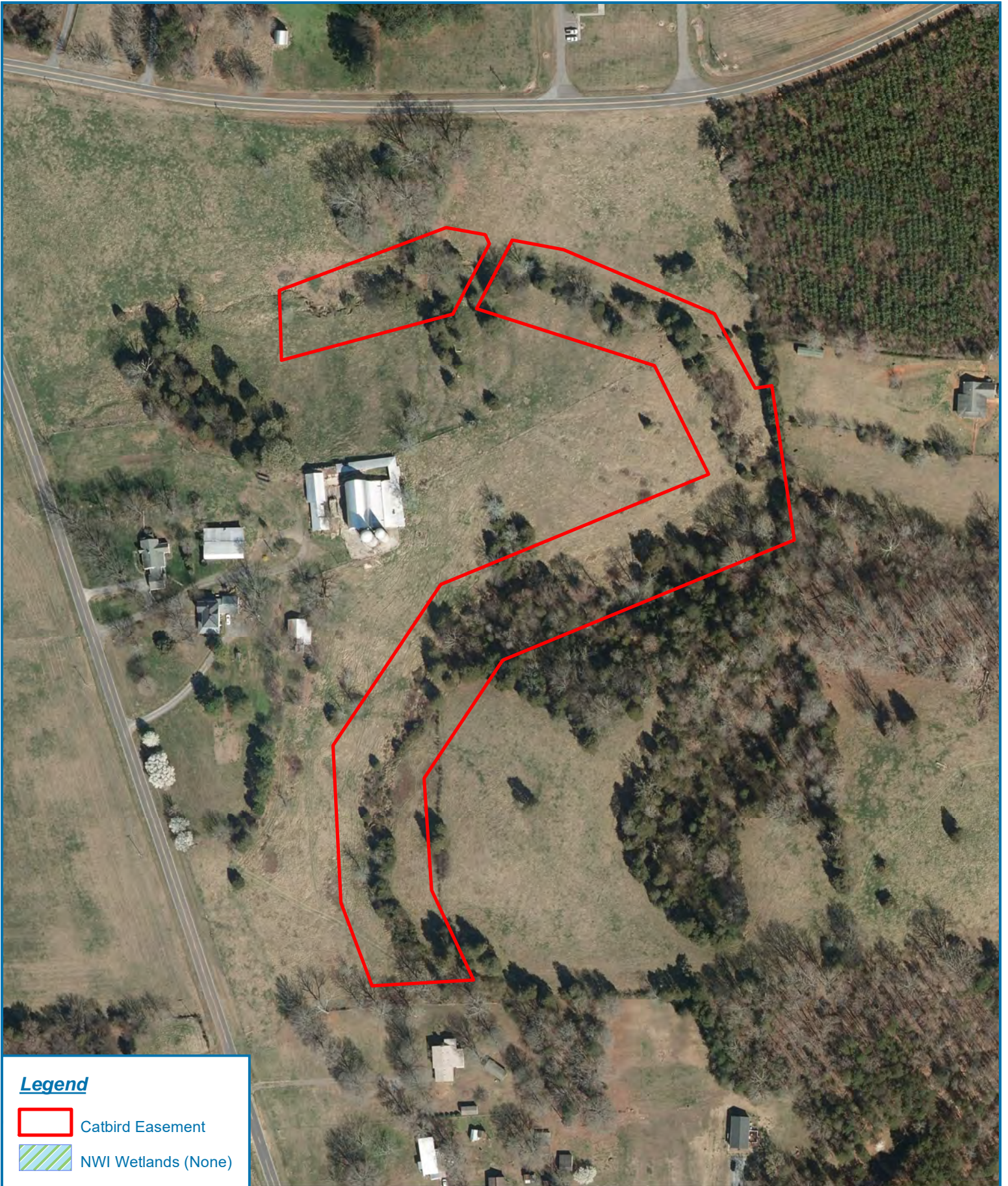
Date: 12/14/2018

Drawn by: SCF



Checked by: MDE

1 inch = 200 feet





Legend

-  Catbird Easement
-  NWI Wetlands (None)

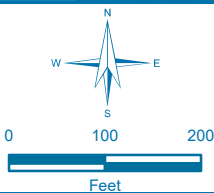


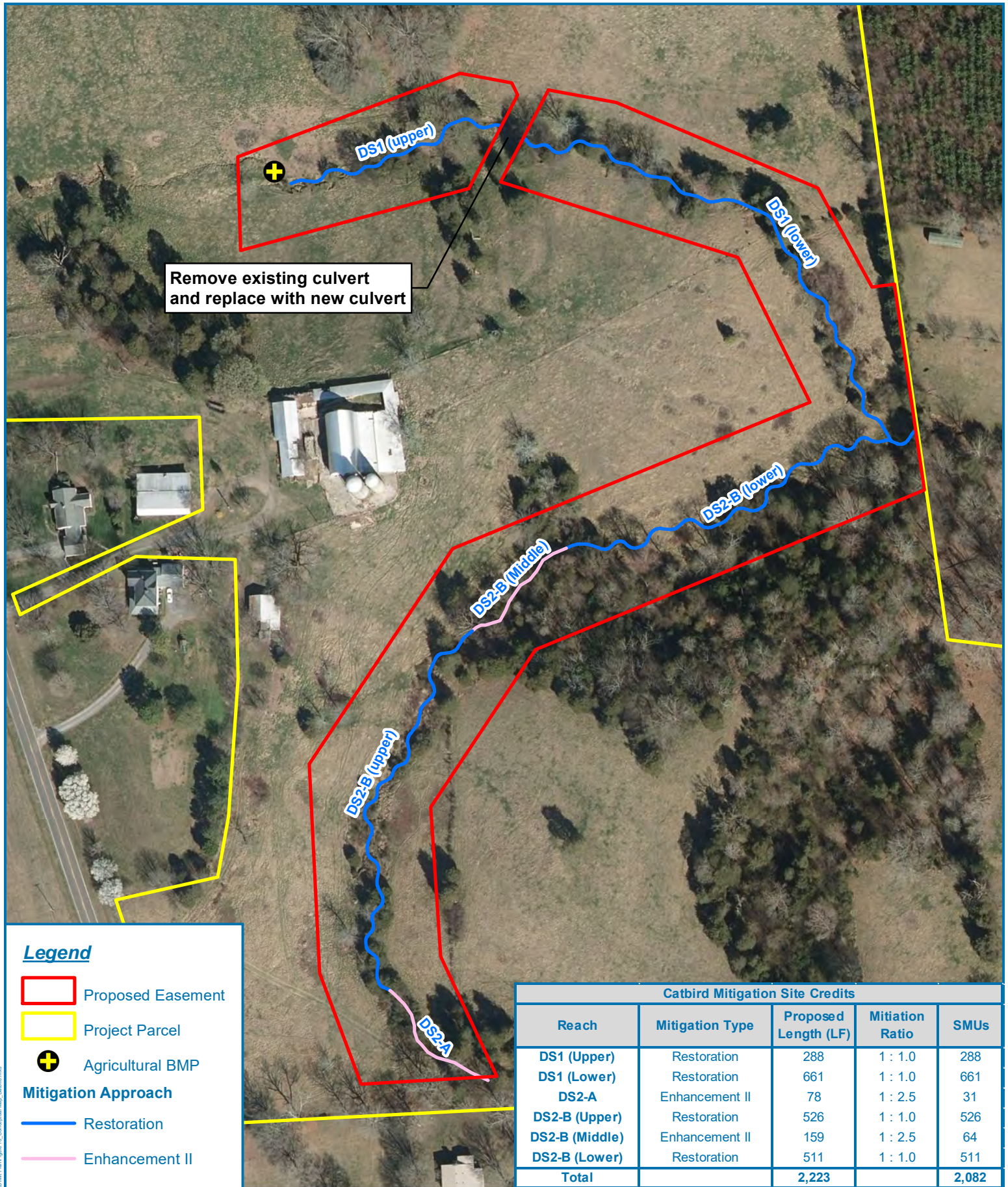
Figure 9 - NWI Map
Catbird Mitigation Site
 Davie County, North Carolina

Date: 12/14/2018

Drawn by: SCF

1 inch = 200 feet





Legend

- Proposed Easement
 - Project Parcel
 - + Agricultural BMP
- Mitigation Approach**
- Restoration
 - Enhancement II

| Catbird Mitigation Site Credits | | | | |
|---------------------------------|-----------------|----------------------|-----------------|--------------|
| Reach | Mitigation Type | Proposed Length (LF) | Mitiation Ratio | SMUs |
| DS1 (Upper) | Restoration | 288 | 1 : 1.0 | 288 |
| DS1 (Lower) | Restoration | 661 | 1 : 1.0 | 661 |
| DS2-A | Enhancement II | 78 | 1 : 2.5 | 31 |
| DS2-B (Upper) | Restoration | 526 | 1 : 1.0 | 526 |
| DS2-B (Middle) | Enhancement II | 159 | 1 : 2.5 | 64 |
| DS2-B (Lower) | Restoration | 511 | 1 : 1.0 | 511 |
| Total | | 2,223 | | 2,082 |

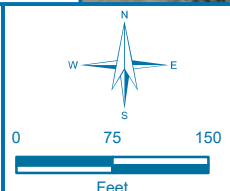
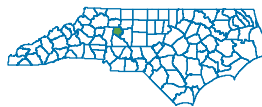
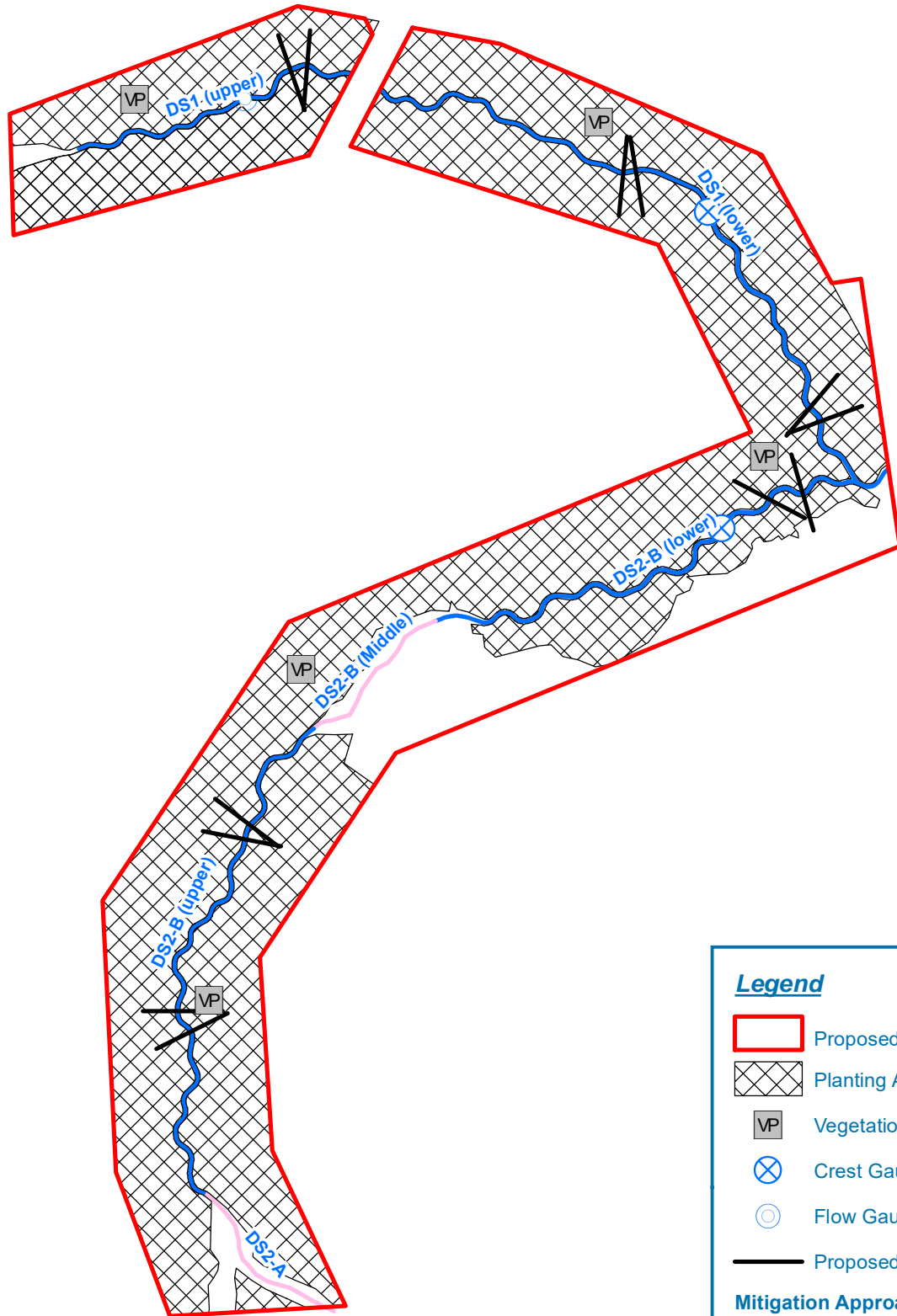


Figure 10 - Conceptual Map
Catbird Mitigation Site
 Davie County, North Carolina

Date: 1/9/2019
 Drawn by: SCF
 Checked by: CSC
 1 inch = 150 feet



Document Path: S:\RES GIS\Projects\NC\Catbird\MOI\Figures\Figure 10_Conceptual Map_Catbird.mxd



Legend

- Proposed Easement
- Planting Area
- VP
- X Crest Gauge
- Flow Gauge
- Proposed Cross Section

Mitigation Approach

- Restoration
- Enhancement II

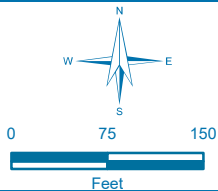


Figure 11 - Monitoring Plan Map
Catbird Mitigation Site
 Davie County, North Carolina

Date: 12/14/2018

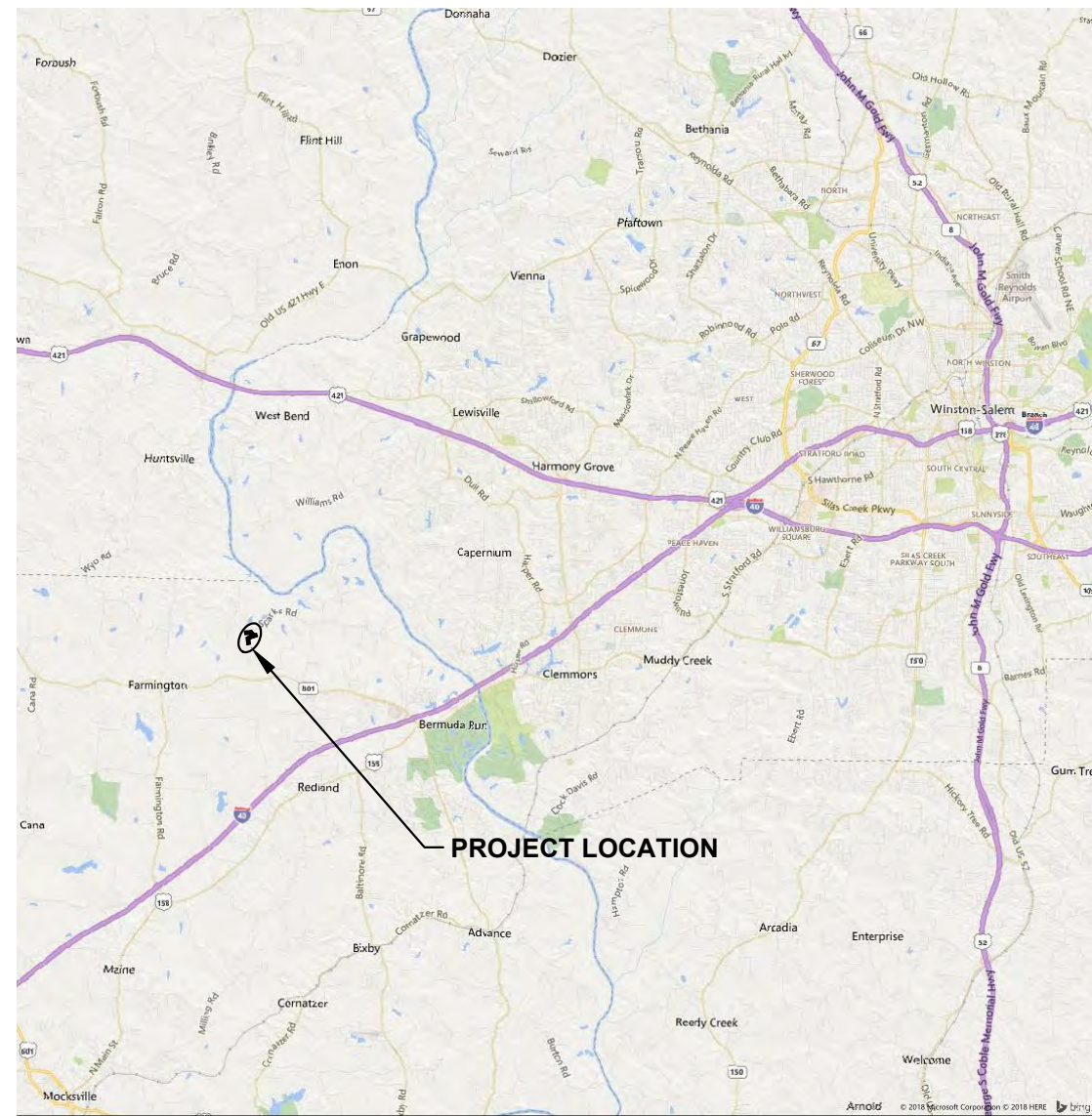
Drawn by: MDD

Checked by: CSC

1 inch = 150 feet



Appendix A - Plan Sheets



VICINITY MAP
NTS

CATBIRD SITE

DAVIE COUNTY, NORTH CAROLINA

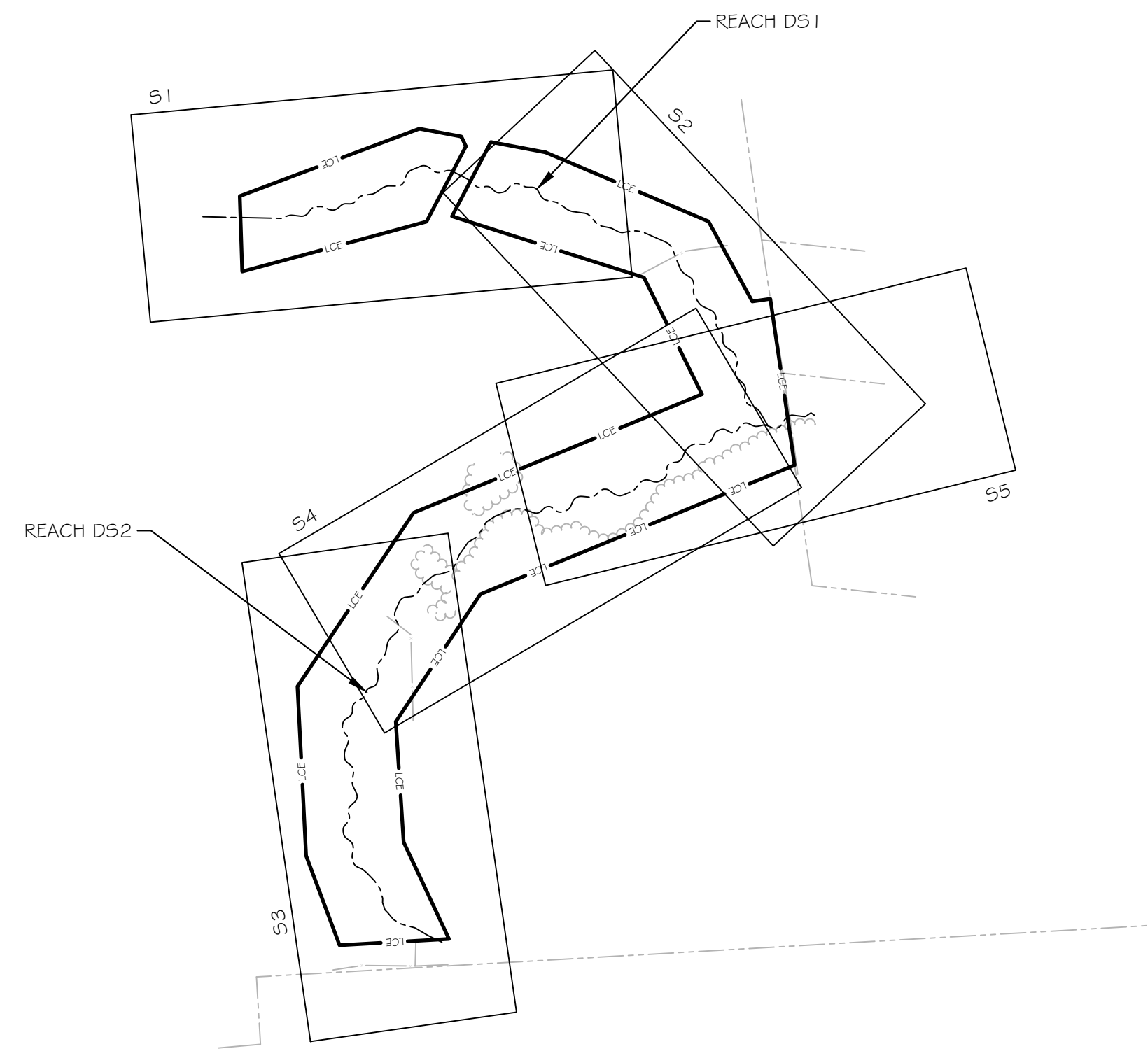
YADKIN 01 RIVER BASIN: HUC 03040101

DECEMBER 2018

RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

302 JEFFERSON ST, SUITE 110

RALEIGH, NC 27605



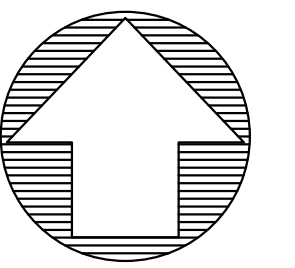
SITE MAP
NTS

| Sheet List Table | |
|------------------|---------------------|
| Sheet Number | Sheet Title |
| - | COVER |
| A1 | OVERALL PROJECT |
| E1 | NOTES |
| E2 | EXISTING CONDITIONS |
| S1 | REACH D51 |
| S2 | REACH D51 |
| S3 | REACH D52 |
| S4 | REACH D52 |
| S5 | REACH D52 |
| P1 | PLANTING PLAN |
| M1 | MONITORING PLAN |
| D1 | DETAILS |
| D2 | DETAILS |
| D3 | DETAILS |
| D4 | DETAILS |
| D5 | DETAILS |
| D6 | DETAILS |
| D7 | DETAILS |



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SEAL



PLOT DATE:
12/11/2018

MARK DATE DESCRIPTION

REVISIONS:

RELEASED FOR:

PRELIMINARY - NOT FOR CONSTRUCTION

PROJECT NUMBER: 0386
PROJECT MANAGER: BPB
DESIGNED: AFM
DRAWN: BRC
CHECKED: AFM

SHEET NUMBER:

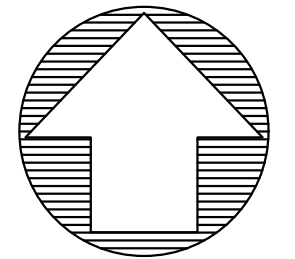
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FILE NAME: S:\@RES GIS\Projects\NC\Catbird\CADD\DWG\0386_SHT_SITE.dwg, SAVED BY: Bearroll

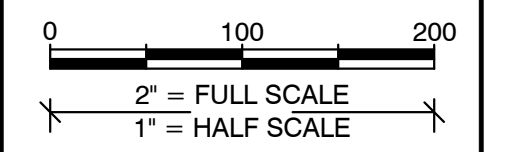


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SEAL



FULL SCALE: 1" = 100'



| MARK | DATE | DESCRIPTION | REVISIONS: | RELEASED FOR: | PRELIMINARY - NOT FOR CONSTRUCTION | PLOT DATE: |
|------|------|-------------|------------|---------------|------------------------------------|------------|
| | | | | | | 12/11/2018 |

PROJECT NAME:
 CATBIRD SITE
 DAVIE COUNTY, NORTH CAROLINA

DRAWING TITLE:
 OVERALL PROJECT

PROJECT NUMBER: 0386
 PROJECT MANAGER: BPB
 DESIGNED: AFM
 DRAWN: BRC
 CHECKED: AFM

SHEET NUMBER:

A1

CONSTRUCTION NOTES:

1. INSTALL EROSION CONTROL MEASURES AS DESCRIBED IN THE EROSION CONTROL PLAN AND NOTES. EROSION CONTROL MEASURES MAY BE PHASED-IN TO THOSE AREAS OF THE PROJECT CURRENTLY BEING WORKED ON. THE CONTRACTOR MAY MODIFY OR RELOCATE EROSION CONTROL MEASURES TO MAKE ADJUSTMENTS FOR UNFORESEEN FIELD CONDITIONS SO LONG AS PROPER CONSTRUCTION IS MAINTAINED TO ENSURE THE INTEGRITY AND USEFULNESS OF THE PROPOSED MEASURES. ALL DISTURBED AREAS ALONG CHANNEL BANKS SHALL BE STABILIZED WITH TEMPORARY SEED AND MULCH AT THE END OF EACH DAY.
2. IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
3. EXISTING WETLANDS CANNOT BE ENCLOSED UPON UNDER ANY CIRCUMSTANCES IF NOT APPROVED AS DESIGNATED IMPACT AREAS. HIGH VISIBILITY FENCING MUST BE PLACED AROUND ALL EXISTING WETLANDS THAT ARE LOCATED ADJACENT TO CONSTRUCTION ACTIVITIES AND/OR ARE LOCATED WITHIN THE PROPOSED CONSERVATION EASEMENT.
4. DURING STREAM CONSTRUCTION ACTIVITIES, THE WORK AREA SHALL BE STABILIZED AT THE END OF EACH WORKING DAY.
5. UNLESS NOTED OTHERWISE, FILL MATERIAL GENERATED FROM CHANNEL EXCAVATION AND STABILIZATION SHALL BE PLACED INSIDE THE EXISTING CHANNEL TO BE ABANDONED AT AN ELEVATION THAT PROVIDES POSITIVE DRAINAGE TOWARDS THE PROPOSED CHANNEL.
6. STOCKPILE AREAS MAY BE RELOCATED UPON THE APPROVAL OF THE ENGINEER. SILT FENCING MUST BE INSTALLED AROUND ALL STOCKPILE AREAS.
7. CONTRACTOR SHALL NOT COMPACT SOIL AROUND ROOTS OR TREES TO REMAIN, AND SHALL NOT DAMAGE SUCH TREES IN ANY WAY. EXCAVATED OR OTHER MATERIAL SHALL NOT BE PLACED, FILED OR STORED WITHIN THE CRITICAL ROOT ZONE AREA OF THE TREES TO BE SAVED. ANY COMPROMISED TREES NOT USED IN CONSTRUCTION ARE TO BE REMOVED AND DISPOSED OF OFF SITE.
8. CONTRACTOR SHALL CONSTRUCT PROPOSED RIFFLES PER SHEET D7.
9. IN-STREAM STRUCTURES PROPOSED ALONG THE OUTSIDE OF MEANDER BENDS (BRUSH TOES, LOG VANES, AND LOG TOES) MAY BE USED INTERCHANGEABLY THROUGHOUT THE PROJECT PER APPROVAL FROM DESIGNER.
10. THE WORK TO RESHAPE THE CHANNEL BANKS WILL BE PERFORMED USING EQUIPMENT WORKING FROM THE TOP OF THE EXISTING STREAM BANK, WHERE POSSIBLE.
11. CONSTRUCTION EQUIPMENT WILL NOT BE PLACED WITHIN THE ACTIVE CHANNEL TO PERFORM WORK IF POSSIBLE. PLATFORMS SHOULD BE USED TO CROSS CHANNEL WHERE ACCESS IS NOT POSSIBLE.
12. NO MORE CHANNEL SHALL BE DISTURBED THAN CAN BE STABILIZED BY THE END OF THE WORK DAY OR PRIOR TO RESTORING FLOW TO NEWLY CONSTRUCTED CHANNEL SEGMENTS.
13. CONTRACTOR SHALL REMOVE ALL TEMPORARY CONTROL DEVICES ONCE CONSTRUCTION IS COMPLETE AND THE SITE IS STABILIZED. A MAXIMUM OF 200 LINEAR FEET OF STREAM MAY BE DISTURBED AT ANY ONE TIME.
14. ALL EXCAVATED MATERIAL MUST BE PLACED WITHIN DESIGNATED STOCKPILE AREAS.
15. AT LOCATIONS IN WHICH THE EXISTING CHANNEL IS BEING MAINTAINED, TEMPORARY PUMP AROUND DAMS AND BYPASS PUMPING WILL BE USED TO DE-WATER THE WORK AREA AS DESCRIBED IN THE DETAILS.
16. WHEN THE PROPOSED CHANNEL HAS BEEN SUFFICIENTLY STABILIZED TO PREVENT EROSION, ALL TEMPORARY PUMP AROUND DAMS WILL BE REMOVED FROM THE ACTIVE STREAM CHANNEL AND NORMAL FLOW RESTORED. ACCUMULATED SEDIMENT SHALL BE DISPOSED OF IN DESIGNATED SPOILS AREAS PRIOR TO REMOVAL OF TEMPORARY PUMP AROUND DAM.
17. AT LOCATIONS IN WHICH ROCK STRUCTURES, BOULDER TOE STABILIZATION, AND LOG TOE STABILIZATION ARE CALLED FOR ON THE PLANS, TEMPORARY COFFER DAMS AND BYPASS PUMPING WILL BE USED TO DE-WATER THE WORK AREA, EXCEPT AT LOCATIONS IN WHICH THE NORMAL FLOW CAN BE DIVERTED AROUND THE WORK AREA WITH THE USE OF AN EXISTING CHANNEL. WHEN THE TOE HAS BEEN SUFFICIENTLY STABILIZED TO RESTRAIN EROSION ALL TEMPORARY COFFER DAMS WILL BE REMOVED FROM THE ACTIVE STREAM CHANNEL AND NORMAL FLOW RESTORED. ACCUMULATED SEDIMENT SHALL BE DISPOSED OF IN DESIGNATED SPOILS AREA PRIOR TO REMOVAL OF TEMPORARY COFFER DAM.
18. MATERIAL THAT IS REMOVED FROM THE STREAM WILL BE RE-DEPOSITED OUTSIDE OF THE ACTIVE CHANNEL AND ITS FLOODPLAIN.
19. TEMPORARY AND PERMANENT STABILIZATION OF ALL DISTURBED GRASSED AREAS AT THE TOP OF THE CHANNEL BANKS WILL BE IN ACCORDANCE WITH THE SEEDING AND MULCHING SPECIFICATION AS SHOWN ON PLANS.
20. RE-FERTILIZE AND RE-SEED DISTURBED AREAS IF NECESSARY.
21. TEMPORARY AND/OR PERMANENT IMPACTS TO EXISTING WETLANDS SHALL BE AVOIDED TO THE EXTENT POSSIBLE. HIGH VISIBILITY FENCING SHALL BE INSTALLED AROUND ALL EXISTING WETLANDS LOCATED WITHIN THE PROJECT AREA AND/OR ADJACENT TO ANY CONSTRUCTION ACTIVITIES.

STREAM CONSTRUCTION SEQUENCE:

1. CONDUCT PRE-CONSTRUCTION MEETING INCLUDING OWNER, ENGINEER, ASSOCIATED CONTRACTORS, NCDEQ EROSION CONTROL PERSONNEL, AND OTHER AFFECTED PARTIES. CONTACT NCDEQ EROSION CONTROL PERSONNEL AT 919-791-4200.
2. OBTAIN EROSION CONTROL PERMIT FROM NCDENR - LAND QUALITY SECTION AND ALL OTHER APPROVALS NECESSARY TO BEGIN AND COMPLETE THE PROJECT.
3. CONTRACTOR IS FULLY RESPONSIBLE FOR CONTACTING ALL APPROPRIATE PARTIES AND ASSURING THAT UTILITIES ARE LOCATED PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. CALL NC ONE-CALL (PREVIOUSLY ULOCO) AT 1-800-632-4949 FOR UTILITY LOCATING SERVICES 48 HOURS PRIOR TO COMMENCEMENT OF ANY WORK. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION.
4. PRIOR TO CONSTRUCTION, STABILIZED GRAVEL ENTRANCE/EXIT AND ROUTES OF INGRESS AND EGRESS SHALL BE ESTABLISHED AS SHOWN ON THE PLANS AND DETAILS. MAINTAIN EXISTING DRIVEWAY OVERTOPPING ELEVATION / PROFILE.
5. PREPARE STAGING AND STOCKPILING AREAS IN LOCATIONS AS SHOWN ON THE CONSTRUCTION PLANS OR AS APPROVED BY THE ENGINEER. ANY EXCESS SPOIL FROM STREAM CONSTRUCTION SHALL BE USED TO CONSTRUCT CHANNEL PLUGS AS SHOWN ON PLANS.
6. INSTALL PUMP AROUND APPARATUS AND IMPERVIOUS DIKES AT UPSTREAM END OF PROJECT. AS CONSTRUCTION PROGRESSES, MOVE PUMP AROUND OPERATION DOWNSTREAM. (SEE DETAILS ON SHEET D1)
7. INSTALL SILT FENCE, TEMPORARY CROSSINGS AND ALL OTHER EROSION CONTROL MEASURES AS SHOWN ON PLANS.
8. CONSTRUCT UPSTREAM PORTION OF THE CHANNEL FIRST, WORKING IN AN UPSTREAM TO DOWNSTREAM DIRECTION.
9. ROUGH GRADING OF CHANNEL SHALL BE PERFORMED PRIOR TO INSTALLATION OF STRUCTURES.
10. INSTALL STRUCTURES AS SHOWN ON PLANS AND DETAILS. PRIOR TO FINE GRADING, OBTAIN APPROVAL OF THE ENGINEER ON INSTALLATION OF STRUCTURES.
11. UPON COMPLETION OF FINE GRADING, INSTALL EROSION CONTROL MATTING OR SOD MATS ALONG CHANNEL BANKS.
12. FILL AND STABILIZE ABANDONED SEGMENTS OF THE EXISTING CHANNEL PER DIRECTION OF THE ENGINEER.
13. ALL IMPERVIOUS DIKES AND PUMPING APPARATUS SHALL BE REMOVED FROM THE STREAM AT THE END OF EACH DAY TO RESTORE NORMAL FLOW BACK TO THE CHANNEL.
14. DURING STREAM CONSTRUCTION ACTIVITIES, THE WORK AREA SHALL BE STABILIZED AT THE END OF EACH WORKING DAY.
15. INSTALL LIVE STAKE, BARE ROOT, AND CONTAINERIZED PLANTINGS AS SPECIFIED ON PLANTING PLANS.

LEGEND

| | | |
|---|-----|----|
| EXISTING CONTOUR MAJOR | --- | 50 |
| EXISTING CONTOUR MINOR | --- | 46 |
| PROPOSED CONTOUR MAJOR | --- | 50 |
| PROPOSED CONTOUR MINOR | --- | 42 |
| EXISTING WETLAND | | |
| EXISTING STREAM | | |
| EXISTING TOP OF BANK | --- | |
| EXISTING BOTTOM OF BANK | --- | |
| EXISTING OVERHEAD ELECTRIC UTILITY LINE | --- | |
| PROPERTY LINE | --- | |
| EXISTING FENCELINE | --- | |
| EXISTING TREELINE | | |
| PROPOSED TOP OF BANK | --- | |
| PROPOSED CENTERLINE OF CHANNEL | --- | |
| LIMITS OF PROPOSED CONSERVATION EASEMENT | --- | |
| PROPOSED CHANNEL PLUG (SEE DETAIL DWG D2) | | |
| PROPOSED FILL AREA | | |
| EXISTING TREE | | |
| BRUSH TOE PROTECTION (SEE DETAIL D2) | | |
| LOG TOE (SEE DETAIL D2) | | |
| DOUBLE LOG DROP (SEE DETAIL D4) | | |
| ROCK SILL (SEE DETAIL D3) | | |
| ROCK STEP POOL (SEE DETAIL D6) | | |
| ROCK CROSS VANE (SEE DETAIL D6) | | |
| LOG VANE (SEE DETAIL D3) | | |
| CONSTRUCTED RIFFLE (SEE DETAIL D6) | | |
| SEDIMENT TRAP (SEE DETAIL D3) | | |
| LOG SILL (PROFILE) | | |
| DOUBLE LOG DROP (PROFILE) | | |
| ROCK SILL/ CROSS-VANE / STEP POOL (PROFILE) | | |



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SEAL

SCALE: AS SHOWN

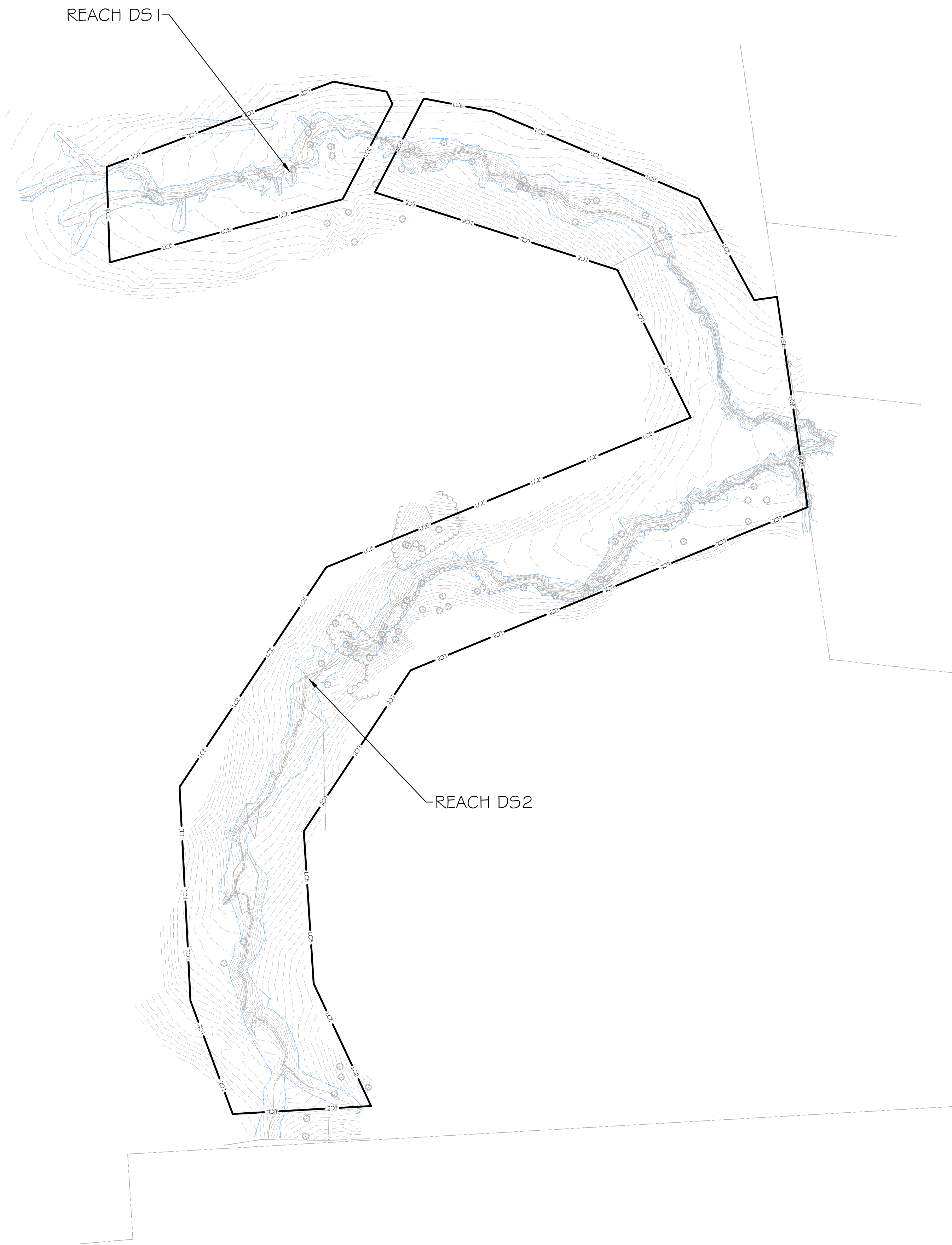
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| | | | 12/11/2018 |
| REVISIONS: | | | RELEASED FOR: |
| | | | PRELIMINARY - NOT FOR CONSTRUCTION |

PROJECT NAME: CATBIRD SITE
 DAVIE COUNTY, NORTH CAROLINA
 DRAWING TITLE: NOTES

| | |
|------------------|------|
| PROJECT NUMBER: | 0386 |
| PROJECT MANAGER: | BPB |
| DESIGNED: | AFM |
| DRAWN: | BRC |
| CHECKED: | AFM |

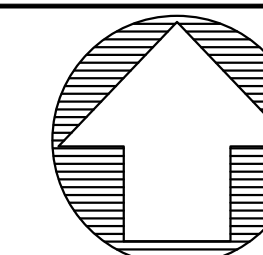
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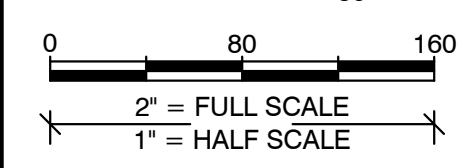


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SEAL



FULL SCALE: 1" = 80'



| MARK | DATE | DESCRIPTION | PLOT DATE: |
|------------------------------------|------|-------------|------------|
| | | | 12/11/2018 |
| REVISIONS: | | | |
| RELEASED FOR: | | | |
| PRELIMINARY - NOT FOR CONSTRUCTION | | | |

PROJECT NAME:
CATBIRD SITE
DAVIE COUNTY, NORTH CAROLINA

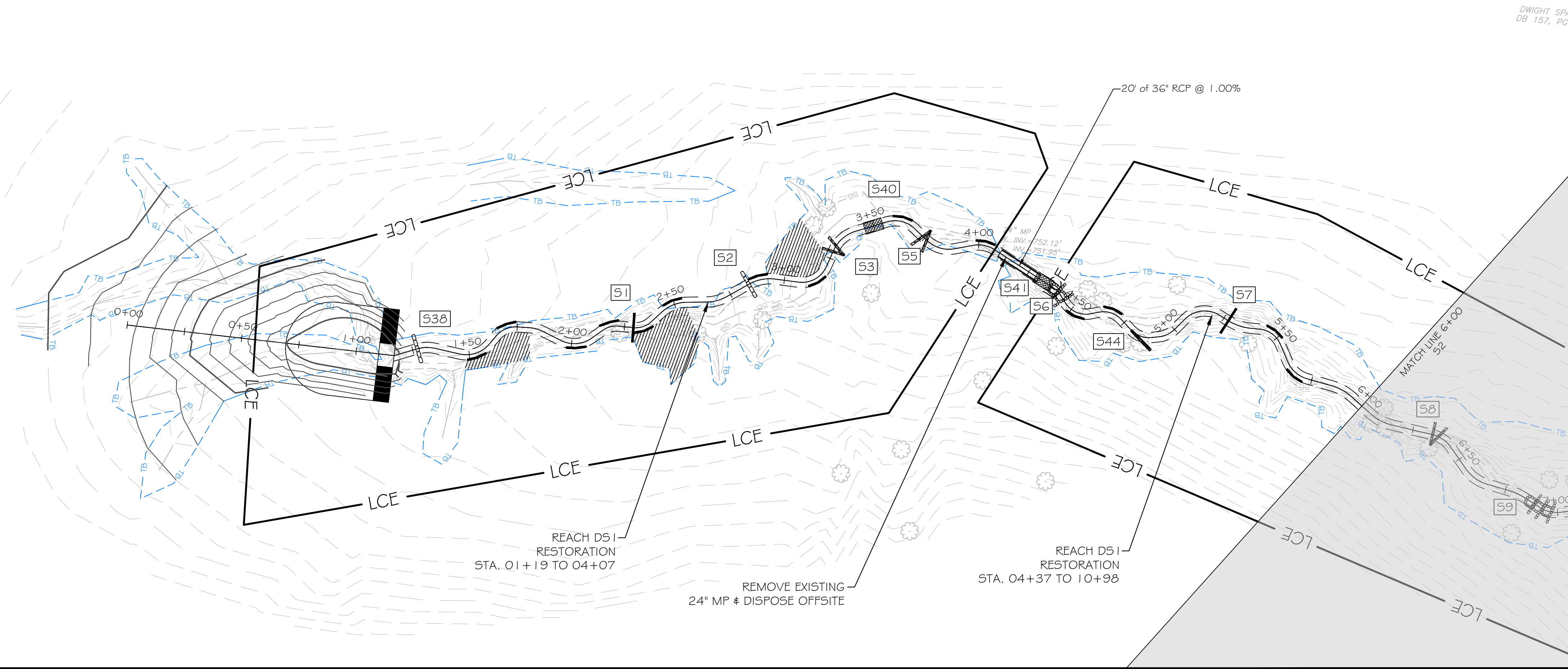
DRAWING TITLE:
EXISTING CONDITIONS

| | |
|------------------|------|
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| PROJECT MANAGER: | BPB |
| DESIGNED: | AFM |
| DRAWN: | BRC |
| CHECKED: | AFM |

SHEET NUMBER:

E2

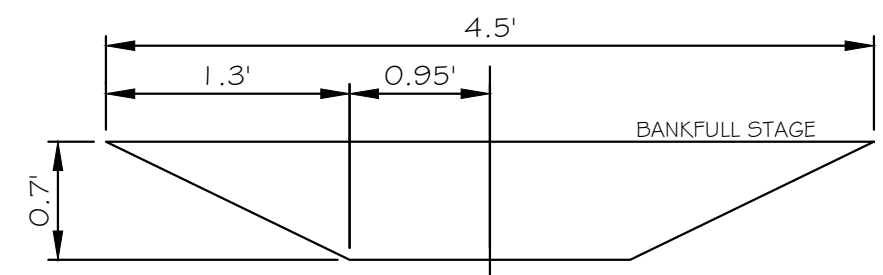
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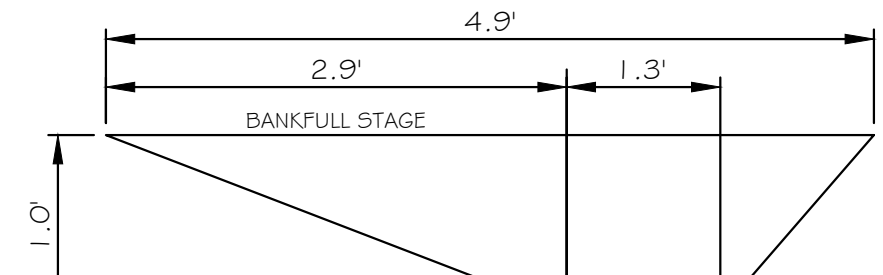
DWIGHT SPA
DB 157, PG

20' of 36" RCP @ 1.00%

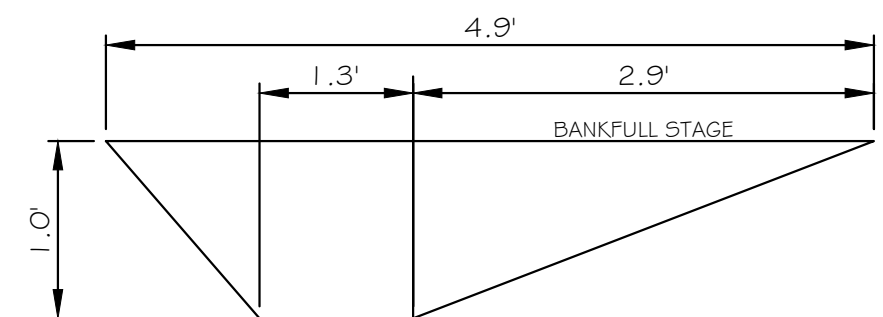
REACH DS1 STA 01+04 TO STA 07+00



TYPICAL SHALLOW CROSS SECTION



TYPICAL RIGHT MEANDER CROSS SECTION

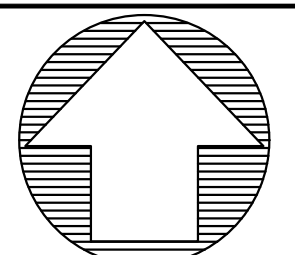


TYPICAL LEFT MEANDER CROSS SECTION

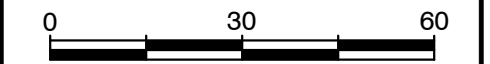


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SEAL

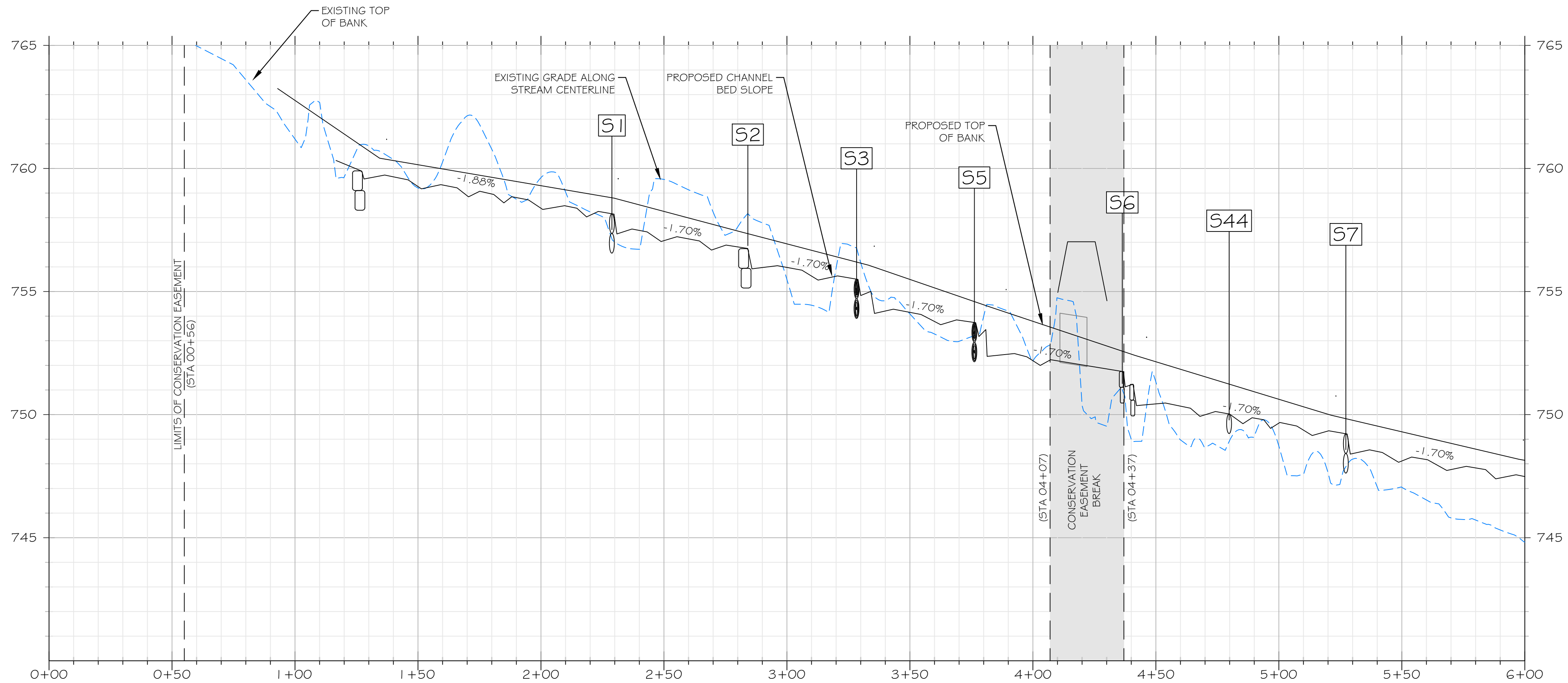


FULL SCALE: 1"=30'



2" = FULL SCALE
1" = HALF SCALE

| MARK | DATE | DESCRIPTION | REVISIONS: | RELEASED FOR: | PLOT DATE: |
|------|------|-------------|------------|------------------------------------|------------|
| | | | | PRELIMINARY - NOT FOR CONSTRUCTION | 12/11/2018 |



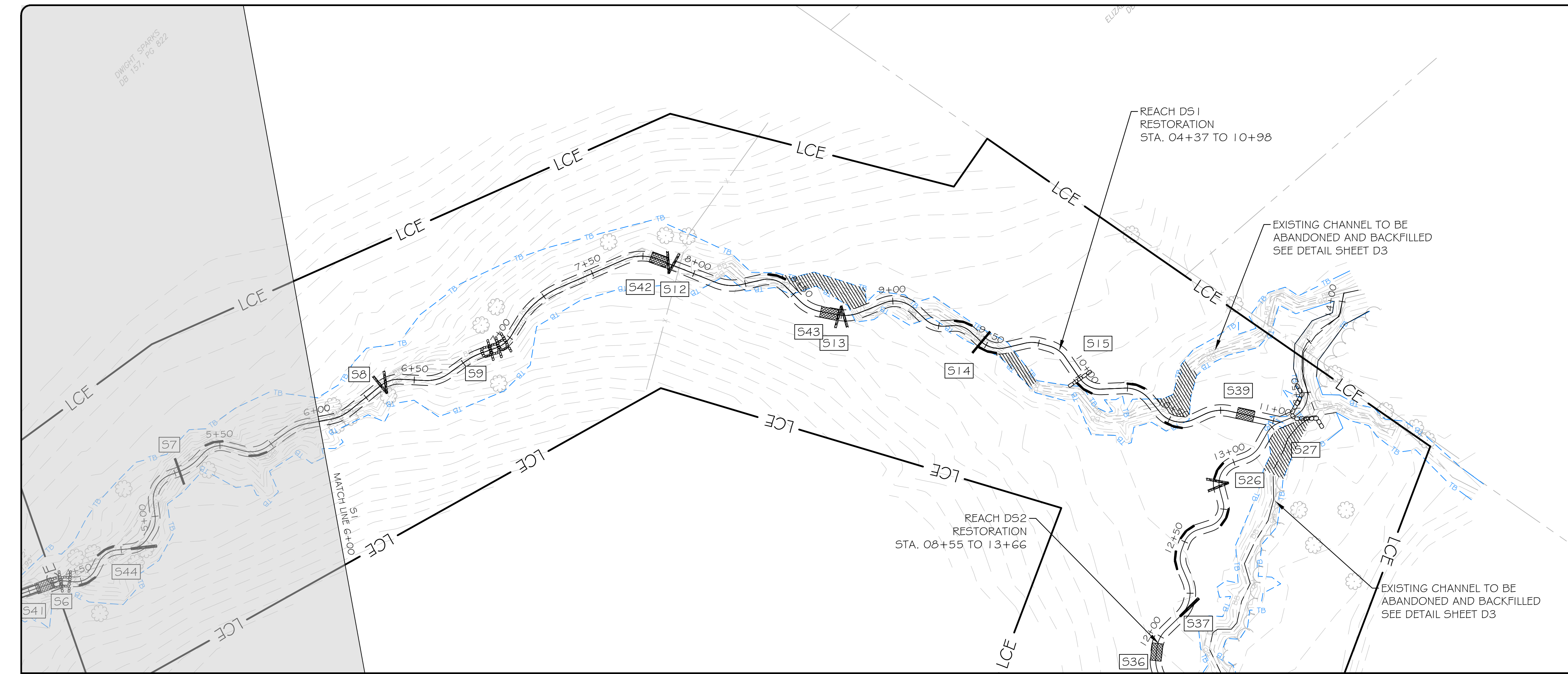
SCALE: HOR 1"=30'; VERT 1"=3'

PROJECT NAME: CATBIRD SITE
DAVIE COUNTY, NORTH CAROLINA
DRAWING TITLE: REACH DS1

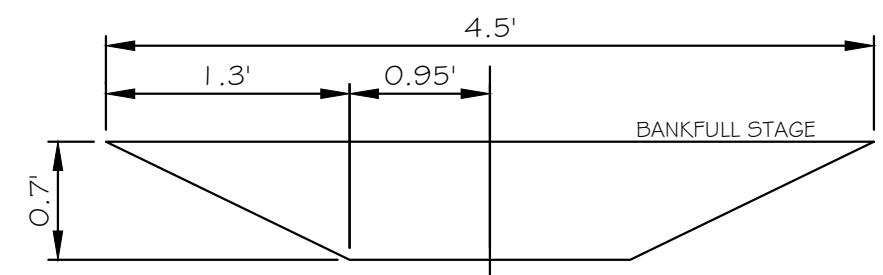
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PROJECT MANAGER: BPB
DESIGNED: AFM
DRAWN: BRC
CHECKED: AFM

SHEET NUMBER:

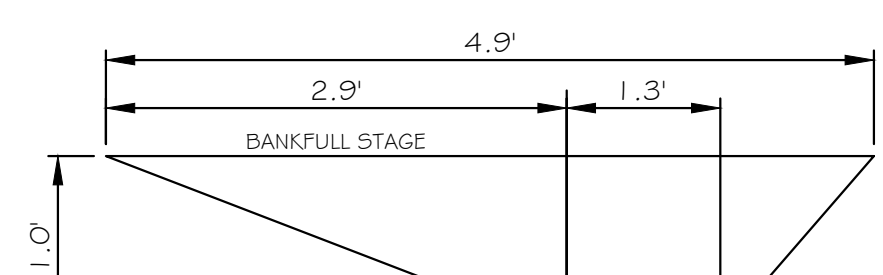
S1



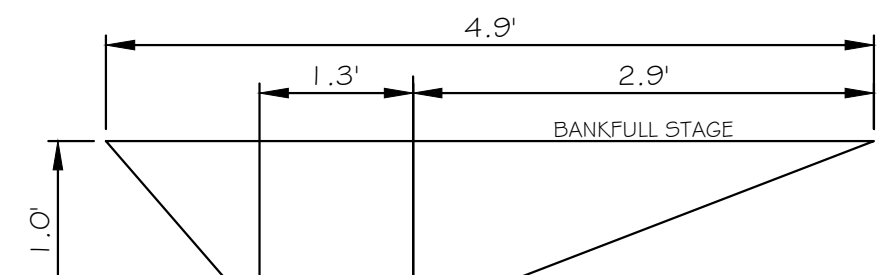
REACH D51 STA 01+04 TO STA 07+00



TYPICAL SHALLOW CROSS SECTION

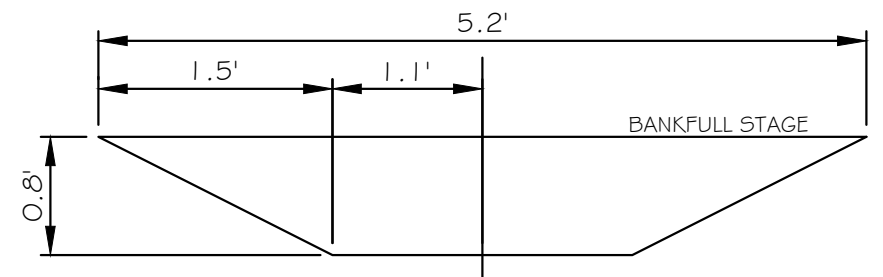


TYPICAL RIGHT MEANDER CROSS SECTION

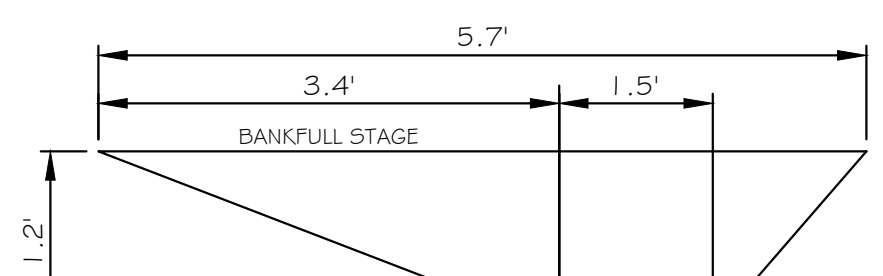


TYPICAL LEFT MEANDER CROSS SECTION

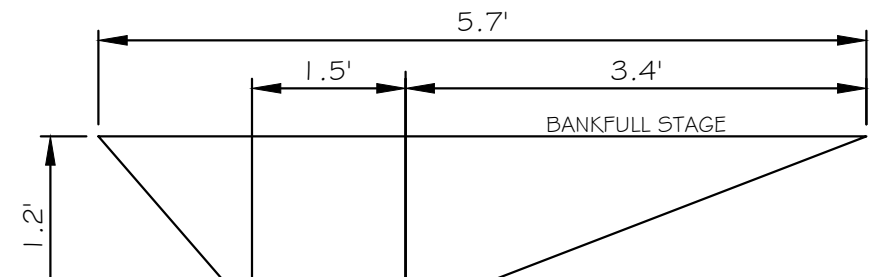
REACH D51 STA 07+90 TO STA 10+98



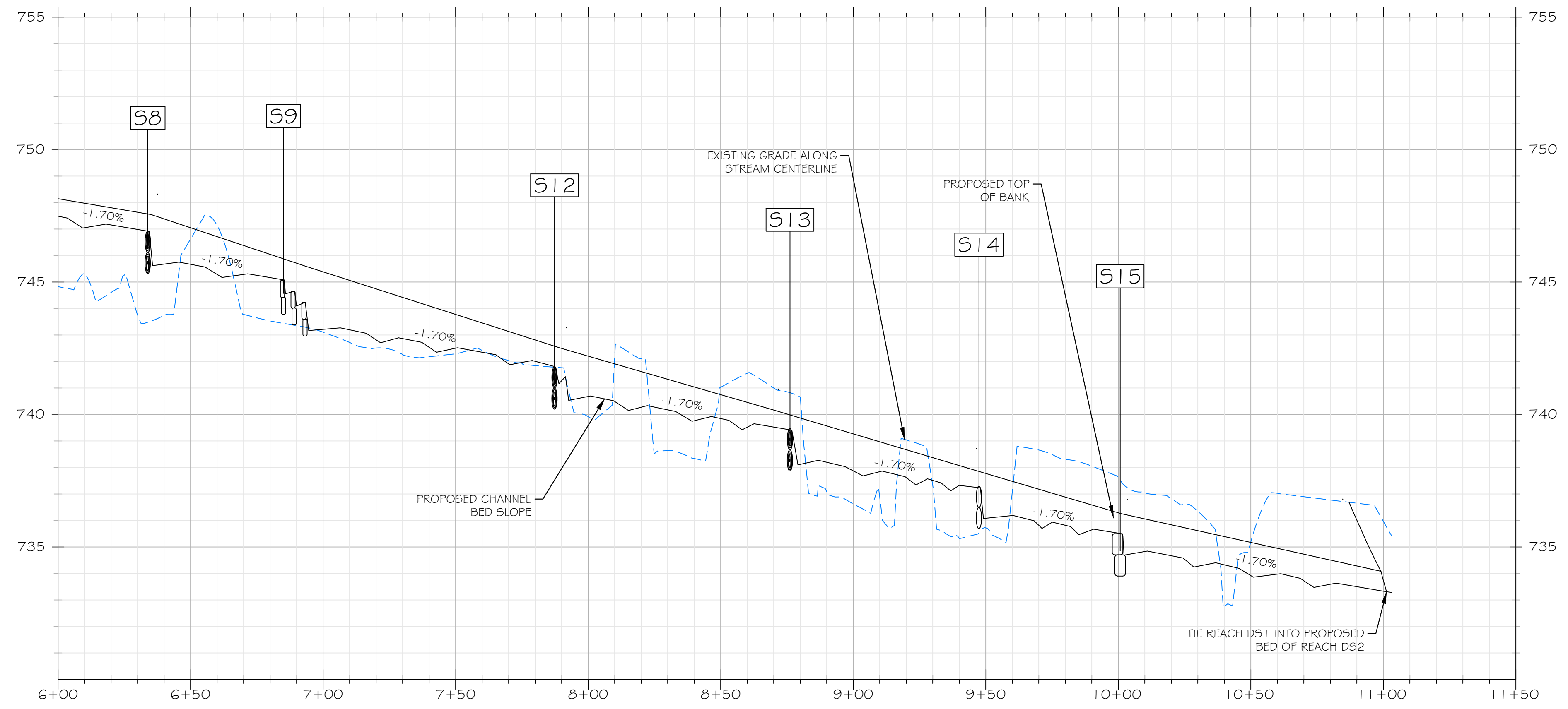
TYPICAL SHALLOW CROSS SECTION



TYPICAL RIGHT MEANDER CROSS SECTION



TYPICAL LEFT MEANDER CROSS SECTION



SCALE: HOR 1"=30'; VERT 1"=3'

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SEAL

FULL SCALE: 1"=30'

0 30 60

2" = FULL SCALE
1" = HALF SCALE

| MARK | DATE | DESCRIPTION | PLOT DATE: |
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| | | | 12/11/2018 |
| REVISIONS: | | | |
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PROJECT NAME: CATBIRD SITE
DAVIE COUNTY, NORTH CAROLINA

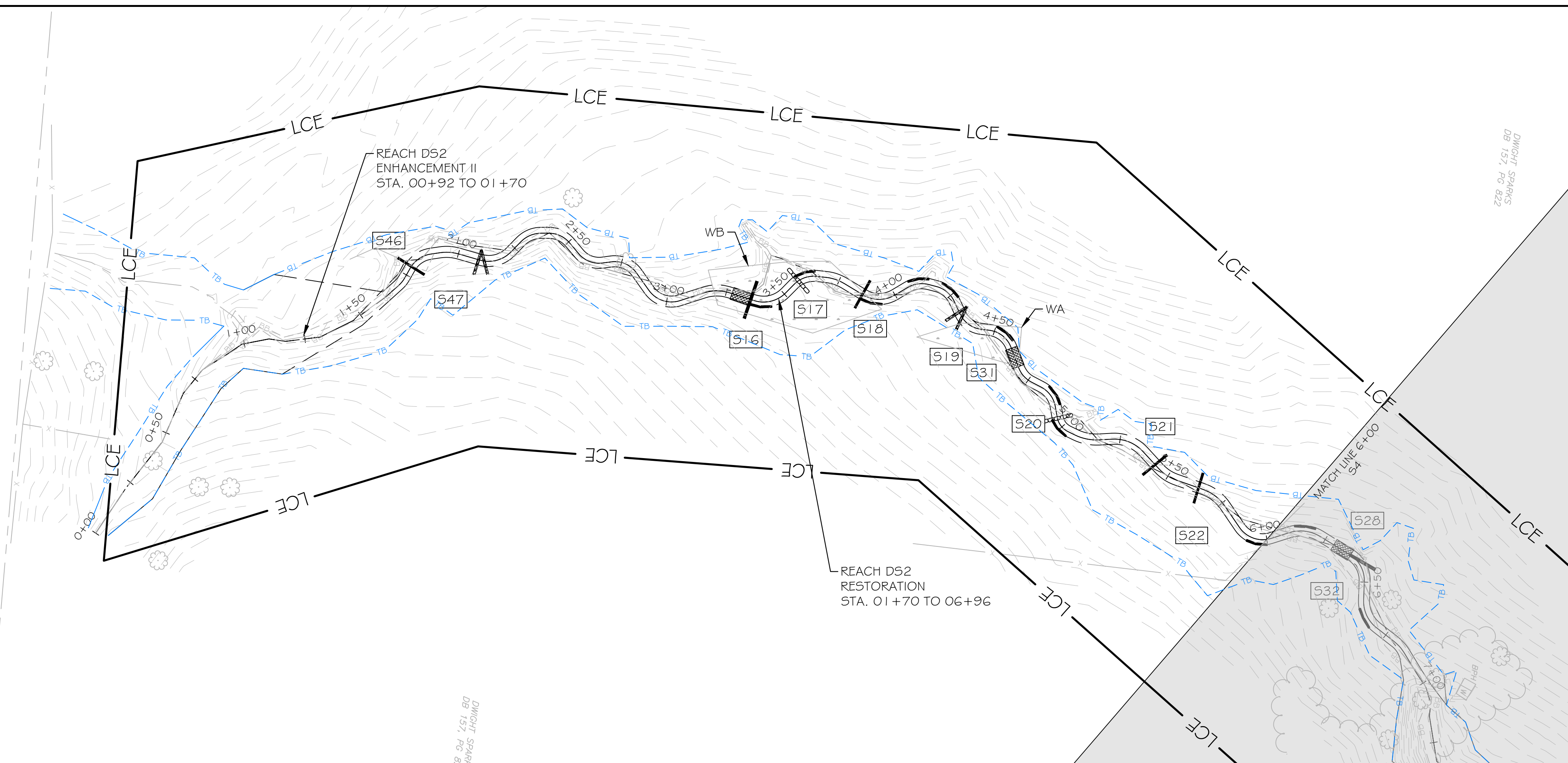
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PROJECT NUMBER: 0386
PROJECT MANAGER: BPB
DESIGNED: AFM
DRAWN: BRC
CHECKED: AFM

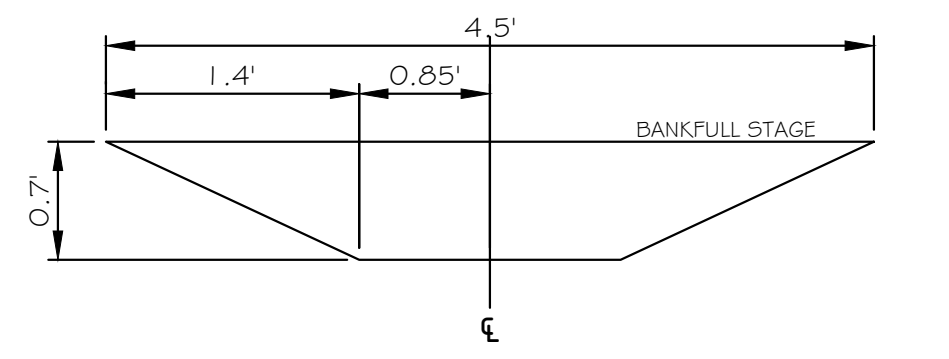
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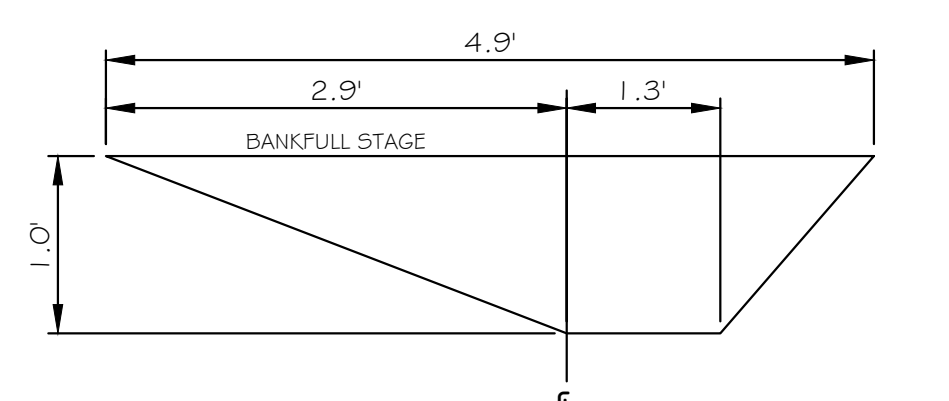
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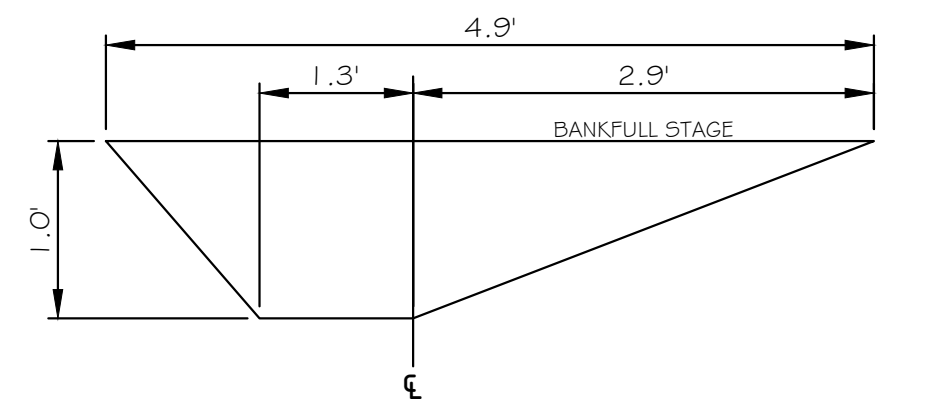
REACH D52 STA 02+91 TO STA 06+90



TYPICAL SHALLOW CROSS SECTION



TYPICAL RIGHT MEANDER CROSS SECTION

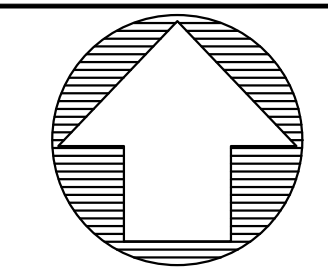


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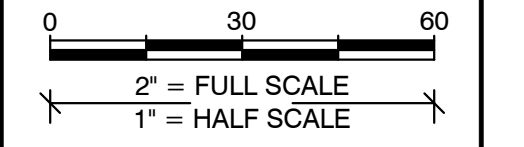


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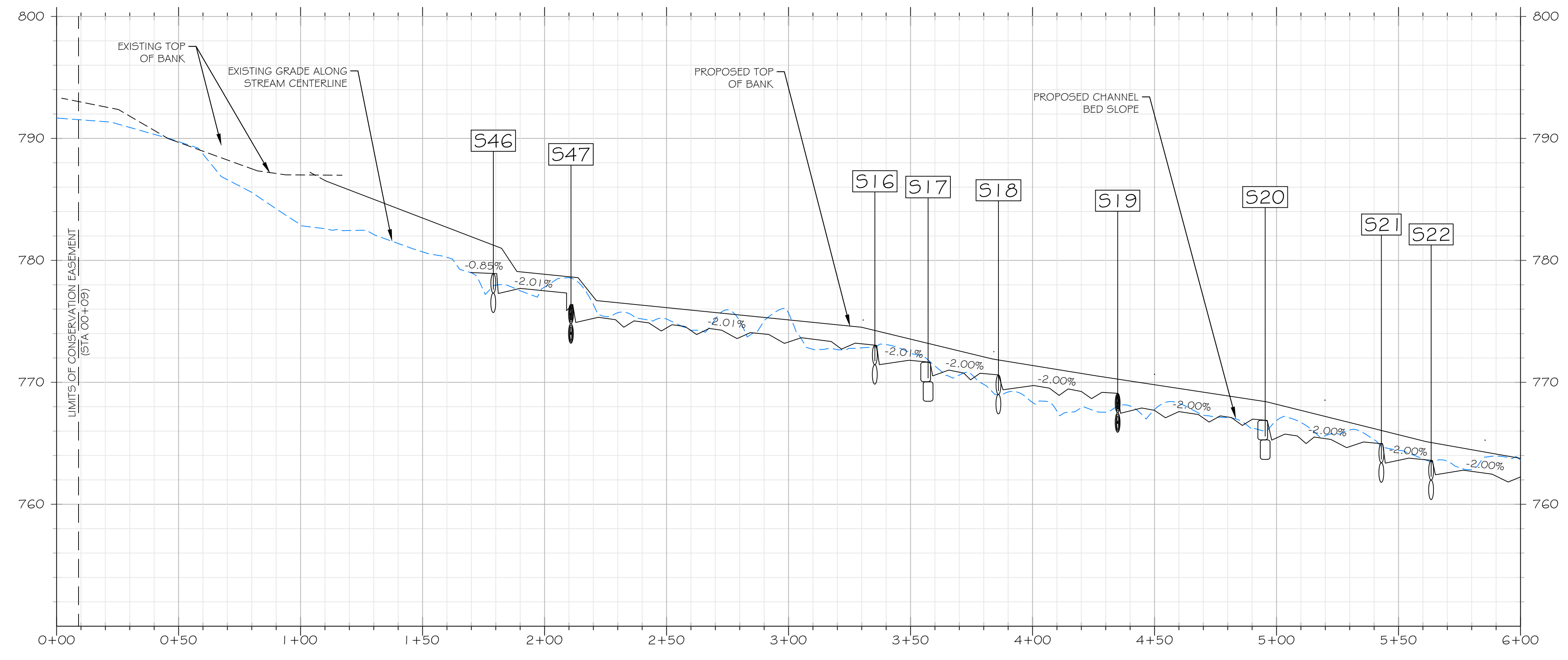
SEAL



FULL SCALE: 1"=30'



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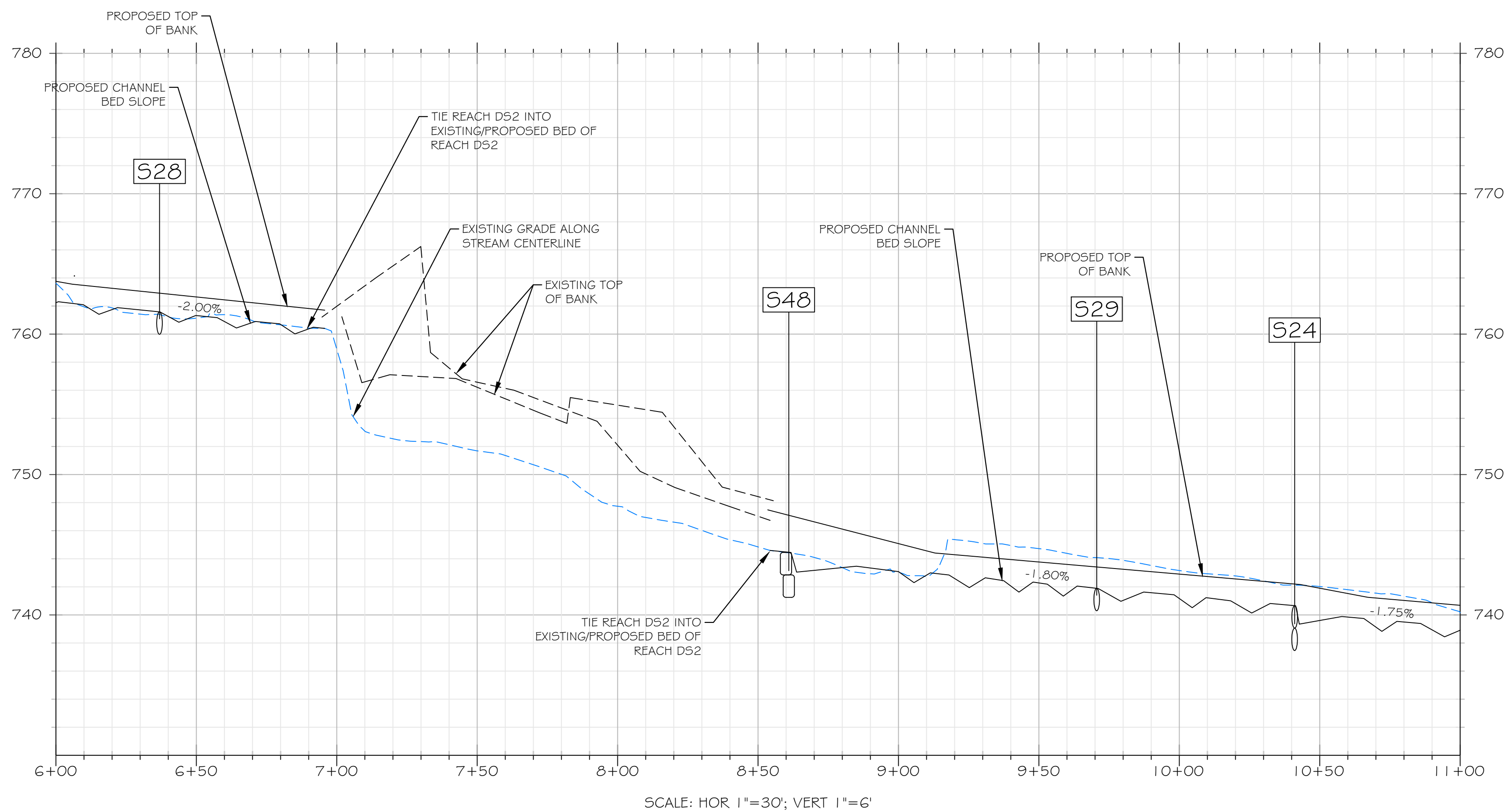
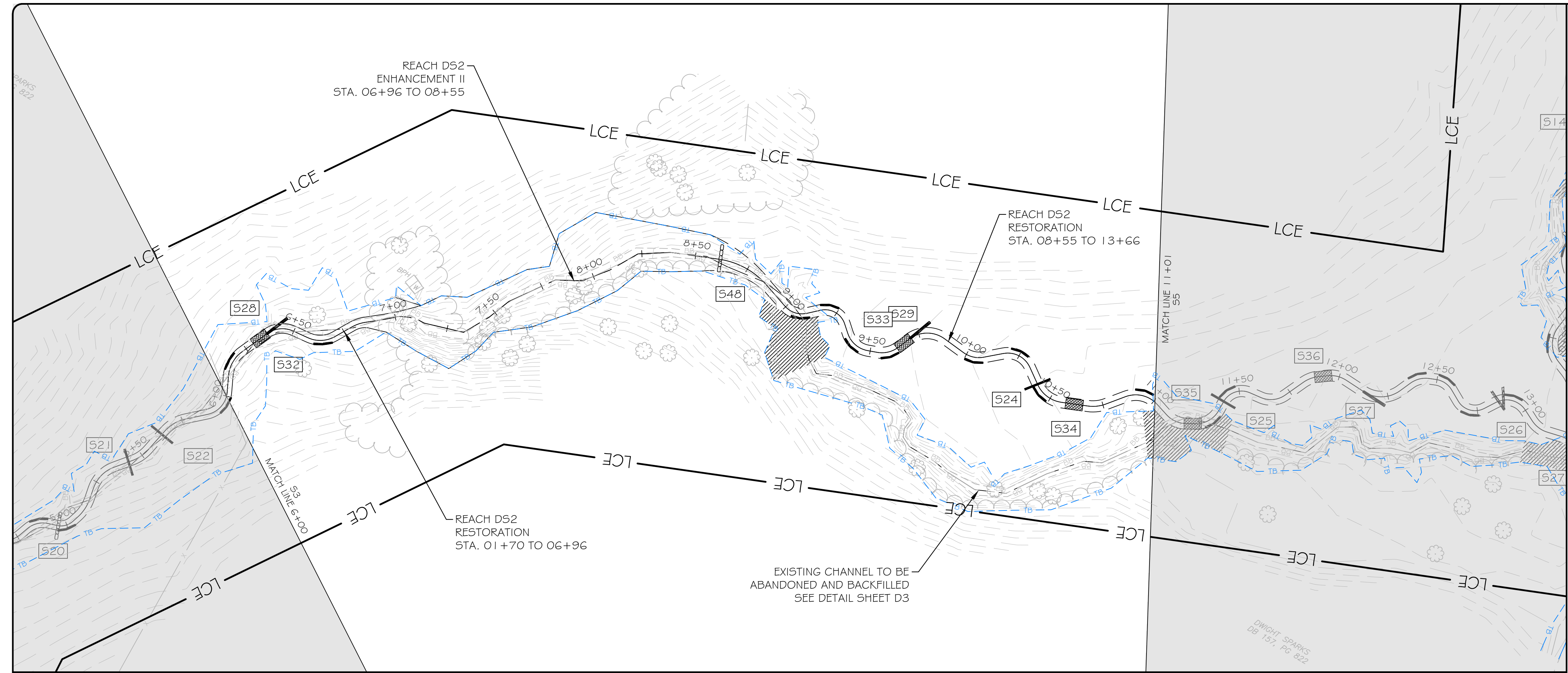
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CATBIRD SITE
DAVIE COUNTY, NORTH CAROLINA
DRAWING TITLE:
REACH D52

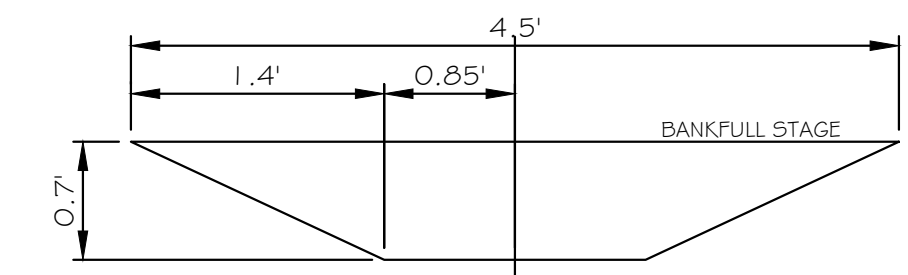
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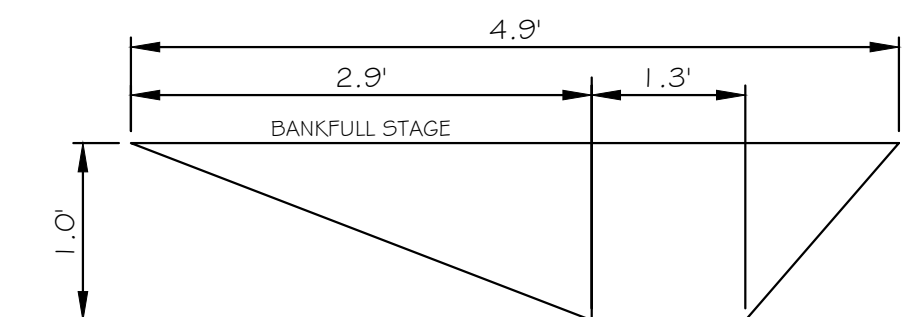
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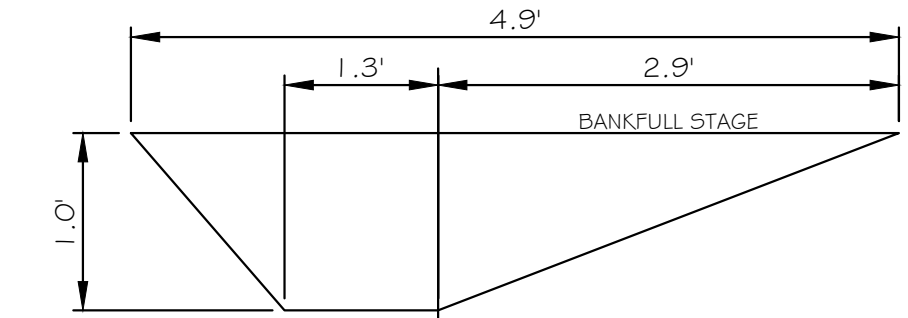
REACH D52 STA 02+91 TO STA 06+90



TYPICAL SHALLOW CROSS SECTION

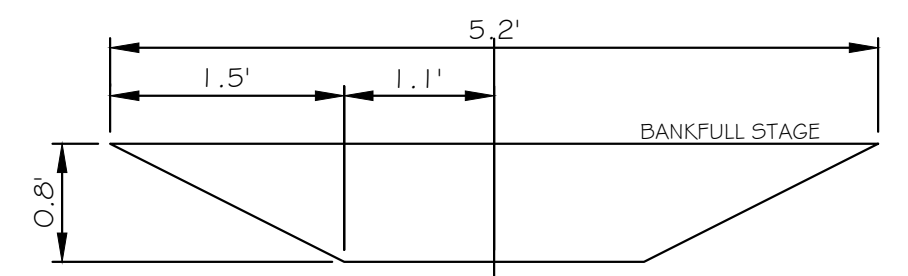


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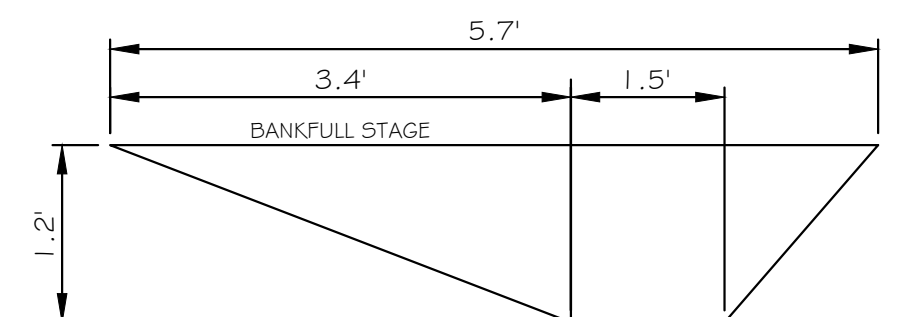


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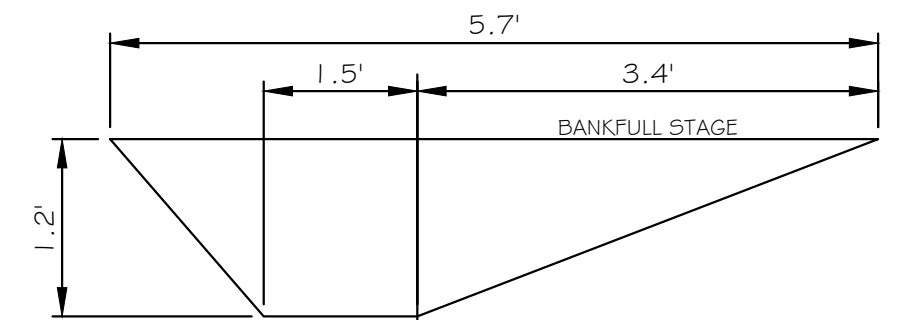
REACH D52 STA 08+70 TO STA 13+60



TYPICAL SHALLOW CROSS SECTION



TYPICAL RIGHT MEANDER CROSS SECTION

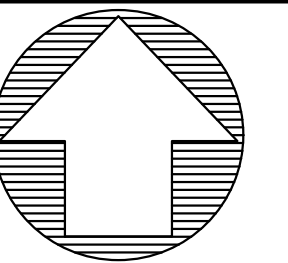


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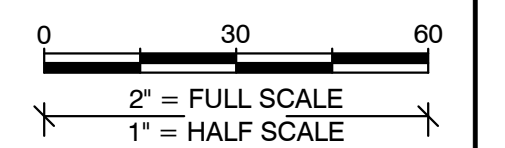


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SEAL



FULL SCALE: 1"=30'



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PLOT DATE: 12/11/2018

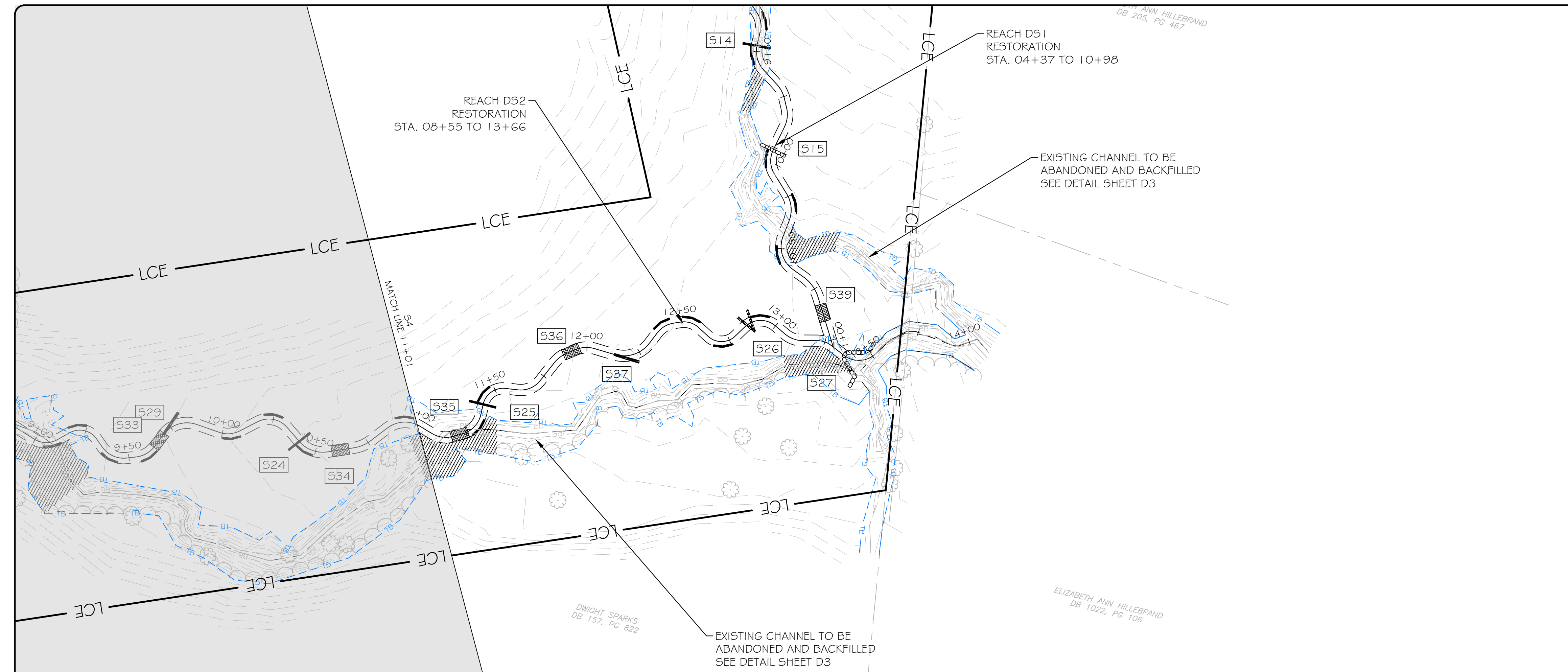
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DAVIE COUNTY, NORTH CAROLINA

DRAWING TITLE: REACH D52

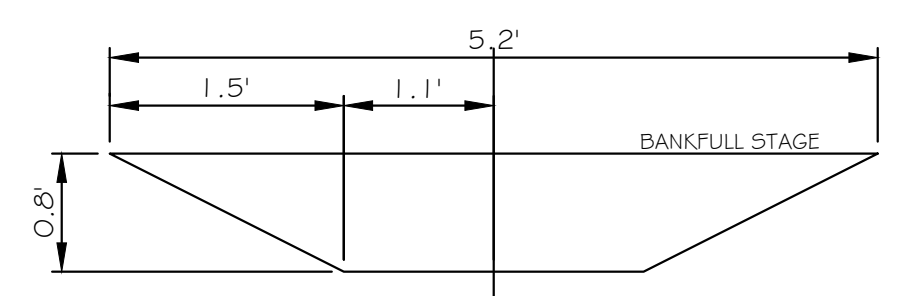
PROJECT NUMBER: 0386
PROJECT MANAGER: BPB
DESIGNED: AFM
DRAWN: BRC
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SHEET NUMBER:

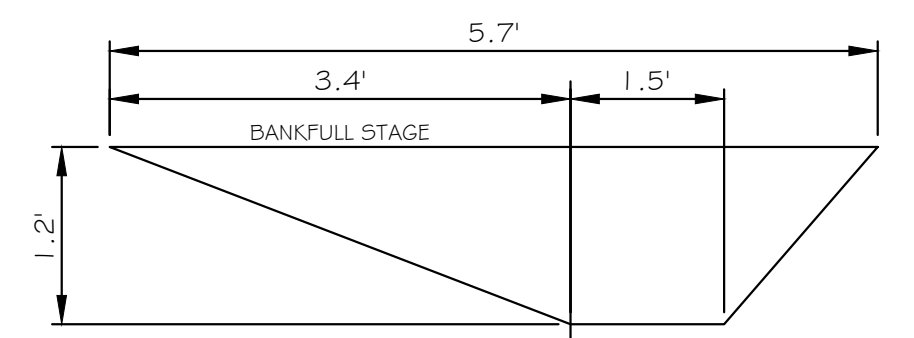
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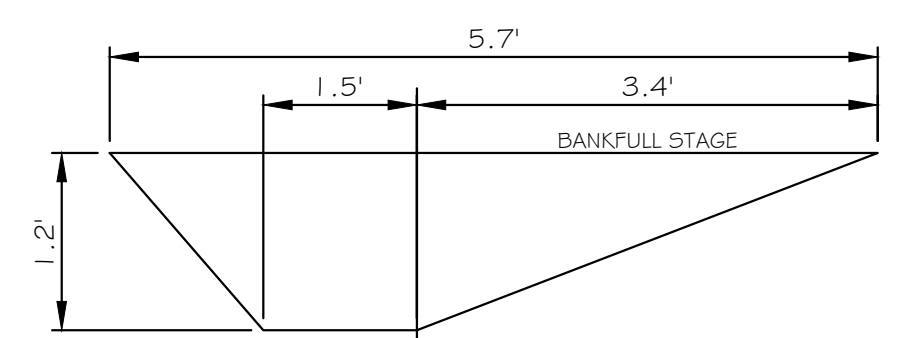
REACH D52 STA 08+70 TO STA 13+60



TYPICAL SHALLOW CROSS SECTION



TYPICAL RIGHT MEANDER CROSS SECTION

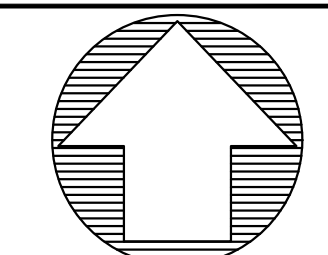


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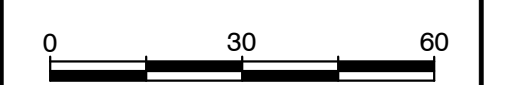


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SEAL



FULL SCALE: 1"=30'



2" = FULL SCALE
 1" = HALF SCALE

| MARK | DATE | DESCRIPTION | PLOT DATE: |
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| | | | 12/11/2018 |
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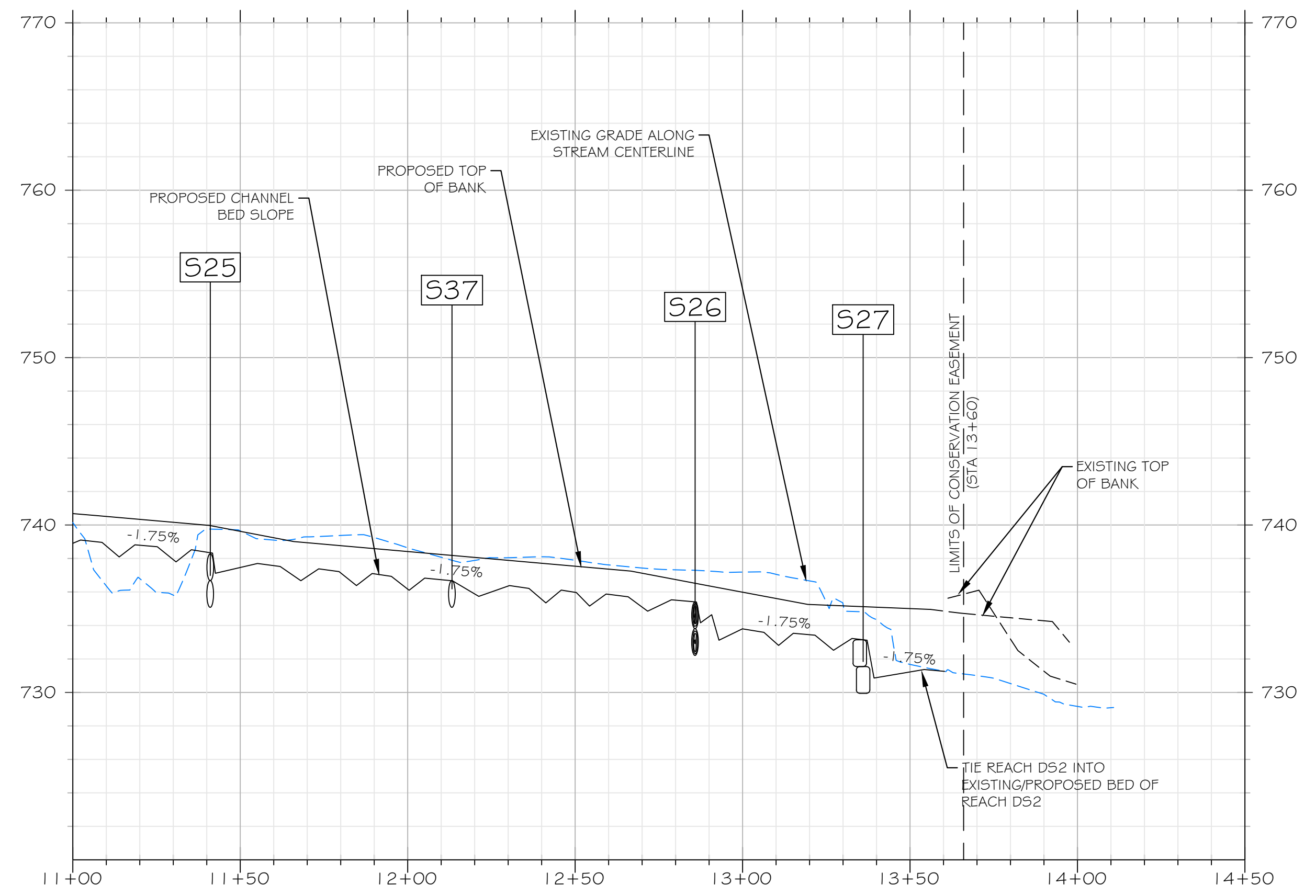
PROJECT NAME:
CATBIRD SITE
DAVIE COUNTY, NORTH CAROLINA

DRAWING TITLE:
REACH D52

PROJECT NUMBER: 0386
 PROJECT MANAGER: BPB
 DESIGNED: AFM
 DRAWN: BRC
 CHECKED: AFM

SHEET NUMBER:

S5



FILE NAME: S:\@RES GIS\Projects\NC\Catbird\CADD\DWG\0386_SHT_SITE.dwg, SAVED BY: Bearroll

PLANTING LEGEND

- LIMITS OF CONSERVATION EASEMENT
- EXISTING TREELINE
- PROPERTY LINE
- RIPARIAN PLANTING (TOTAL AREA: 5.4 AC)

PLANTING TABLE

| Permanent Riparian Seed Mix | | |
|-----------------------------|-----------------------------------|---------------------|
| Common Name | Scientific Name | Percent Composition |
| Virginia Wildrye | <i>Elymus virginicus</i> | 25% |
| Indian Grass | <i>Sorghastrum nutans</i> | 25% |
| Little Blue Stem | <i>Schizachyrium scapanum</i> | 10% |
| Soft Rush | <i>Juncus effusus</i> | 10% |
| Blackeyed susan | <i>Rudbeckia hirta</i> | 10% |
| Desertongue | <i>Dichanthelium clandestinum</i> | 10% |
| Common Milkweed | <i>Asclepias syriaca</i> | 5% |
| Showy Goldenrod | <i>Solidago erecta</i> | 5% |

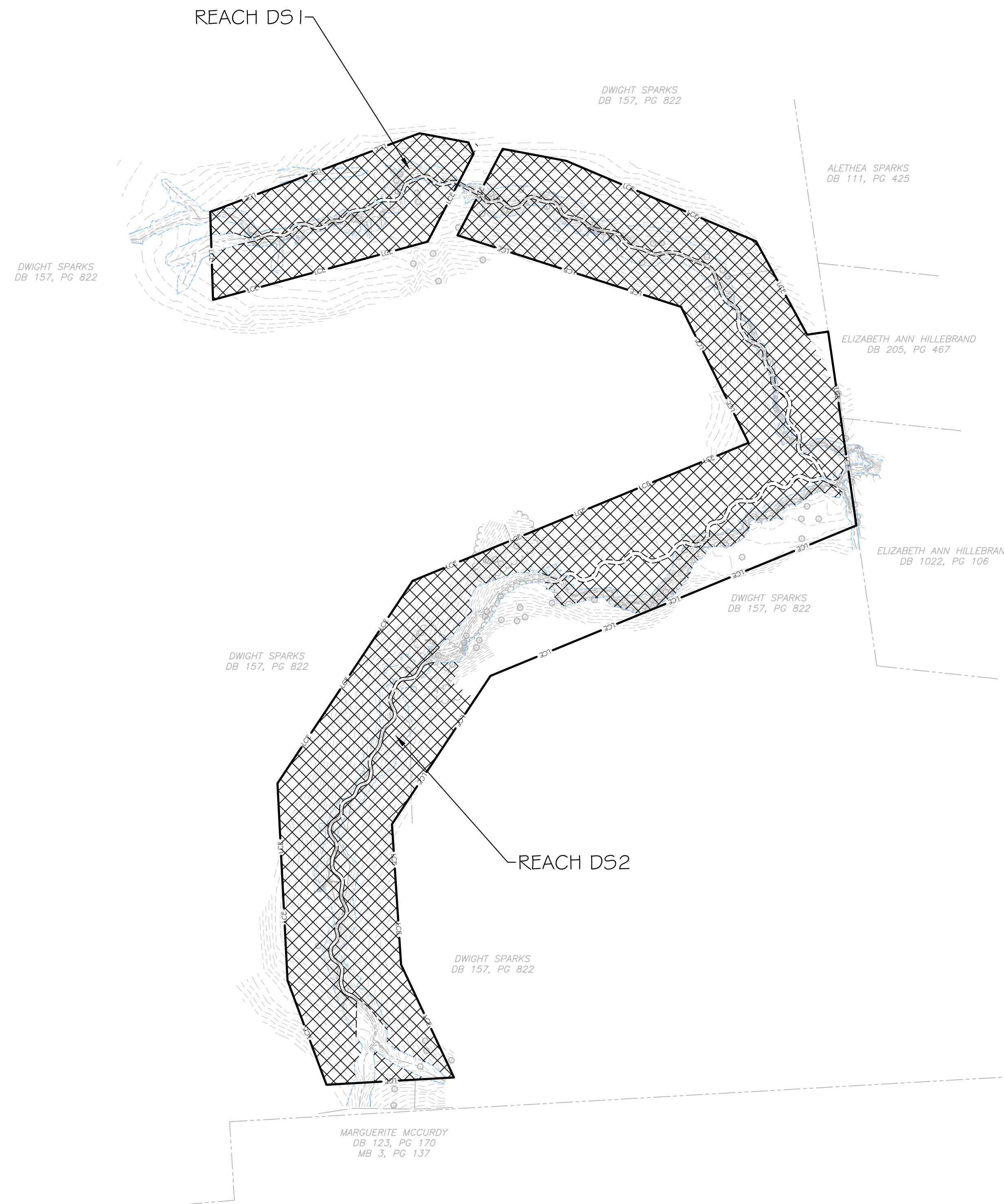
| Live Staking and Live Cuttings Bundle Tree Species | | |
|--|----------------------|---------------------|
| Common Name | Scientific Name | Percent Composition |
| Silky dogwood | <i>Cornus amomum</i> | 40% |
| Black willow | <i>Salix nigra</i> | 60% |

| Bare Root Planting Tree Species | | |
|---------------------------------|-------------------------------|---------------------|
| Common Name | Scientific Name | Percent Composition |
| Water Oak | <i>Quercus nigra</i> | 15% |
| Willow Oak | <i>Quercus phellos</i> | 15% |
| River Birch | <i>Betula nigra</i> | 15% |
| American Sycamore | <i>Platanus occidentalis</i> | 15% |
| Northern Red Oak | <i>Quercus rubra</i> | 10% |
| Green Ash | <i>Fraxinus pennsylvanica</i> | 10% |
| Yellow Poplar | <i>Liquidambar tulipifera</i> | 10% |
| Persimmon | <i>Diospyros virginiana</i> | 5% |
| Black Gum | <i>Nyssa biflora</i> | 5% |

PLANTING NOTES

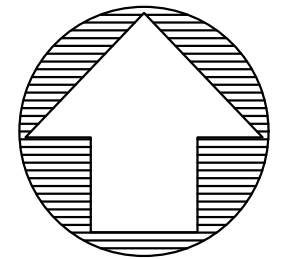
ALL PLANTING AREAS

- EROSION CONTROL MEASURES SHALL BE PROPERLY MAINTAINED UNTIL PERMANENT VEGETATION IS ESTABLISHED AND FINAL APPROVAL HAS BEEN ISSUED. THE CONTRACTOR SHALL INSPECT EROSION CONTROL MEASURES AT THE END OF EACH WORKING DAY TO ENSURE MEASURES ARE FUNCTIONING PROPERLY.
- DISTURBED AREAS NOT AT FINAL GRADE SHALL BE TEMPORARILY VEGETATED WITHIN 10 WORKING DAYS. UPON COMPLETION OF FINAL GRADING, PERMANENT VEGETATION SHALL BE ESTABLISHED FOR ALL DISTURBED AREAS WITHIN 10 WORKING DAYS. SEEDING SHALL BE IN ACCORDANCE WITH EROSION CONTROL PLAN.
- ALL DISTURBED AREAS SHALL BE PREPARED PRIOR TO PLANTING BY DISC OR SPRING-TOOTH CHISEL PLOW TO MINIMUM DEPTH OF 12 INCHES. MULTIPLE PASSES SHALL BE MADE ACROSS PLANTING AREAS WITH THE IMPLEMENT AND THE FINAL PASS SHALL FOLLOW TOPOGRAPHIC CONTOURS.
- BARE ROOT PLANTINGS SHALL BE PLANTED ACCORDING TO DETAIL SHOWN ON SHEET D2. LIVE STAKES SHALL BE PLANTED ACCORDING TO DETAIL SHOWN ON SHEET D2.
- TREATMENT/REMOVAL OF INVASIVE SPECIES, PINES AND SWEET GUMS LESS THAN 6" DBH SHALL BE PERFORMED THROUGHOUT THE PLANTED AREA.
- SPECIES SHALL BE DISTRIBUTED SUCH THAT 3 TO 6 PLANTS OF THE SAME SPECIES ARE GROUPED TOGETHER.
- BARE ROOT PLANTING DENSITY IS APPROXIMATELY 800 STEMS PER ACRE.
- LIVE STAKES ARE PROPOSED ALONG THE OUTSIDE OF MEANDER BENDS AND ALONG BOTH BANKS OF STRAIGHT REACHES ADJACENT TO POOLS.
- TEMPORARY SEED MIX SHALL BE APPLIED AT A RATE OF 150 LBS/ACRE TO ALL DISTURBED AREAS WITH SLOPES EQUAL TO OR STEEPER THAN 3:1.
- PERMANENT RIPARIAN SEED MIX SHALL BE APPLIED TO ALL DISTURBED AREAS WITHIN THE CONSERVATION EASEMENT AT A RATE OF 15 LBS/ACRE.
- PERMANENT HERB SEED MIX SHALL BE APPLIED TO ALL DISTURBED AREAS WITHIN THE CONSERVATION EASEMENT BREAKS AT A RATE OF 15 LBS/ACRE.

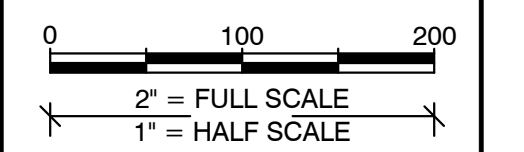


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SEAL



FULL SCALE: 1"=100'



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PROJECT NAME:
 CATBIRD SITE
 DAVIE COUNTY, NORTH CAROLINA

DRAWING TITLE:
 PLANTING PLAN

PROJECT NUMBER: 0386
 PROJECT MANAGER: BPB
 DESIGNED: AFM
 DRAWN: BRC
 CHECKED: AFM

SHEET NUMBER:

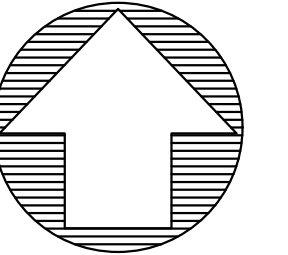
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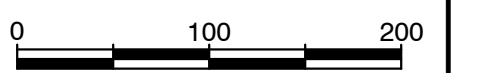


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SEAL



FULL SCALE: 1" = 100'



2" = FULL SCALE
 1" = HALF SCALE

| MARK | DATE | DESCRIPTION | PLOT DATE: |
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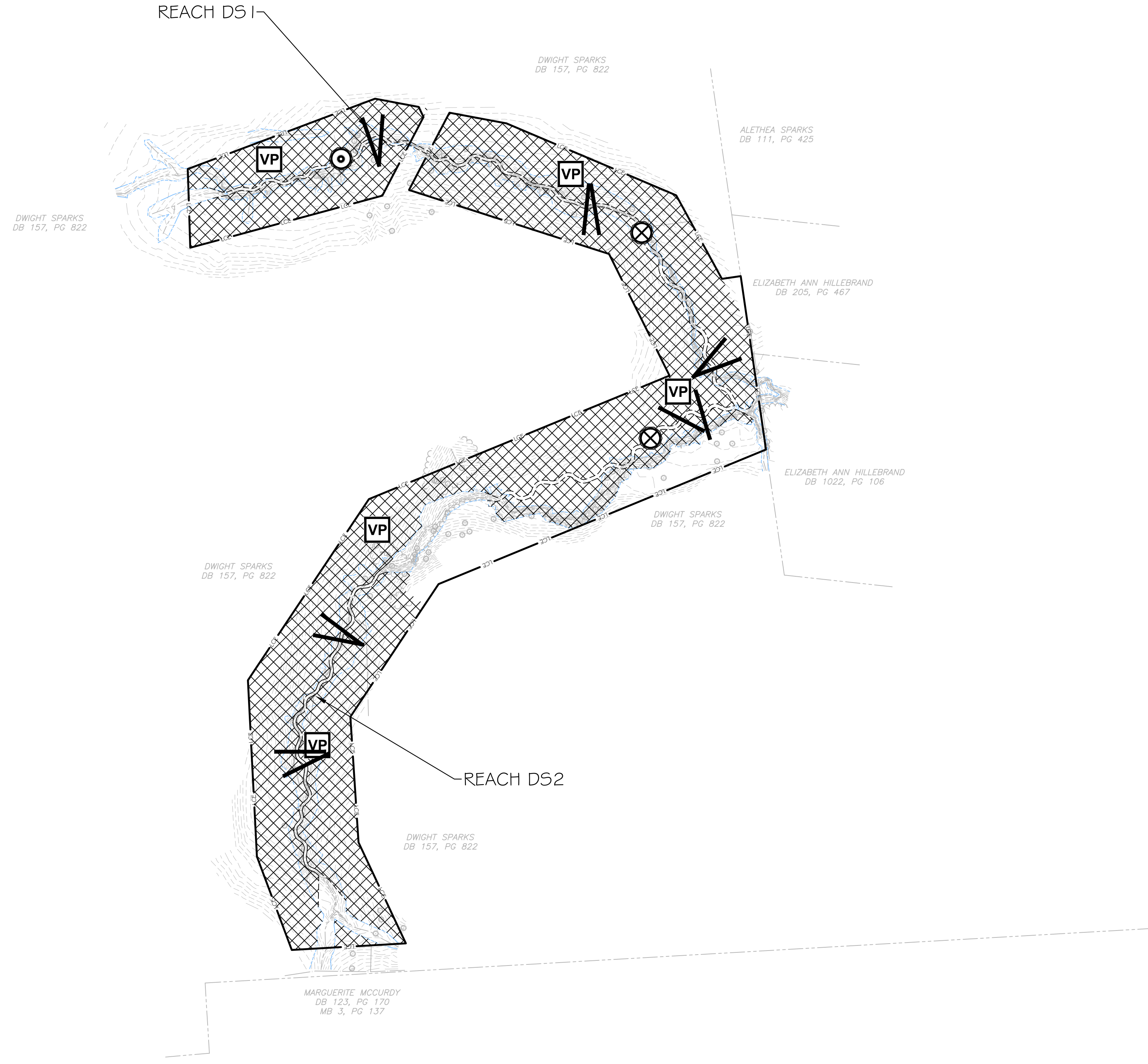
PROJECT NAME:
 CATBIRD SITE
 DAVIE COUNTY, NORTH CAROLINA

DRAWING TITLE:
 MONITORING PLAN

| | |
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| PROJECT NUMBER: | 0386 |
| PROJECT MANAGER: | BPB |
| DESIGNED: | AFM |
| DRAWN: | BRC |
| CHECKED: | AFM |

SHEET NUMBER:

M1



LEGEND

- RIPARIAN PLANTING
- LIMITS OF CONSERVATION EASEMENT
- PROPOSED VEGETATION PLOT (AREA: 0.02 AC)
- PROPOSED CROSS SECTION LOCATIONS
- PROPOSED CREST GAUGE
- PROPOSED FLOW GAUGE

WHEN AND WHERE TO USE IT
SILT FENCE IS APPLICABLE IN AREAS:

WHERE THE MAXIMUM SHEET OR OVERLAND FLOW PATH LENGTH TO THE FENCE IS 100 FEET.
WHERE THE MAXIMUM SLOPE STEEPNESS (NORMAL PERPENDICULAR TO FENCE LINE) IS 2H:1V.
THAT DO NOT RECEIVE CONCENTRATED FLOWS GREATER THAN 0.5 CFS.

DO NOT PLACE SILT FENCE ACROSS CHANNELS OR USE IT AS A VELOCITY CONTROL BMP.

CONSTRUCTION SPECIFICATIONS:

1. USE A SYNTHETIC FILTER FABRIC OF AT LEAST 95% BY WEIGHT OF POLYOLEFINS OR POLYESTER, WHICH IS CERTIFIED BY THE MANUFACTURER OR SUPPLIER AS CONFORMING TO THE REQUIREMENTS IN ASTM D 6461. SYNTHETIC FILTER FABRIC SHOULD CONTAIN ULTRAVIOLET RAY INHIBITORS AND STABILIZERS TO PROVIDE A MINIMUM OF 6 MONTHS OF EXPECTED USABLE CONSTRUCTION LIFE AT A TEMPERATURE RANGE OF 0° TO 120° F.
2. ENSURE THAT POSTS FOR SEDIMENT FENCES ARE 1.33 LB/LINEAR FT STEEL WITH A MINIMUM LENGTH OF 5 FEET. MAKE SURE THAT STEEL POSTS HAVE PROJECTIONS TO FACILITATE FASTENING THE FABRIC.

CONSTRUCTION:

1. CONSTRUCT THE SEDIMENT BARRIER OF EXTRA STRENGTH SYNTHETIC FILTER FABRICS.
2. ENSURE THAT THE HEIGHT OF THE SEDIMENT FENCE DOES NOT EXCEED 24 INCHES ABOVE THE GROUND SURFACE. (HIGHER FENCES MAY IMPOUND VOLUMES OF WATER SUFFICIENT TO CAUSE FAILURE OF THE STRUCTURE.)
3. CONSTRUCT THE FILTER FABRIC FROM A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID JOINTS. WHEN JOINTS ARE NECESSARY, SECURELY FASTEN THE FILTER CLOTH ONLY AT A SUPPORT POST WITH 4 FEET MINIMUM OVERLAP TO THE NEXT POST.
4. EXTRA STRENGTH FILTER FABRIC WITH 6 FEET POST SPACING DOES NOT REQUIRE WIRE MESH SUPPORT FENCE. SECURELY FASTEN THE FILTER FABRIC DIRECTLY TO POSTS. WIRE OR PLASTIC ZIP TIES SHOULD HAVE MINIMUM 50 POUND TENSILE STRENGTH.
5. EXCAVATE A TRENCH APPROXIMATELY 4 INCHES WIDE AND 8 INCHES DEEP ALONG THE PROPOSED LINE OF POSTS AND UPSLOPE FROM THE BARRIER.
6. PLACE 12 INCHES OF THE FABRIC ALONG THE BOTTOM AND SIDE OF THE TRENCH.
7. BACKFILL THE TRENCH WITH SOIL PLACED OVER THE FILTER FABRIC AND COMPACT. THOROUGH COMPACTION OF THE BACKFILL IS CRITICAL TO SILT FENCE PERFORMANCE.
8. DO NOT ATTACH FILTER FABRIC TO EXISTING TREES.

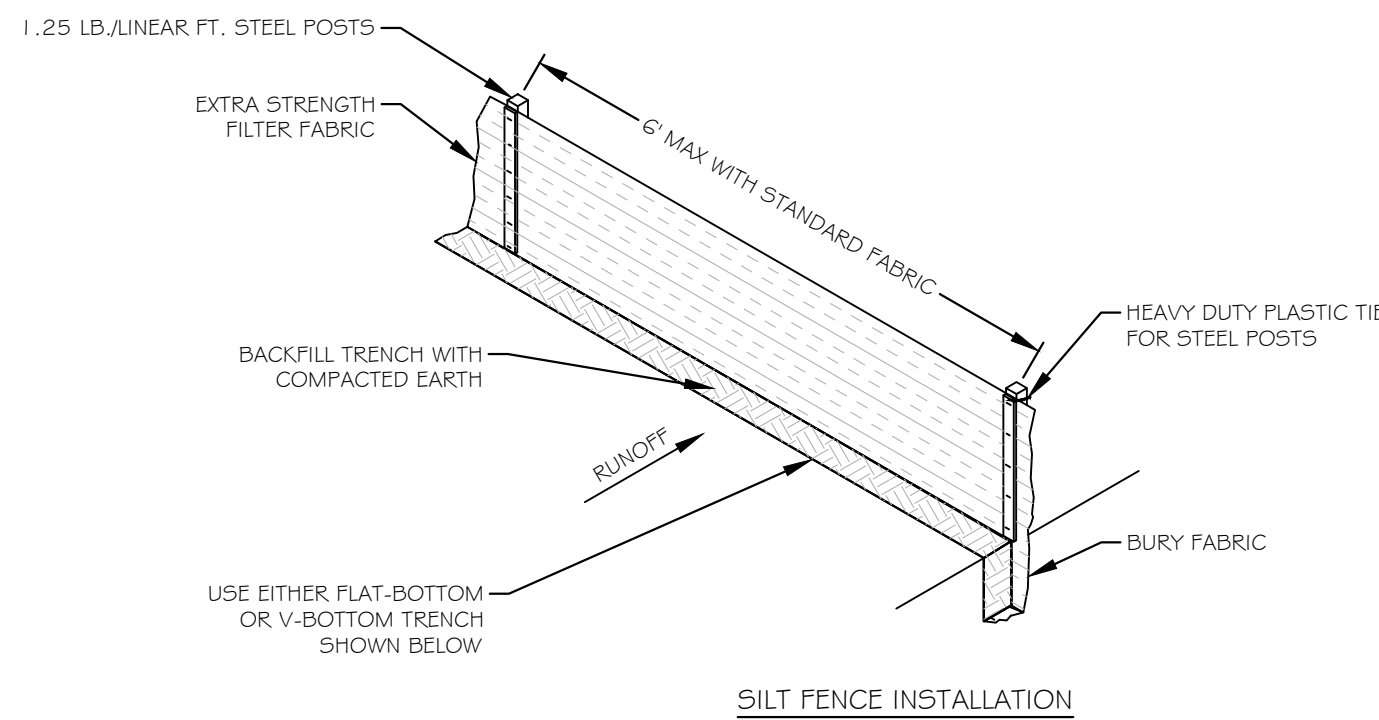
MAINTENANCE:

INSPECT SEDIMENT FENCES AT LEAST ONCE A WEEK AND AFTER EACH RAINFALL. MAKE ANY REQUIRED REPAIRS IMMEDIATELY.

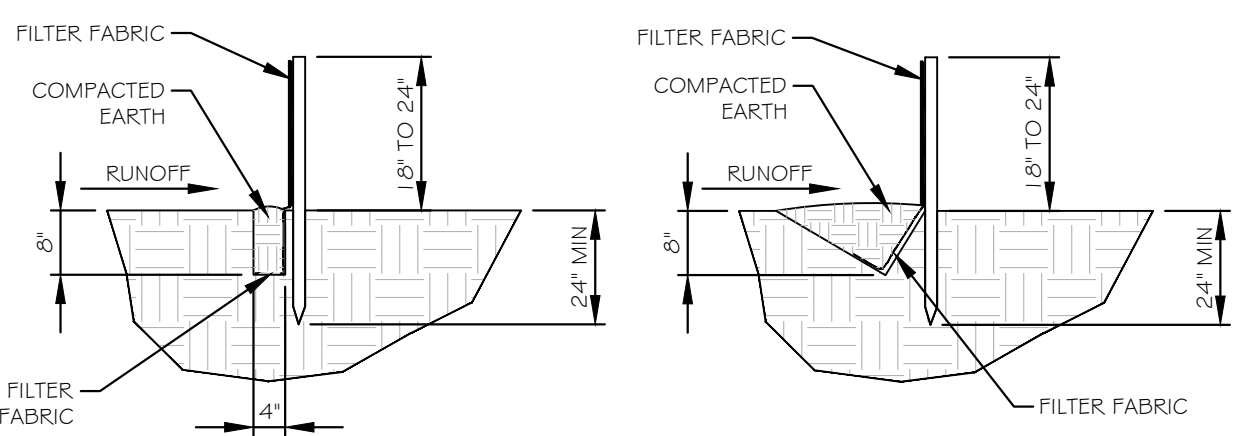
SHOULD THE FABRIC OF A SEDIMENT FENCE COLLAPSE, TEAR, DECOMPOSE OR BECOME INEFFECTIVE, REPLACE IT PROMPTLY.

REMOVE SEDIMENT DEPOSITS AS NECESSARY TO PROVIDE ADEQUATE STORAGE VOLUME FOR THE NEXT RAIN AND TO REDUCE PRESSURE ON THE FENCE. TAKE CARE TO AVOID UNDERMINING THE FENCE DURING CLEANOUT.

REMOVE ALL FENCING MATERIALS AND UNSTABLE SEDIMENT DEPOSITS AND BRING THE AREA TO GRADE AND STABILIZE IT AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.



SILT FENCE INSTALLATION

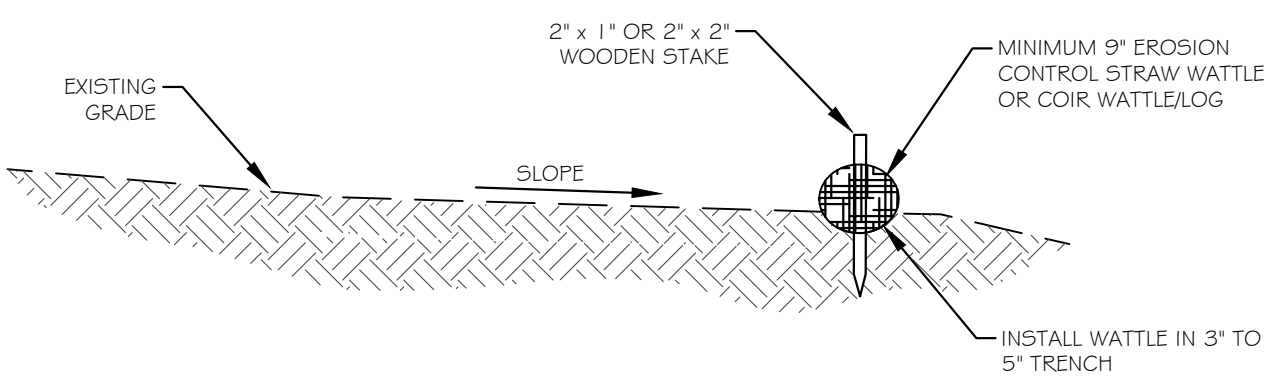


FLAT-BOTTOM TRENCH DETAIL

V-SHAPED TRENCH DETAIL

TEMPORARY SILT FENCE

NTS



EROSION CONTROL WATTLE

NTS

NOTE: EROSION CONTROL WATTLES OR COIR LOGS/WATTLES MAY BE USED IN PLACE OF SILT FENCE.

INSTALLATION NOTES:

SITE PREPARATION

1. GRADE AND COMPACT AREA.
2. REMOVE ALL ROCKS, CLOGS, VEGETATION, AND OBSTRUCTIONS SO THAT MATTING WILL HAVE DIRECT CONTACT WITH THE SOIL.
3. PREPARE SEEDBED BY LOOSENING 3 TO 4 INCHES OF TOPSOIL ABOVE FINAL GRADE.
4. TEST SOILS FOR ANY NUTRIENT DEFICIENCIES AND SUBMIT SOIL TEST RESULTS TO THE ENGINEER. APPLY ANY TREATMENT SUCH AS LIME OR FERTILIZERS TO THE SOIL IF NEEDED.

SEEDING

1. SEE PLANTING SHEETS FOR SEEDING REQUIREMENTS.
2. APPLY SEED TO SOIL BEFORE PLACING MATTING.

INSTALLATION - STREAM BANK

1. SEE GRADING NOTES ON PLAN AND PROFILE SHEETS AND DETAIL SHEETS FOR INFORMATION REGARDING WHAT AREAS ARE TO RECEIVE COIR MATTING.
2. OVERLAP ADJACENT MATS 3' (IN DIRECTION PARALLEL TO FLOW) AND ANCHOR EVERY 12' ACROSS THE OVERLAP. THE UPSTREAM MAT SHOULD BE PLACED OVER THE DOWNSTREAM MAT.
3. EDGES SHOULD BE SHINGLED AWAY FROM THE FLOW OF WATER.
4. LAY MAT LOOSE TO ALLOW CONTACT WITH SOIL. DO NOT STRETCH TIGHT.
5. ANCHOR MAT USING BIODEGRADABLE STAKES OR PINS.
6. CUT 8" x 8" TRENCH ALONG TOP OF BANK FOR MAT TERMINATION AS SHOWN IN FIGURES 1 & 2. EXTEND MAT 2 TO 3 FEET PAST TOP OF BANK.
7. PLACE ADJACENT ROLLS IN THE ANCHOR TRENCH WITH A MINIMUM OF 4' OVERLAP. SECURE WITH BIODEGRADABLE STAKES OR PINS, BACKFILL ANCHOR TRENCH, AND COMPACT SOIL.
8. STAPLE AT 12" INTERVALS ALONG OVERLAP.
9. STREAM BANK MATTING TO BE INSTALLED FROM TOE OF BANK TO A MINIMUM OF 2' PAST TOP OF BANK. SEE FIGURE 3 FOR TERMINATION AT TOP OF BANK.
10. IF MORE THAN ONE ROLL IS REQUIRED TO COVER THE CHANNEL FROM THE TOP OF BANK DOWN TO THE TOE, THEN OVERLAP MATTING BY A MINIMUM OF 1'.

EROSION CONTROL MATTING MUST MEET OR EXCEED THE FOLLOWING REQUIREMENTS:

- 100% COCONUT FIBER (COIR) TWINE WOVEN INTO A HIGH STRENGTH MATRIX.
- THICKNESS - 0.35 IN. MINIMUM.
- SHEAR STRESS - 5 LBS/SQFT
- FLOW VELOCITY - OBSERVED 1.6 FT/SEC
- WEIGHT - 29 OZ/SY
- OPEN AREA - 36%
- SLOPES - UP TO A MAXIMUM OF 1:1

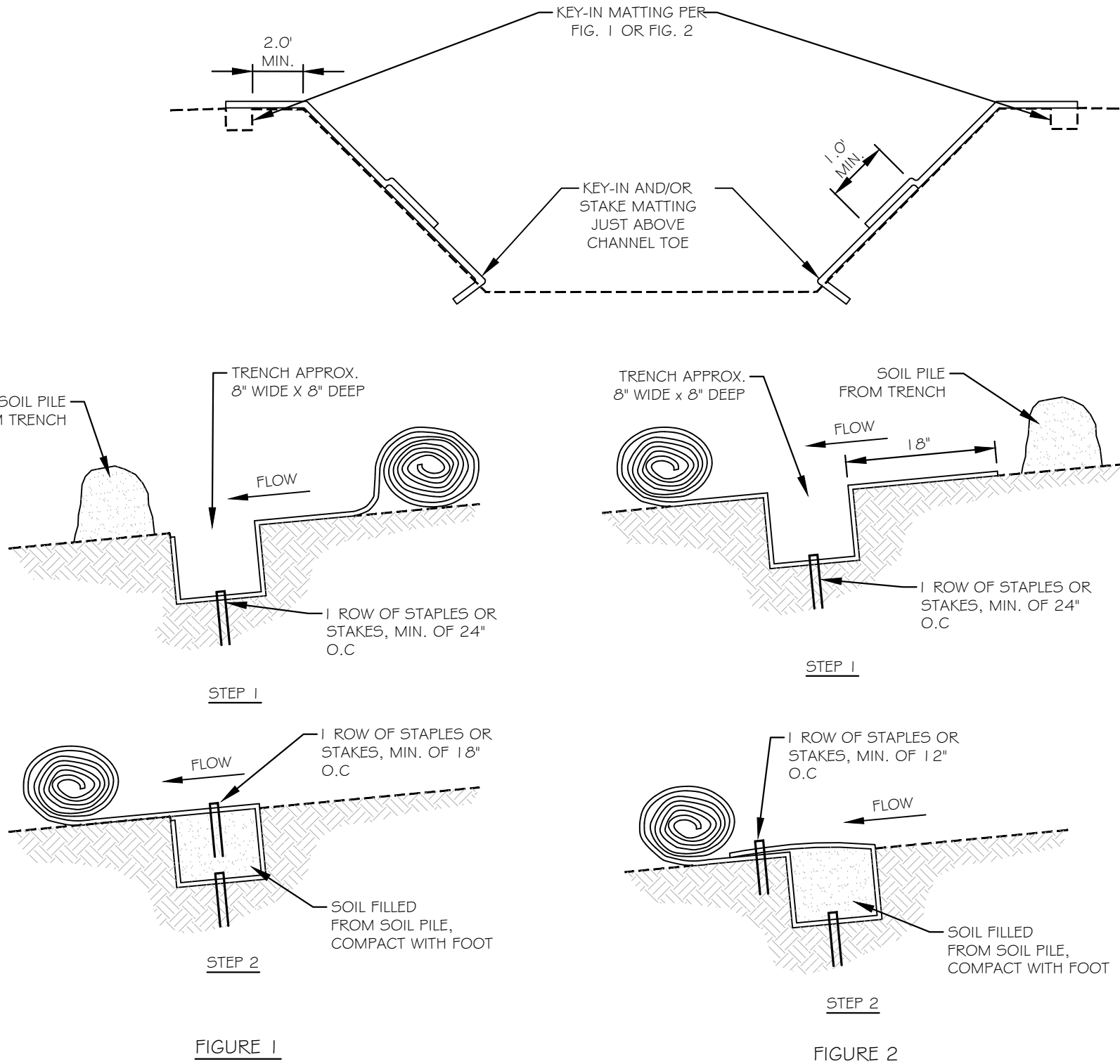
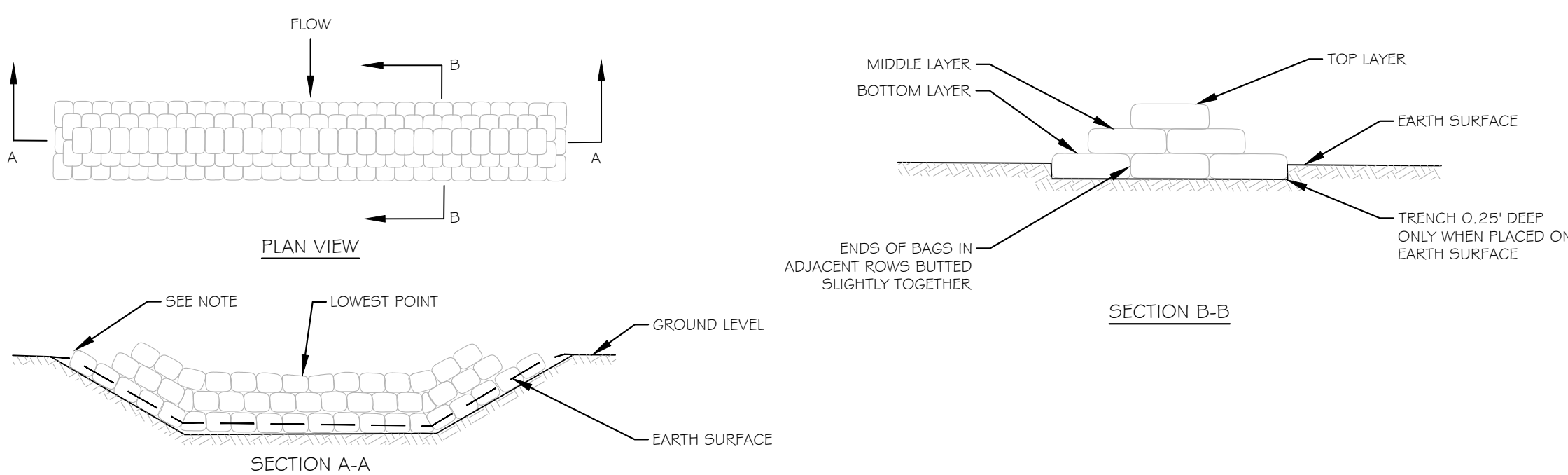


FIGURE 1

FIGURE 2

COIR MATTING

NTS

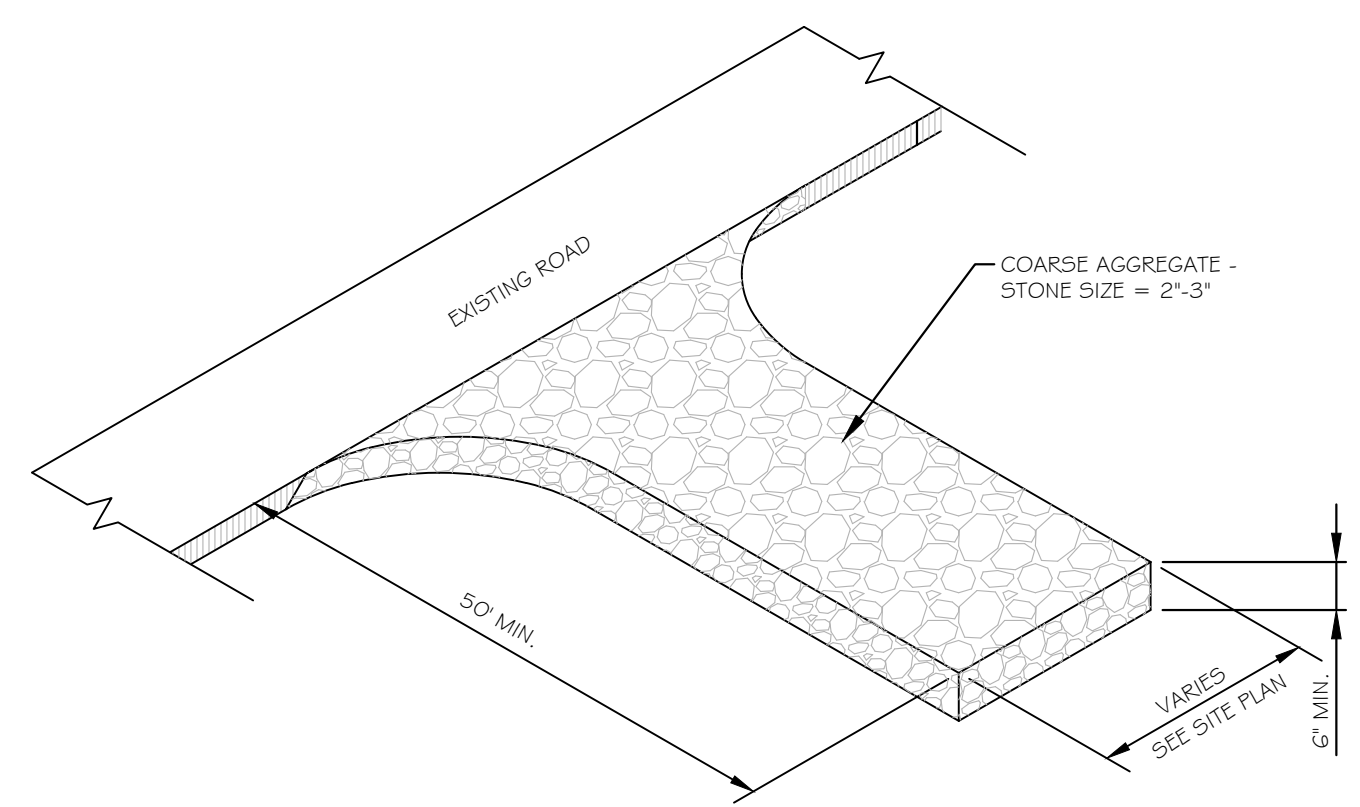


SANDBAG IMPERVIOUS DIKE

NTS

NOTE: END OF DIKE AT GROUND LEVEL TO BE HIGHER THAN THE LOWEST POINT OF FLOW CHECK. SUFFICIENT SANDBAGS ARE TO BE PLACED TO PREVENT SCOURING.

SANDBAG BARRIERS SHALL BE CONSTRUCTED OF THREE LAYERS OF SANDBAGS. THE BOTTOM LAYER SHALL CONSIST OF 3 ROWS OF BAGS, THE MIDDLE LAYER SHALL CONSIST OF 2 ROWS OF BAGS AND THE TOP LAYER SHALL CONSIST OF 1 ROW OF BAGS. THE RECOMMENDED DIMENSION OF A FILLED SANDBAG SHALL BE APPROXIMATELY 0.5 FT X 0.5 FT X 1.5 FT.



PURPOSE:

STABILIZED CONSTRUCTION ENTRANCES SHOULD BE USED AT ALL POINTS WHERE TRAFFIC WILL BE LEAVING A CONSTRUCTION SITE AND MOVING DIRECTLY ONTO A PUBLIC ROAD.

CONSTRUCTION SPECIFICATIONS:

1. CLEAR THE ENTRANCE AND EXIT AREA OF ALL VEGETATION, ROOTS, AND OTHER OBJECTIONABLE MATERIAL AND PROPERLY GRADE IT.
2. PLACE THE GRAVEL TO THE SPECIFIC GRADE AND DIMENSIONS SHOWN ON THE DETAIL, AND SMOOTH IT.
3. PROVIDE DRAINAGE TO CARRY WATER TO A SEDIMENT TRAP OR OTHER SUITABLE OUTLET.
4. USE GEOTEXTILE FABRICS BECAUSE THEY IMPROVE STABILITY OF THE FOUNDATION IN LOCATIONS SUBJECT TO SEEPAGE OR HIGH WATER TABLE.

MAINTENANCE:

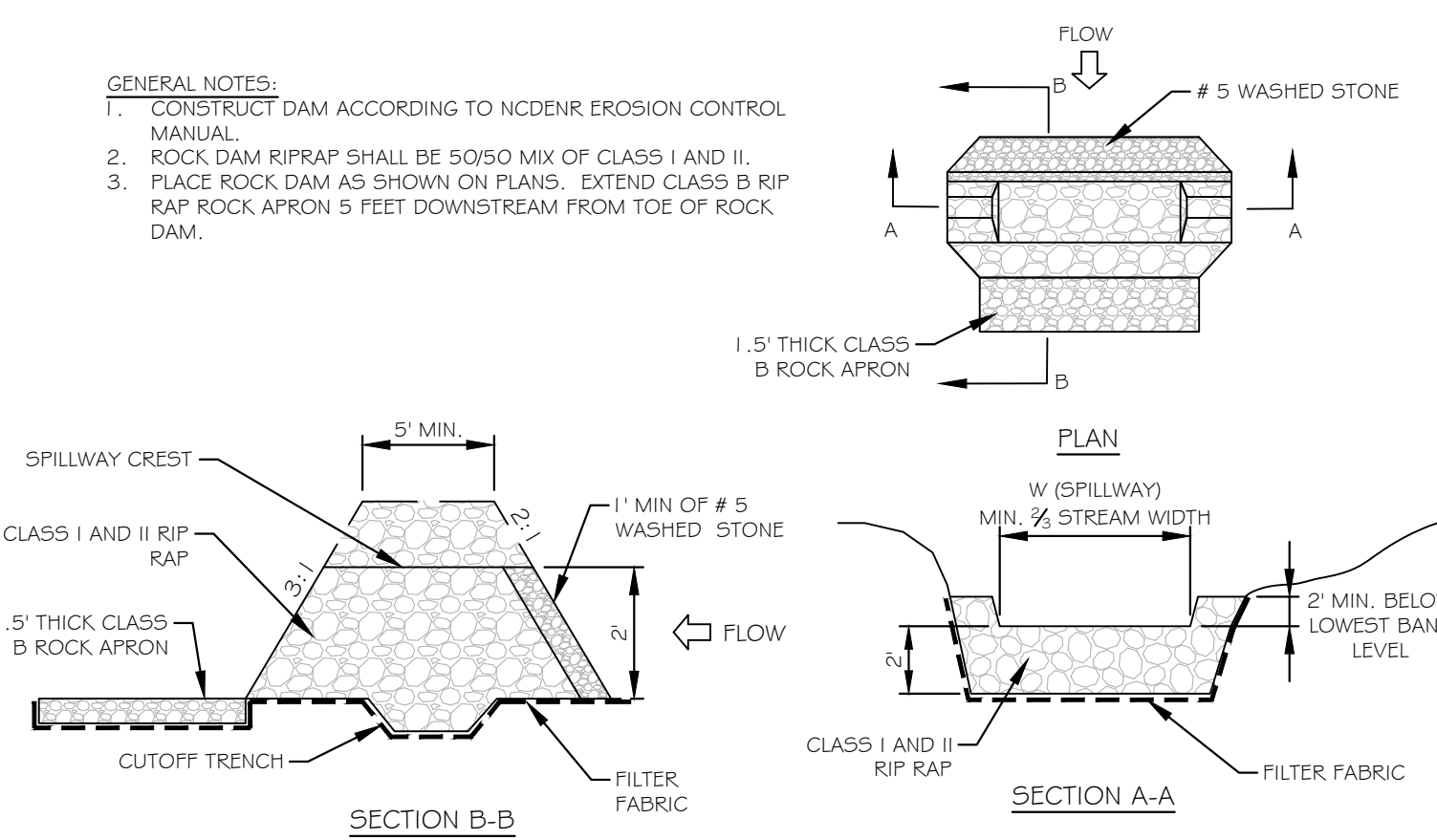
MAINTAIN THE GRAVEL PAD IN A CONDITION TO PREVENT MUD OR SEDIMENT FROM LEAVING THE CONSTRUCTION SITE. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH 2-INCH STONE. AFTER EACH RAINFALL, INSPECT ANY STRUCTURE USED TO TRAP SEDIMENT AND CLEAN IT OUT AS NECESSARY. IMMEDIATELY REMOVE ALL OBJECTIONABLE MATERIALS SPILLED, WASHED, OR TRACKED ONTO PUBLIC ROADWAYS, OR AIRFIELD PAVEMENTS.

TEMPORARY GRAVEL CONSTRUCTION ENTRANCE

NTS

GENERAL NOTES:

1. CONSTRUCT DAM ACCORDING TO NCDENR EROSION CONTROL MANUAL.
2. ROCK DAM RIPRAP SHOULD BE 50/50 MIX OF CLASS I AND II.
3. PLACE ROCK DAM AS SHOWN ON PLANS. EXTEND CLASS B RIP RAP ROCK APRON 5 FEET DOWNSTREAM FROM TOE OF ROCK DAM.



TEMPORARY ROCK CHECK DAM

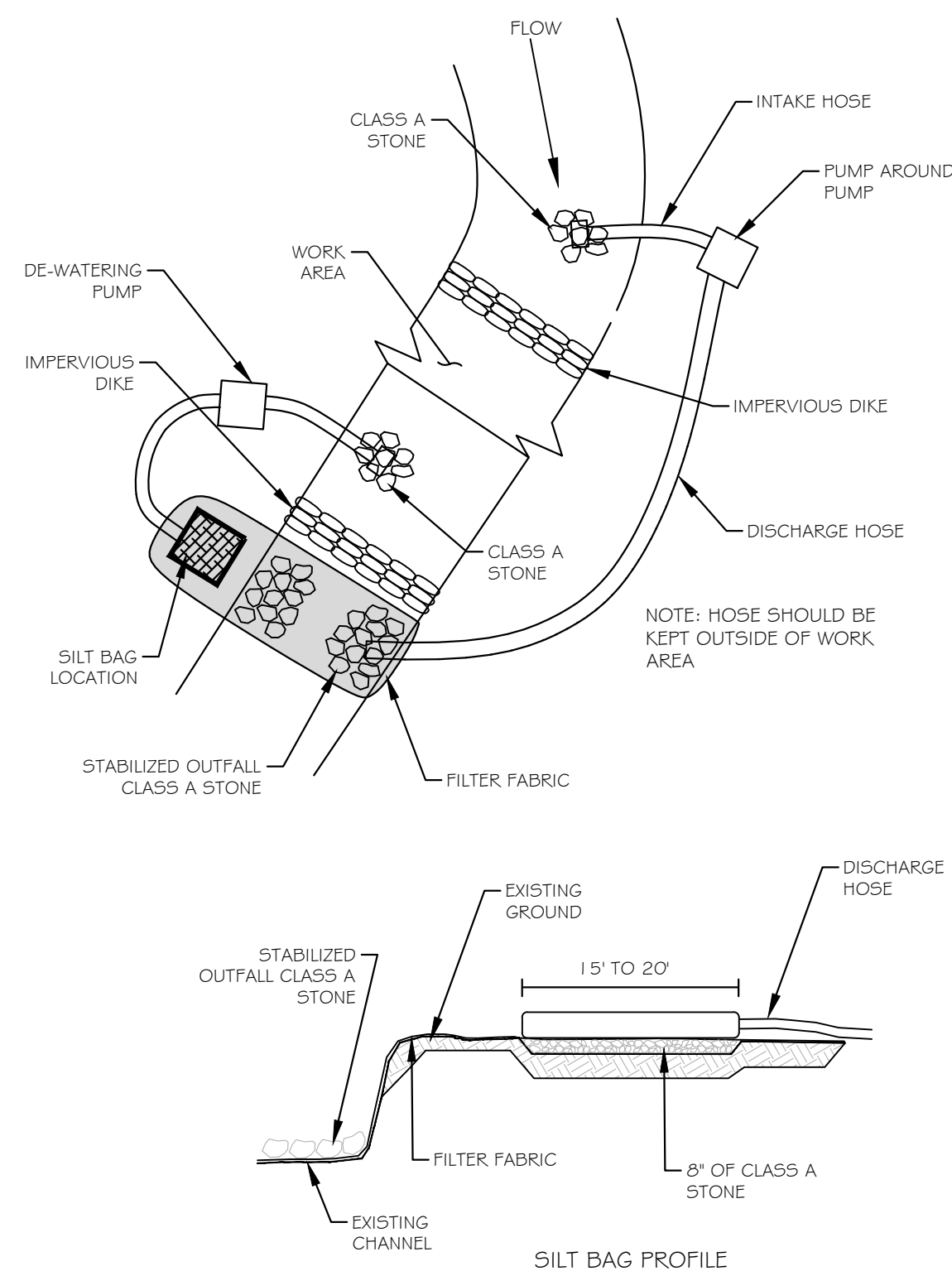
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NOTES:

1. EXCAVATION SHALL BE PERFORMED ONLY IN DRY AND/OR ISOLATED SECTIONS OF CHANNEL.
2. IMPERVIOUS DIKES SHOULD BE USED TO ISOLATE WORK AREAS FROM STREAM FLOW.
3. THE CONTRACTOR SHALL NOT DISTURB MORE AREA THAN CAN BE STABILIZED IN ONE WORKING DAY. A MAXIMUM OF 200 FEET MAY BE DISTURBED AT ANY ONE TIME.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING PUMP SIZE SUFFICIENT TO PUMP BASE FLOW.
5. DIKE MUST BE CONSTRUCTED OF NON-ERODIBLE MATERIALS SUCH AS SANDBAGS.

SEQUENCE OF CONSTRUCTION:

1. INSTALL STILLING BASIN AND STABILIZED OUTFALL USING CLASS A RIP RAP AT THE DOWNSTREAM END OF THE DESIGNATED PROJECT WORKING AREA.
2. THE CONTRACTOR SHALL INSTALL THE PUMP AROUND PUMP AND THE TEMPORARY PIPING THAT WILL CONVEY THE BASE FLOW FROM UPSTREAM OF THE WORK AREA TO THE STABILIZED OUTFALL.
3. INSTALL UPSTREAM IMPERVIOUS DIKE AND BEGIN PUMPING OPERATIONS FOR STREAM DIVERSION.
4. INSTALL THE DOWNSTREAM IMPERVIOUS DIKE AND DEWATERING PUMPING APPARATUS IF NEEDED TO DEWATER THE ENTRAPPED AREA. THE PUMP AND HOSE FOR THIS PURPOSE SHALL BE OF SUFFICIENT SIZE TO DEWATER THE WORK AREA. THIS WATER WILL ALSO BE PUMPED TO AN OUTFALL STABILIZED WITH CLASS A RIP RAP.
5. THE CONTRACTOR SHALL EXCAVATE ANY ACCUMULATED SILT AND DEWATER BEFORE REMOVAL OF THE IMPERVIOUS DIKE. WHEN DEWATERING AREA, ALL DIRTY WATER MUST BE PUMPED THROUGH A SILT BAG. REMOVE IMPERVIOUS DIKES, PUMPS, AND TEMPORARY FLEXIBLE HOSE/PIPING STARTING WITH THE DOWNSTREAM DIKE FIRST.
6. ONCE THE WORKING AREA IS COMPLETED, REMOVE ALL RIP RAP AND IMPERVIOUS DIKES AND STABILIZE DISTURBED AREAS WITH SEED AND MULCH.
7. ALL WORK IN CHANNEL MUST BE COMPLETED BEFORE REMOVING IMPERVIOUS DIKE.



PUMP AROUND & DEWATERING DETAIL

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PROJECT NAME:
**CATBIRD SITE
DAVIE COUNTY, NORTH CAROLINA**

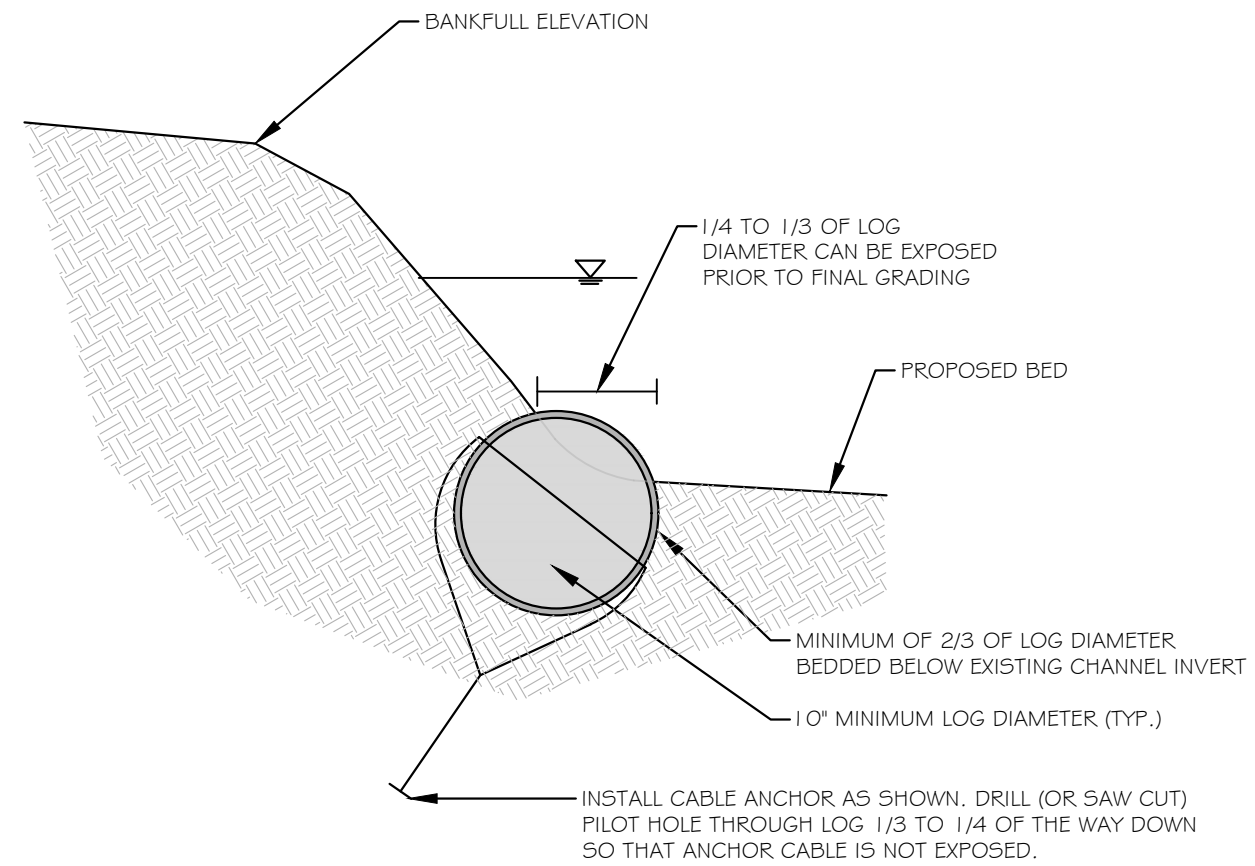
DRAWING TITLE:
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PROJECT NUMBER: 0386
PROJECT MANAGER: BPB
DESIGNED: AFM
DRAWN: BRC
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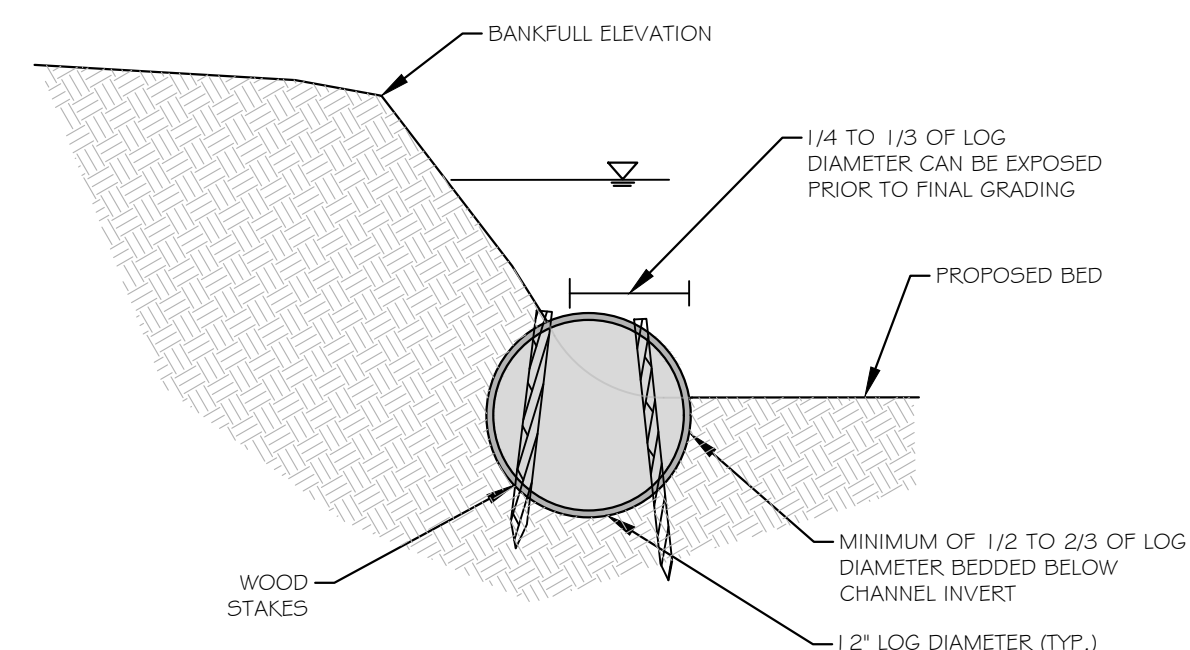
D1

- NOTES:
- LOGS SHOULD BE AT LEAST 10 INCHES IN DIAMETER, 5-8 FEET LONG, RELATIVELY STRAIGHT, AND HARDWOOD.
 - CABLE ANCHORS SHOULD BE PLACED 1' TO 3' FROM EACH END OF LOG. REBAR (5/8" MINIMUM DIAMETER, 3' MIN. LENGTH TYPICAL) MAY BE USED AS A SUBSTITUTION FOR CABLE ANCHORS PER DIRECTION OF ENGINEER.
 - IF REBAR IS USED, PRE-DRILL HOLES WITH 5/8" DRILL BIT.



LOG TOE PROTECTION

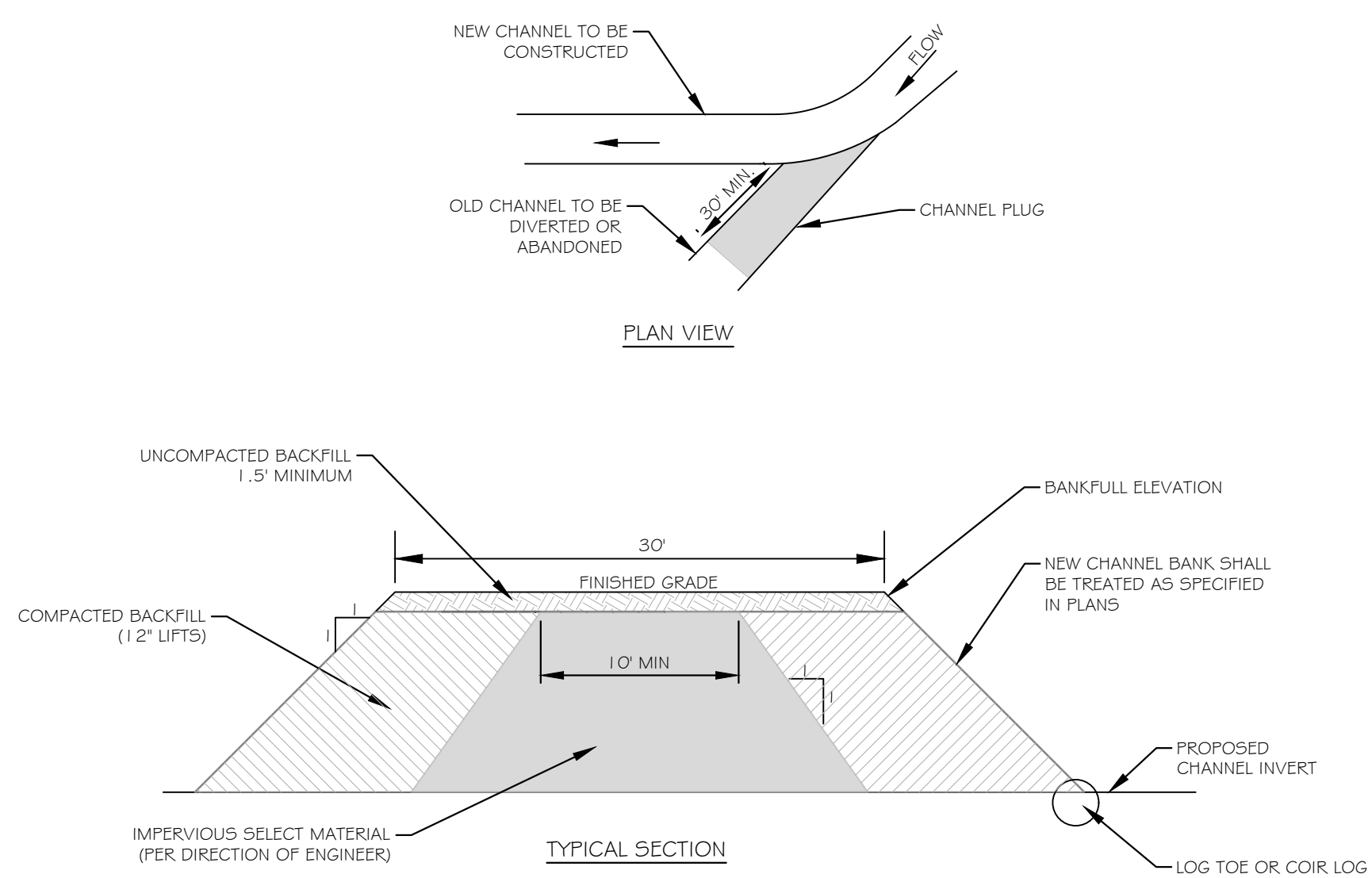
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COIR LOG (TOE PROTECTION)

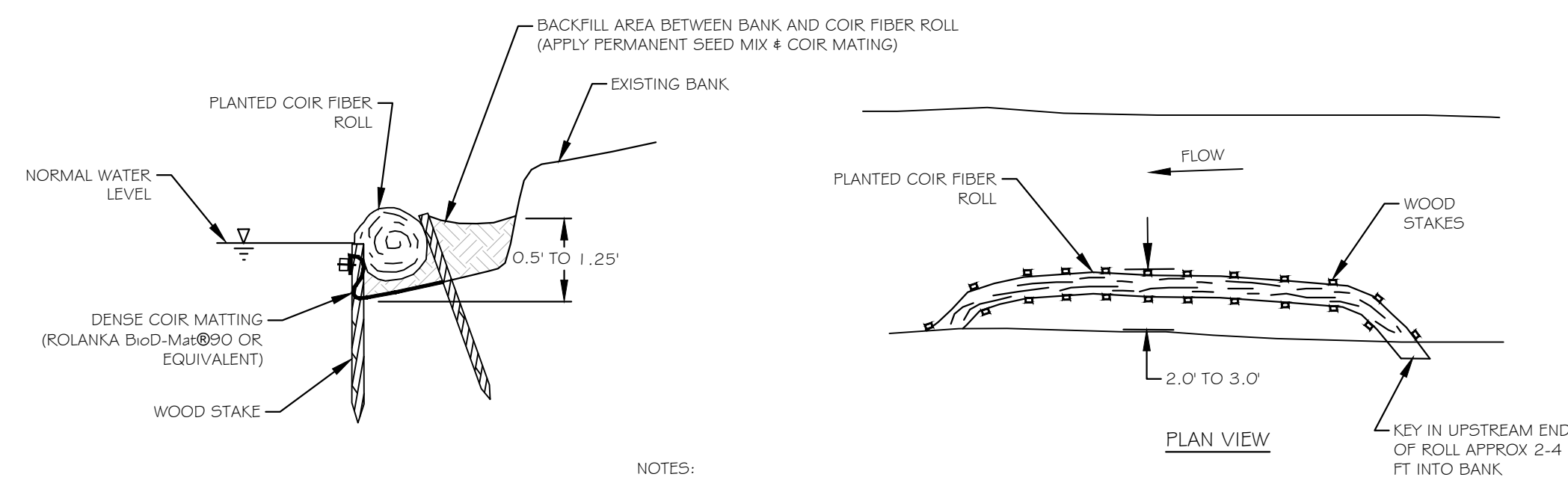
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- NOTES:
- INSTALL STAKES ON 3' CENTERS ON EACH SIDE OF ROLL. TOP OF STAKE SHOULD NOT EXTEND ABOVE ROLL.
 - EXCAVATE A SMALL TRENCH (DEPTH APPROX 1/2 TO 2/3 OF LOG DIAM) FOR PLACEMENT OF ROLL.
 - COIR LOGS SHALL BE 10 FT LONG AND HAVE A DIAMETER OF 12 IN.



CHANNEL PLUG

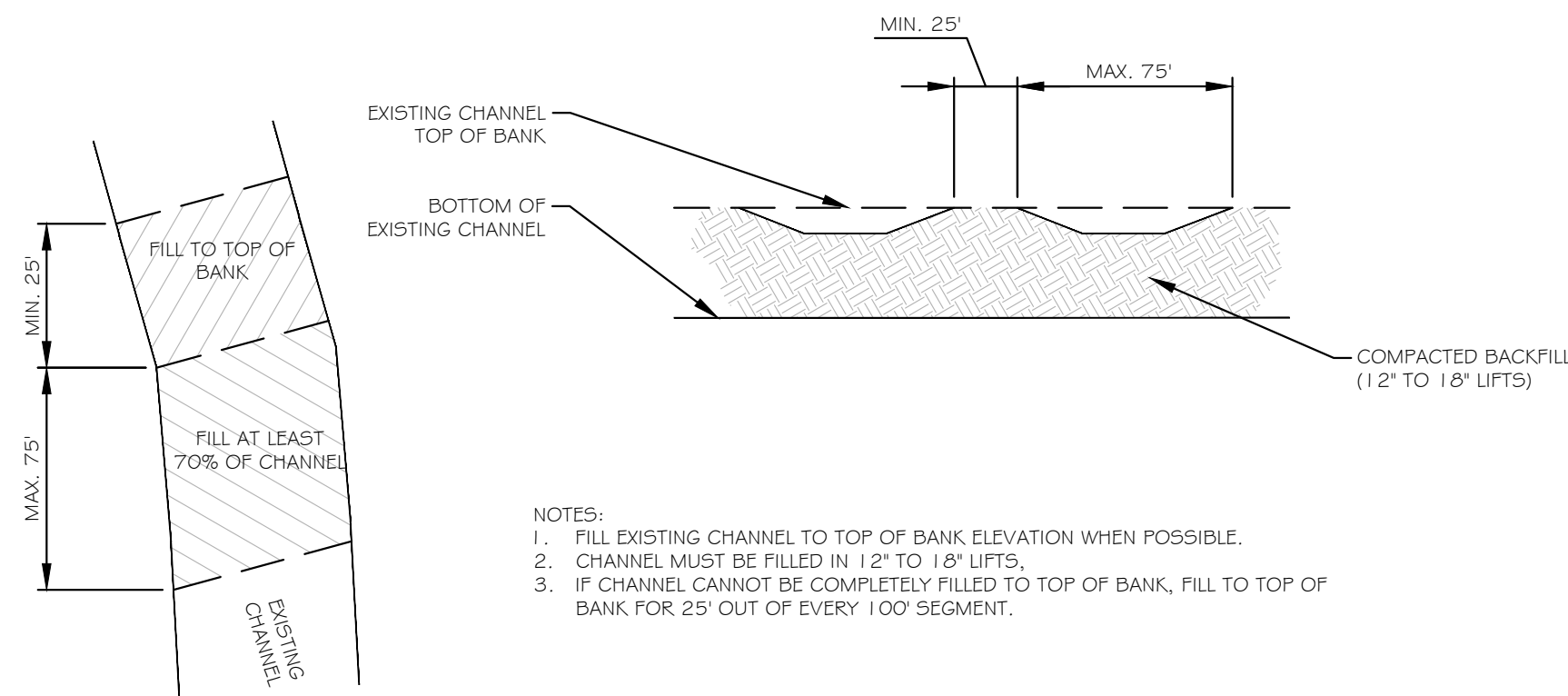
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VEGETATED SILL DEFLECTOR

NTS

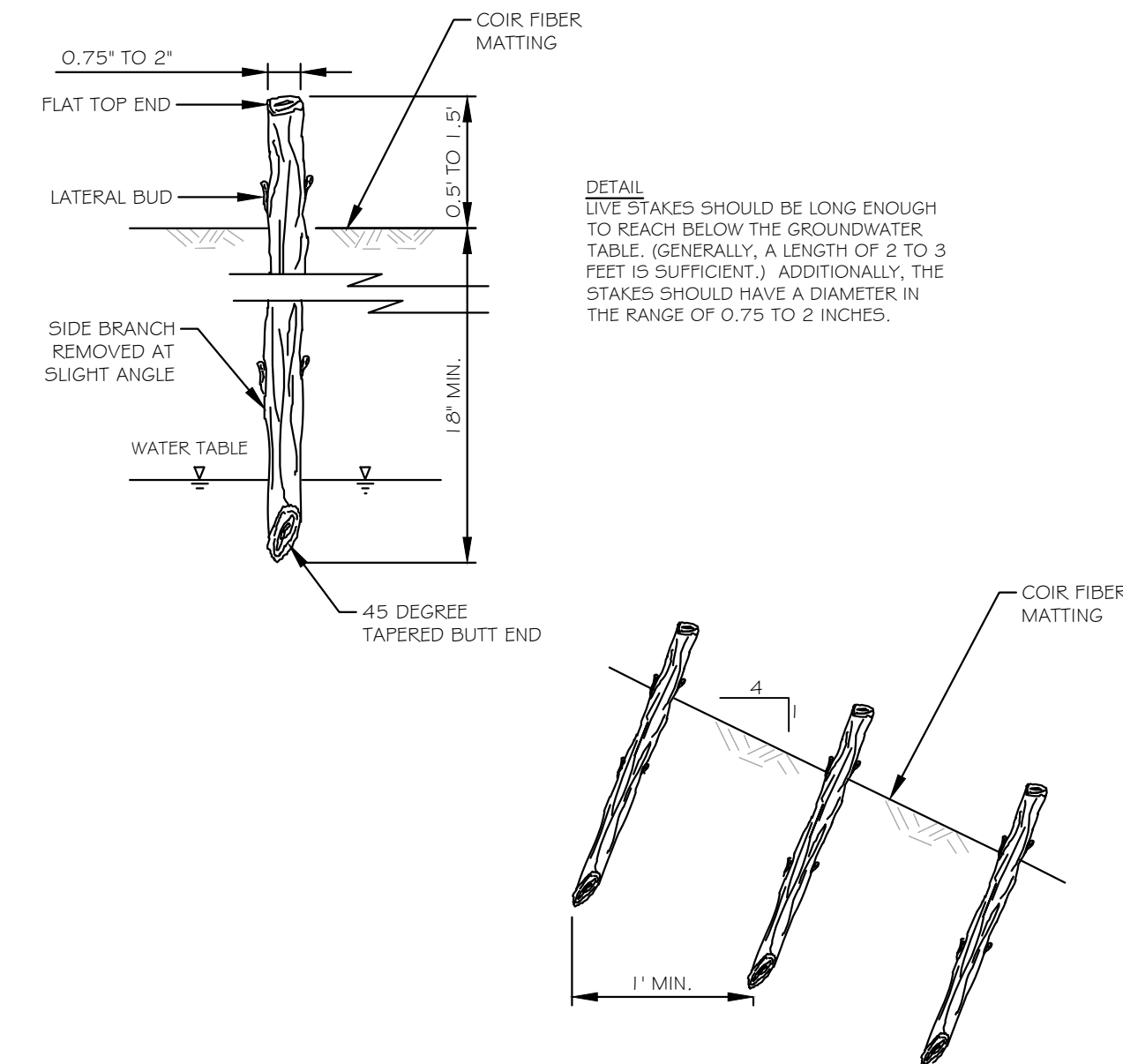
- NOTES:
- DESIGNER TO MARK LOCATIONS AND DIMENSIONS OF SILLS IN THE FIELD PRIOR TO CONSTRUCTION.
 - INSTALL STAKES ON 3' CENTERS ON EACH SIDE OF ROLL. TOP OF STAKE SHOULD NOT EXTEND ABOVE ROLL.
 - EXCAVATE A SMALL TRENCH (APPROX 2" DEEP) FOR PLACEMENT OF ROLL.



CHANNEL BACKFILL

NTS

- NOTES:
- FILL EXISTING CHANNEL TO TOP OF BANK ELEVATION WHEN POSSIBLE.
 - CHANNEL MUST BE FILLED IN 1.2' TO 1.8' LIFTS.
 - IF CHANNEL CANNOT BE COMPLETELY FILLED TO TOP OF BANK, FILL TO TOP OF BANK FOR 25' OUT OF EVERY 100' SEGMENT.

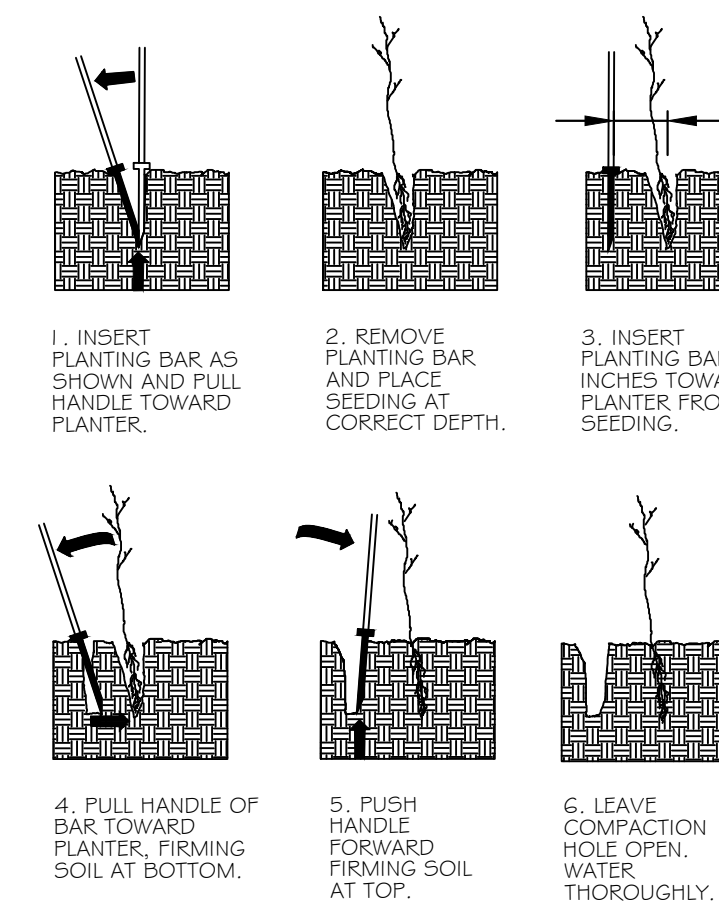


LIVE STAKE

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- NOTE:
- ACCEPTABLE SPECIES INCLUDE BLACK WILLOW (SALIX NIGRA), SILKY WILLOW (SALIX SERICEA) AND SILKY DOGWOOD (CORNUS AMMOMUM).
 - LIVE STAKES SHALL BE PLANTED IN AN AREA EXTENDING 3 FEET OUT FROM TOP OF BANK TO JUST BELOW BANKFULL.
 - LIVE STAKES SHALL BE SPACED 3 FEET APART, ALTERNATE SPACING.

DIBBLE PLANTING METHOD USING THE KBC PLANTING BAR



PLANTING NOTES:

PLANTING BAG DURING PLANTING, SEEDLINGS SHALL BE KEPT IN A MOIST CANVAS BAG OR SIMILAR CONTAINER TO PREVENT THE ROOT SYSTEMS FROM DRYING.

KBC PLANTING BAR PLANTING BAR SHALL HAVE A BLADE WITH A TRIANGULAR CROSS SECTION, AND SHALL BE 12 INCHES LONG, 4 INCHES WIDE AND 1 INCH THICK AT CENTER.

ROOT PRUNING ALL SEEDLINGS SHALL BE ROOT PRUNED, IF NECESSARY, SO THAT NO ROOTS EXTEND MORE THAN 10 INCHES BELOW THE ROOT COLLAR.

NOTES: BARE ROOTS SHALL BE PLANTED 6 FT. TO 10 FT. ON CENTER. RANDOM SPACING, AVERAGING 8 FT. ON CENTER, APPROXIMATELY 680 PLANTS PER ACRE.

BARE ROOT PLANTING

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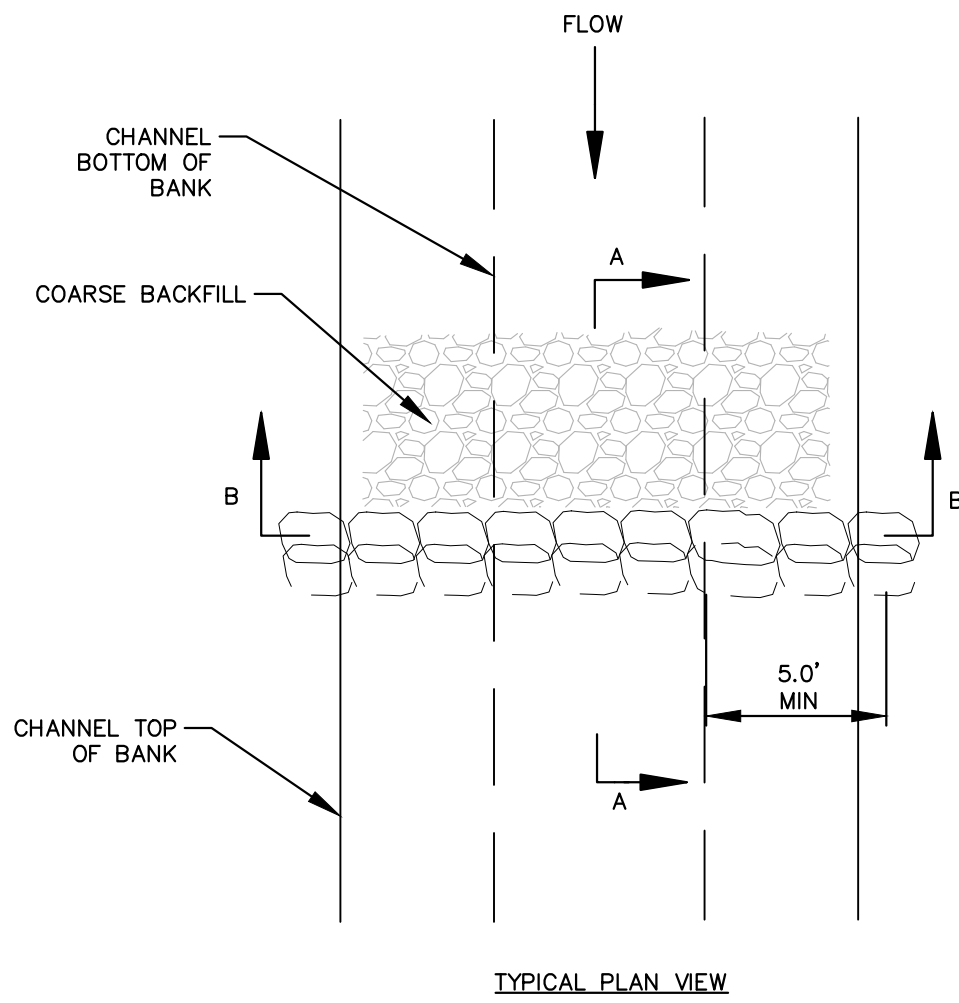
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DAVIE COUNTY, NORTH CAROLINA

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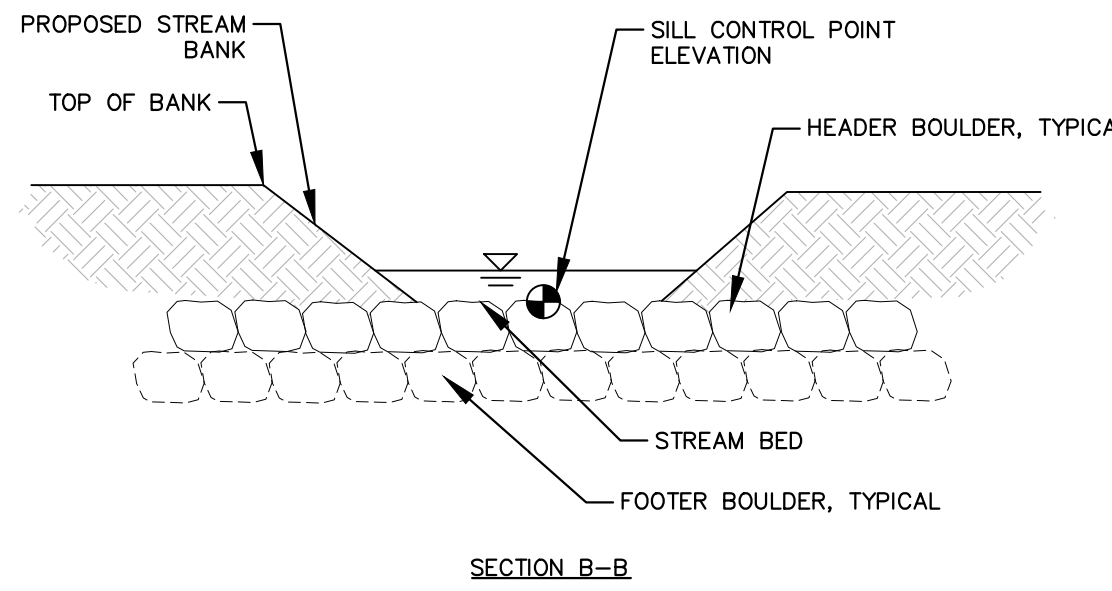
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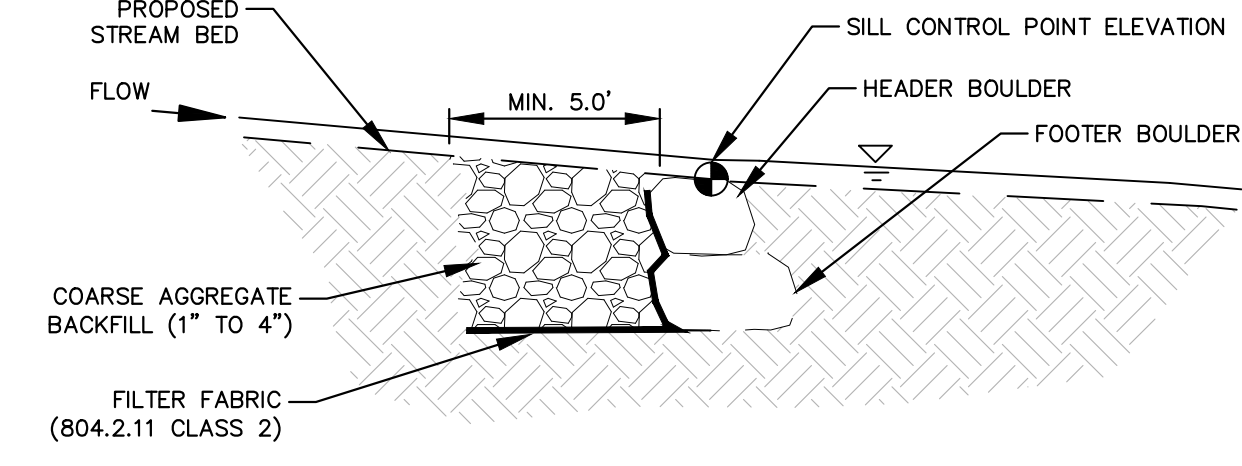
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TYPICAL PLAN VIEW



SECTION B-B



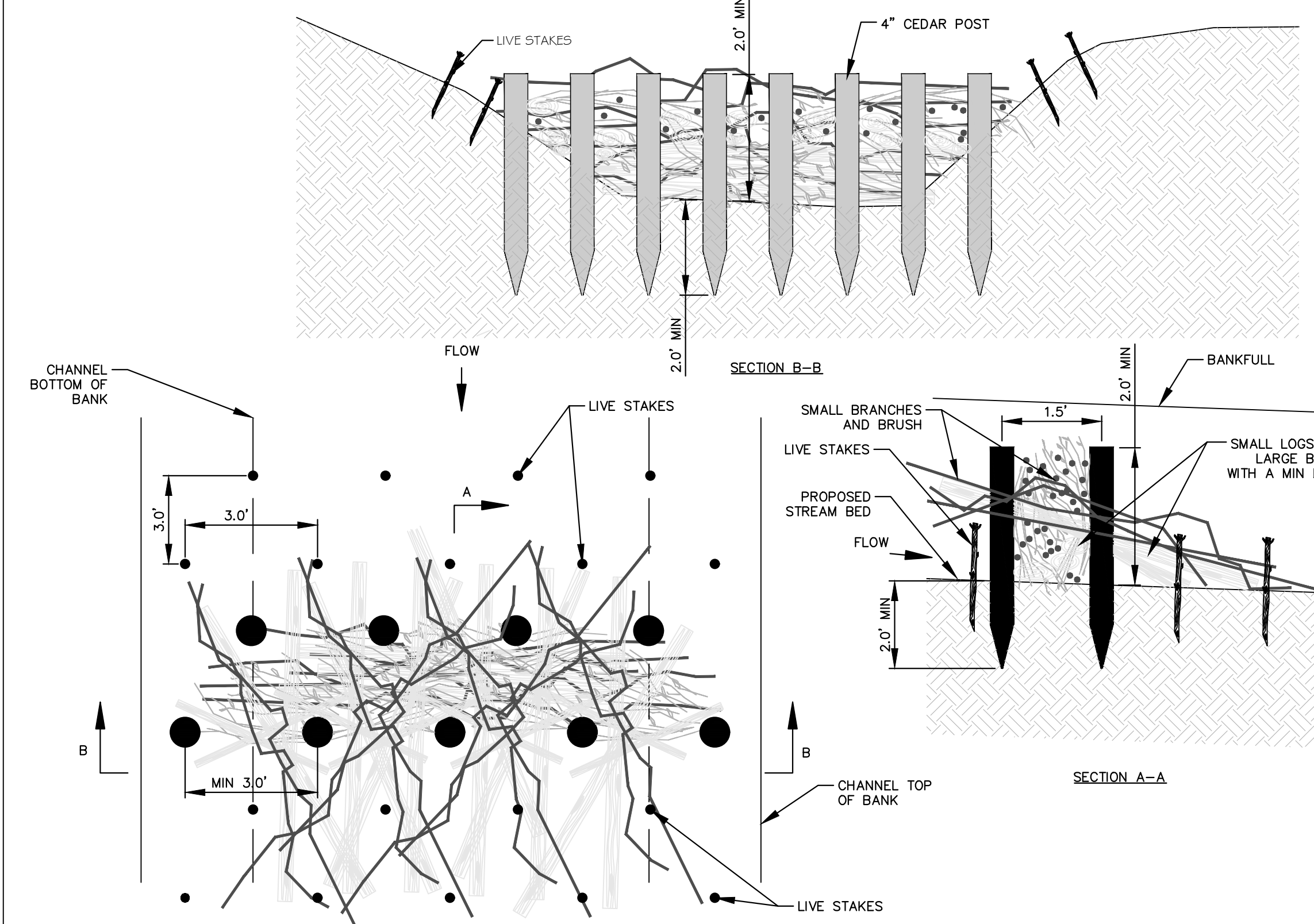
SECTION A-A

ROCK SILL

NTS

NOTES:

- BOULDERS DIMENSIONS SHALL BE AT LEAST:
REACH TC1-A: 3.0' X 2.0' X 2.0'
REACH TC2, TC3, & TC6: 2.0' X 2.0' X 1.5'
- COARSE AGGREGATE BACKFILL SHALL CONSIST OF A MIX OF GRAVEL, BALLAST STONE, AND CLASS A RIPRAP.
- THE BOULDER SILL IS GENERALLY CONSTRUCTED AS FOLLOWS:
A. PLACE FOOTER BOULDERS. A LAYER OF BEDDING MATERIAL UNDER THE FOOTER BOULDERS MAY BE SPECIFIED BY THE DESIGNER. THERE SHALL BE NO GAPS BETWEEN BOULDERS.
B. INSTALL FILTER FABRIC.
C. PLACE COARSE BACKFILL BEHIND THE FOOTER BOULDERS.
D. INSTALL HEADER BOULDERS ON TOP OF AND SET SLIGHTLY BACK FROM THE FOOTER BOULDERS (SUCH THAT PART OF THE HEADER BOULDER IS RESTING ON THE COARSE BACKFILL). HEADER BOULDERS SHALL SPAN THE SEAMS OF THE FOOTER BOULDERS. THERE SHALL NOT BE A SEAM IN THE CENTER OF THE STREAM BED (AT THE THALWEG). THERE SHALL BE NO GAPS BETWEEN BOULDERS.
E. PLACE COARSE BACKFILL BEHIND HEADER BOULDERS ENSURING THAT ANY VOIDS BETWEEN THE BOULDERS ARE FILLED.
4. BACKFILL SHALL BE COMPACTED IN 12" LIFTS.

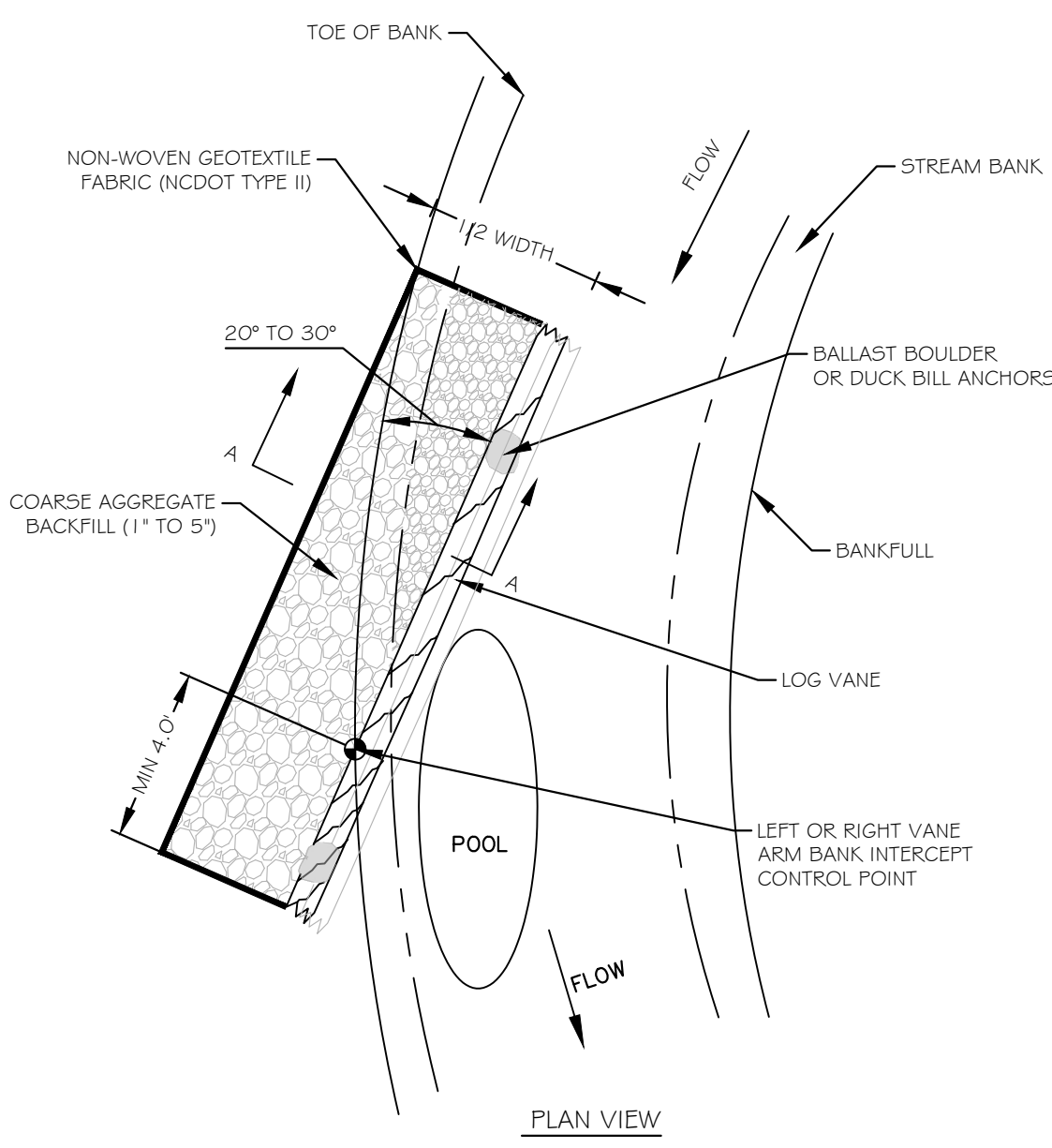


SEDIMENT TRAP

NTS

NOTES:

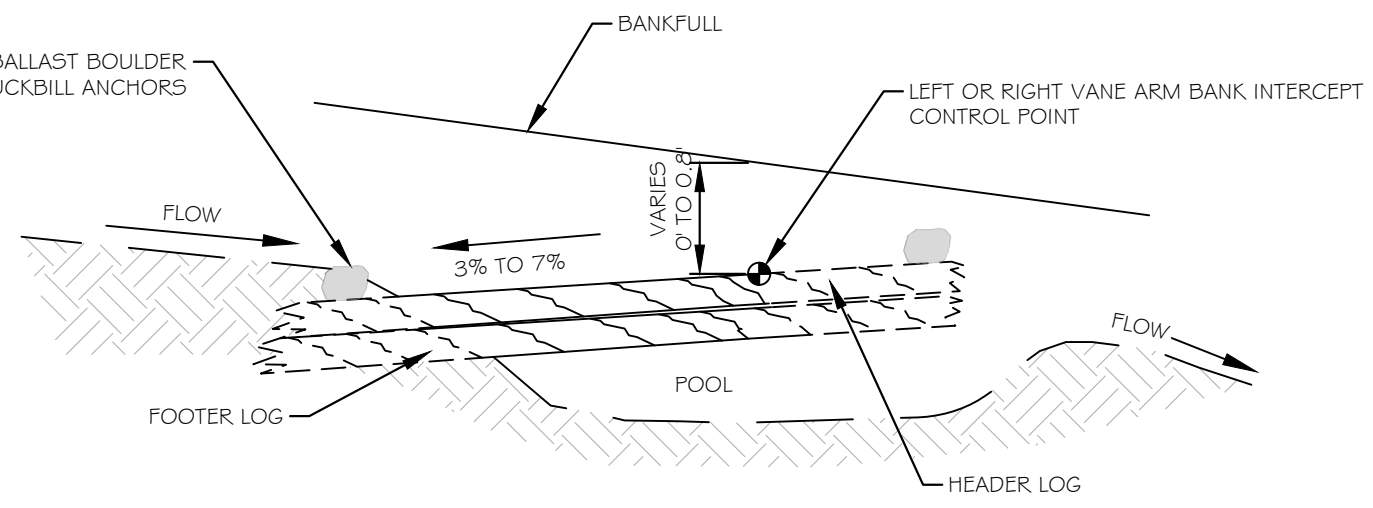
- DRIVE 2 ROWS OF 4" CEDAR POSTS ON MINIMUM 3' CENTERS PAST MINIMUM DEPTH AS SHOWN.
- FILL THE VOID BETWEEN POST ROWS W/ AN EVEN MIX OF HARDWOOD LOGS, LIMBS, AND BRUSH AS SHOWN.
- REDUCE POST SPACING AS NEEDED TO IMPROVE STRUCTURE STABILITY.



PLAN VIEW

NOTES:

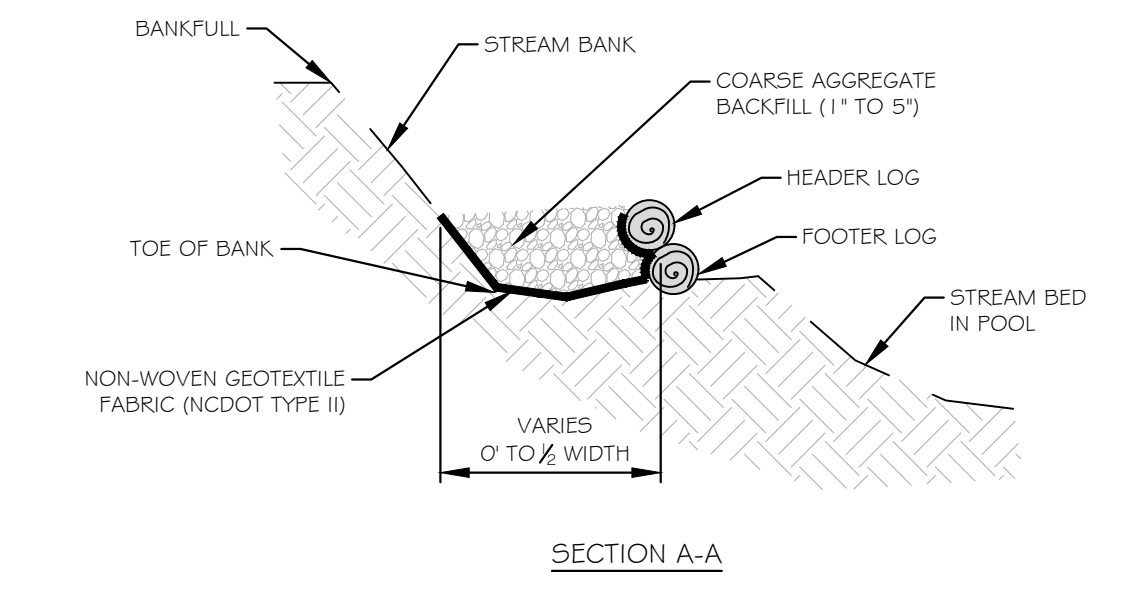
- LOG VANES SHALL BE CONSTRUCTED OF ONE OR MORE LOGS HELD IN PLACE BY EITHER BALLAST BOULDERS, DUCKBILL ANCHORS, OR REBAR. LOGS SHALL BE OF A LENGTH AND DIAMETER SPECIFIED BY THE DESIGNER AND BE RELATIVELY STRAIGHT HARDWOOD, RECENTLY HARVESTED. THE LENGTH SHALL BE SUCH THAT THE LOG IS BURIED INTO THE SOIL OF THE STREAM BANK (ON ONE END) AND STREAM BED (ON THE OTHER END) A MINIMUM DISTANCE OF 4.0'. FLAT-SIDED BALLAST BOULDERS SHALL BE OF SIZE 2' X 2' X 1.5' OR AS SPECIFIED BY THE DESIGNER.
- THE VANE SHALL INTERCEPT THE STREAM BANK AT A HEIGHT EQUAL TO BETWEEN 1/2 BANKFULL STAGE AND BANKFULL STAGE. AN ELEVATION CONTROL POINT MAY BE ESTABLISHED AT THE LEFT OR RIGHT STREAM BANK/VANE INTERCEPT POINT. THE VANE INTERCEPT LOCATION MAY BE OTHERWISE DESCRIBED BY ITS RELATIONSHIP TO BANKFULL STAGE OR BY THE LENGTH AND SLOPE OF THE VANE ARM. BANKFULL IS NOT NECESSARILY THE TOP OF THE STREAM BANK SLOPE.
- FILTER FABRIC SHALL BE USED TO SEAL THE GAPS BETWEEN THE LOGS AND UNDER THE COARSE BACKFILL MATERIAL OF THE VANE. THERE SHALL BE NO FILTER FABRIC VISIBLE IN THE FINISHED WORK; EDGES SHALL BE FOLDED TUCKED, OR TRIMMED AS NEEDED.
- LOG VANES SHALL BE BUILT TYPICALLY AS FOLLOWS:
A. OVER-EXCAVATE STREAM BED TO A DEPTH EQUAL TO THE TOTAL THICKNESS OF THE HEADER (AND FOOTER IF SPECIFIED) LOGS.
B. PLACE FOOTER LOG OF THE VANE ARM IF SPECIFIED. THE SLOPE OF THE VANE ARM IS MEASURED ALONG THE VANE ARM WHICH IS INSTALLED AT AN ANGLE TO THE STREAM BANK AND PROFILE.
C. INSTALL HEADER LOG OF THE VANE ARM ON TOP OF AND SLIGHTLY FORWARD OR BACK FROM THE FOOTER LOG.
D. NAIL FILTER FABRIC TO THE HEADER LOG USING A GALVANIZED NAIL WITH A PLASTIC CAP. THE SIZE AND GAGE OF NAIL AND NAIL SPACING SHALL BE SPECIFIED BY THE DESIGNER.
E. PLACE BALLAST BOULDERS OR DUCKBILL ANCHOR ON THE VANE.
F. PLACE COARSE BACKFILL BEHIND LOGS ENSURING THAT ANY VOIDS BETWEEN THE LOGS ARE FILLED.
G. BACKFILL REMAINDER OF VANE WITH PREVIOUSLY EXCAVATED MATERIAL.
- IF ANY EROSION CONTROL MATTING IS SPECIFIED FOR USE IN THE VICINITY OF THE STREAM BANK/VANE INTERCEPT POINT THE MATTING EDGES SHALL BE NEATLY SECURED AROUND THE LOGS.



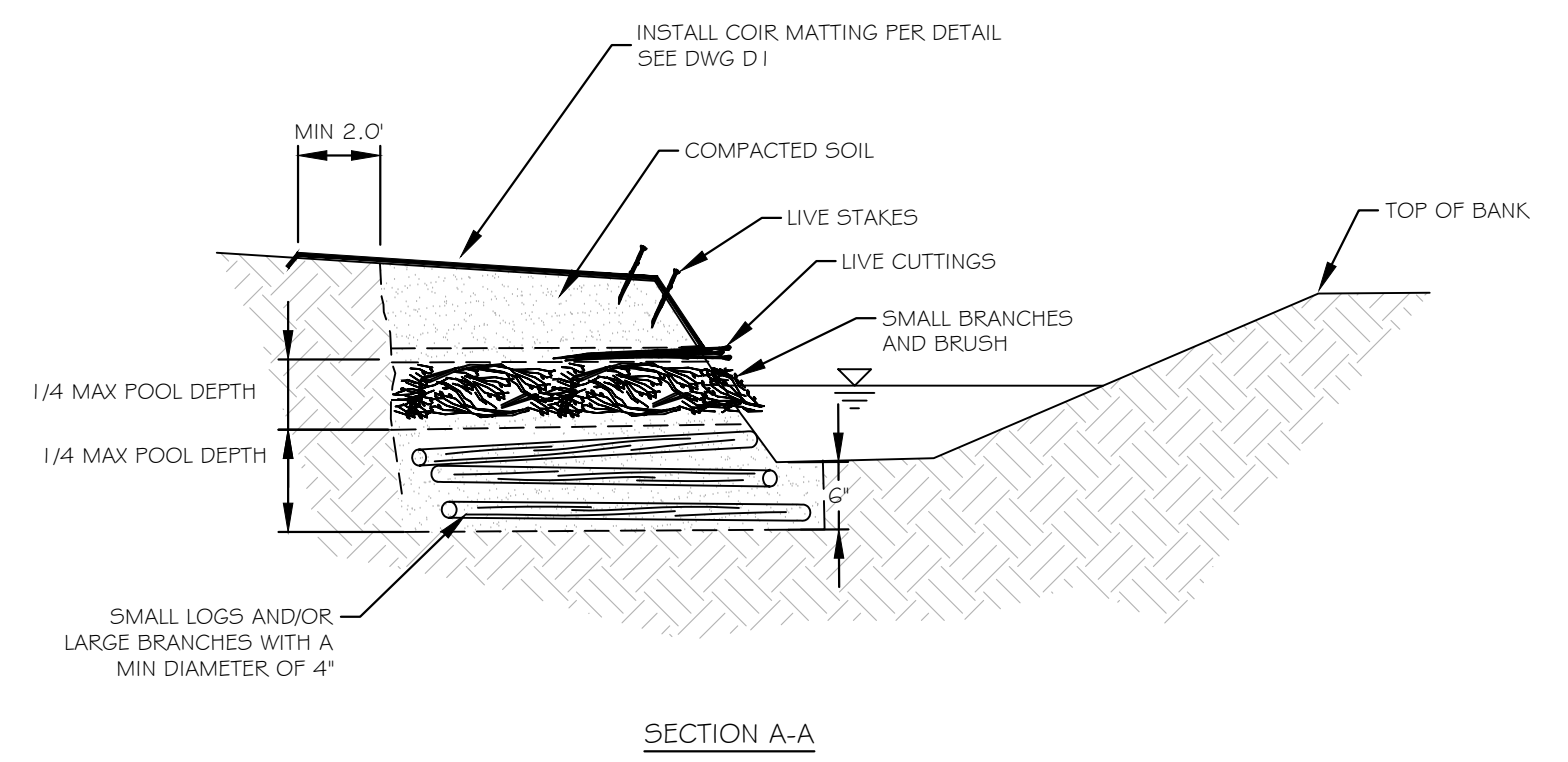
PROFILE VIEW

LOG VANE

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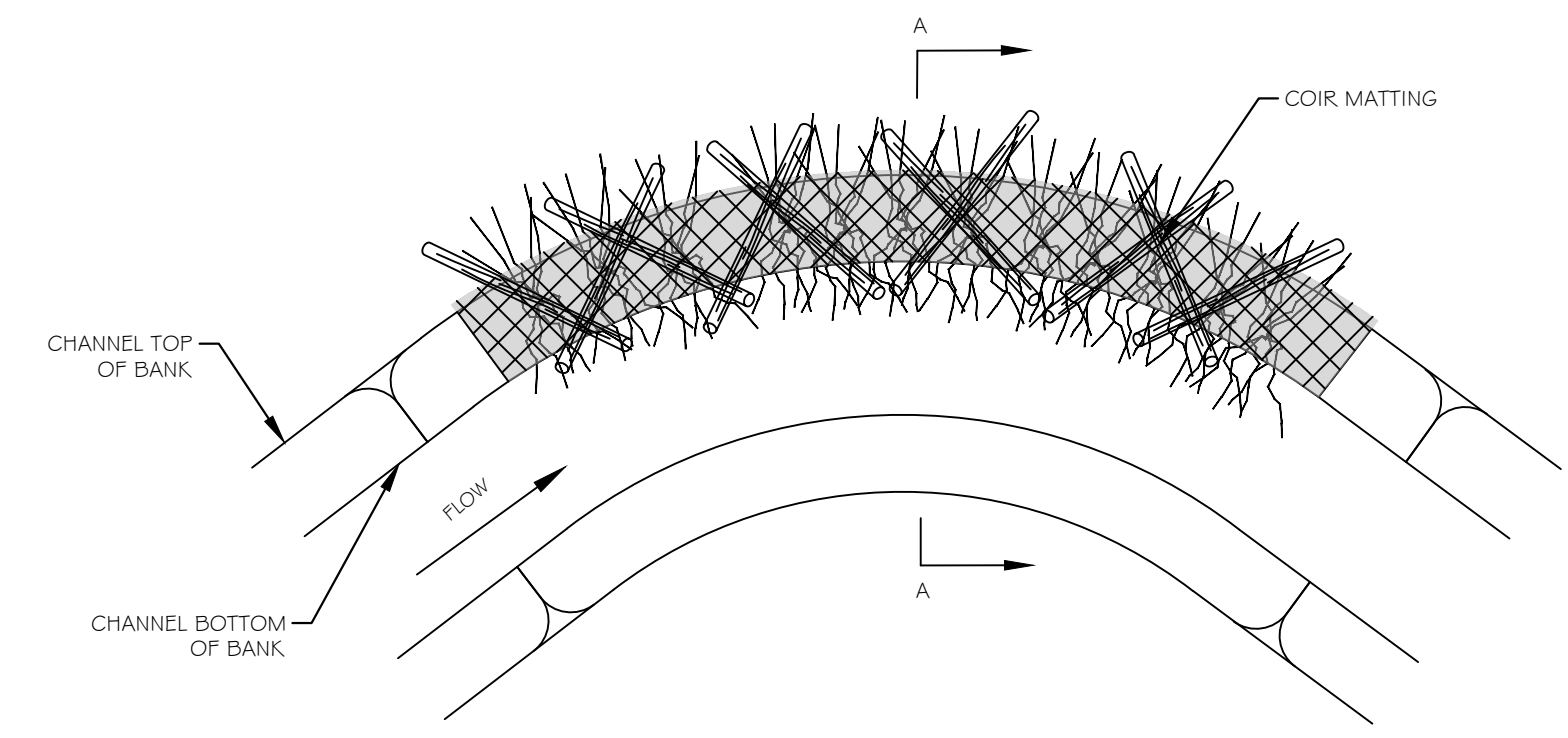
SECTION A-A



SECTION A-A

NOTES:

- OVER EXCAVATE THE OUTSIDE BEND OF THE CHANNEL. PLACE LARGER BRANCHES AND/OR APPROPRIATELY SIZED LOGS IN A CRUS-CROSS PATTERN. LOCK IN PLACE WITH FILL COVERING 6 IN TO 18 IN OF THE LARGER BRANCHES/SWALL LOGS.
- PLACE SMALLER BRANCHES AND BRUSH OVER THE LARGER BRANCHES/SWALL LOGS (HARDWOOD SPECIES ONLY) AND COMPACT LIGHTLY TOGETHER. BACKFILL AND COMPACT TO LOCK IN PLACE.
- ACCEPTABLE LIVE CUTTINGS SPECIES INCLUDE BLACK WILLOW (SALIX NIGRA) AND SILKY WILLOW (SALIX SERICEA). WILLOW CUTTINGS SHOULD BE RINSED AT CUTTING POINT TO ALLOW BETTER ROOTING.
- INSTALL EROSION CONTROL (COIR) MATTING OVER COMPACTED SOIL PER DIRECTION OF ENGINEER.
- INSTALL 1 TO 3 ROWS OF LIVE STAKES ABOVE THE LIVE CUTTINGS LAYER PER DIRECTION OF ENGINEER.



TYPICAL PLAN VIEW

BRUSH TOE

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CATBIRD SITE
DAVIE COUNTY, NORTH CAROLINA

DRAWING TITLE:
DETAILS

PROJECT NUMBER: 0386
PROJECT MANAGER: BPB
DESIGNED: AFM
DRAWN: BRC
CHECKED: AFM

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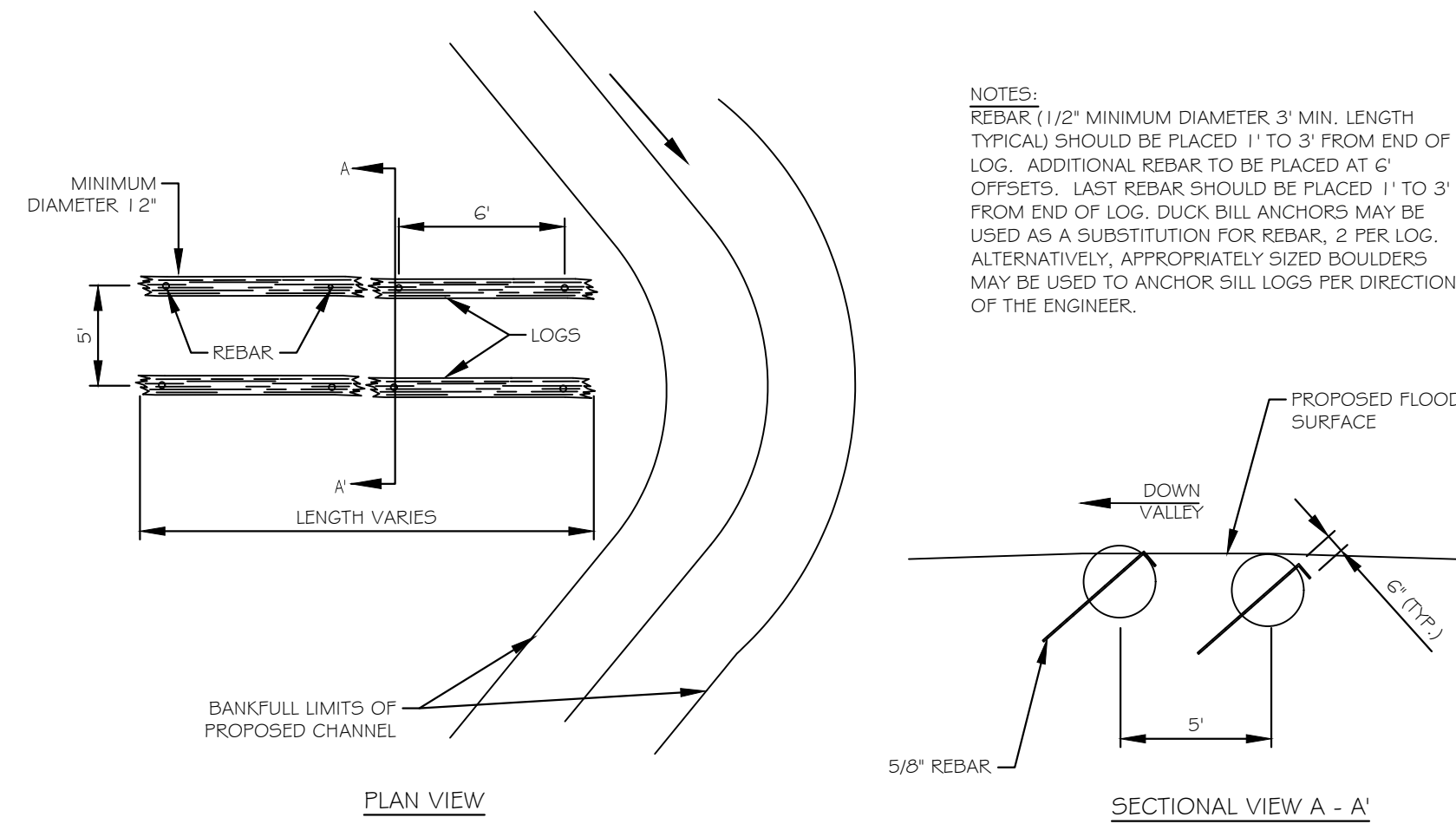
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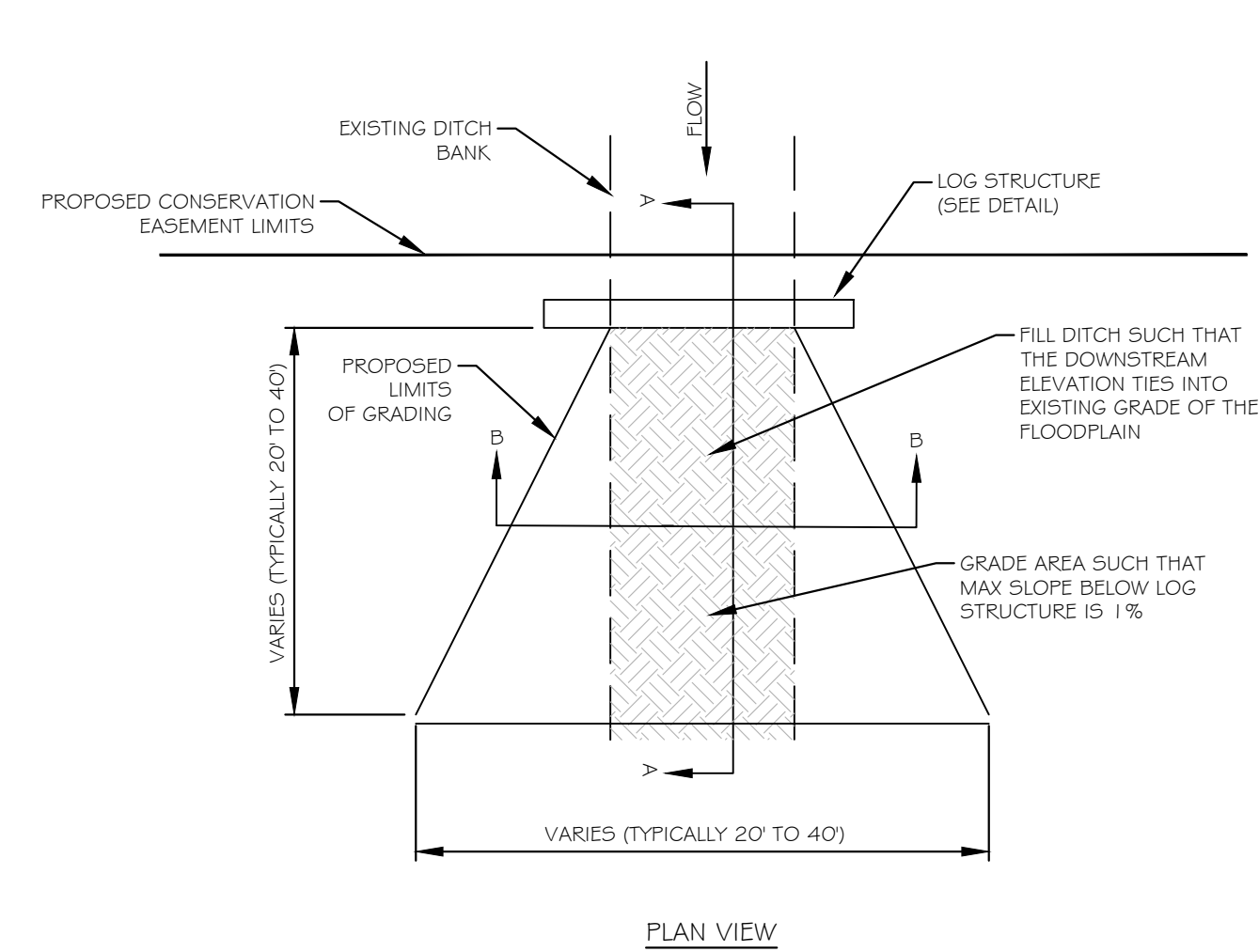
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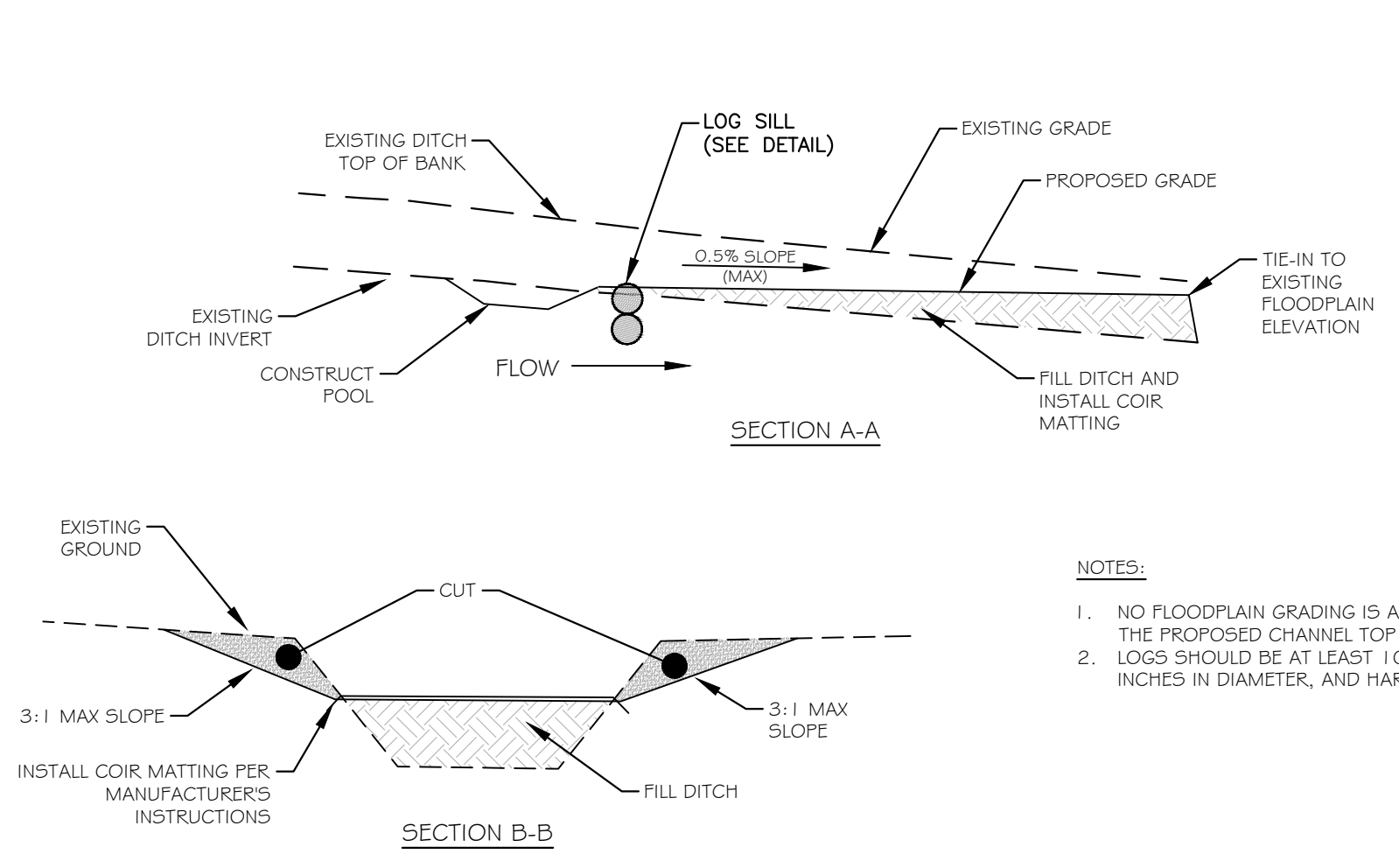
FLOODPLAIN SILL

NTS

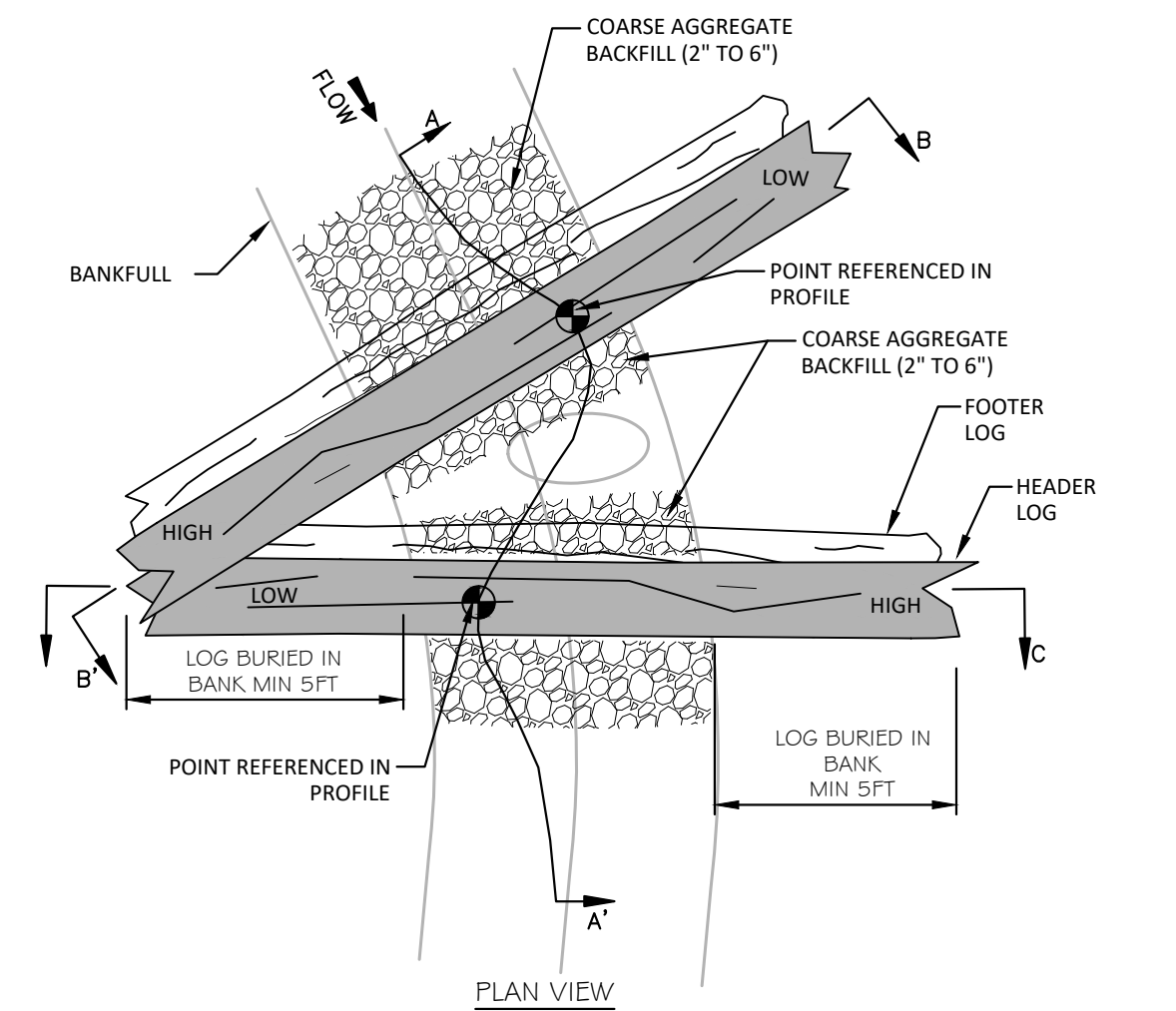


DIFFUSE FLOW STRUCTURE

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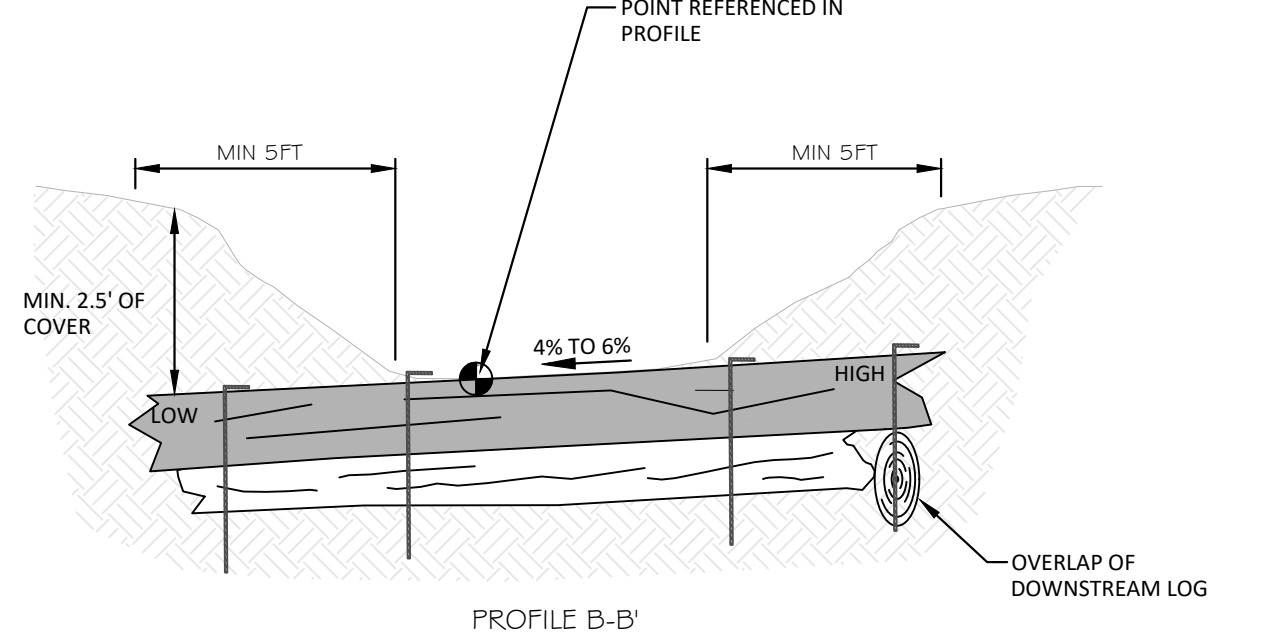


- NOTES:
- NO FLOODPLAIN GRADING IS ALLOWED WITHIN 10 FT OF THE PROPOSED CHANNEL TOP OF BANK.
 - LOGS SHOULD BE AT LEAST 10'-20' LONG AND AT LEAST 8 INCHES IN DIAMETER, AND HARDWOOD.

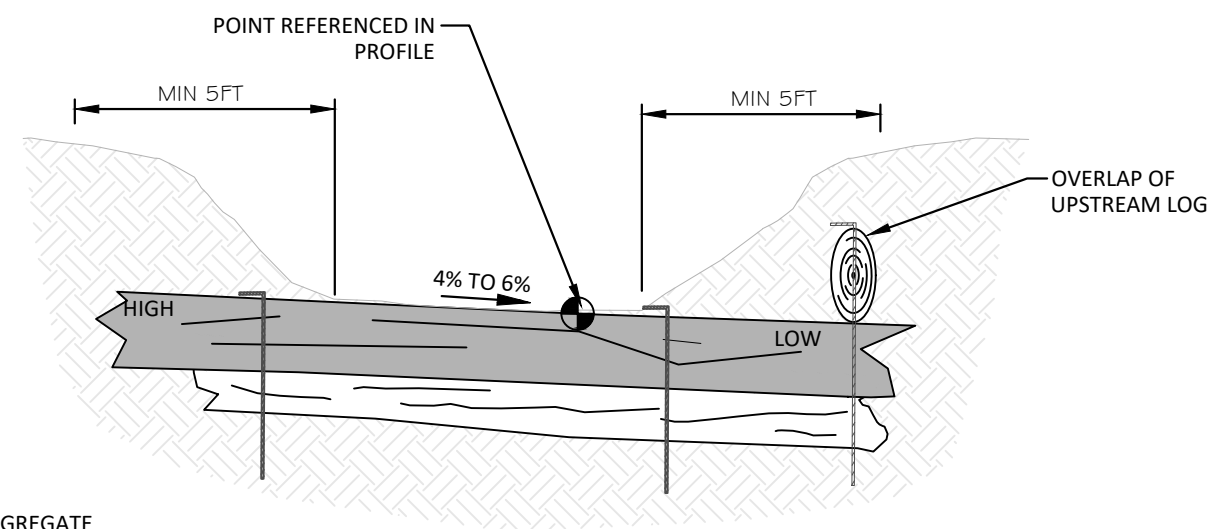


DOUBLE LOG DROP

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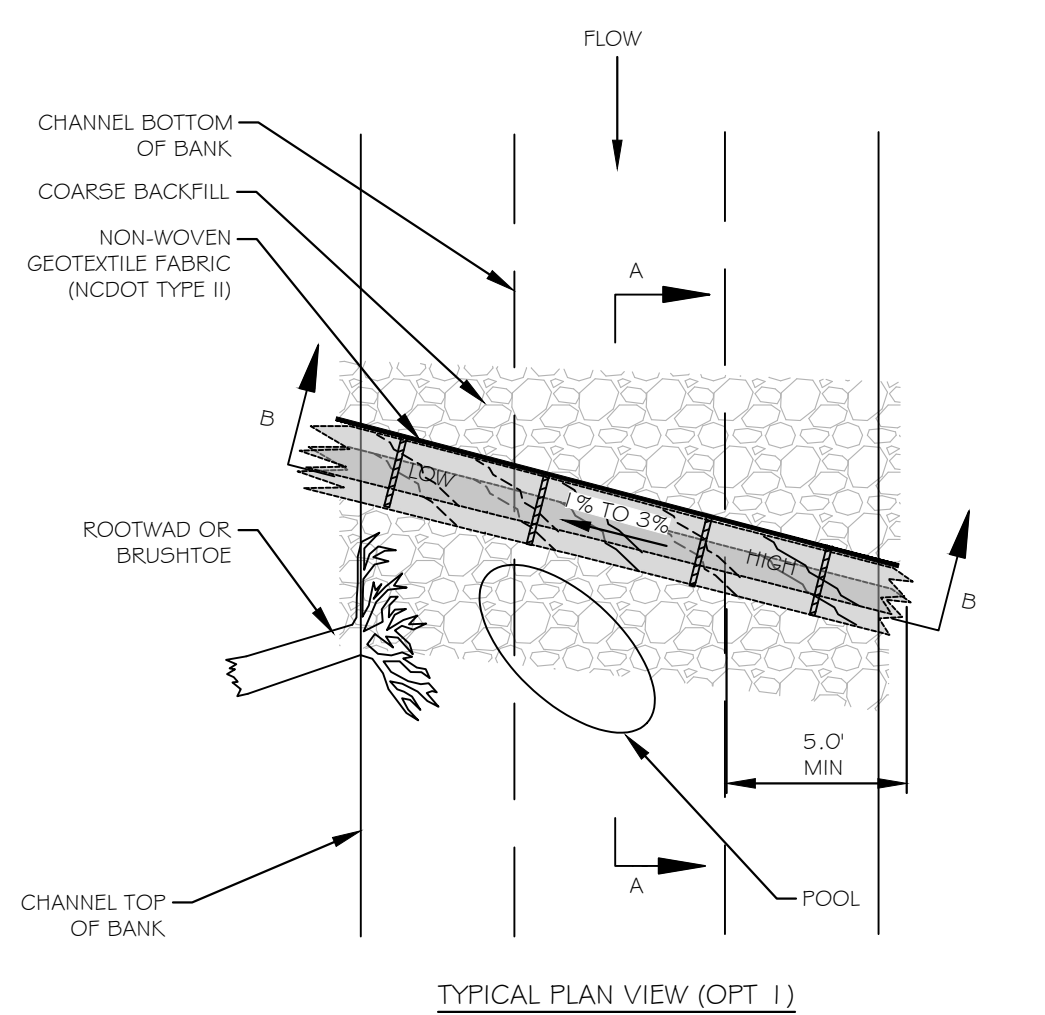


PROFILE B-B'

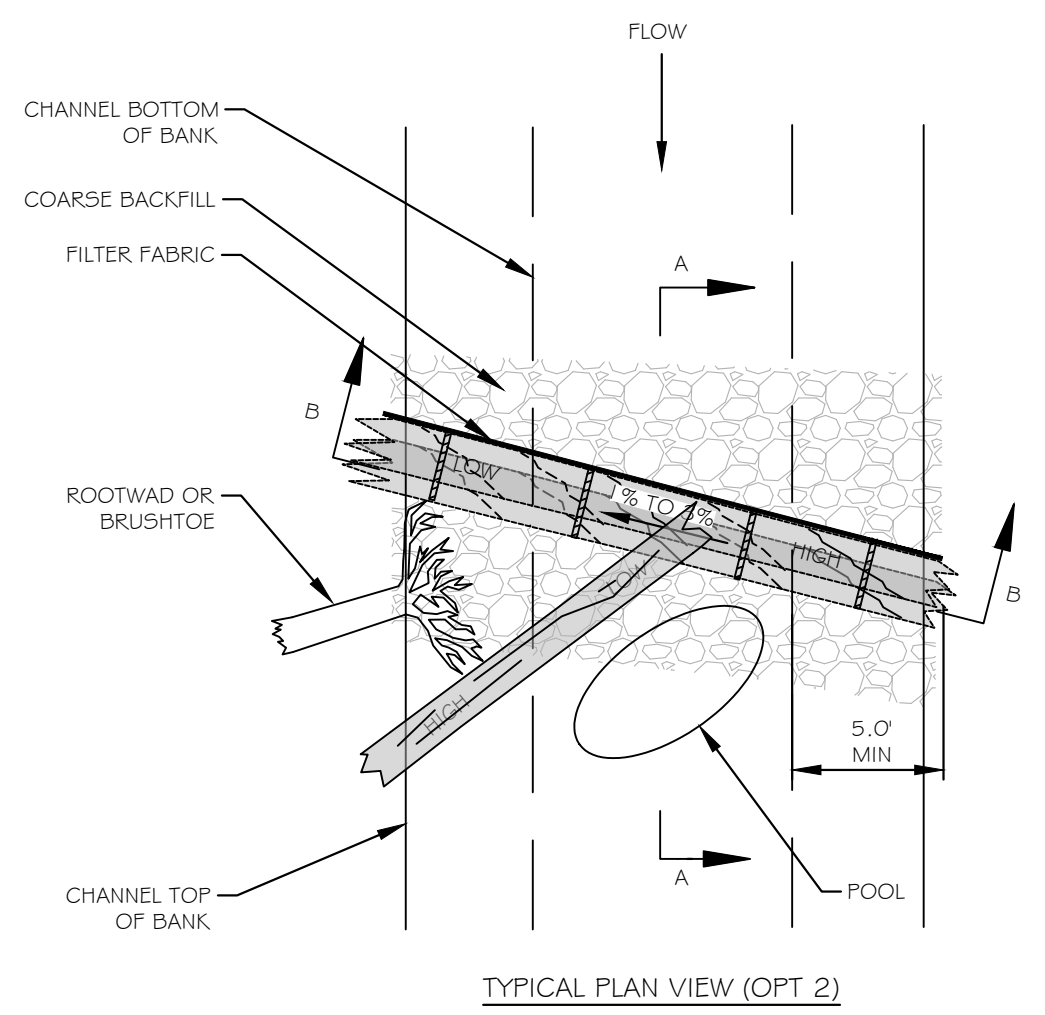


PROFILE C-C'

- NOTES:
- LOGS SHOULD BE RELATIVELY STRAIGHT HARDWOOD AND RECENTLY HARVESTED.
 - LOG DIMENSIONS: MIN DIAM. = 1 1/2", MIN LENGTH = 15'
 - NAIL FILTER FABRIC USING 3" 10D GALVANIZED COMMON NAIL EVERY 1.5' ALONG THE LOG.
 - DUCKBILL ANCHORS MAY BE USED IN PLACE OF REBAR.



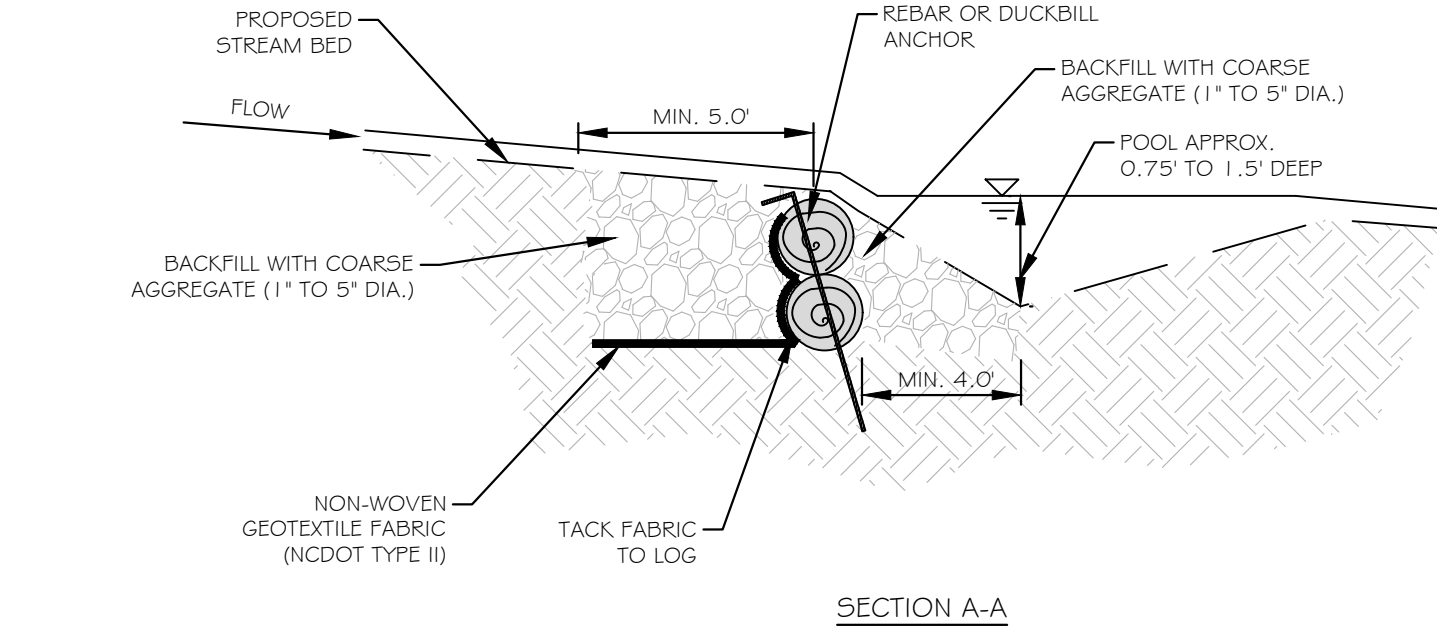
TYPICAL PLAN VIEW (OPT 1)



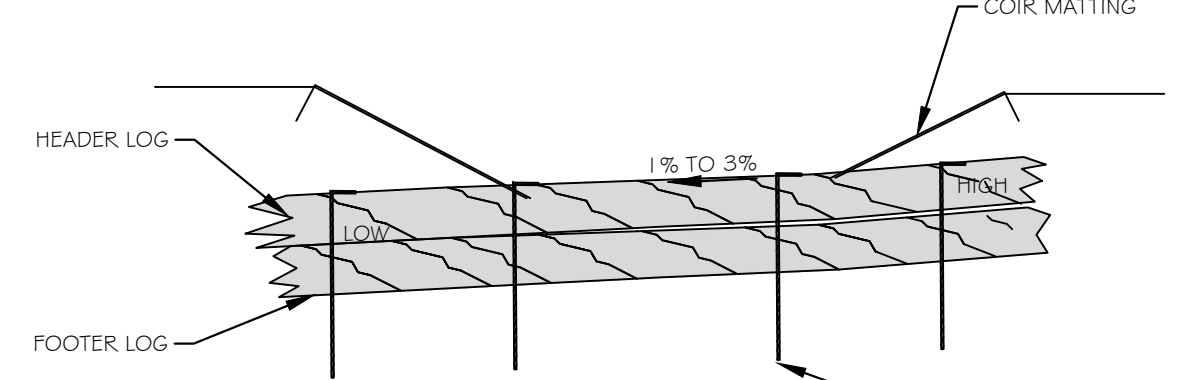
TYPICAL PLAN VIEW (OPT 2)

LOG SILL

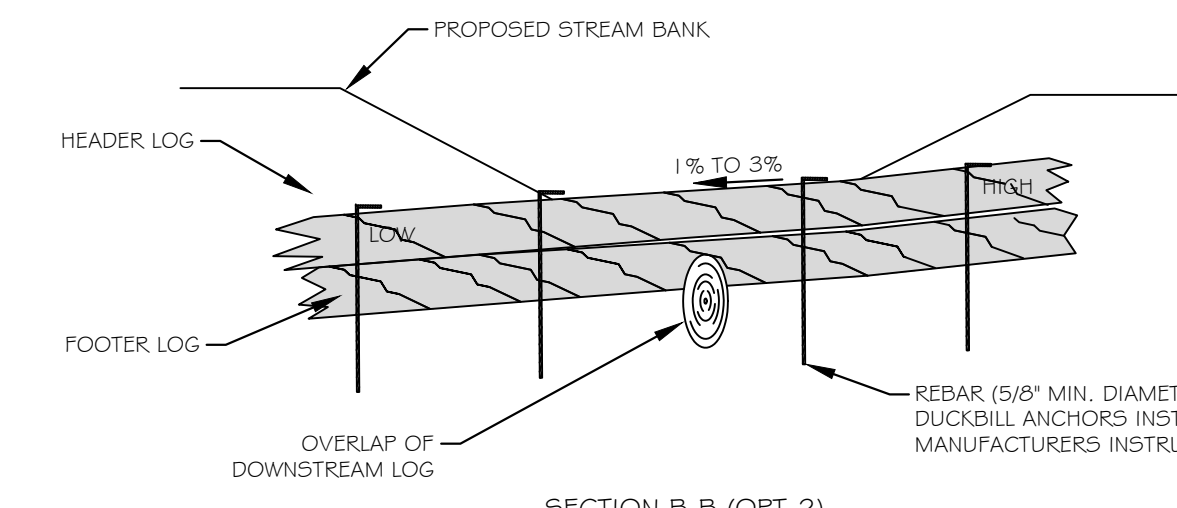
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SECTION A-A



SECTION B-B (OPT 1)



SECTION B-B (OPT 2)

- NOTES:
- LOGS SHOULD BE RELATIVELY STRAIGHT HARDWOOD AND RECENTLY HARVESTED.
 - LOG DIMENSIONS: MIN DIAM. = 1 1/2", MIN LENGTH = 18'
 - NAIL FILTER FABRIC USING 3" 10D GALVANIZED COMMON NAIL EVERY 1.5' ALONG THE LOG.
 - DUCKBILL ANCHORS MAY BE USED IN PLACE OF REBAR.

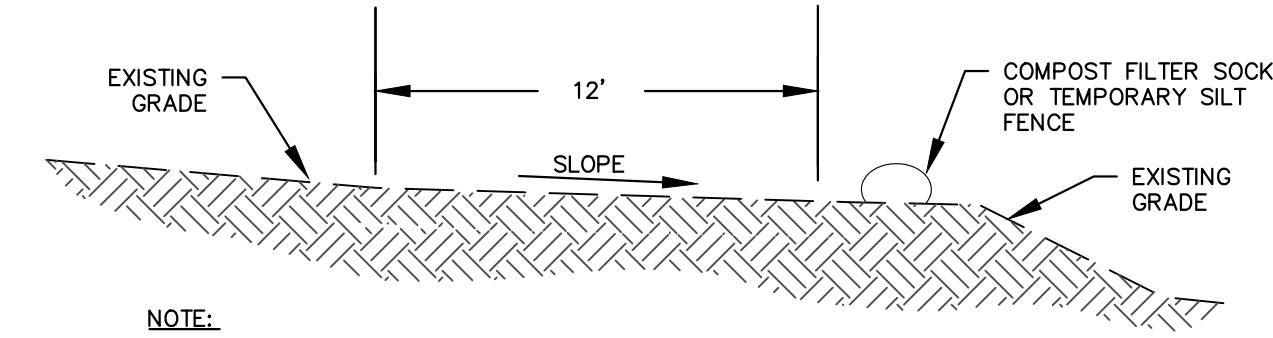
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| PROJECT MANAGER: | BPB |
| DESIGNED: | AFM |
| DRAWN: | BRC |
| CHECKED: | AFM |

SHEET NUMBER:

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- NOTE:
1. MAINTAIN HAUL ROAD DURING CONSTRUCTION.
 2. RETURN TO ORIGINAL GRADE AT THE COMPLETION OF WORK.
 3. VEGETATE ALL DISTURBED AREAS.
 4. REMOVE COMPOST FILTER SOCK UPON ESTABLISHMENT OF VEGETATION.

TYPICAL HAUL ROAD SECTION DETAIL
 NTS

SCALE: AS SHOWN

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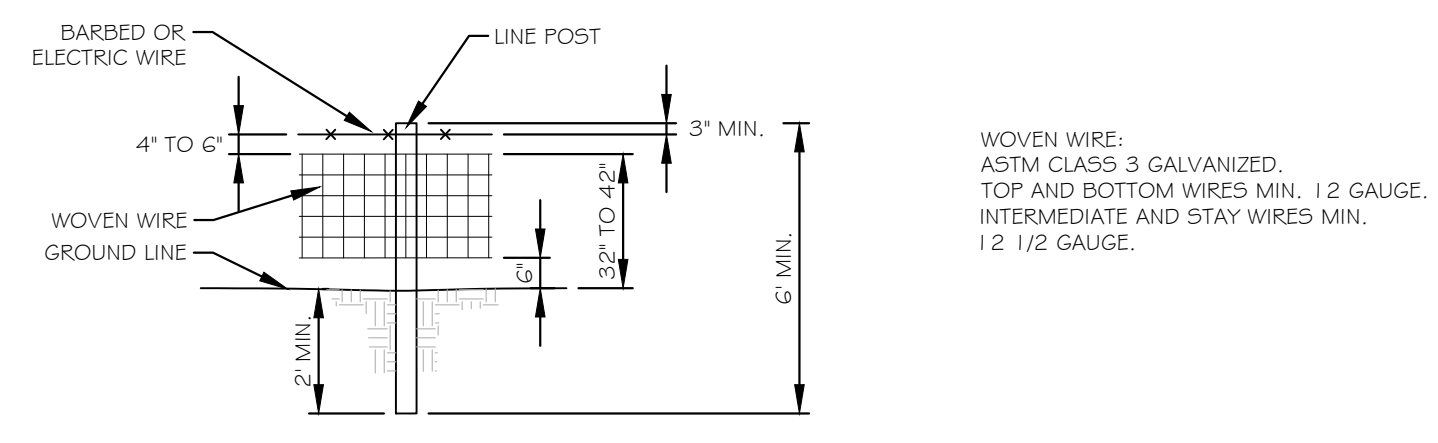
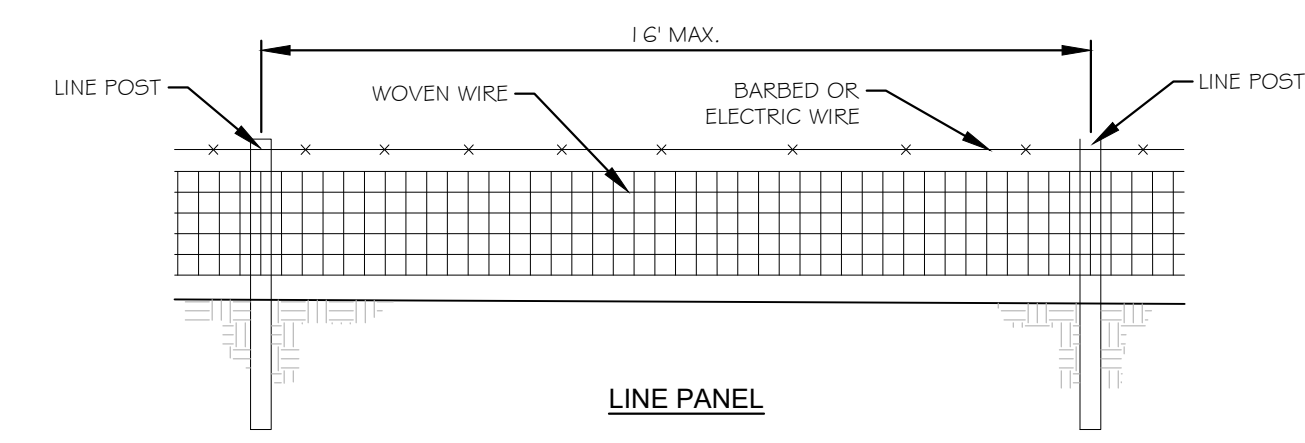
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 PROJECT MANAGER: BPB
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 DRAWN: BRC
 CHECKED: AFM

SHEET NUMBER:

D5



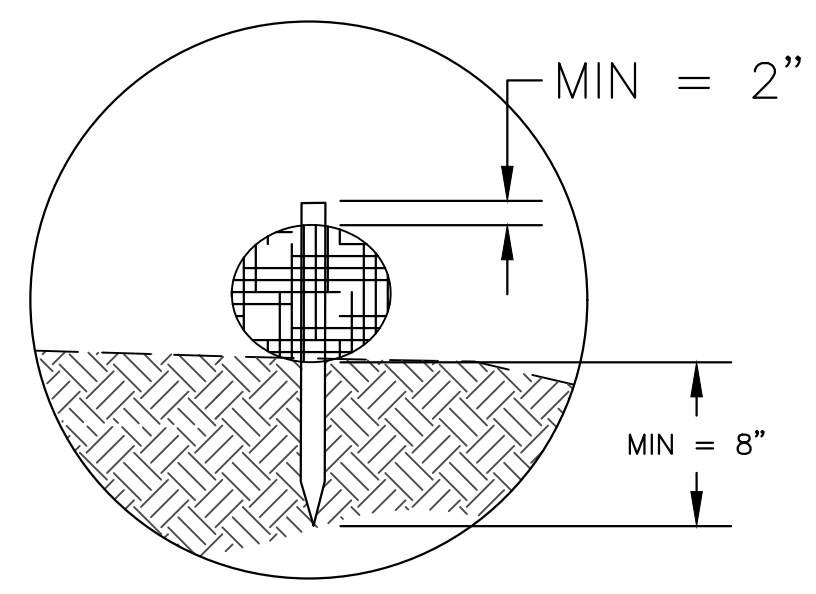
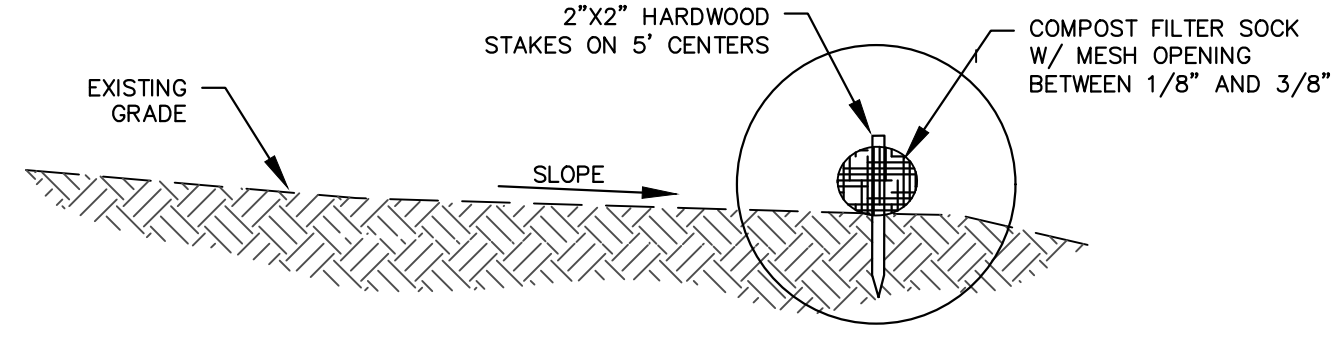
- NOTES:
1. LINE POSTS (WOODEN): MIN. 4 IN. DIAM. OR 4 IN. SQUARE.
 2. LINE POSTS (STEEL): STUDDED OR PUNCHED T, U, OR Y SHAPED, WITH ANCHOR PLATES.
 3. MIN. WEIGHT 1.3 LBS./FT. (EXCLUDING ANCHOR PLATE). POSTS SHALL BE DRIVEN A MINIMUM OF 1.6' DEEP AND MUST BE AT LEAST 5.5 FT IN LENGTH.
 4. SPECIES AND TREATMENT FOR ALL WOOD: USE UNTREATED DURABLE POSTS OF SPECIES SUCH AS RED CEDAR, BLACK LOCUST OR OSAGE-ORANGE WITH BARK REMOVED, OR NON-DURABLE WOOD THAT IS PRESERVATIVE PRESSURE TREATED (0.40 LBS./CUBIC FOOT CCA, OR EQUIVALENT NON-CCA TREATMENT). DO NOT USE RED PINE.

WOVEN WIRE FENCE (NRCS DETAIL 382A)
 NTS

- INSTALLATION:
- A. COMPOST FILTER SOCK SHALL BE PLACED PERPENDICULAR TO STORMWATER FLOW, ACROSS THE SLOPE, SWALE, DITCH, OR CHANNEL.
 - B. LOOSE COMPOST MAY BE USED TO BACKFILL THE COMPOST FILTER SOCK TO CONNECT THE GROUND AND COMPOST FILTER SOCK INTERFACE.
 - C. EDGES OF THE COMPOST FILTER SOCKS SHALL BE TURNED UPSLOPE TO PREVENT FLOW AROUND THE ENDS OF THE COMPOST FILTER SOCK.
 - D. COMPOST FILTER SOCKS MY BE INSTALLED ON TOP OF ANY EROSION CONTROL BLANKET.

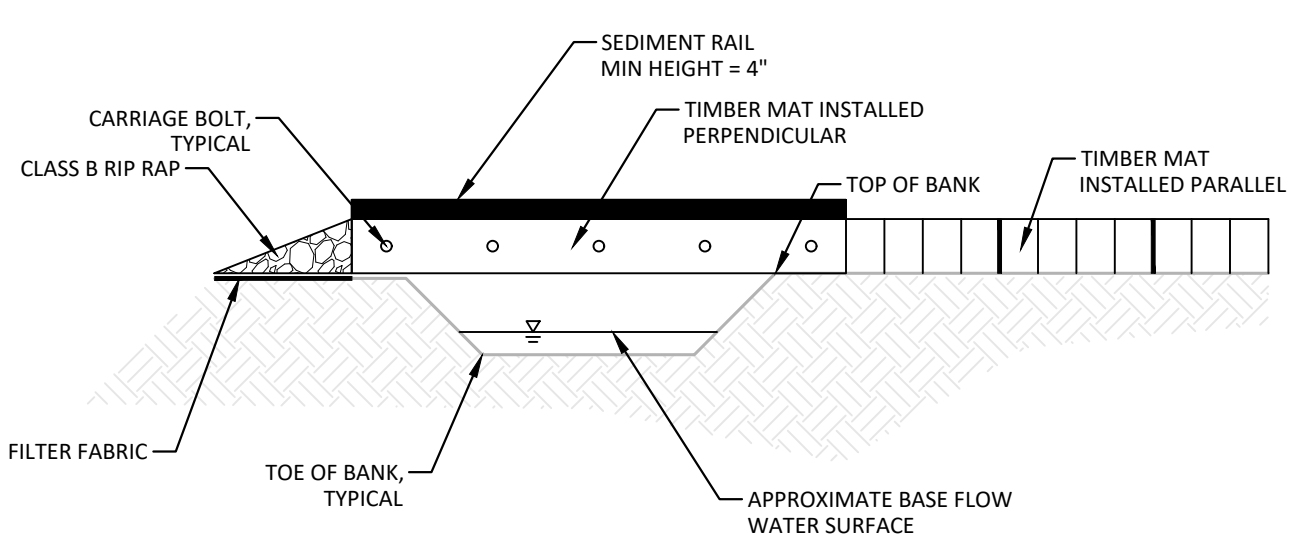
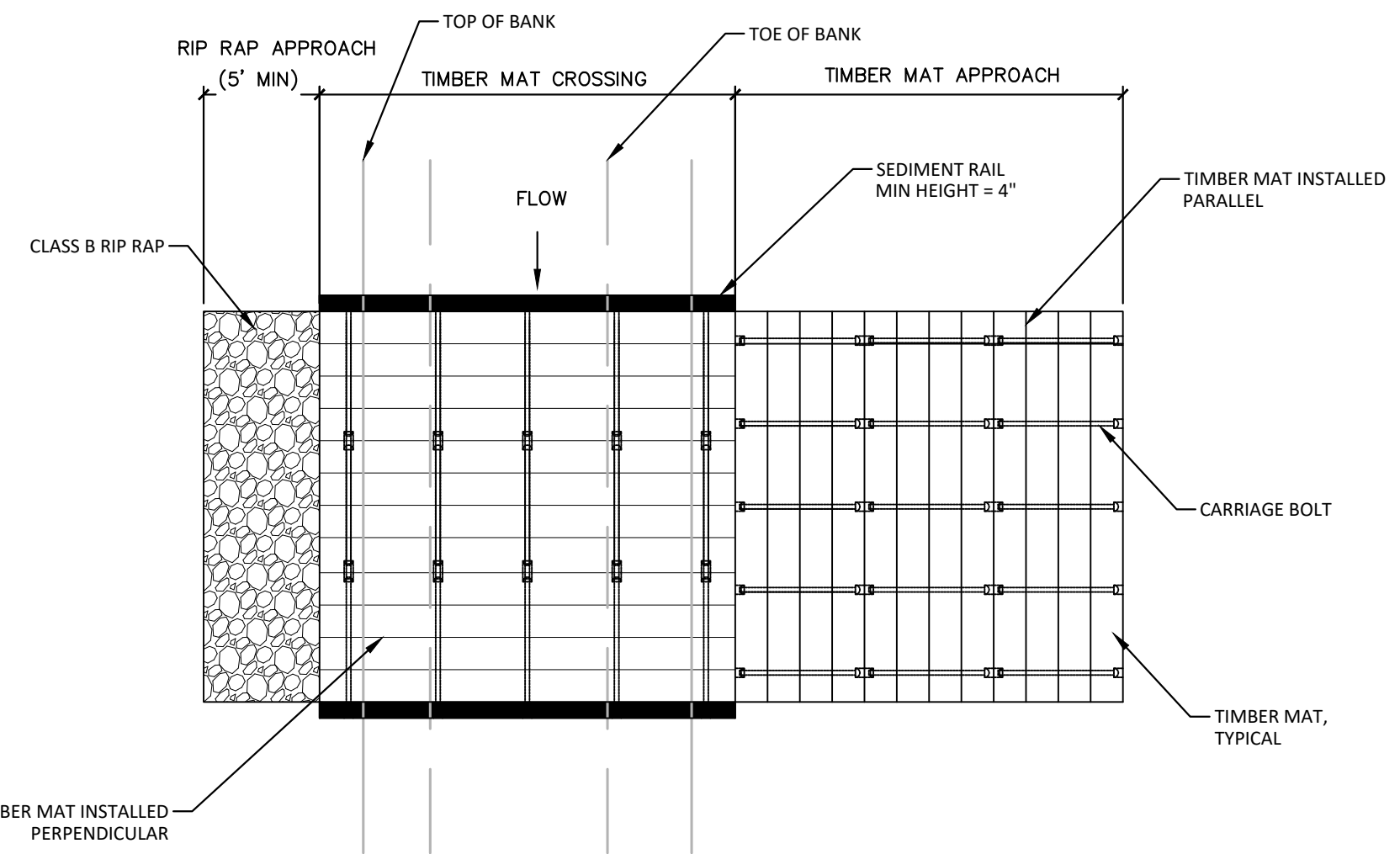
- MAINTENANCE:
- A. COMPOST FILTER SOCKS SHOULD BE INSPECTED AFTER RUNOFF EVENTS TO ENSURE PROPER FUNCTION AND PERFORMANCE.
 - B. IF FLOW-THROUGH BECOMES RESTRICTED, AN ADDITIONAL COMPOST FILTER SOCK CAN BE PLACED ON TOP OF THE ORIGINAL TO PREVENT OVERTOPPING.
 - C. SEDIMENT SHOULD BE REMOVED ONCE IT REACHES HALF THE HEIGHT OF THE COMPOST FILTER SOCK.
 - D. AN ADDITIONAL COMPOST FILTER SOCK MY BE INSTALLED ON TOP OF THE ORIGINAL TO INCREASE STORAGE CAPACITY OR TO PREVENT SEDIMENT DISTURBANCE.
 - E. IF A COMPOST FILTER SOCK BECOMES DISLODGED OR DAMAGED, IT SHOULD BE REPAIRED OR REPLACED IMMEDIATELY.
 - F. IF THE COMPOST FILTER SOCK IS USED FOR TEMPORARY APPLICATION, THE COMPOST MATERIAL CAN BE SPREAD OVER THE LANDSCAPE OR INCORPORATED INTO THE SOIL AT THE END OF THE PROJECT.

- FILTER MEDIA:
- A. RANGE OF PH IS 5.0-8.0 IN ACCORDANCE WITH TMECC 04.11-A, 'ELECTROMETRIC PH DETERMINATIONS FOR COMPOST'
 - B. PARTICLE SIZE - 99% PASSING A 2 IN (50MM) SIEVE WITH A RANGE OF 30%-50% PASSING A 3/8 IN (9.5MM) SIEVE, IN ACCORDANCE WITH TMECC 02.02-B, 'SAMPLE SIEVING FOR AGGREGATESIZE CLASSIFICATION'. (NOTE - IN THE FIELD, PRODUCT COMMONLY IS BETWEEN 1/2 IN [12.5MM] AND 2 IN [50MM] PARTICLE SIZE.)
 - C. MOISTURE CONTENT OF LESS THAN 60% IN ACCORDANCE WITH STANDARDIZED TEST METHODS FOR MOISTURE DETERMINATION.
 - D. MATERIAL SHALL BE RELATIVELY FREE (<1% BY DRY WEIGHT) OF INERT OR FOREIGN MAN MADE MATERIALS.
 - E. MATERIAL FEEDSTOCKS SHALL NOT CONTAIN WOOD MATERIALS THAT HAVE BEEN TREATED OR PAINTED, CONTAIN PRESERVATIVES OR ADHESIVES, OR ARE COMPOSED OF ENGINEERED WOOD PRODUCTS. A SAMPLE SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO BEING USED AND MUST COMPLY WITH ALL LOCAL, STATE AND FEDERAL REGULATIONS.
 - G. MATERIAL SHOULD BE ODOR FREE, HAVE NO RECOGNIZABLE ORIGINAL FEEDSTOCK MATERIALS AND SHOULD ADHERE TO TITLE 40 CFR PART 503.



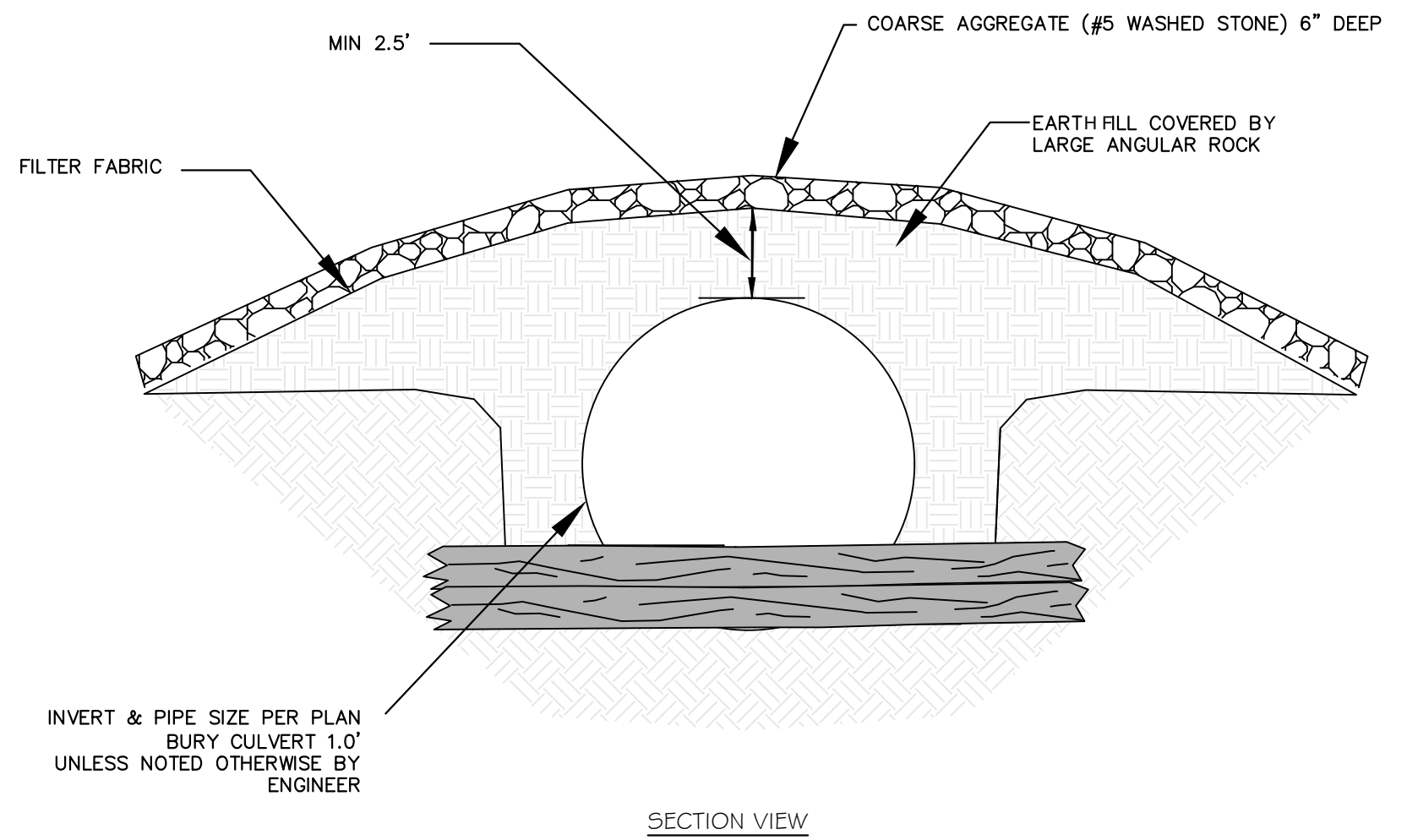
COMPOST FILTER SOCK DETAIL
 NTS

| SLOPE % | MAXIMUM SLOPE LENGTH ABOVE COMPOST FILTER SOCK (FT) | | | |
|-------------|---|---------|---------|---------|
| | 8-INCH | 12-INCH | 18-INCH | 24-INCH |
| 2 (OR LESS) | 300 | 375 | 500 | 650 |
| 5 | 200 | 250 | 275 | 325 |
| 10 | 100 | 125 | 150 | 200 |
| 15 | 70 | 85 | 100 | 160 |
| 20 | 50 | 65 | 70 | 130 |
| 25 | 40 | 50 | 55 | 100 |
| 30 | 30 | 40 | 45 | 65 |
| 35 | 30 | 40 | 45 | 55 |
| 40 | 30 | 40 | 45 | 50 |
| 45 | 20 | 25 | 30 | 40 |
| 50 | 20 | 25 | 30 | 35 |

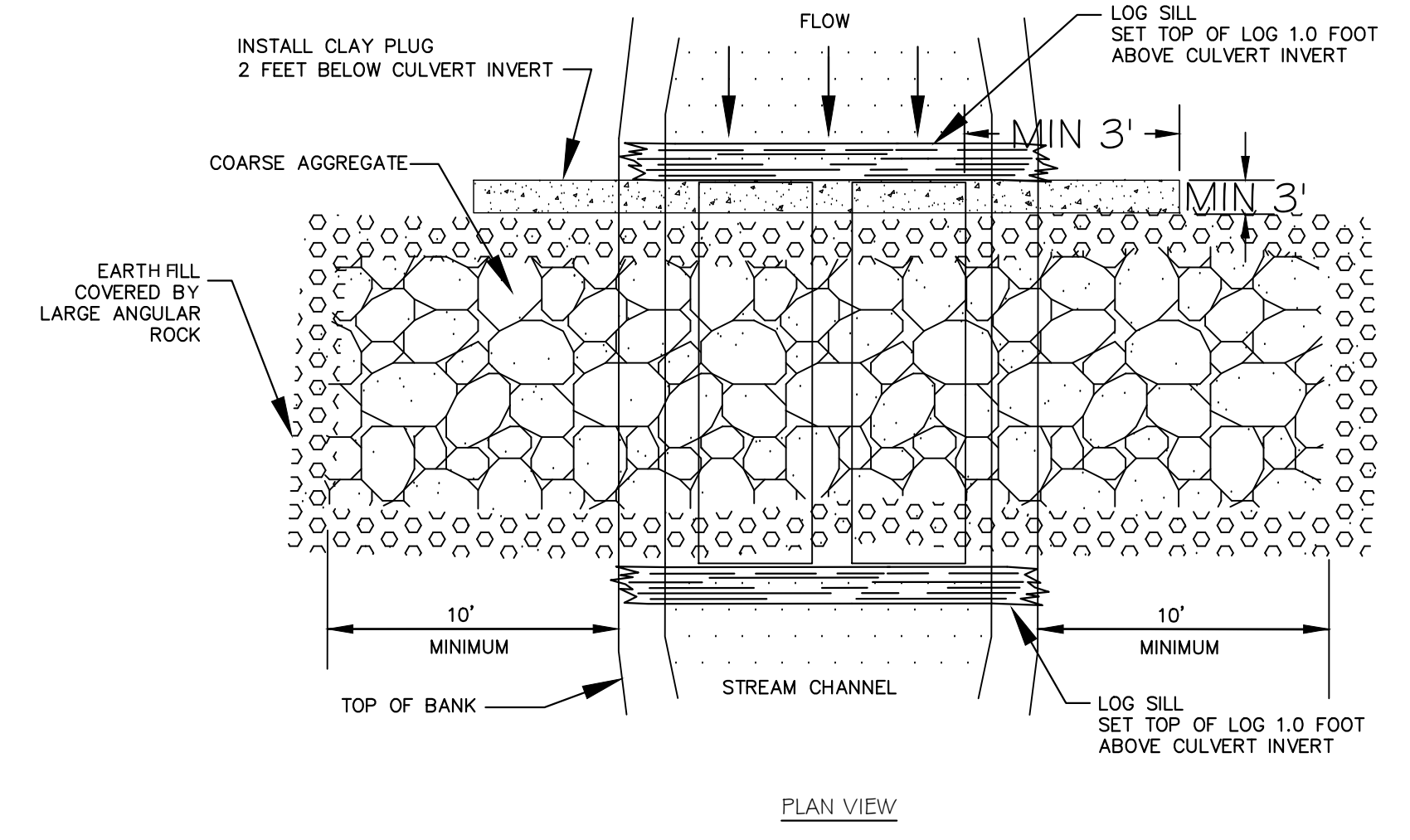


- NOTES:
1. TIMBER MATS SHALL BE USED FOR TEMPORARY CONSTRUCTION ACCESS TO TRAVERSE WET AND/OR MUDDY AREAS ADJACENT TO THE STREAM AND TO CROSS THE STREAM AND OTHER CONCENTRATED FLOW AREAS.
 2. THE STREAM CROSSING SHALL BE INSTALLED IN A DRY CONDITION WHEN FLOW IS LOW. THERE SHALL BE MINIMAL TO NO DISTURBANCE OF THE CHANNEL BED AND BANKS AS A RESULT OF INSTALLING THE APPROACHES OR CROSSING.
 3. THE LENGTH OF TIMBER MAT REQUIRED TO CROSS THE STREAM OR CONCENTRATED FLOW AREAS SHALL BE SUCH THAT THE TIMBER MAT EXTENDS PAST THE TOP OF BANK ON EACH SIDE OF THE CROSSING A SUFFICIENT DISTANCE TO SUPPORT THE MAXIMUM EQUIPMENT SIZE USING THE CROSSING.
 4. STREAM CROSSINGS SHALL BE INSTALLED WITH THE TIMBER MAT LENGTHS ORIENTED PERPENDICULAR TO THE TOPS OF THE STREAM BANKS. TIMBER MAT STREAM APPROACHES SHALL BE INSTALLED WITH THE TIMBER MAT LENGTHS ORIENTED PARALLEL TO THE TOPS OF THE STREAM BANKS.
 5. A 4" MINIMUM HEIGHT SEDIMENT RAIL SHALL BE PROVIDED AT STREAM CROSSINGS TO PREVENT TRACKED SEDIMENT FROM FALLING INTO THE STREAM BED.
 6. STREAM CROSSING APPROACHES FROM DRY AREAS SHALL BE CONSTRUCTED USING CLASS B RIP RAP PLACED OVER FILTER FABRIC.
 7. ALL TIMBER MATS, FILTER FABRIC, AND RIP RAP SHALL BE COMPLETELY REMOVED FROM THE SITE WHEN THE CROSSING IS REMOVED.

TIMBER MAT TEMPORARY CROSSING
 NTS



- NOTES:
1. CONSTRUCT STREAM CROSSING IN A DRY/ DEWATERED CONDITION.
 2. INSTALL STREAM CROSSING PERPENDICULAR TO FLOW.
 3. CONTRACTOR TO COORDINATE APPROPRIATE BEDDING MATERIAL WITH MANUFACTURER.
 4. FILTER FABRIC USED SHALL BE NCDOT TYPE 2 ENGINEERING FABRIC OR EQUIVALENT.
 5. WIDTH OF TYPICAL FARM CROSSINGS SHALL BE PER PLAN OR A MINIMUM OF 12'.
 6. WHEN REQUIRED, CONTRACTOR TO ENSURE PIPE MATERIAL AND COVER MEET H=20 LOADING REQUIREMENTS.



PROPOSED CULVERT CROSSING
 NTS

FILE NAME: S:\@RES GIS\Projects\NC\Catbird\CADD\DWG\0386_SHT_DETAILS.dwg SAVED BY: Stasking

SEAL

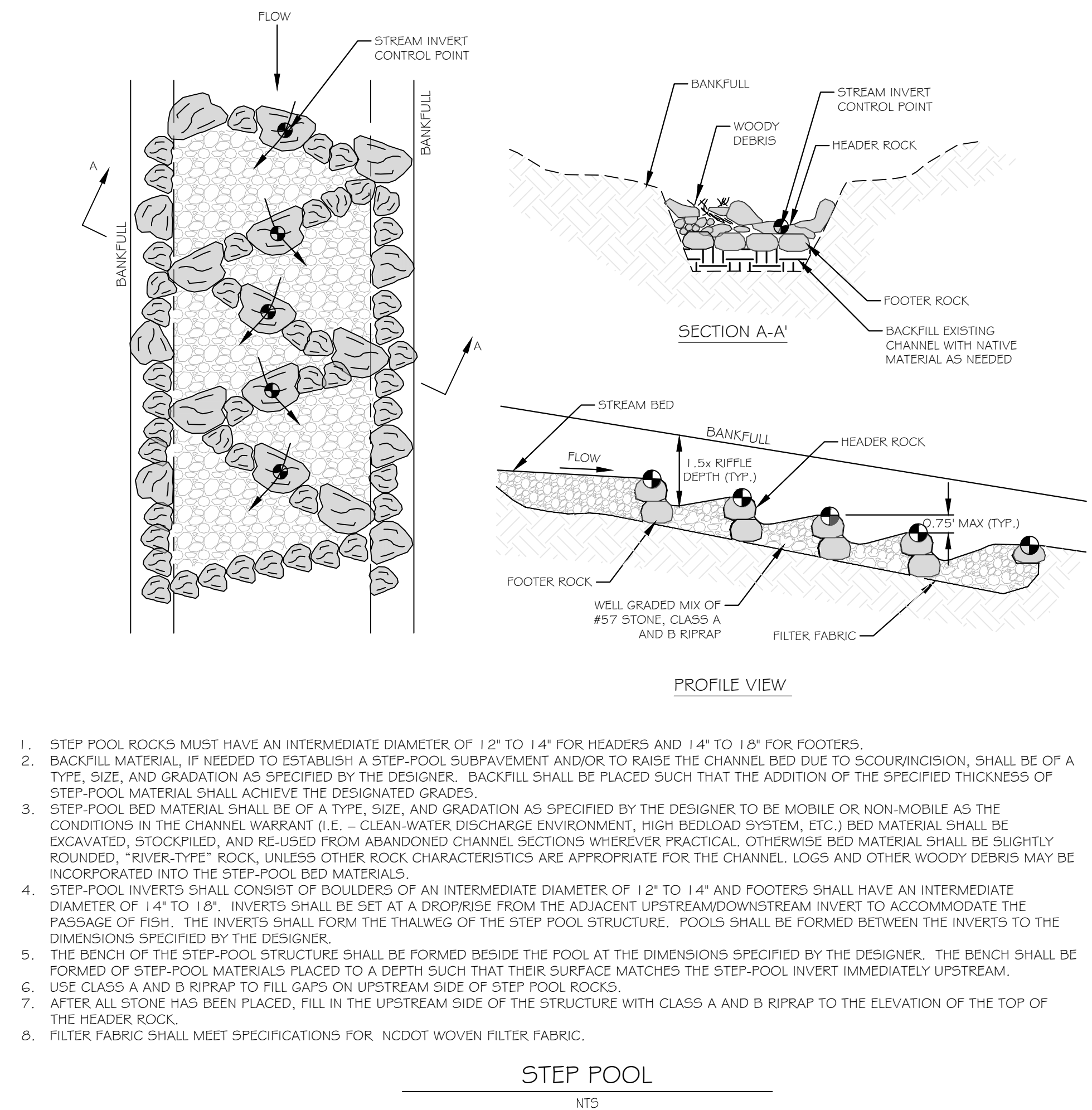
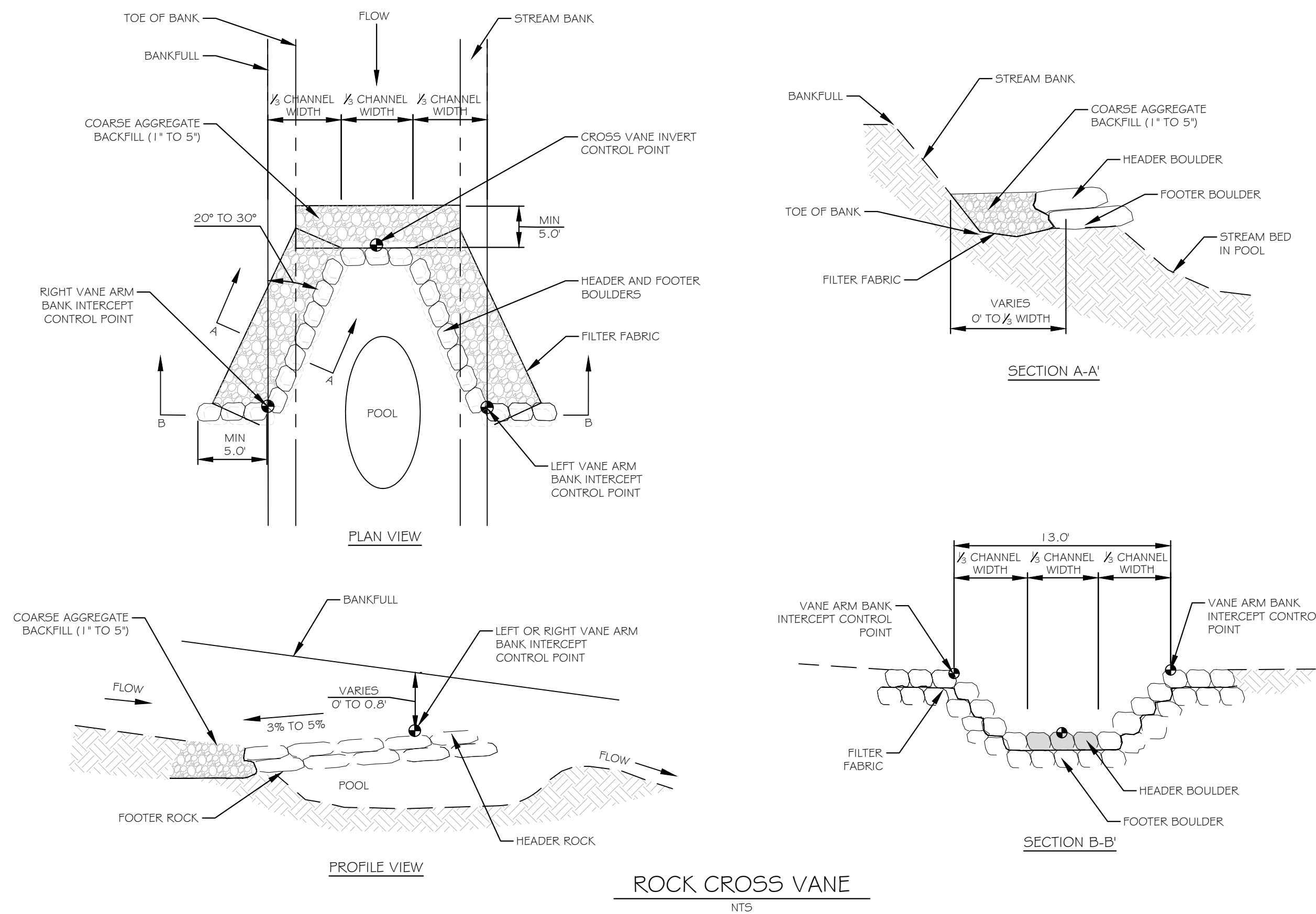
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MARK | DATE | DESCRIPTION
REVISIONS:
RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION
PLOT DATE: 12/11/2018

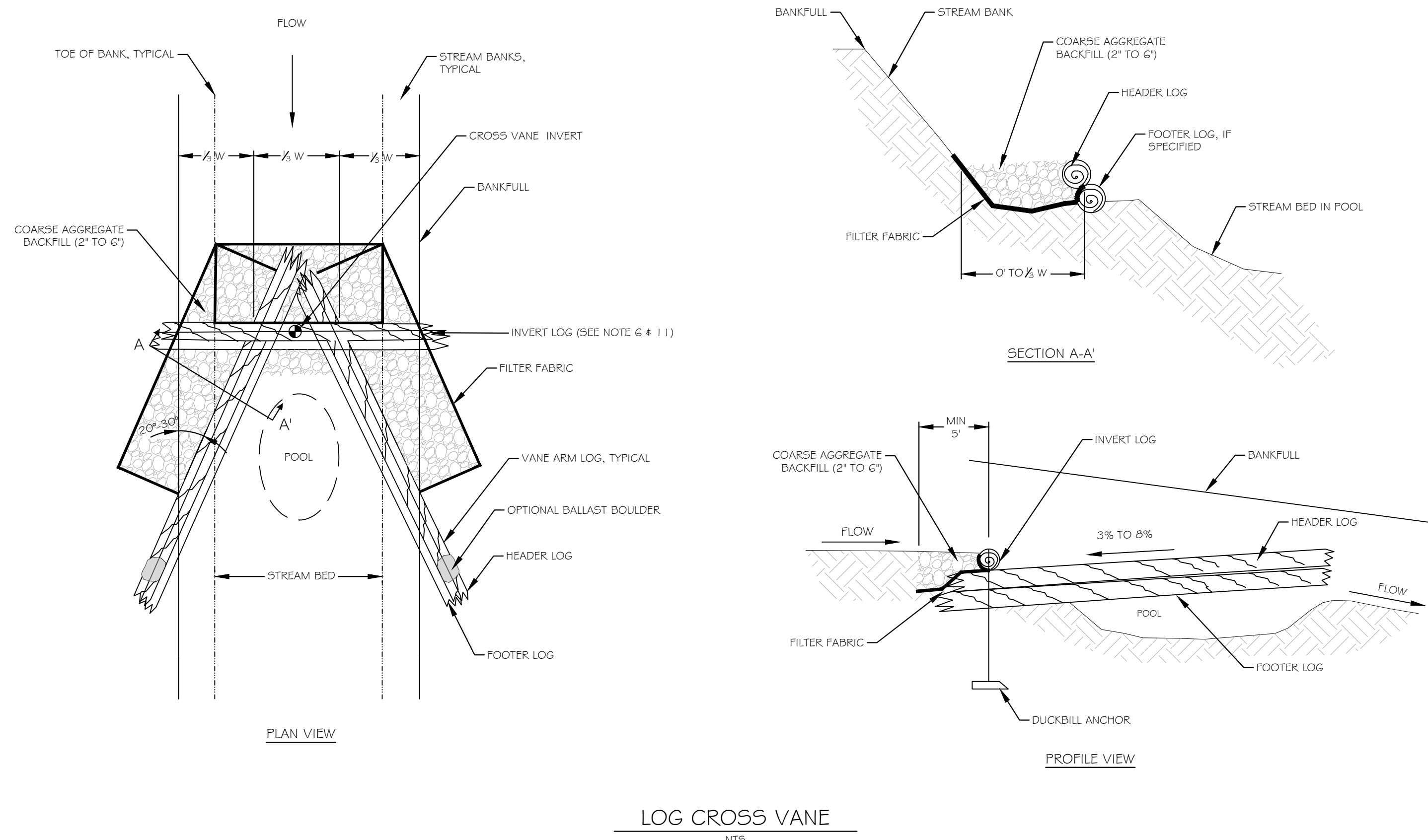
PROJECT NAME: CATBIRD SITE
DAVIE COUNTY, NORTH CAROLINA
DRAWING TITLE: DETAILS

PROJECT NUMBER: 0386
PROJECT MANAGER: BPB
DESIGNED: AFM
DRAWN: BRC
CHECKED: AFM

SHEET NUMBER:
D6



- STEP POOL ROCKS MUST HAVE AN INTERMEDIATE DIAMETER OF 12" TO 14" FOR HEADERS AND 14" TO 18" FOR FOOTERS.
- BACKFILL MATERIAL, IF NEEDED TO ESTABLISH A STEP-POOL SUBPAVEMENT AND/OR TO RAISE THE CHANNEL BED DUE TO SCOUR/INCISION, SHALL BE OF A TYPE, SIZE, AND GRADATION AS SPECIFIED BY THE DESIGNER. BACKFILL SHALL BE PLACED SUCH THAT THE ADDITION OF THE SPECIFIED THICKNESS OF STEP-POOL MATERIAL SHALL ACHIEVE THE DESIGNATED GRADES.
- STEP-POOL BED MATERIAL SHALL BE OF A TYPE, SIZE, AND GRADATION AS SPECIFIED BY THE DESIGNER TO BE MOBILE OR NON-MOBILE AS THE CONDITIONS IN THE CHANNEL WARRANT (I.E. - CLEAN-WATER DISCHARGE ENVIRONMENT, HIGH BEDLOAD SYSTEM, ETC.) BED MATERIAL SHALL BE EXCAVATED, STOCKPILED, AND RE-USED FROM ABANDONED CHANNEL SECTIONS WHEREVER PRACTICAL. OTHERWISE BED MATERIAL SHALL BE SLIGHTLY ROUNDED, "RIVER-TYPE" ROCK, UNLESS OTHER ROCK CHARACTERISTICS ARE APPROPRIATE FOR THE CHANNEL. LOGS AND OTHER WOODY DEBRIS MAY BE INCORPORATED INTO THE STEP-POOL BED MATERIALS.
- STEP-POOL INVERTS SHALL CONSIST OF BOULDERS OF AN INTERMEDIATE DIAMETER OF 12" TO 14" AND FOOTERS SHALL HAVE AN INTERMEDIATE DIAMETER OF 14" TO 18". INVERTS SHALL BE SET AT A DROP/RISE FROM THE ADJACENT UPSTREAM/DOWNSTREAM INVERT TO ACCOMMODATE THE PASSAGE OF FISH. THE INVERTS SHALL FORM THE THALWEG OF THE STEP POOL STRUCTURE. POOLS SHALL BE FORMED BETWEEN THE INVERTS TO THE DIMENSIONS SPECIFIED BY THE DESIGNER.
- THE BENCH OF THE STEP-POOL STRUCTURE SHALL BE FORMED BESIDE THE POOL AT THE DIMENSIONS SPECIFIED BY THE DESIGNER. THE BENCH SHALL BE FORMED OF STEP-POOL MATERIALS PLACED TO A DEPTH SUCH THAT THEIR SURFACE MATCHES THE STEP-POOL INVERT IMMEDIATELY UPSTREAM.
- USE CLASS A AND B RIPRAP TO FILL GAPS ON UPSTREAM SIDE OF STEP POOL ROCKS.
- AFTER ALL STONE HAS BEEN PLACED, FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH CLASS A AND B RIPRAP TO THE ELEVATION OF THE TOP OF THE HEADER ROCK.
- FILTER FABRIC SHALL MEET SPECIFICATIONS FOR NCDOT WOVEN FILTER FABRIC.



- NOTES:
- LOGS SHALL BE OF A MINIMUM OF 12' IN LENGTH AND 10" IN DIAMETER AND RELATIVELY STRAIGHT HARDWOOD, RECENTLY HARVESTED.
 - A SINGLE LOG MAY BE USED IN LIEU OF A HEADER/FOOTER LOG COMBINATION, PER DIRECTION OF DESIGNER.
 - FILTER FABRIC SHALL BE USED TO SEAL THE GAPS BETWEEN THE LOG(S) AND THE STREAM BED, UNDER THE COARSE BACKFILL MATERIAL. THERE SHALL BE NO FILTER FABRIC VISIBLE IN THE FINISHED WORK; EDGES SHALL BE FOLDED, TUCKED, OR TRIMMED AS NEEDED.
 - COARSE BACKFILL SHALL BE PLACED TO A THICKNESS EQUAL TO THE DEPTH OF THE HEADER (AND ANY FOOTER) LOGS AND SHALL EXTEND OUT FROM THE VANE ARMS TO THE STREAM BANK AND UPSTREAM.
 - AS AN OPTION, FLAT-SIDED BOULDERS MAY BE PLACED AS BALLAST ON TOP OF THE STREAM BANK SIDE OF THE EMBEDDED VANE ARMS. DUCK BILL ANCHORS MAY BE USED IN LIEU OF BALLAST BOULDERS.
 - DUCKBILL ANCHORS WITH GALVANIZED CABLE ATTACHED MAY BE USED TO SECURE LOGS INTO THE STREAM BED AND/OR BANKS. FLAT SIDED BOULDERS CAN BE USED IN LIEU OF THE LOG INVERT/DUCKBILL ANCHOR SYSTEM.

SEAL

SCALE: AS SHOWN

MARK | DATE | DESCRIPTION
 REVISIONS:
 RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION
 PLOT DATE: 12/11/2018

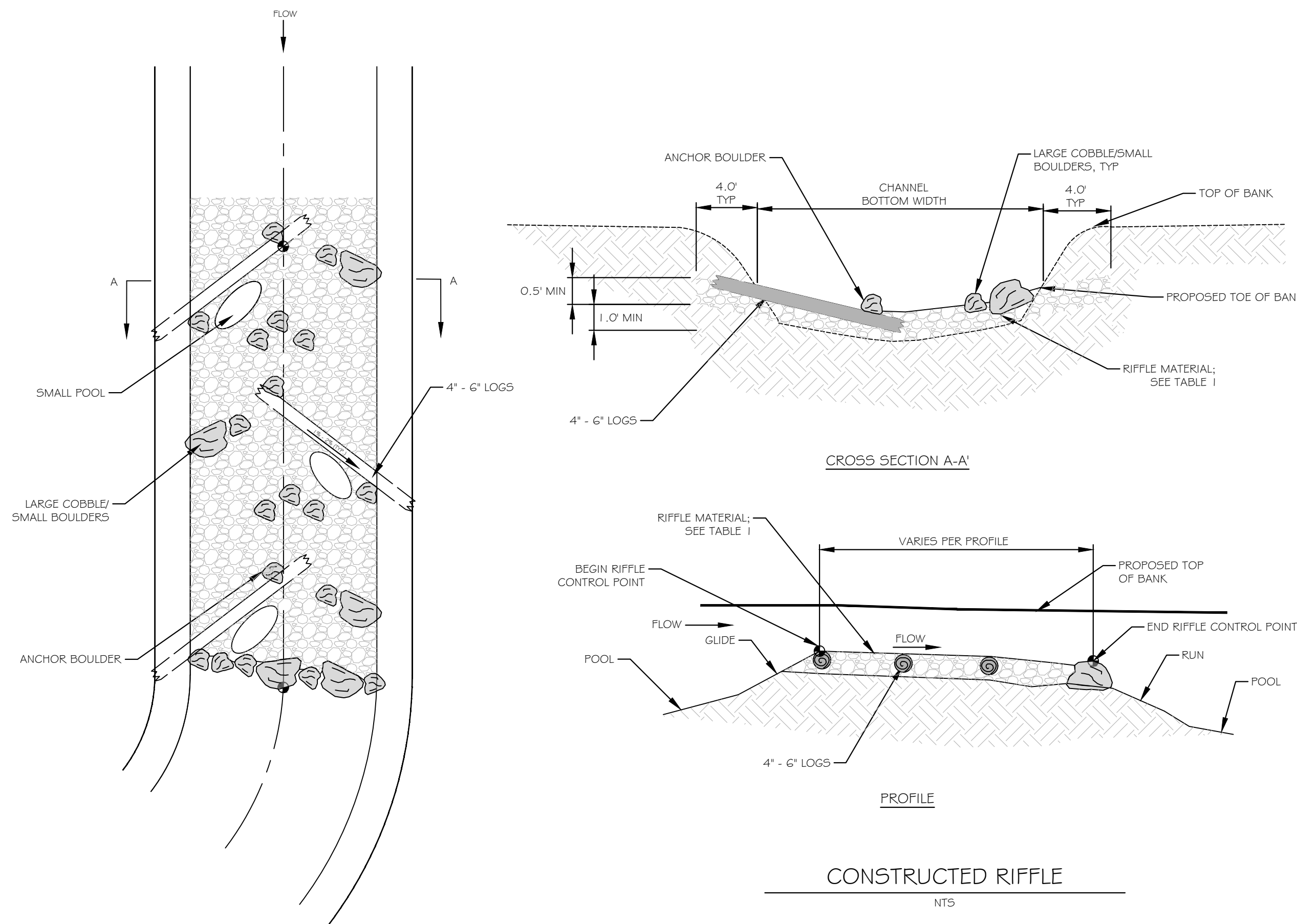
PROJECT NAME:
**CATBIRD SITE
 DAVIE COUNTY, NORTH CAROLINA**

DRAWING TITLE:
DETAILS

PROJECT NUMBER: 0386
 PROJECT MANAGER: BPB
 DESIGNED: AFM
 DRAWN: BRC
 CHECKED: AFM

SHEET NUMBER:

D7

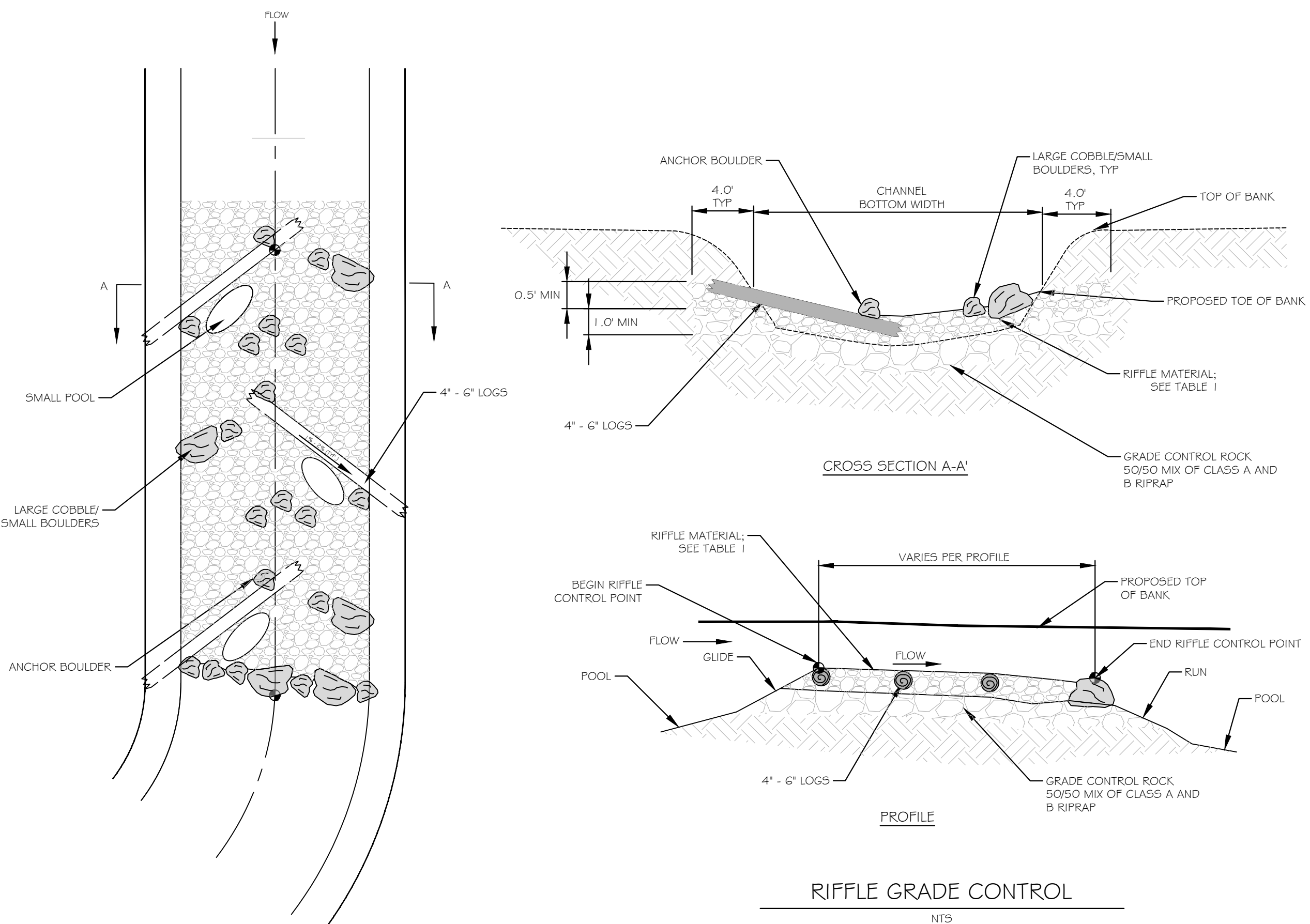


NOTES:

1. CONSTRUCTED RIFFLES SHALL BE INSTALLED IN NEWLY GRADED CHANNEL SECTIONS, AS SPECIFIED BY THE DESIGNER.
2. ELEVATION CONTROL POINTS SHALL BE DESIGNATED AT THE BEGINNING AND END OF RIFFLE POINTS TO ESTABLISH PART OF THE PROFILE OF THE CHANNEL. SURVEY OF CONTROL POINTS SHALL BE REQUIRED TO ESTABLISH ACCURATE RIFFLE INSTALLATION WITHIN A TOLERANCE OF $\pm 0.2'$.
3. RIFFLE MATERIAL SHALL BE COMPRISED OF ROCKS AND LOGS. THE ROCK MATERIAL COMPOSITION SHALL MATCH TABLE 1. RIFFLE MATERIAL SHALL BE EXCAVATED, STOCKPILED, AND RE-USED FROM ABANDONED CHANNEL SECTIONS. ROCK RIFFLE MATERIAL OBTAINED OFFSITE SHALL BE SLIGHTLY ROUNDED, "RIVER-TYPE" ROCK, UNLESS OTHER ROCK CHARACTERISTICS ARE APPROPRIATE FOR THE CHANNEL.
4. SPACING AND NUMBER OF LOGS SHOULD BE BASED ON RIFFLE LENGTH AND MAY VARY BASED ON LOG AVAILABILITY. LOGS SHOULD BE SPACED EQUALLY AND ANCHORED TO THE CHANNEL BED WITH BOULDERS.
5. THE PLACEMENT OF RIFFLE MATERIAL SHALL BE DONE IN A MANNER TO CREATE A SMOOTH PROFILE, WITH NO ABRUPT "JUMP" (TRANSITION) BETWEEN THE UPSTREAM POOL-GLIDE AND THE RIFFLE, AND LIKEWISE NO ABRUPT "DROP" (TRANSITION) BETWEEN THE RIFFLE AND THE DOWNSTREAM RUN-POOL. THE FINISHED CROSS SECTION OF THE RIFFLE MATERIAL SHALL GENERALLY MATCH THE SHAPE AND DIMENSIONS SHOWN ON THE RIFFLE TYPICAL SECTION WITH SOME VARIABILITY OF THE THALWEG LOCATION AS A RESULT OF THE SMALL POOLS AND LOGS.
6. THE END OF RIFFLE CONTROL POINT MAY TIE IN TO ANOTHER IN-STREAM STRUCTURE (LOG SILL, J-HOOK, ETC.). NO LOGS SHOULD BE INCLUDED WITHIN THE FOOTPRINT OF THE PROPOSED STRUCTURE.
7. THE CONSTRUCTED RIFFLE SHALL BE KEYPED IN TO THE STREAM BANKS AND/OR BED AS DESIGNATED BY THE DESIGNER. THE "KEY" SHALL EXTEND BEYOND THE TOP OF BANK AT THE BEGINNING (CREST) OF THE RIFFLE. WHERE PRESERVATION OF EXISTING STREAM BANK VEGETATION IS A PRIORITY A "KEY" MAY NOT BE USED (OR THE DIMENSIONS MAY BE ADJUSTED) TO LIMIT DISTURBANCE.

TABLE 1 - RIFFLE COMPOSITION

| REACH | STONE SIZE | |
|-----------|------------|----|
| | NATIVE | % |
| DS1 & DS2 | #5 | 50 |
| | SURGE | 25 |
| | | 25 |



NOTES:

1. CONSTRUCTED RIFFLES SHALL BE INSTALLED IN NEWLY GRADED CHANNEL SECTIONS, AS SPECIFIED BY THE DESIGNER.
2. ELEVATION CONTROL POINTS SHALL BE DESIGNATED AT THE BEGINNING AND END OF RIFFLE POINTS TO ESTABLISH PART OF THE PROFILE OF THE CHANNEL. SURVEY OF CONTROL POINTS SHALL BE REQUIRED TO ESTABLISH ACCURATE RIFFLE INSTALLATION WITHIN A TOLERANCE OF $\pm 0.2'$.
3. GRADE CONTROL ROCK SHALL BE COMPRISED OF A 50/50 MIX OF CLASS A AND B RIPRAP. GRADE CONTROL ROCK SHALL BE PLACED SUCH THAT THE ADDITION OF THE SPECIFIED THICKNESS OF RIFFLE MATERIAL SHALL ACHIEVE THE DESIGNATED GRADES.
4. RIFFLE MATERIAL SHALL BE COMPRISED OF ROCKS AND LOGS. THE ROCK MATERIAL COMPOSITION SHALL MATCH TABLE 1. RIFFLE MATERIAL SHALL BE EXCAVATED, STOCKPILED, AND RE-USED FROM ABANDONED CHANNEL SECTIONS. ROCK RIFFLE MATERIAL OBTAINED OFFSITE SHALL BE SLIGHTLY ROUNDED, "RIVER-TYPE" ROCK, UNLESS OTHER ROCK CHARACTERISTICS ARE APPROPRIATE FOR THE CHANNEL.
5. SPACING AND NUMBER OF LOGS SHOULD BE BASED ON RIFFLE LENGTH AND MAY VARY BASED ON LOG AVAILABILITY. LOGS SHOULD BE SPACED EQUALLY AND ANCHORED TO THE CHANNEL BED WITH BOULDERS.
6. THE PLACEMENT OF GRADE CONTROL ROCK AND/OR RIFFLE MATERIAL SHALL BE DONE IN A MANNER TO CREATE A SMOOTH PROFILE, WITH NO ABRUPT "JUMP" (TRANSITION) BETWEEN THE UPSTREAM POOL-GLIDE AND THE RIFFLE, AND LIKEWISE NO ABRUPT "DROP" (TRANSITION) BETWEEN THE RIFFLE AND THE DOWNSTREAM RUN-POOL. THE FINISHED CROSS SECTION OF THE RIFFLE MATERIAL SHALL GENERALLY MATCH THE SHAPE AND DIMENSIONS SHOWN ON THE RIFFLE TYPICAL SECTION WITH SOME VARIABILITY OF THE THALWEG LOCATION AS A RESULT OF THE SMALL POOLS AND LOGS.
7. THE END OF RIFFLE CONTROL POINT MAY TIE IN TO ANOTHER IN-STREAM STRUCTURE (LOG SILL, J-HOOK, ETC.). NO LOGS SHOULD BE INCLUDED WITHIN THE FOOTPRINT OF THE PROPOSED STRUCTURE.
8. THE CONSTRUCTED RIFFLE SHALL BE KEYPED IN TO THE STREAM BANKS AND/OR BED AS DESIGNATED BY THE DESIGNER. THE "KEY" SHALL EXTEND BEYOND THE TOP OF BANK AT THE BEGINNING (CREST) OF THE RIFFLE. WHERE PRESERVATION OF EXISTING STREAM BANK VEGETATION IS A PRIORITY A "KEY" MAY NOT BE USED (OR THE DIMENSIONS MAY BE ADJUSTED) TO LIMIT DISTURBANCE.

TABLE 1 - RIFFLE COMPOSITION

| REACH | STONE SIZE | |
|-----------|------------|----|
| | NATIVE | % |
| DS1 & DS2 | #5 | 50 |
| | SURGE | 25 |
| | | 25 |

Appendix B –
Data/Analysis/Supplementary Information

IRT Meeting Minutes



ROY COOPER
Governor

MICHAEL S. REGAN
Secretary

October 1, 2018

Cara Conder, Project Manager
Resource Environmental Solutions, LLC
302 Jefferson Street, Suite 110
Raleigh, NC 27605

Subject: Draft Mitigation Plan Report and Construction Plans
Catbird Site
Yadkin River Basin Cataloging Unit 03040101
DMS Project ID #100022

Dear Cara,

The NC Division of Mitigation Services (DMS) has reviewed the Draft Mitigation Plan and Preliminary Plans for the Catbird Site. Following are comments on this Task 3 design deliverable:

BASELINE AND EXISTING CONDITIONS

- a) Page 4, last paragraph. Please clarify the sentence beginning “The channel has a moderate bedload and a moderate sediment supply.” What is moderate bedload? Is this reference to substrate size, bedload transport, or coarse sediment? The term “sediment supply” covers all the bases in this sentence. And the substrate is defined in the next sentence.
- b) Page 5, paragraph 1. While Catbird lies in the Milton and Charlotte Belts, the specific unit underlying the project is gabbro, an intrusive rock likely part of the mafic-volcanic complexes, or the metagabbros. To find this, I used ARCGIS to overlay the site on the geology.
- c) Page 5, land use, paragraph 2 and 3. These 2 paragraphs would be better placed in a section more relevant to the overall treatment of the site.
- d) Page 9 (reach summaries). Discuss bedrock influence in the channel descriptions. Is future incision possible or does bedrock occur frequently enough to prevent ongoing incision?

FUNCTIONAL UPLIFT POTENTIAL

Page 13, last paragraph. The reference to determination of credits in the first sentence need to be removed. The discussion of credits and function is not relevant to this mitigation plan. Sentence 2 and 3 referring to applying an ecosystem approach (and sentence 2, a functional a based approach (at the reach scale) are a bit overstated. Additionally, the functions RES is able to address directly from restoration are hydraulic and geomorphology, rather than, as stated, “have the greatest effect on.”

Pages 14-16:

- a) Hydraulic. “Healthy” floodplain connectivity? Is the intent to improve/increase the frequency of floodplain access? And, please clarify the reference to stable base flow and instream structures in last sentence.

- b) Geomorphology. What is not functioning in terms of wood and sediment? Input, output, storage? How will LWD transport and storage be “improved” by installation of instream structures? Is the gradient and bed material in these streams suitable for riffle-pool sequences, or step-pools? DMS does not agree that RES will achieve “dynamic equilibrium” and maximum geomorphic uplift. Please provide clarification.
- c) Physicochemical (not physiochemical) - global edit needed.
- d) Biology. Macroinvertebrates are not difficult to measure, so please remove that statement.
- e) Page 16. Livestock removal statement does not belong in this section.

MITIGATION PROJECT GOALS AND OBJECTIVES

Pages 17-18:

- a) Second bullet. Overbanks should be overbank and the word active before floodplain is redundant.
- b) First bullet under objectives. The last part of the objective “based on...” is unnecessary.
- c) Will work on enhancement reaches (EII) include bank stabilization, constructed riffles, or woody materials? If not, please remove enhancement from those statements where full restoration is proposed.
- d) Objective for reducing BHR and increasing ER is implied and understood in objective 1. Recommend modifying or removing.
- e) Paragraph beginning ‘Limitations to achieving’ is unnecessary. Recommend removing.
- f) Please add ‘agricultural’ to the heading to emphasize that treatments will not require long-term maintenance.
- g) The BMP section includes information previously stated and explained in the document. Recommend that removal of cattle and the addition of fencing should be included in the goals/objective table rather than extensive explanation in this section.

Table 10 is good for relating goals, objectives and measurement. Why did RES choose to exclude performance standards measurements, e.g., BF events? See suggestions below and please comment.

- a) The functional parameter column includes variables meant to be measured that will not be applied to this project. Please remove this column. And, please remain realistic in stating the benefits of this restoration, that is, RES is only able to directly affect hydro, geomorph and hydraulics.
- b) Hydrology objective refers to the ag BMP has attenuating runoff. Is this BMP truly designed to achieve this attenuation? And how does RES intend to measure/monitor the integrity of runoff attenuation structure?
- c) Geomorphology objective to improve pool spacing, percent riffles, etc suggest RES intends to explicitly measure these bedforms, so please remove if that is not the intent. And, stream walk is basically the same as visually monitoring, so please remove.
- d) Biology and Physicochemical also include unmeasurable goals that need to be removed. If RES would like to leave these functions in the table, do not include a goal, objective, or measurement method. Instead, state that as expected benefits.
- e) Vegetation plots and fencing cannot be used to address physicochemical and biology within this framework. Rather, state the goal and objective, i.e., plant buffer, and conduct veg plot surveys.
- f) The justification for the delta in the functional ratings is not well defined. DMS suggests removal of this column. The intent is understood and appreciated although the execution is not clear.

MITIGATION WORK PLAN

- a) Page 20. The reference discharge section refers to UT Hauser discharge. Is RES stating that the UT Hauser discharge was used as reference for design? Hauser Creek DA is much larger than this projects' streams. How will the UT Hauser be 'scaled' for this project?
- b) Page 21. Design approach. This majority of this section is nonspecific and does not provide useful information until the reach specific paragraphs.
- c) Reach DS1. Is RES 'widening' the riparian area or simply planting wider buffers? And, what is the primary function of the ag BMP?
- d) Reach DS1, DS2-A, DS2-B. RES has listed, explained and emphasized the benefits of the project to water quality and habitat throughout the document: DMS suggests further reference be removed.
- e) Reach DS2-B. Will shifting the channel to a new alignment provide appropriate morphology and floodplain connection? Please re-think this statement.
- f) Page 23 Design Methods. Please remove this section.
- g) Page 25-26. Shear stress approach. The shear stress being calculated is the average boundary shear stress. If RES needs to explain this concept, please include critical shear stress in the explanation and report boundary shear accurately.
- h) The sediment size distribution reported in the morph table (fine gravel and sand) appear to be a magnitude smaller than the sediment sizes referenced in this section. Does RES intend to replace the bed material with larger gravel and cobble? Will the excavated material be large enough to use? If so, will this material be sustained over time?

Table 15 (Mitigation Components). Total existing stream lengths for DS1 and DS2 do not reflect the preliminary JD lengths (see PJD, Appendix I). Please clarify.

IRT meeting minutes (Appendix B) indicated a concern that P1 Restoration near the top of DS-1 may result in loss of seasonal stream flow. RES staff indicated they would base the design and channel origin on the JD and provide post construction flow monitoring to document flow conditions. Please include further discussion in the plan about how stream origin was determined on DS-1, and provide justification for the P1 approach given the intermittent flow and the concern about losing hydrology.

IRT members also suggested monitoring water quality and/or benthics to document aquatic uplift in the upper end of DS1. Please comment on if/how the plan will address this suggestion.

PERFORMANCE STANDARDS

RES state that a flow monitoring device will be placed near the top of DS-1 to document post-construction flow conditions. However, Plan Sheet M1 indicates the planned flow gauge located towards the lower end of DS-1. Please clarify or correct this apparent discrepancy.

MONITORING PLAN

Table 16. The functional category definition should not serve as a goal in this project and the monitoring requirements. Please make sure Table 10 and Table 16 do not contradict each other. And, the same comments for Table 10 apply to Table 16, e.g., outcomes (look like the goals from table 19), physicochemical and biology.

Plan Sheets

- a) S1 - Culvert needs to be plotted accurately on profile.
- b) D3 Rock Sill (Section A-A') - Recommend extending filter fabric above footer rock onto header rock.
- c) D3 Brush Toe (Section A-A) - Consider adding an additional course of footer logs to be buried beneath the channel bed to reduce the potential for toe scour.

- d) D4 Floodplain Sill – Thank you for including this structure and for providing the detail. Add boulders as an alternate anchoring method if deemed appropriate.
- e) D5 Culvert Crossing Plan View – Due to frequent observations of perched sills at these type of culvert treatments please add a channel grade control feature downstream of the culvert outlet to prevent a perched sill.
- f) D6 Rock Cross Vane Section A-A’ - Extend filter fabric onto header.
- g) E1 (Legend) -Indicates ‘existing stream’ as blue shading; however, in many locations the apparent stream widths shaded in blue are 50-60 feet wide. Please clarify what exactly does the blue represent, and edit the plan sheets/legend as necessary.

Figures

Figure 1, Vicinity Map: Add text boxes with leaders to call out the several sites shown on the figure.

Figure 10:

- a) Mitigation work plan indicates that an agricultural BMP will be placed at the upper end of DS-1; please show this on the conceptual map.
- b) Please indicate planned culvert crossing on the map.
- c) Please show reach breaks more clearly to match up with the asset table; for example it is not shown where DS-2B starts, where DS-1 (above crossing?) and DS-1 (below crossing?) start and stop. Typically, there is a unique Reach ID assigned for each unique reach / approach combination. Suggest labelling reaches such as DS-1 (upper), DS-1 (lower), DS-2A, DS-2B (upper), DS-2B (middle), DS-2B (lower), or similar. This will make for easier database and asset tracking, credit release discussions, etc.

Appendices

Appendix B

- a) Please include the email thread with the IRT site visit meeting memo dated 9/29/2017. Specifically, email dated 10/6/17 from Paul Wiesner copied to RES, dating back to initial memo submittal email dated 10/2/2018, and including additional comments/concerns from IRT about the memo itself.
- b) Morphological Table – The proposed width to depth ratios are low which is consistent with E stream types as previously mentioned in the Mockingbird Project Comments. Please observe all available stability indicators during monitoring to minimize potential adaptive management requirements.

Appendix G, Stream ID Forms

Please provide sketches on the forms or a map showing locations where along each reach the forms were filled out.

Thank you for your time in addressing these comments. Please send a revised PDF to me for final completeness review, along with comment responses. RES can then generate and send four final bound hard copies to IRT contacts, in addition to a single flash drive or CD with a PDF of the report and all digital support files in the correct file structure. Please include a copy of your response letter, bound inside the front cover of each hard copy report (and included in the final PDF).

If you have any questions, please contact me at (828) 545-7057 or email me at harry.tsomides@ncdenr.gov.

Sincerely,



Harry Tsomides
Project Manager, NCDEQ-DMS



MEMORANDUM

Date: September 29, 2017

Re: Catbird Site Post-Contract IRT Site Visit Meeting Minutes

CU: 03040101

DMS Project No.: 100022

DEQ Contract No.: 7186

County: Davie

Location: 36.030644° N, -80.500865 ° W, Spillman Road

DMS Project Manager: Harry Tsomides

Meeting Summary

Date: August 15, 2017

RES Attendees: Daniel Ingram, Cara Conder, David Godley, Daniel Ramsay

DMS Attendees: Paul Wiesner, Harry Tsomides, Kirsten Ullman

IRT Attendees: Todd Tugwell (USACE), Mac Haupt (NCDWR), Olivia Munzer (NCWRC)

General Summary: IRT members generally agreed the Catbird Site is suitable to provide compensatory stream mitigation credits. IRT members also confirmed the technical approach, and ratios proposed as appropriate. No decreases to contracted credit totals are expected, however, the survey and design approach on Reach DS2 will determine final credit yield. Specific discussions related to each reach are discussed below.

Reach DS1: Todd Tugwell and Mac Haupt both expressed concern that P1 Restoration near the top of the stream channel may result in loss of seasonal stream flow. RES staff indicated they would base the design and channel origin on the JD and provide post construction flow monitoring to document flow conditions. The generally accepted flow criteria is 30 days of continuous flow annually. IRT members also suggested monitoring water quality and/or benthics to document aquatic uplift in the upper end of DS1.

Reach DS2: The lower portion of Reach DS2 was generally accepted as a good candidate for P1 Restoration. The upper end of DS2 includes stream segments of varying degrees of impairment. IRT members suggested the mitigation plan utilize a "blended ratio" combined with a detailed description of impairments and enhancement/restoration interventions. Another option would be splitting the credit ratios by distinct stream segments and interventions. The proposed mitigation approach and associated crediting on the upper end of Reach DS2 will be based on survey and assessment data and will be justified in the project mitigation plan. Final project limits will be based on the JD. All IRT members generally agreed with the upstream limits of enhancement.

412 N. 4th St. #300
Baton Rouge, LA 70802

1200 Camellia Blvd. #220
Lafayette, LA 70508

1434 Odenton Rd.
Odenton, MD 21113

10055 Red Run Blvd. #130
Owings Mills, MD 21117

302 Jefferson St. #110
Raleigh, NC 27605

33 Terminal Way #431
Pittsburgh, PA 15219

701 E. Bay St. #306
Charleston, SC 29403

5020 Montrose Blvd. #650
Houston, TX 77006

2750 Prosperity Ave. #220
Fairfax, VA 22031

1521 W. Main 2nd Floor
Richmond, VA 23233

3751 Westerre Pkwy. #A
Richmond, VA 23220

5367 Telephone Rd.
Warrenton, VA 20187

137½ East Main St. #210
Oak Hill, WV 25901

Wiesner, Paul

From: Wiesner, Paul
Sent: Friday, October 06, 2017 8:44 AM
To: Haupt, Mac; Tugwell, Todd J CIV USARMY CESAW (US); Browning, Kimberly D CIV USARMY CESAW (US); Munzer, Olivia; Hughes, Andrea W CIV USARMY CESAW (US)
Cc: Daniel Ingram; Tsomides, Harry; Cara Conder
Subject: RE: RES Sites_Yadkin 01_Post Contract IRT Site Visit Meeting Minutes

Mac,

DMS and RES understand that all final agreements on ratios and approaches are established and approved by the IRT during the Mitigation Plan review.

We will attach this e-mail to the project meeting minutes for Catbird, Mockingbird, and Little Sebastian to document your concerns.

Thanks

Paul Wiesner
Western Regional Supervisor
North Carolina Department of Environmental Quality
Division of Mitigation Services

828-273-1673 Mobile
paul.wiesner@ncdenr.gov

Western DMS Field Office
5 Ravenscroft Drive
Suite 102
Asheville, N.C. 28801



Nothing Compares

Email correspondence to and from this address is subject to the North Carolina Public Records Law and may be disclosed to third parties.

From: Haupt, Mac
Sent: Tuesday, October 03, 2017 3:44 PM
To: Wiesner, Paul <paul.wiesner@ncdenr.gov>; Tugwell, Todd J CIV USARMY CESAW (US) <Todd.Tugwell@usace.army.mil>; Browning, Kimberly D CIV USARMY CESAW (US) <Kimberly.D.Browning@usace.army.mil>; Munzer, Olivia <olivia.munzer@ncwildlife.org>; Hughes, Andrea W CIV USARMY CESAW (US) <Andrea.W.Hughes@usace.army.mil>
Cc: Daniel Ingram <dingram@res.us>; Tsomides, Harry <harry.tsomides@ncdenr.gov>; Cara Conder <cconder@res.us>
Subject: RE: RES Sites_Yadkin 01_Post Contract IRT Site Visit Meeting Minutes

Paul,

Thanks,

Mac

From: Wiesner, Paul

Sent: Monday, October 02, 2017 11:21 AM

To: Tugwell, Todd J CIV USARMY CESA W (US) <Todd.Tugwell@usace.army.mil>; Haupt, Mac <mac.haupt@ncdenr.gov>;

Browning, Kimberly D CIV USARMY CESA W (US) <Kimberly.D.Browning@usace.army.mil>; Munzer, Olivia

<olivia.munzer@ncwildlife.org>; Hughes, Andrea W CIV USARMY CESA W (US) <Andrea.W.Hughes@usace.army.mil>

Cc: Daniel Ingram <dingram@res.us>; Tsomides, Harry <harry.tsomides@ncdenr.gov>; Cara Conder <cconder@res.us>

Subject: RES Sites_Yadkin 01_Post Contract IRT Site Visit Meeting Minutes

All:

Please find the Catbird, Mockingbird, and Little Sebastian Post Contract IRT Site Visit Meeting Minutes attached.

Please let us know if you have questions or additional comments/ concerns.

Thanks

Paul Wiesner

Western Regional Supervisor

North Carolina Department of Environmental Quality

Division of Mitigation Services

828-273-1673 Mobile

paul.wiesner@ncdenr.gov <mailto:paul.wiesner@ncdenr.gov>

Western DMS Field Office

5 Ravenscroft Drive
Suite 102
Asheville, N.C. 28801

Email correspondence to and from this address is subject to the
North Carolina Public Records Law and may be disclosed to third parties.

Wiesner, Paul

From: Tugwell, Todd J CIV USARMY CESAW (US) <Todd.Tugwell@usace.army.mil>
Sent: Thursday, October 05, 2017 2:16 PM
To: Haupt, Mac; Wiesner, Paul; Browning, Kimberly D CIV USARMY CESAW (US); Munzer, Olivia; Hughes, Andrea W CIV USARMY CESAW (US)
Cc: Daniel Ingram; Tsomides, Harry; Cara Conder
Subject: [External] RE: RES Sites_Yadkin 01_Post Contract IRT Site Visit Meeting Minutes

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you verify that the attachment and content are safe. Send all suspicious email as an attachment to report.spam@nc.gov.

Paul,
I have also looked over the minutes. Other than the comments made by Mac, the minutes look fine to me.
Thanks,
Todd

-----Original Message-----

From: Haupt, Mac [mailto:mac.haupt@ncdenr.gov]
Sent: Tuesday, October 03, 2017 3:44 PM
To: Wiesner, Paul <paul.wiesner@ncdenr.gov>; Tugwell, Todd J CIV USARMY CESAW (US) <Todd.Tugwell@usace.army.mil>; Browning, Kimberly D CIV USARMY CESAW (US) <Kimberly.D.Browning@usace.army.mil>; Munzer, Olivia <olivia.munzer@ncwildlife.org>; Hughes, Andrea W CIV USARMY CESAW (US) <Andrea.W.Hughes@usace.army.mil>
Cc: Daniel Ingram <dingram@res.us>; Tsomides, Harry <harry.tsomides@ncdenr.gov>; Cara Conder <cconder@res.us>
Subject: [EXTERNAL] RE: RES Sites_Yadkin 01_Post Contract IRT Site Visit Meeting Minutes

Paul,

I reviewed the minutes for all of these and generally agree, however, I do take exception with one sentence that appears in the first paragraph of the Catbird and Mockingbird minutes, "IRT members also confirmed the technical approach, and ratios proposed as appropriate."

At the Catbird site we did have few discussions about the approach and flow at the top of DS1 and other discussions regarding the other reach and appropriate level of intervention. At the Mockingbird site we did generally agree with the approach, however, we did not look closely at NM1 and NM4.

As we have said before, all final agreements on ratios and approach are associated with the Mitigation Plan.

The Little Sebastian site minutes and revised concept plan did a good job of capturing what was discussed.

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Thanks,
Mac

From: Wiesner, Paul
Sent: Monday, October 02, 2017 11:21 AM
To: Tugwell, Todd J CIV USARMY CESA W (US) <Todd.Tugwell@usace.army.mil>; Haupt, Mac <mac.haupt@ncdenr.gov>; Browning, Kimberly D CIV USARMY CESA W (US) <Kimberly.D.Browning@usace.army.mil>; Munzer, Olivia <olivia.munzer@ncwildlife.org>; Hughes, Andrea W CIV USARMY CESA W (US) <Andrea.W.Hughes@usace.army.mil>
Cc: Daniel Ingram <dingram@res.us>; Tsomides, Harry <harry.tsomides@ncdenr.gov>; Cara Conder <cconder@res.us>
Subject: RES Sites_Yadkin 01_Post Contract IRT Site Visit Meeting Minutes

All:

Please find the Catbird, Mockingbird, and Little Sebastian Post Contract IRT Site Visit Meeting Minutes attached.

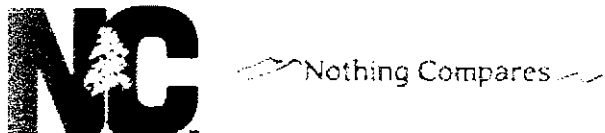
Please let us know if you have questions or additional comments/ concerns.

Thanks

Paul Wiesner
Western Regional Supervisor
North Carolina Department of Environmental Quality
Division of Mitigation Services

828-273-1673 Mobile
paul.wiesner@ncdenr.gov

Western DMS Field Office
5 Ravenscroft Drive
Suite 102
Asheville, N.C. 28801



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Vegetation Survey

Protocol for Existing Conditions Vegetation Surveying

Plot Selection and Setup

Survey multiple plots on-site, which together are representative of all ecotypes present within the easement boundaries. Each plot is a 5m X 20m belt transect, positioned parallel to the channel in the floodplain or adjacent upland.

Take a GPS point at the origin and set the bounds with 5m as the “x-axis” and 20m as the “y-axis.” Set the plot with the y-axis as the side parallel to the stream channel. Record the y-axis azimuth to allow for future resampling. Conclude selection and set-up with a representative photo of the plot taken from the origin.

Data Collection

Identify each plant in the plot to the species level. Sort and measure tree species by height class and diameter at breast height (DBH). Count seedlings <54in (137cm) in height into height categories 0-9cm, 10-50cm, 51-100cm, or 101-137cm. Count saplings >54in (137cm) in height into DBH categories 0-1cm, 1-2.5cm, 2.5-5cm, or 5-12.7cm. Measure the DBH of all trees ≥ 5 in (12.7cm) DBH. Shrubs, vines, and herbaceous taxa receive an estimation of their percent cover over the substrate within the plot. If the personnel are unable to identify to the species level, collect voucher photos and/or specimen(s) for later identification. Record these on the data sheet as UNK-1, UNK-2, etc.

Data Processing

Begin processing collected data by identifying the unknown species observed from voucher photos and specimen(s) collected. When species present are sufficiently identified, use the dominant canopy species assemblages and ecological region to identify a habitat type from Schafale (2012).

Calculate both basal area and stems per acre for each plot surveyed using the formulas below. These metrics help to inform the existing conditions of the canopy on-site and inform the development of the project’s planting plan.

Basal Area Formula:

$$\text{Basal area of each tree (m}^2\text{)} = 0.00007854 \times (\text{DBHcm})^2$$

$$\text{Basal area of plot (m}^2\text{/ha)} = (\text{sum of basal areas for all trees in plot}) \times 100$$

•100 is to scale up from our 0.01ha plot to 1ha

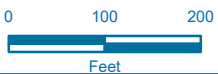
Stems per Acre Formula:

$$\text{Stems/Acre} = (\# \text{ of stems})/0.02471$$



Legend

- Proposed Easement
- ◆ Vegetation Survey Plots



Vegetation Survey
Catbird Mitigation Site
 Davie County, North Carolina

Date: 6/15/2018

Drawn by: MDE

Checked by: CSC



Existing Conditions Vegetation Survey

Date: 6/14/18

Latitude:

NOTES:

Site: CAMP 2X

Plot: VP1

Longitude:

110 FOX VEG
PROX PHOTO

Personnel: CSC, NCF

Azimuth: 110

| Species | Form | | SEEDLINGS - Height Classes | | | | SAPLINGS - DBH | | | | TREE - DBH | | | | Est. % Cover <small>Record 5% to 100% in increments of 5; <5% for anything below</small> |
|---------------|------|---|----------------------------|-------------------------|---------------------------|--------------------------|--------------------|----------------------|--------------------|---------------------|-----------------------------|------|--|-----|--|
| | T | S | 0-9cm (0-3.5in) | 10-50cm (3.6-19.7in) | 51-100cm (19.8-39.4in) | 101-137cm (39.5-54in) | 0-1cm (0-0.4in) | 1-2.5cm (0.5-1in) | 2.5-5cm (1-2in) | 5-12.7cm (2-5in) | >10cm = Measure Size (>5in) | | | | |
| Cedar | ✓ | | | | | | | | | | 8.1 | 10.1 | | 1% | |
| Winged Elm | ✓ | | | | | | | | | | 13.0 | | | 95% | |
| Beauty Berry | | | | | | | | | | | | | | 4% | |
| Microsyrphium | | | | | | | | | | | | | | 2% | |
| Hlex | | | | | | | | | | | | | | 2% | |
| UNK#1 | | | | | | | | | | | | | | 2% | |
| Slavel | | | | | | | | | | | | | | 2% | |
| Aspen Snake | | | | | | | | | | | | | | 1% | |
| Mulberry | | | | | | | | | | | | | | 1% | |
| UNK#2 | | | | | | | | | | | | | | 1% | |
| UNK#3 | | | | | | | | | | | | | | 1% | |

*List unidentified species starting with UNK-1; Take pics and/or pressings for later ID

Existing Conditions Vegetation Survey

Date: 6/14/18

Latitude:

Site: GAGEVO

Plot: 112

Longitude:

Personnel: CSC, MK

Azimuth: 200

Photo 15 Veg Plot
Photo

NOTES:

| Species | Form | | SEEDLINGS - Height Classes | | | | SAPLINGS - DBH | | | TREE - DBH | | Est. % Cover <small>Record 5% to 100% in increments of 5, <5% for anything below</small> |
|------------------|------|---|----------------------------|-------------------------|---------------------------|--------------------------|--------------------|----------------------|--------------------|---------------------|--------------------------------|--|
| | T | S | 0-9cm (0-3.5in) | 10-50cm (3.6-19.7in) | 51-100cm (19.8-39.4in) | 101-137cm (39.5-54in) | 0-1cm (0-0.4in) | 1-2.5cm (0.5-1in) | 2.5-5cm (1-2in) | 5-12.7cm (2-5in) | >10cm = Measure Size (>5in) | |
| Rubus | | | | | | | | | | | | 1% |
| Jap Honey Suck | | | | | | | | | | | | 1% |
| White Aster | | | | | | | | | | | | 2% |
| Unknown #4 | | | | | | | | | | | | 2% |
| Fescue | | | | | | | | | | | | 7% |
| Unknown #5 | | | | | | | | | | | | 1% |
| UNK #6 | | | | | | | | | | | | 2% |
| Unknown #7 | | | | | | | | | | | | 2% |
| Unknown #7 | | | | | | | | | | | | 2% |
| Unknown grass #1 | | | | | | | | | | | | 2% |
| Poa | | | | | | | | | | | | 2% |
| White clover | | | | | | | | | | | | 2% |
| Honey locust | | | | | | | | | | | | 2% |
| | | | | | | | | | | | | <1% |
| | | | | | | | | | | | | <1% |
| | | | | | | | | | | | | <1% |
| | | | | | | | | | | | | <1% |
| | | | | | | | | | | | | <1% |
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| | | | | | | | | | | | | <1% |
| | | | | | | | | | | | | <1% |
| | | | | | | | | | | | | <1% |

*List unidentified species starting with UNK-1; Take pics and/or pressings for later ID

Morphological Parameters

Catbird Morphological Parameters

| Feature | Reference Reach | | Existing | | | | | | | | Design | | | | | |
|--|--------------------|------|----------|--------|--------|-------------|--------|-------------|--------|--------|--------|------------------|--------|--------------------|------|--|
| | UT to Hauser Creek | | DS1 | | | DS2-A | | DS2-B | | DS1 | | DS2-B (Upstream) | | DS2-B (Downstream) | | |
| | Riffle | Pool | Riffle | Riffle | Riffle | Riffle | Riffle | Riffle | Riffle | Pool | Riffle | Pool | Riffle | Pool | | |
| Drainage Area (ac) | 29 | | 26 | | | 12 | | 27 | | 26 | | 12 | | 27 | | |
| Drainage Area (mi ²) | 0.05 | | 0.04 | | | 0.02 | | 0.04 | | 0.04 | | 0.02 | | 0.04 | | |
| NC Regional Curve Discharge (cfs) ² | 9.3 | | 8.6 | | | 4.8 | | 8.8 | | 8.6 | | 4.8 | | 8.8 | | |
| NC Regional Curve Discharge (cfs) ³ | 10.2 | | 9.4 | | | 5.3 | | 9.7 | | 9.4 | | 5.3 | | 9.7 | | |
| Design/Calculated Discharge (cfs) | 7 | | | | | | | | | 6-8 | | 4-5 | | 7 | | |
| Dimension | | | | | | | | | | | | | | | | |
| Cross Section ID | | | 1 | 2 | 3 | 13 | 14 | 20 | 21 | | | | | | | |
| BF Cross Sectional Area (ft ²) | 2.8 | 3.9 | 3.4 | 3.7 | 2.3 | 3.3 | 1.1 | 3.1 | 2.1 | 2.1 | 3.1 | 2.2 | 3.1 | 2.8 | 4.1 | |
| BF Width (ft) | 4.4 | 6.6 | 7.4 | 5.4 | 3.0 | 6.6 | 3.8 | 4.8 | 4.3 | 4.5 | 4.9 | 4.5 | 4.9 | 5.2 | 5.7 | |
| BF Mean Depth (ft) | 0.6 | 0.6 | 0.5 | 0.7 | 0.8 | 0.5 | 0.3 | 0.7 | 0.5 | 0.5 | 0.6 | 0.5 | 0.6 | 0.5 | 0.7 | |
| BF Max Depth (ft) | 0.9 | 1.2 | 0.8 | 1.1 | 1.1 | 1.0 | 0.5 | 1.2 | 0.7 | 0.7 | 1.0 | 0.7 | 1.0 | 0.8 | 1.2 | |
| Wetted Perimeter (ft) | 4.8 | 7.1 | 7.6 | 6.3 | 4.2 | 7.1 | 4.0 | 5.8 | 4.7 | 4.8 | 5.6 | 4.8 | 5.6 | 5.6 | 6.5 | |
| Hydraulic Radius (ft) | 0.6 | 0.6 | 0.4 | 0.6 | 0.5 | 0.5 | 0.3 | 0.5 | 0.4 | 0.4 | 0.6 | 0.4 | 0.6 | 0.5 | 0.6 | |
| Width/Depth Ratio | 6.9 | 10.9 | 16.1 | 7.8 | 3.9 | 12.9 | 12.9 | 7.3 | 9.0 | 9.7 | 7.7 | 9.3 | 7.7 | 9.7 | 7.8 | |
| Floodprone Width (ft) | >10 | >15 | 10.0 | 6.8 | 5.4 | 10.1 | 4.9 | 7.6 | 5.6 | 30 | 26.5 | 30 | 26.5 | 30 | 26.5 | |
| Entrenchment Ratio | >2.2 | >2.2 | 1.4 | 1.3 | 1.8 | 1.5 | 1.3 | 1.6 | 1.3 | 6.7 | 5.4 | 6.7 | 5.4 | 5.8 | 4.6 | |
| Bank/Height Ratio | 1.0 | 1.2 | 1.8 | 2.5 | 1.0 | 2.5 | 6.0 | 0.8 | 8.4 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | |
| Substrate | | | | | | | | | | | | | | | | |
| Description (D50) | Fine Gravel | | Gravel | | | Coarse Sand | | Coarse Sand | | Gravel | | Gravel | | Gravel | | |
| D16 (mm) | 1.1 | | 1.4 | | | 0.85 | | 0.85 | | - | | - | | - | | |
| D50 (mm) | 3.7 | | 12 | | | 1.7 | | 1.7 | | - | | - | | - | | |
| D84 (mm) | 25 | | 51 | | | 26 | | 26 | | - | | - | | - | | |
| Pattern | | | | | | | | | | | | | | | | |
| | Min | Max | Min | Max | Min | Max | Max | Max | Max | Min | Max | Min | Max | Min | Max | |
| Channel Beltwidth (ft) | 18 | 35 | - | - | - | - | - | - | - | 13 | 30 | 13 | 30 | 15 | 35 | |
| Radius of Curvature (ft) | 7 | 19 | - | - | - | - | - | - | - | 5 | 15 | 5 | 15 | 6 | 17 | |
| Radius of Curvature Ratio | 1.6 | 4.3 | - | - | - | - | - | - | - | 1.1 | 3.3 | 1.1 | 3.3 | 1.2 | 3.3 | |
| Meander Wavelength (ft) | 30 | 44 | - | - | - | - | - | - | - | 20 | 37 | 20 | 37 | 23 | 43 | |
| Meander Width Ratio | 4.1 | 8.0 | - | - | - | - | - | - | - | 2.9 | 6.7 | 2.9 | 6.7 | 2.9 | 6.7 | |
| Profile | | | | | | | | | | | | | | | | |
| | Min | Max | Min | Max | Min | Max | Max | Max | Max | Min | Max | Min | Max | Min | Max | |
| Riffle Length (ft) | 4 | 18 | - | - | - | - | - | - | - | 3 | 15 | 3 | 15 | 4 | 18 | |
| Run Length (ft) | 3 | 8 | - | - | - | - | - | - | - | 3 | 7 | 3 | 7 | 3 | 8 | |
| Pool Length (ft) | 3 | 10 | - | - | - | - | - | - | - | 3 | 8 | 3 | 8 | 3 | 10 | |
| Pool -to-Pool Spacing (ft) | 12 | 35 | - | - | - | - | - | - | - | 10 | 30 | 10 | 30 | 12 | 35 | |
| Additional Reach Parameters | | | | | | | | | | | | | | | | |
| Valley Length (ft) | 146 | | 1136 | | | 288 | | 990 | | 924 | | 482 | | 450 | | |
| Channel Length (ft) | 185 | | 1179 | | | 300 | | 1051 | | 1211 | | 526 | | 512 | | |
| Sinuosity | 1.27 | | 1.04 | | | 1.04 | | 1.06 | | 1.31 | | 1.09 | | 1.14 | | |
| Valley Slope (ft/ft) | - | | 0.0282 | | | 0.0660 | | 0.0455 | | 0.0282 | | 0.0660 | | 0.0455 | | |
| Channel Slope (ft/ft) | 0.0130 | | 0.0305 | | | 0.0639 | | 0.0383 | | 0.0170 | | 0.0200 | | 0.0175 | | |
| Rosgen Classification | E4 | | G4 | | | F5b | | G5 | | E4 | | E4 | | E4 | | |

¹ Bankfull stage was estimated using NC Regional Curve equations and existing conditions data

² NC Regional Curve equations source: Doll et al. (2003)

³ NC Regional Curve equations source: Sweet and Geratz (2003)

E or C

CATBIRD

| Mitigation Type | Restoration | E2 | Restoration |
|--|-------------|-------|-------------|
| Reach | DS1 | DS2-A | DS2-B |
| DA (ac) | 26 | 12 | 27 |
| DA (sqmi) | 0.04 | 0.02 | 0.04 |
| Ex. Conds XSs | | | |
| ~ Q _{BKF} | | | |
| FFQ Analysis | | | |
| Q _{1.1} | 14 | 9 | 15 |
| Q _{1.5} | 21 | 14 | 22 |
| Q ₂ | 29 | 19 | 30 |
| Q ₁₀ | 56 | 35 | 57 |
| Rural Piedmont Regional Curves | | | |
| NC-Q _{BKF} orig | 9 | 5 | 9 |
| NC-Q _{BKF} rev | 9 | 5 | 10 |
| ~ BKF _{CSA} | 2.6 | 1.5 | 2.6 |
| VA-Q _{BKF} | 2 | 1 | 2 |
| SCS (Hydraflow Hydrographs with 6 hour duration and a PSF of 484) | | | |
| Q ₁ | 4 | 3 | 6 |
| Q ₂ | 8 | 6 | 11 |
| Q ₅ | 14 | 10 | 19 |
| Q ₁₀ | 20 | 13 | 27 |
| Q ₂₅ | 29 | 18 | 37 |
| Q ₅₀ | 37 | 22 | 46 |
| SCS (Hydraflow Hydrographs with 6 hour duration and a PSF of 384) | | | |
| Q ₁ | 4 | 3 | 5 |
| Q ₂ | 7 | 6 | 10 |
| Q ₅ | 13 | 10 | 18 |
| Q ₁₀ | 18 | 13 | 25 |
| Q ₂₅ | 26 | 18 | 35 |
| Q ₅₀ | 34 | 22 | 43 |
| USGS RR Eqns (Region 1) | | | |
| Q _{2(1996 EQNS)} | 16 | 9 | 16 |
| Q _{2(2001 EQNS)} | 14 | 8 | 15 |
| Q ₂ | 20 | 12 | 20 |
| Q ₅ | 40 | 24 | 41 |
| Q ₁₀ | 55 | 34 | 56 |
| Q ₂₅ | 77 | 48 | 79 |
| Q ₅₀ | 97 | 61 | 99 |

| Recommended Design Flows = | | | |
|-----------------------------------|-----|---|---|
| Q _{bnkfull} | 5-7 | 4 | 7 |

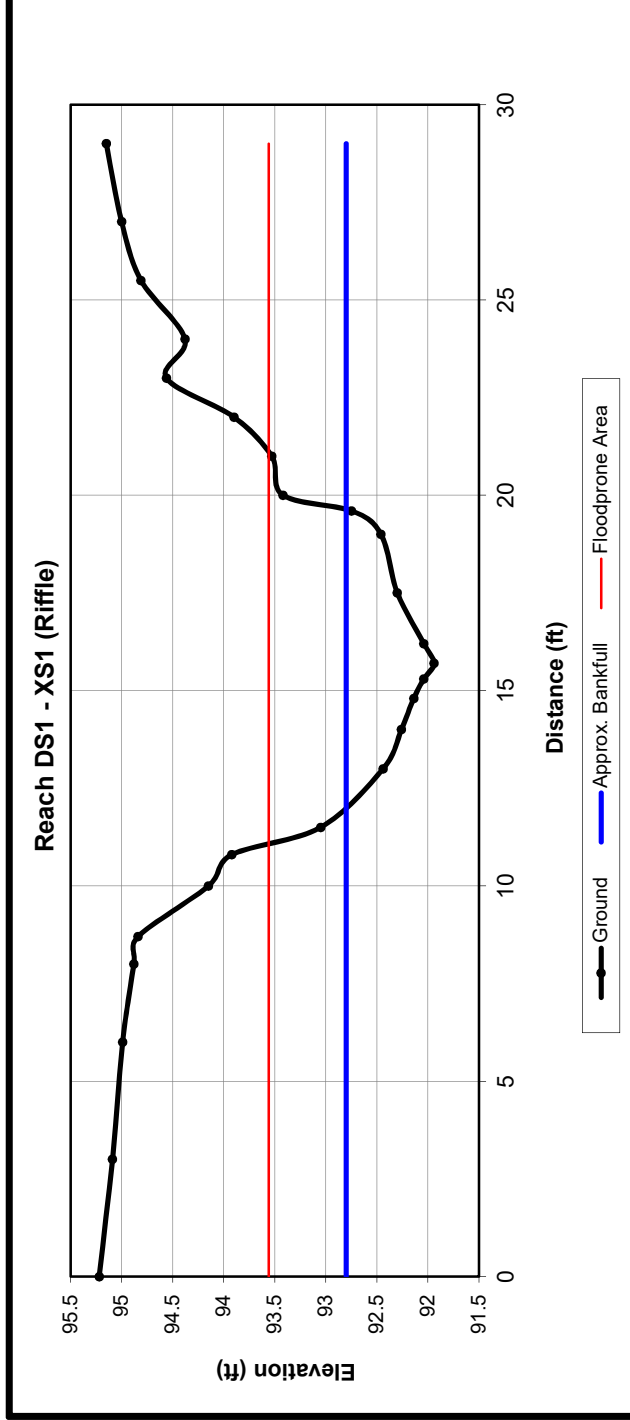
Cross Sections of Current Conditions
& Reference Reaches



Upstream



Downstream

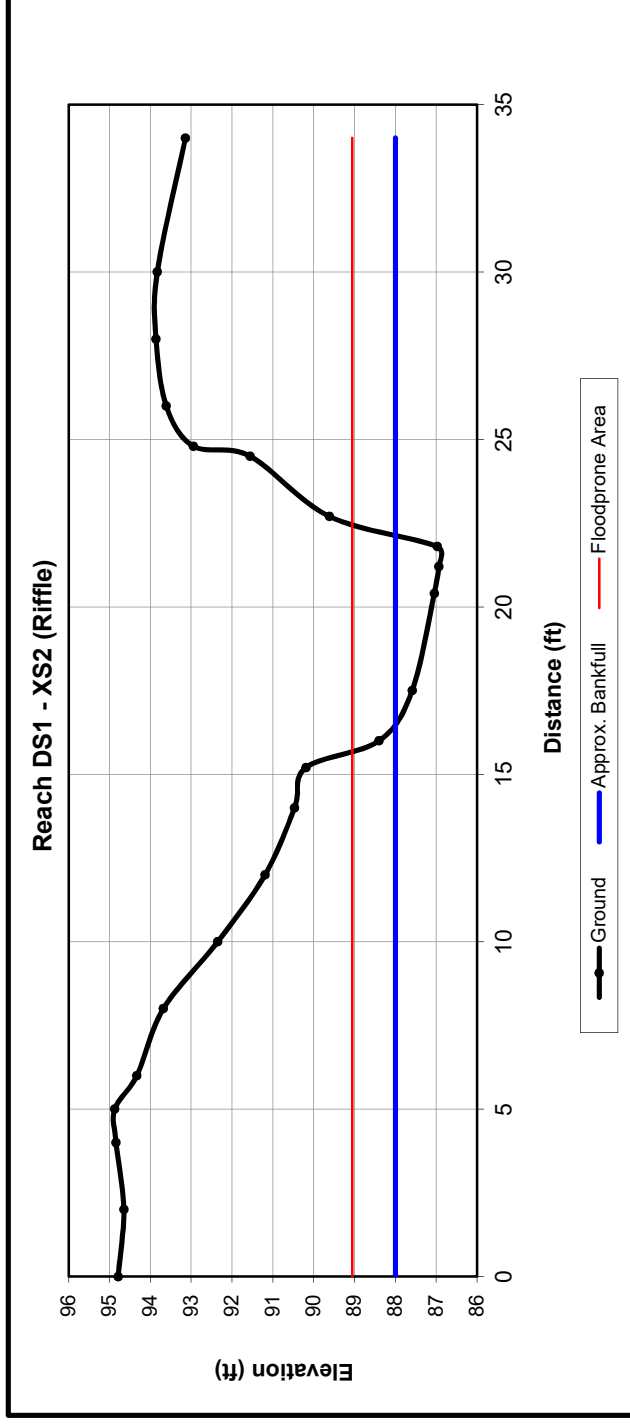


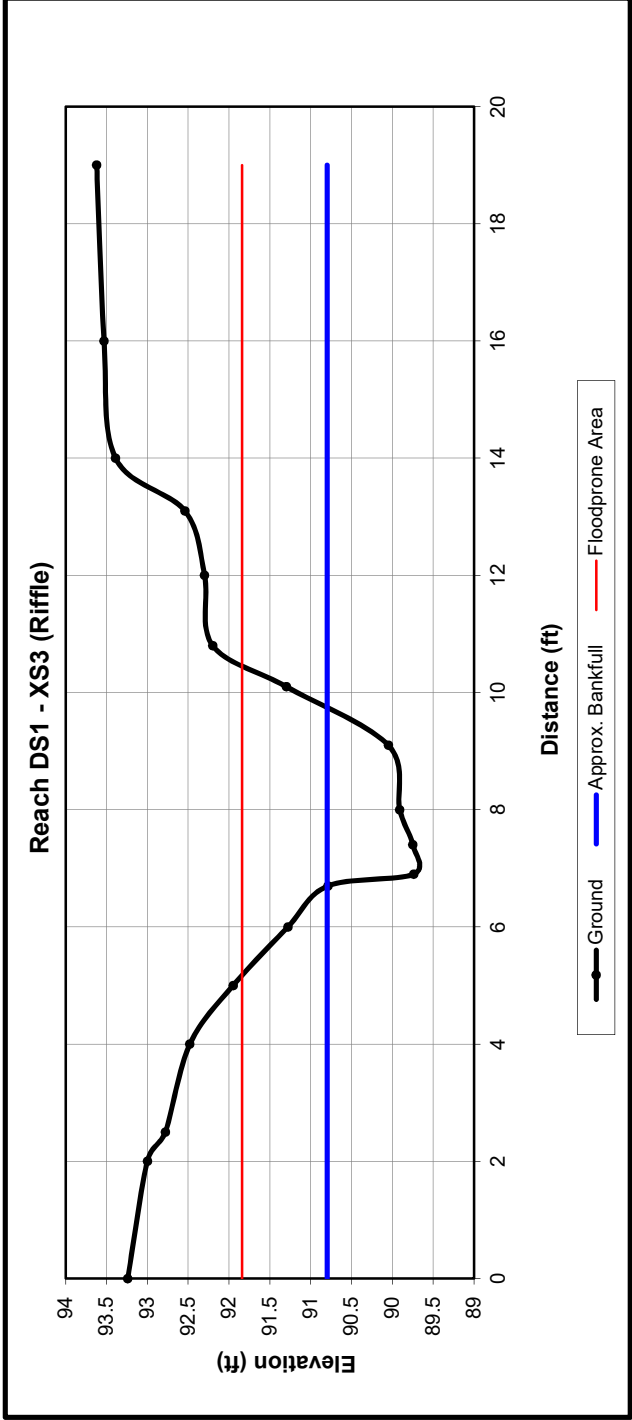


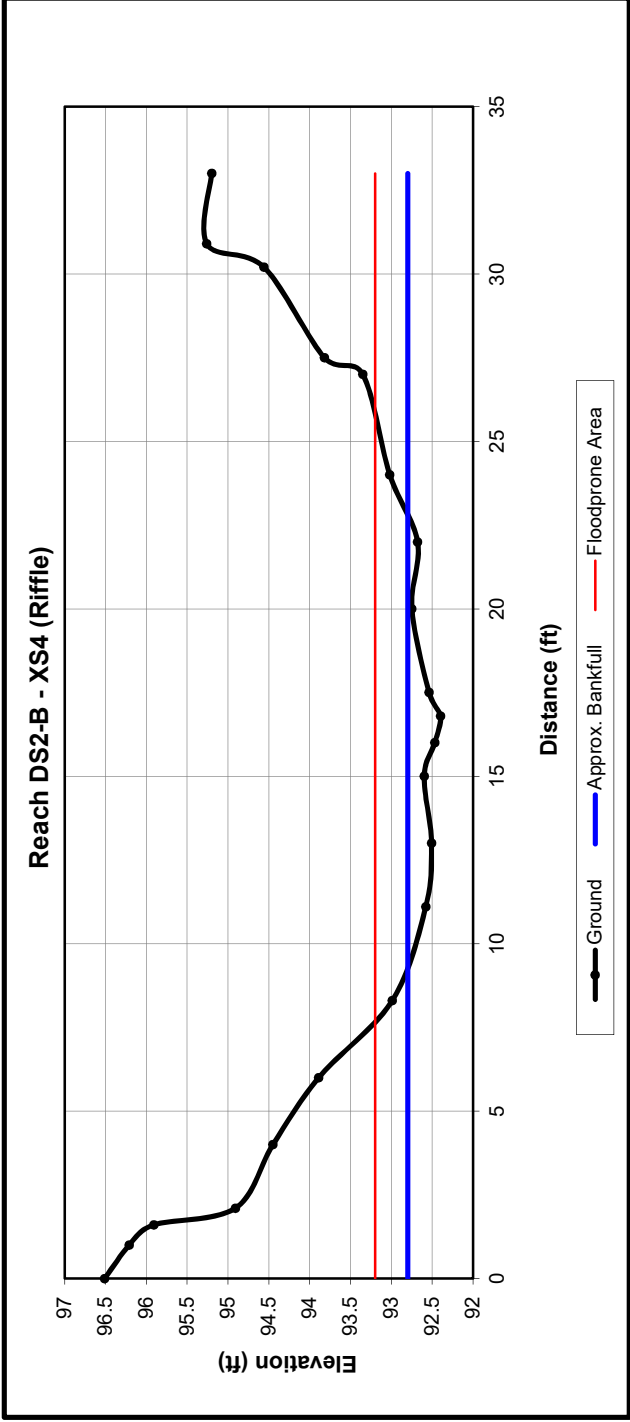
Upstream



Downstream





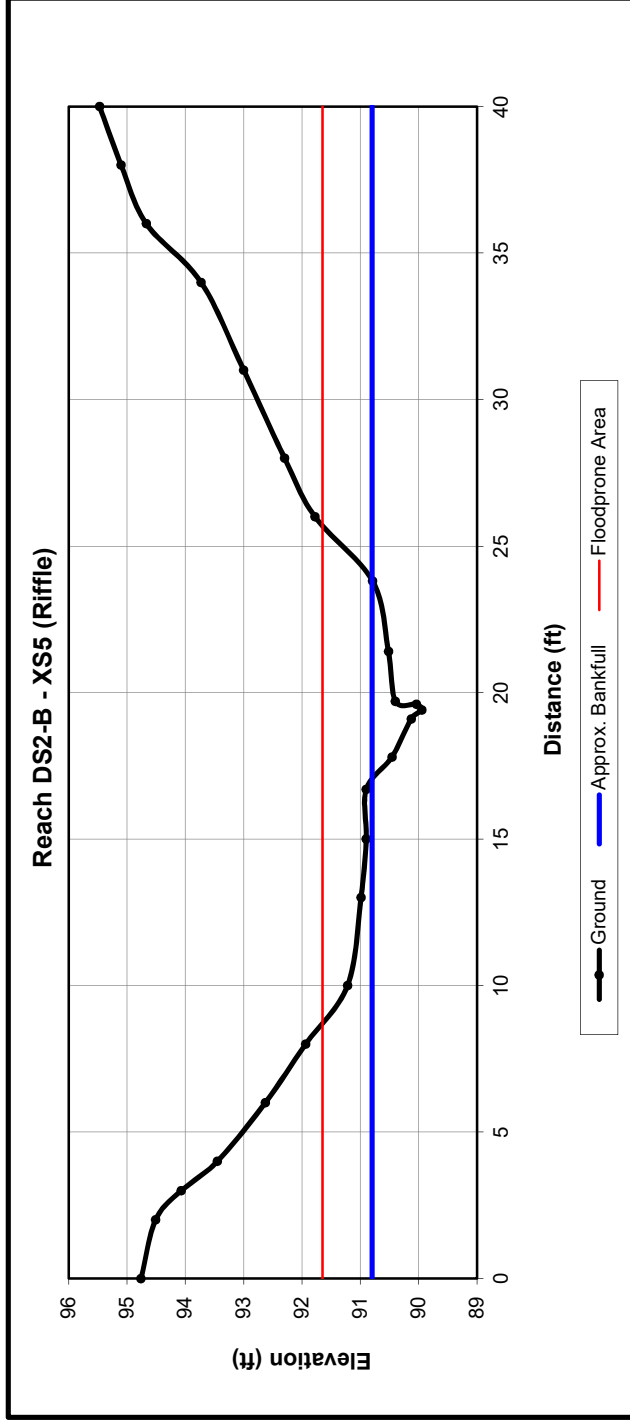




Upstream



Downstream

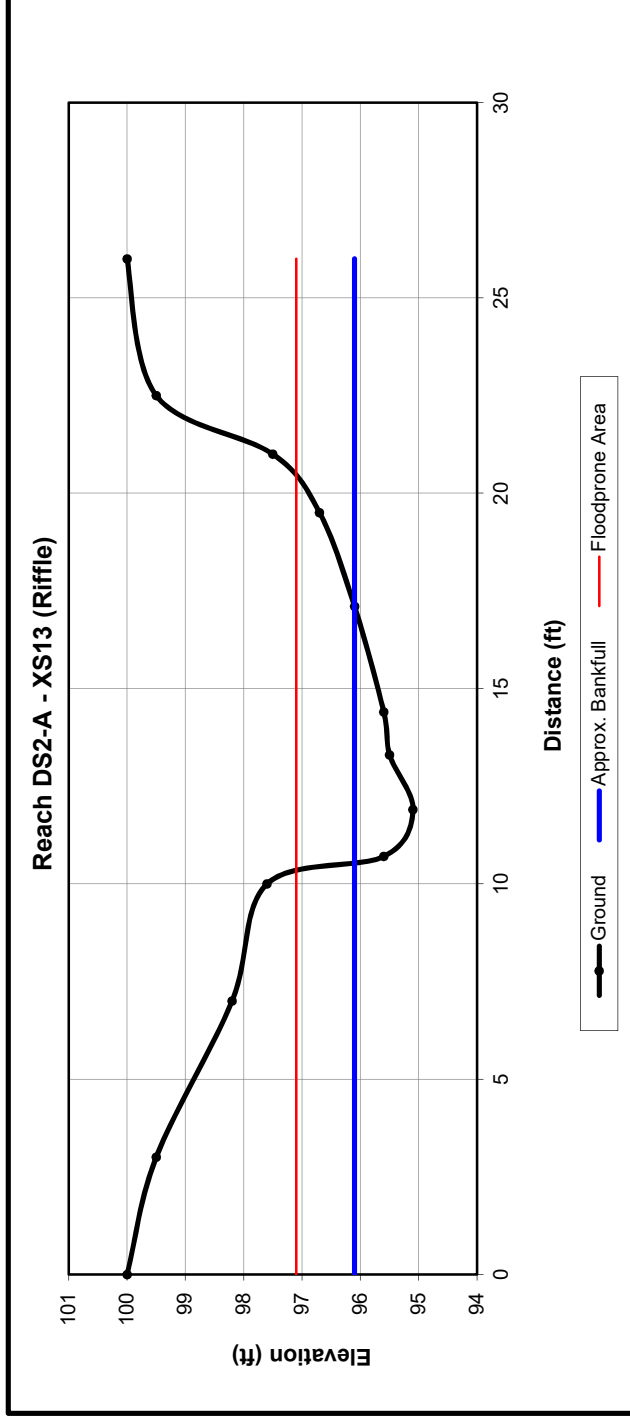




Upstream



Downstream

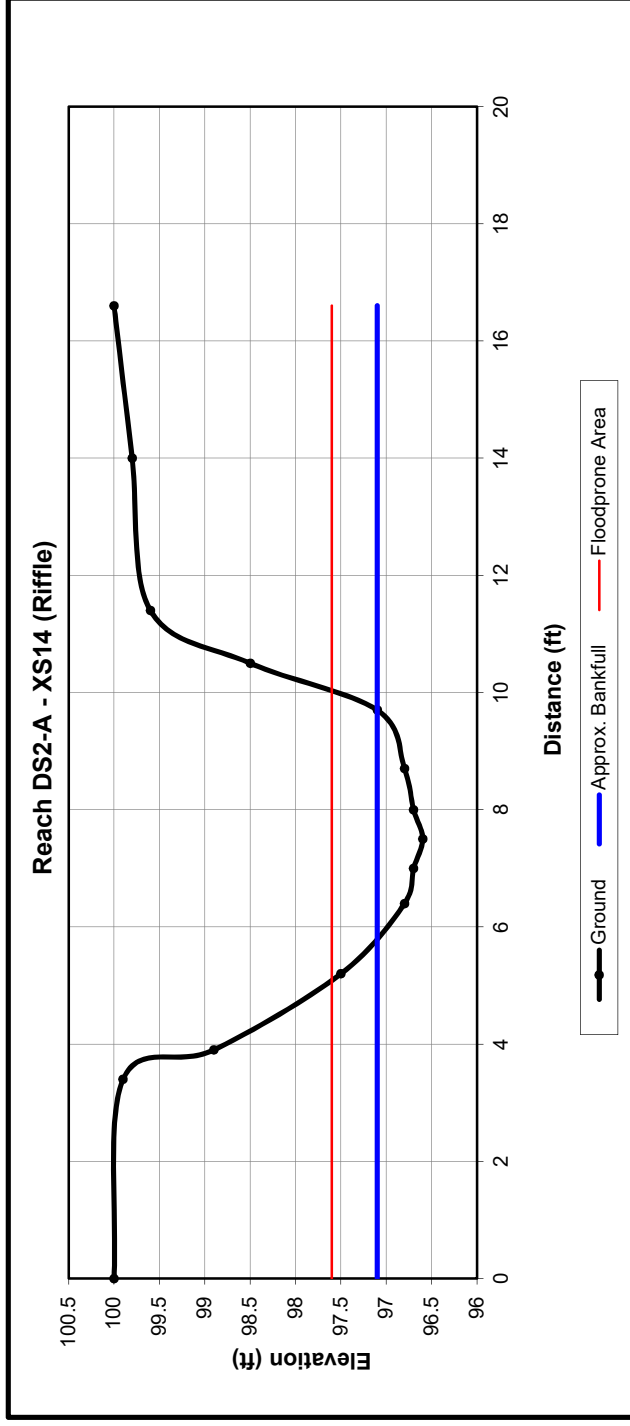




Upstream



Downstream

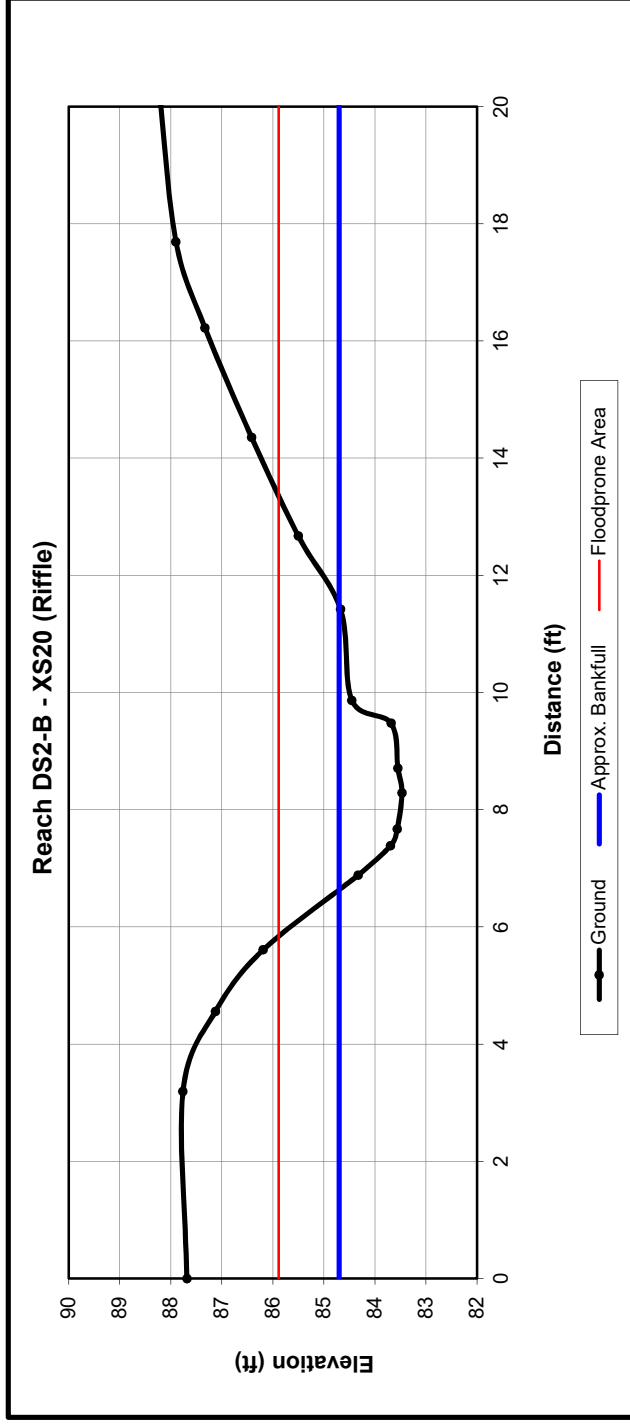




Upstream



Downstream

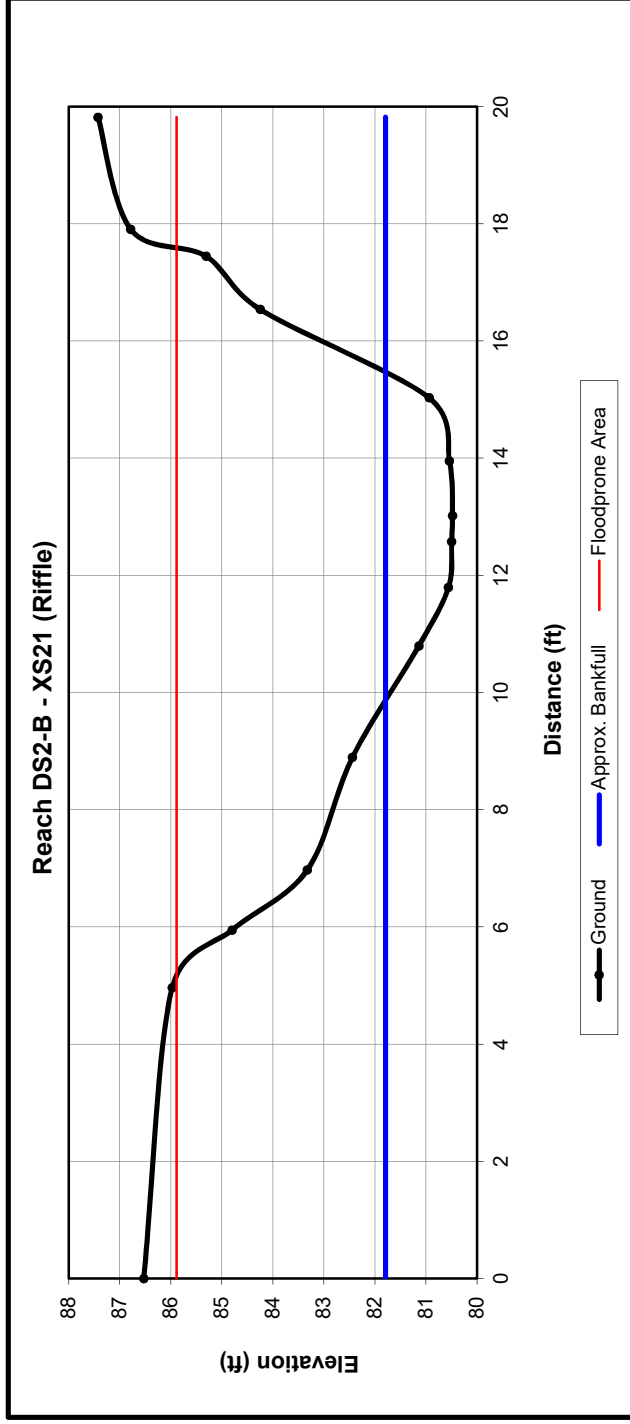




Upstream



Downstream



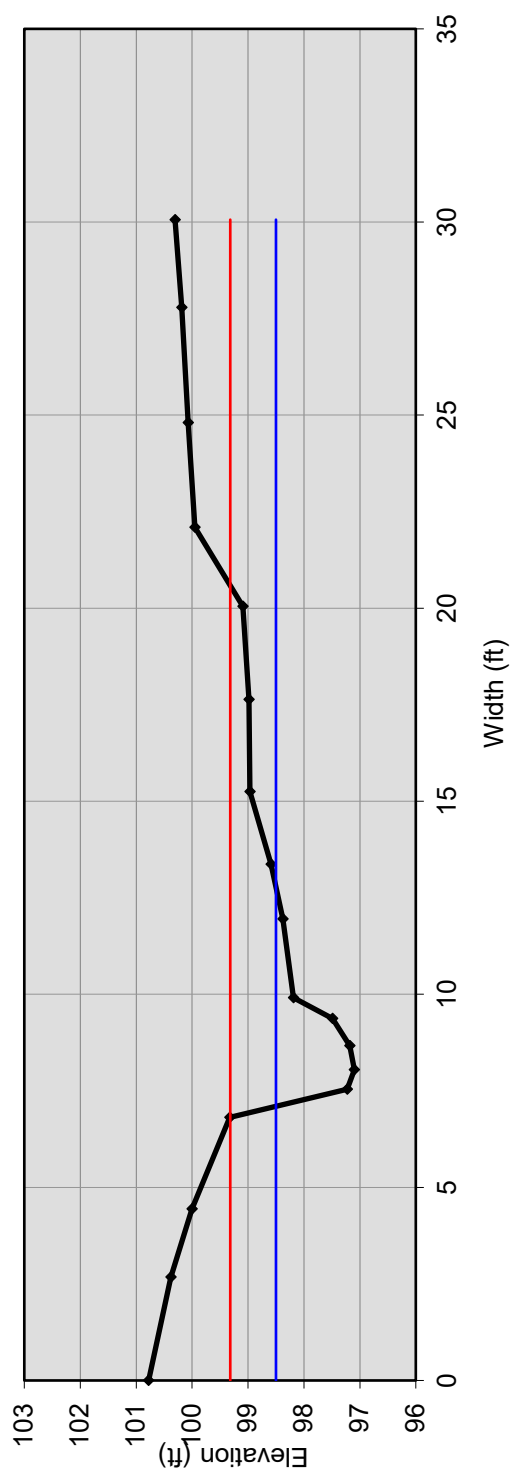
Cross Section 1 – UT to Hauser Creek - Pool



Downstream



Upstream



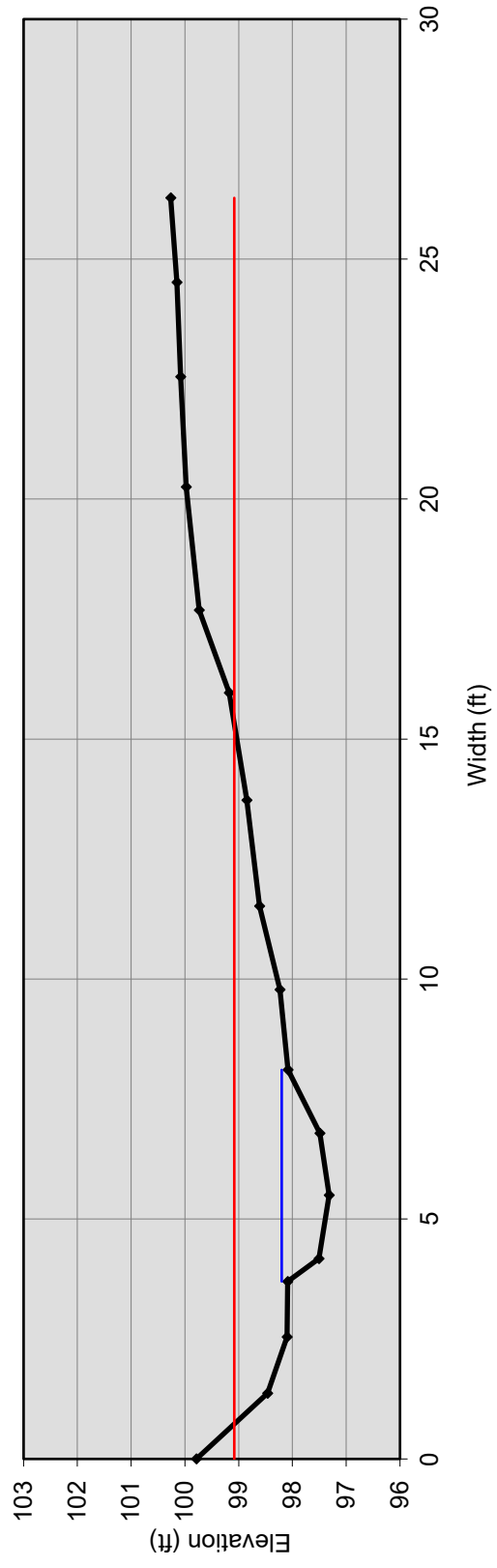
Cross Section 2 – UT to Hauser Creek – Riffle



Downstream



Upstream



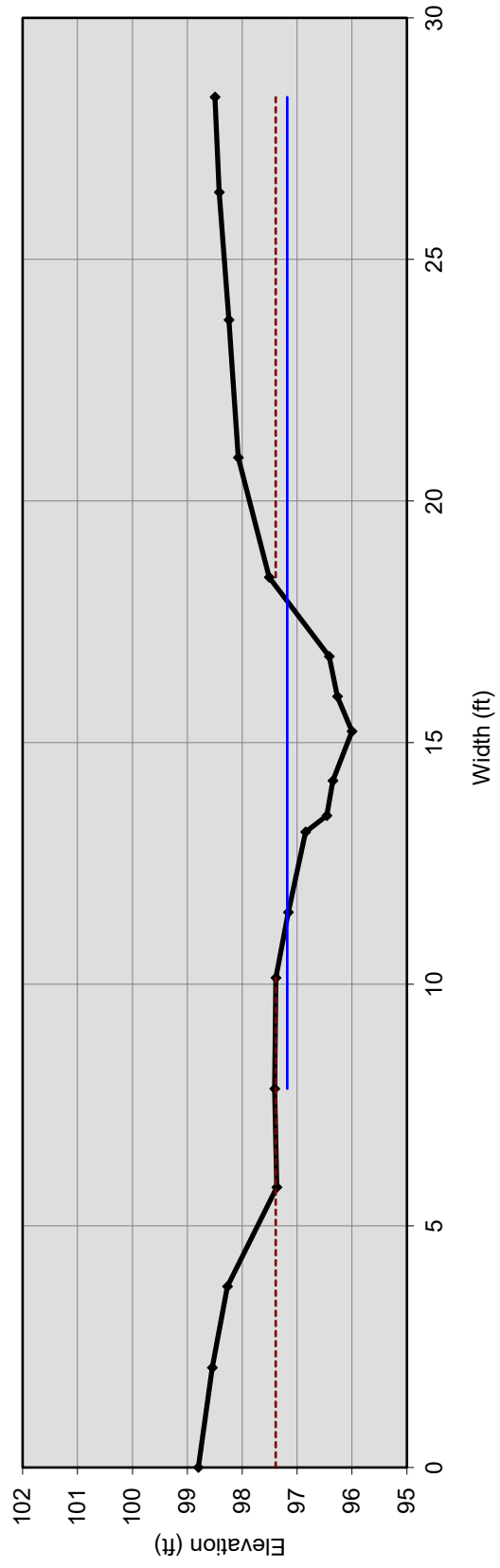
Cross Section 3 – UT to Hauser Creek – Pool



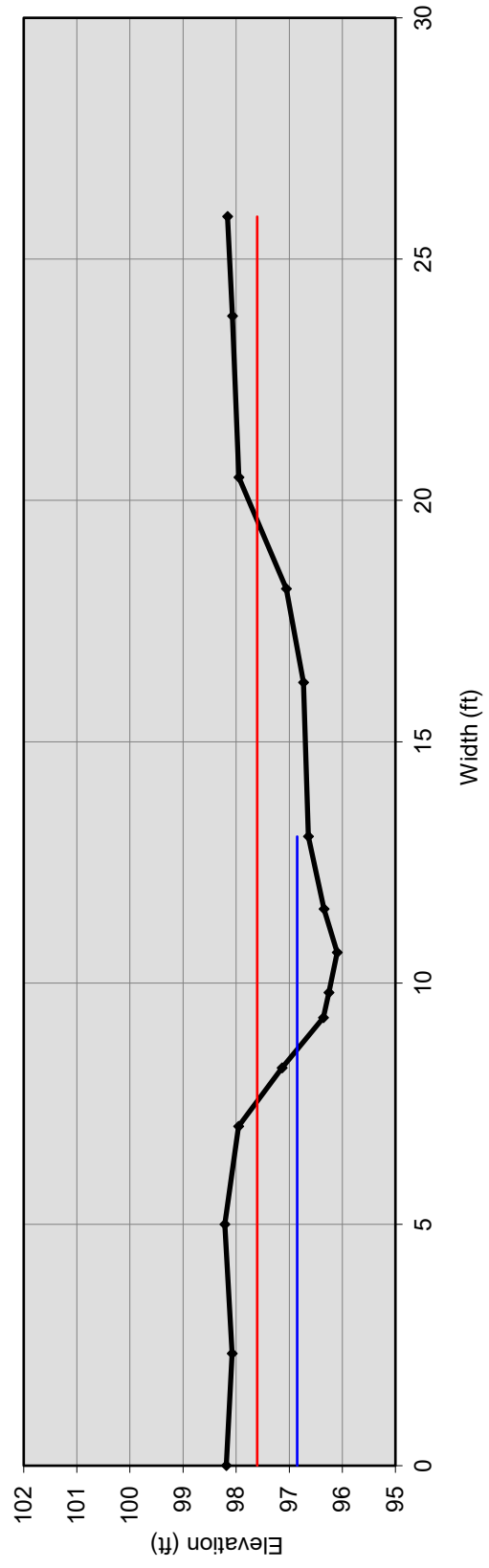
Downstream



Upstream



Cross Section 4 – UT to Hauser Creek – Riffle



Channel Stability Assessment

Channel Stability Assessment Summary Table

| | DS1 | DS2-A | DS2-B |
|---|-------------|--------------|--------------|
| 1 Watershed characteristics | 11 | 11 | 11 |
| 2 Flow habit | 8 | 6 | 8 |
| 3 Channel pattern | 4 | 4 | 4 |
| 4 Entrenchment/channel confinement | 10 | 7 | 11 |
| 5 Bed material | 9 | 7 | 6 |
| 6 Bar development | 5 | 3 | 3 |
| 7 Obstructions/debris jams | 5 | 2 | 2 |
| 8 Bank soil texture and coherence | 7 | 7 | 7 |
| 9 Average bank angle | 8 | 10 | 10 |
| 10 Bank vegetation/protection | 10 | 7 | 9 |
| 11 Bank cutting | 8 | 8 | 10 |
| 12 Mass wasting/bank failure | 8 | 6 | 10 |
| 13 Upstream distance to bridge | NA | NA | NA |
| Score | 93 | 78 | 91 |
| Rating* | Fair | Fair | Fair |

* Excellent (0 < Score <= 36), Good (36 < Score <= 72), Fair (72 < Score <= 108), Poor (108 < Score <= 144)

Stream: REACH DS1
 Reach: 4
 Date: 2/1/88
 Weather: OVERCAST
 Location: _____

Observers: EWT / MDD
 Project: CATBIRD
 Drainage Area: _____
 Stream Type: INTERMITTENT

| Stability Indicator | Excellent (1-3) | Good (4-6) | Fair (7-9) | Poor (10-12) | Score |
|--|---|---|--|---|-------|
| 1. Watershed and flood plain activity and characteristics | Stable, forested, undisturbed watershed | Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities | Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed | Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed | 11 |
| 2. Flow habit | Perennial stream with no flashy behavior | Perennial stream or ephemeral first-order stream with slightly increased rate of flooding | Perennial or intermittent stream with flashy behavior | Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream | 8 |
| 3. Channel pattern (revised) | No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel. | Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment. | Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel. | Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach. | 4 |
| 4. Entrenchment/ channel confinement | Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees | Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river | Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river | Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ratio small; deeply confined; no active flood plain; levees are high and along the channel edge | 10 |
| 5. Bed material Fs = approximate portion of sand in the bed | Assorted sized tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. Fs < 20% | Moderately packed with some overlapping. Very small amounts of material < 4 mm. 20 < Fs < 50% | Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. 50 < Fs < 70% | Very loose assortment with no packing. Large amounts of material < 4 mm. Fs > 70% | 9 |
| 6. Bar development | For S < 0.02 and wly > 12, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For S > 0.02 and wly are < 12, no bars are evident | For S < 0.02 and wly > 12, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For S > 0.02 and wly < 12, no bars are evident | For S < 0.02 and wly > 12, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for S > 0.02 and wly < 12 | Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for S < 0.02 and wly > 12 | 5 |
| 7. Obstructions, including bedrock outcrops, armor layer, LWD jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap | Rare or not present | Occasional, causing cross currents and minor bank and bottom erosion | Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions | Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen | 5 |

Stability Indicator

Excellent (1 - 3)

Good (4 - 6)

Fair (7 - 9)

Poor (10 - 12)

Score

| | | | | | |
|---|--|---|---|--|-----|
| 8. Bank soil texture and coherence | Clay and silty clay; cohesive material | Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures exist, but are cohesive materials | Sandy clay to sandy loam; unconsolidated mixtures of other materials; small layers and lenses of noncohesive or unconsolidated mixtures | Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers of lenses that include noncohesive sands and gravels | 7 |
| 9. Average bank slope angle (where 90° is a vertical bank) | Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides | Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks | Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks | Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks | 8 |
| 10. Vegetative or engineered bank protection | Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored | Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Wood vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks | Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank | Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks | 10 |
| 11. Bank cutting | Little or none evident. Infrequent raw banks, insignificant percentage of total bank | Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction | Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs | Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs | 8 |
| 12. Mass wasting or bank failure | No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach | Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks | Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident | Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped | 8 |
| 13. Upstream distance to bridge from meander impact point and alignment | More than 35 m; bridge is well-aligned with river flow | 20-35 m; bridge is aligned with flow | 10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge | Less than 10 m; bridge is poorly aligned with flow | N/A |

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, wly = width-to-depth ratio

Total Score

~~93~~

Stream: DS2-A
 Reach: 2/c/18
 Date: OVERCAST
 Weather: OVERCAST
 Location:

Observers: EWST/MDD
 Project: CATBBS
 Drainage Area:
 Stream Type: PERENNIAL

| Stability Indicator | Excellent (1-3) | Good (4-6) | Fair (7-9) | Poor (10-12) | Score |
|--|---|---|--|---|-------|
| 1. Watershed and flood plain activity and characteristics | Stable, forested, undisturbed watershed | Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities | Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed | Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed | 11 |
| 2. Flow habit | Perennial stream with no flashy behavior | Perennial stream or ephemeral first-order stream with slightly increased rate of flooding | Perennial or intermittent stream with flashy behavior | Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream | 9 |
| 3. Channel pattern (revised) | No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel. | Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment. | Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel. | Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach. | 4 |
| 4. Entrenchment/ channel confinement | Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees | Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river | Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river | Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ratio small; deeply confined; no active flood plain; levees are high and along the channel edge | 7 |
| 5. Bed material Fs = approximate portion of sand in the bed | Assorted sized tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. Fs < 20% | Moderately packed with some overlapping. Very small amounts of material < 4 mm. 20 < Fs < 50% | Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. 50 < Fs < 70% | Very loose assortment with no packing. Large amounts of material < 4 mm. Fs > 70% | 7 |
| 6. Bar development | For S < 0.02 and wly > 12, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For S > 0.02 and wly are < 12, no bars are evident | For S < 0.02 and wly > 12, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For S > 0.02 and wly < 12, no bars are evident | For S < 0.02 and wly > 12, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for S > 0.02 and wly < 12 | Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for S < 0.02 and wly > 12 | 3 |
| 7. Obstructions, including bedrock outcrops, armor layer, LWD jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap | Rare or not present | Occasional, causing cross currents and minor bank and bottom erosion | Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions | Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen | 2 |

| Stability Indicator | Excellent (1 - 3) | Good (4 - 6) | Fair (7 - 9) | Poor (10 - 12) | Score |
|---|--|---|---|--|-------|
| 8. Bank soil texture and coherence | Clay and silty clay; cohesive material | Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures; layers may exist, but are cohesive materials | Sandy clay to sandy loam; unconsolidated mixtures of glacial or other materials; small layers and lenses of noncohesive or unconsolidated mixtures | Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers of lenses that include noncohesive sands and gravels | 7 |
| 9. Average bank slope angle (where 90° is a vertical bank) | Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides | Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks | Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks | Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks | 10 |
| 10. Vegetative or engineered bank protection | Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored | Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Wood vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks | Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank | Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks | 7 |
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| 12. Mass wasting or bank failure | No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach | Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks | Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident | Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped | 9 |
| 13. Upstream distance to bridge from meander impact point and alignment | More than 35 m; bridge is well-aligned with river flow | 20-35 m; bridge is aligned with flow | 10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge | Less than 10 m; bridge is poorly aligned with flow | N/A |

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, wly = width-to-depth ratio

Total Score

78

Stream:

Reach: DSR-B

Date: 2/1/18

Weather: BUREAS

Location:

Observers: EWT / MAP

Project: CAT BIRD

Drainage Area:

Stream Type: PERENNIAL

| Stability Indicator | Excellent (1 - 3) | Good (4 - 6) | Fair (7 - 9) | Poor (10 - 12) | Score |
|--|---|---|--|---|-------|
| 1. Watershed and flood plain activity and characteristics | Stable, forested, undisturbed watershed | Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities | Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed | Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed | 11 |
| 2. Flow habit | Perennial stream with no flashy behavior | Perennial stream or ephemeral first-order stream with slightly increased rate of flooding | Perennial or intermittent stream with flashy behavior | Extremely flashy, flash floods prevalent mode of discharge, ephemeral stream other than first-order stream | 8 |
| 3. Channel pattern (revised) | No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel. | Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment. | Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel. | Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach. | 4 |
| 4. Entrenchment/ channel confinement | Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees | Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river | Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river | Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ratio small; deeply confined; no active flood plain; levees are high and along the channel edge | 11 |
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| 6. Bar development | For S < 0.02 and w/y > 12, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For S > 0.02 and w/y are < 12, no bars are evident | For S < 0.02 and w/y > 12, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For S > 0.02 and w/y < 12, no bars are evident | For S < 0.02 and w/y > 12, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for S > 0.02 and w/y < 12 | Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for S < 0.02 and w/y > 12 | 3 |
| 7. Obstructions, including bedrock outcrops, armor layer, LWD jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap | Rare or not present | Occasional, causing cross currents and minor bank and bottom erosion | Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions | Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen | 2 |

| Stability Indicator | Excellent (1 - 3) | Good (4 - 6) | Fair (7 - 9) | Poor (10 - 12) | Score |
|---|--|--|---|--|-------|
| 8. Bank soil texture and coherence | Clay and silty clay; cohesive material | Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures; layers may exist, but are cohesive materials | Sandy clay to sandy loam; unconsolidated mixtures of glacial or other materials; small layers and lenses of noncohesive or unconsolidated mixtures | Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers of lenses that include noncohesive sands and gravels | 7 |
| 9. Average bank slope angle (where 90° is a vertical bank) | Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides | Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks | Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks | Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks | 10 |
| 10. Vegetative or engineered bank protection | Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored | Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Woody vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks | Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank | Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks | 9 |
| 11. Bank cuffing | Little or none evident. Infrequent raw banks, insignificant percentage of total bank | Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction | Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs | Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs | 10 |
| 12. Mass wasting or bank failure | No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach | Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks | Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident | Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped | 10 |
| 13. Upstream distance to bridge from meander impact point and alignment | More than 35 m; bridge is well-aligned with river flow | 20-35 m; bridge is aligned with flow | 10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge | Less than 10 m; bridge is poorly aligned with flow | N/A |

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Total Score

91

Background Attribute Table

| Table 4. Project Background Information | | | |
|---|--------------------------------|---|------------------|
| Project Name | | Catbird Site | |
| County | | Davie | |
| Project Area (acres) | | 6.52 | |
| Project Coordinates (latitude and longitude) | | 36.030644, -80.500865 | |
| Planted Acreage (Acres of Woody Stems Planted) | | 5.4 | |
| Project Watershed Summary Information | | | |
| Physiographic Province | | 45b - Southern Outer Piedmont | |
| River Basin | | Yadkin Pee-Dee | |
| USGS Hydrologic Unit 8-digit | 03040101 | USGS Hydrologic Unit 14-digit | 03040101160010 |
| DWR Sub-basin | | 03-07-02 | |
| Project Drainage Area (Acres and Square Miles) | | 53 acres (0.083 sq mi) | |
| Project Drainage Area Percentage of Impervious Area | | 4% | |
| CGIA Land Use Classification | | Managed Herbaceous Cover and Mixed Upland Hardwoods | |
| Reach Summary Information | | | |
| Parameters | DS1 | DS2-A | DS2-B |
| Length of reach (linear feet) | 968 | 78 | 1,218 |
| Valley confinement (Confined, moderately confined, unconfined) | mod. confined | mod. unconfined | confined |
| Drainage area (Acres and Square Miles) | 26 (0.041) | 12 (.019) | 27 (0.042) |
| Perennial, Intermittent, Ephemeral | Intermittent | Intermittent | Perennial |
| NCDWR Water Quality Classification | C, WS-IV | C, WS-IV | C, WS-IV |
| Stream Classification (existing) | G4 | F5b | G5 |
| Stream Classification (proposed) | E4 | F5b | E4 |
| Evolutionary trend (Simon) | III/IV | III/IV | III/IV |
| FEMA classification | N/A | N/A | N/A |
| Wetland Summary Information | | | |
| Parameters | Wetland A | Wetland B | |
| Size of Wetland (acres) | 0.01 | 0.03 | |
| Wetland Type (non-riparian, riparian riverine or riparian non-riverine) | riparian riverine | riparian riverine | |
| Mapped Soil Series | Mocksville Sandy Loam | Mocksville Sandy Loam | |
| Drainage class | Well | Well | |
| Soil Hydric Status | Nonhydric | Nonhydric | |
| Source of Hydrology | groundwater, surface hydrology | groundwater, surface hydrology | |
| Restoration or enhancement method (hydrologic, vegetative etc.) | N/A | N/A | |
| Regulatory Considerations | | | |
| Parameters | Applicable? | Resolved? | Supporting Docs? |
| Water of the United States - Section 404 | Yes | No | Appendix K |
| Water of the United States - Section 401 | Yes | No | Appendix K |
| Endangered Species Act | Yes | Yes | Appendix K |
| Historic Preservation Act | Yes | Yes | Appendix K |
| Coastal Zone Management Act (CZMA or CAMA) | No | N/A | N/A |
| FEMA Floodplain Compliance | No | N/A | N/A |

Appendix C – Site Protection Instrument

SITE PROTECTION INSTRUMENT

Site Protection Instrument(s) Summary Information

The land required for the construction, management, and stewardship of this mitigation project includes portions of the parcels listed below in Table C1. EBX (an entity of RES) has obtained a conservation easement from the current landowners for the project area. The easement deed and survey plat will be submitted to DMS and State Property Office (SPO) for approval and will be held by the State of North Carolina. The easement deed will follow the NCDMS Full Delivery Conservation Easement Template dated May 5, 2017 and included in this appendix. Once recorded, the secured easement will allow EBX to proceed with the project development and protect the mitigation assets in perpetuity. Once finalized, a copy of the land protection instrument(s) will be included in **Appendix C**.

Table C1. Project Parcel and Landowner Information

| Owner of Record | PIN | County | Site Protection Instrument | Deed Book and Page Numbers | Acreage Protected |
|-----------------|------------|--------|----------------------------|----------------------------|-------------------|
| Dwight Sparks | 5853633218 | Davie | Conservation Easement | -- | 6.5 ac |

STATE OF NORTH CAROLINA

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

_____ COUNTY

SPO File Number:

DMS Project Number:

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 _____ day of _____, 20__, by _____ *Landowner name goes here*, (“**Grantor**”), whose mailing address is _____ *Landowner address goes here* _____, 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 and Wetlands Restoration Program) within the Department of Environment and Natural Resources 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 (*insert name and address of full delivery contract provider*) 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 _____.

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 Division of Mitigation Services (formerly 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' Division of Mitigation Services (formerly 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 _____ Township, _____ County, North Carolina (the "**Property**"), and being more particularly described as that certain parcel of land containing approximately _____ acres and being conveyed to the Grantor by deed as recorded in **Deed Book** _____ **at Page** _____ of the _____ 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 ***if known, insert name of stream, branch, river or waterway here.***

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:

Tracts Number _____ containing a total of _____ **acres** as shown on the plats of survey entitled "Final Plat, Conservation Easement for North Carolina Division of Mitigation Services, Project Name: _____, SPO File No. _____, EEP Site No. _____, Property of _____," dated _____, 20__ by *name of surveyor*, PLS Number _____ and recorded in the _____ County, North Carolina Register of Deeds at **Plat Book** _____ **Pages** _____.

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 Division of Mitigation Services, 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 of Access to the Conservation Easement Area over the Property at reasonable times to undertake any activities on the property 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 subterranean 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
NC 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.

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

_____ (SEAL)

NORTH CAROLINA
COUNTY OF _____

I, _____, a Notary Public in and for the County and State aforesaid, do hereby certify that _____, 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 _____ day of _____, 20__.

Notary Public

My commission expires:

Exhibit A

[INSERT LEGAL DESCRIPTION]

Appendix D – Credit Release Schedule

CREDIT RELEASE SCHEDULE

All credit releases will be based on the total credit generated as reported in the approved final mitigation plan, unless there are major discrepancies and then a mitigation plan addendum will be submitted. 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 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 be restarted 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 in **Table D1**.

Table D1. Stream Credit Release Schedule

| Credit Release Milestone | Release Activity | Interim Release | Total Release |
|--------------------------|--|-----------------|------------------------------|
| 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% |
| 3 | Third year monitoring report demonstrates performance standards are being met | 10% | 60% |
| 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* | Sixth year monitoring report demonstrates performance standards are being met | 5% | 80% (90% ^{**}) |
| 7 | Seventh year monitoring report demonstrates performance standards are being met and project has received closeout approval | 10% | 90% (100% ^{**}) |

**Please note that vegetation data may not be required with monitoring reports submitted during these monitoring years unless otherwise required by the Mitigation Plan or directed by the IRT.*

***10% reserve of credits to be held back until the bankfull event performance standard has been met.*

Initial Allocation of Released Credits

The initial allocation of released credits, as specified in the mitigation plan, can be released by DMS without prior written approval of the DE upon satisfactory completion of the following activities:

- 1) Approval of the final Mitigation Plan.
- 2) Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property.
- 3) Completion of project construction (the initial physical and biological improvements to the mitigation site) pursuant to the mitigation plan; per the DMS Instrument, construction means that a mitigation site has been constructed in its entirety, to include planting, and an as-built report has been produced. As-built reports must be sealed by an engineer prior to project closeout, if appropriate but not prior to the initial allocation of released credits.

- 4) 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 projects a reserve of 10% of a site's total stream credits shall be released after four bankfull events have occurred, in separate years, provided the channel is stable and all other performance standards are met. In the event that less than four 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, DMS will submit a request for credit release to the DE along with documentation substantiating achievement of criteria required for release to occur. This documentation will be included with the annual monitoring report.

Appendix E – Financial Assurance

FINANCIAL ASSURANCE

Pursuant to Section IV H and Appendix III of the NCDEQ DMS (formerly Ecosystem Enhancement Program) In-Lieu Fee Instrument dated July 28, 2010, the North Carolina Department of Environmental Quality (NCDEQ) has provided the USACE-Wilmington District with a formal commitment to fund projects to satisfy mitigation requirements assumed by NCDEQ DMS. This commitment provides financial assurance for all mitigation projects implemented by the program.

Appendix F – Maintenance Plan

MAINTENANCE PLAN

The site will be monitored on a regular basis and a physical inspection will be conducted a minimum of once per year throughout the post construction monitoring period until performance standards are met. These site inspections may identify site components and features that require routine maintenance. Routine maintenance should be expected most often in the first two years following site construction and may include the following:

F1. Maintenance Plan

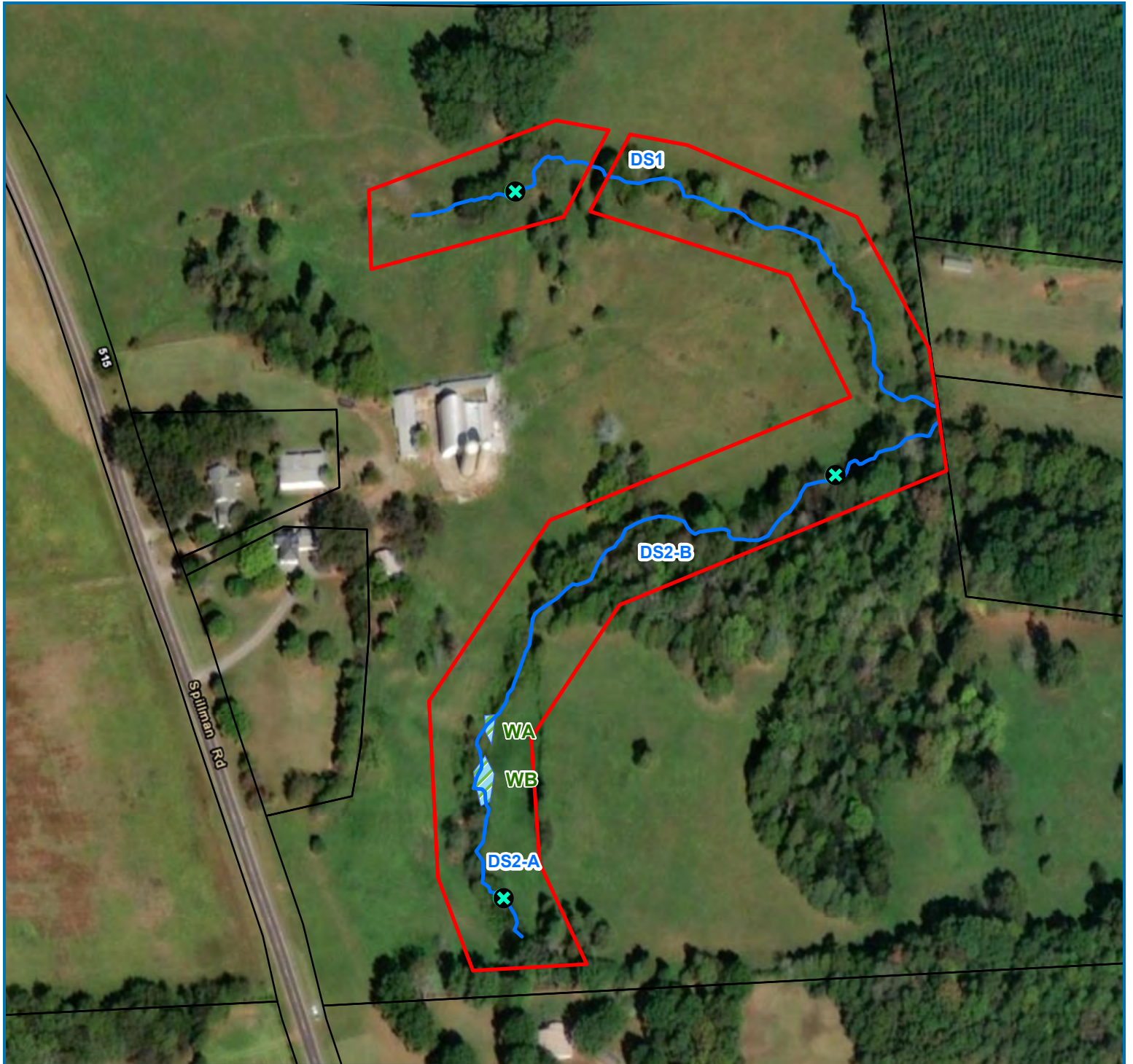
| Component/Feature | Maintenance through project close-out |
|-------------------|--|
| Stream | Routine channel maintenance and repair activities may include chinking of in-stream structures to prevent piping, securing of loose coir matting, and supplemental installations of live stakes and other target vegetation along the channel. Areas where stormwater and floodplain flows intercept the channel may also require maintenance to prevent bank failures and head-cutting. Stream maintenance activities will be documented and reported in annual monitoring reports. Stream maintenance will continue through the monitoring period. |
| Wetland | N/A |
| Vegetation | Vegetation shall be maintained to ensure the health and vigor of the targeted plant community. Routine vegetation maintenance and repair activities may include supplemental planting, pruning, mulching, and fertilizing. Exotic invasive plant species shall be treated by mechanical and/or chemical methods. Any vegetation requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDA) rules and regulations. Vegetation maintenance activities will be documented and reported in annual monitoring reports. Vegetation maintenance will continue through the monitoring period. |
| Site Boundary | Site boundaries shall be identified in the field to ensure clear distinction between the mitigation site and adjacent properties. Boundaries will be marked with signs identifying the property as a mitigation site, and will include the name of the long-term steward and a contact number. Boundaries may be identified by fence, marker, bollard, post, tree-blazing, or other means as allowed by site conditions and/or conservation easement. Boundary markers disturbed, damaged, or destroyed will be repaired and/or replaced on an as-needed basis. Easement monitoring and staking/signage maintenance will continue in perpetuity as a stewardship activity. |
| Road Crossing | Road crossings within the site may be maintained only as allowed by conservation easement or existing easement, deed restrictions, rights of way, or corridor agreements. Crossings in easement breaks are the responsibility of the landowner to maintain. |
| Livestock Fencing | Livestock fencing is to be placed outside the easement limits. Maintenance of fencing is the responsibility of the landowner. |

| Component/Feature | Maintenance through project close-out |
|--------------------------|--|
| Beaver | Routine site visits and monitoring will be used to determine if beaver management is needed. If beaver activity poses a threat to project stability or vegetative success, RES will trap beavers and remove impoundments as needed. All beaver management activities will be documented and included in annual monitoring reports. Beaver monitoring and management will continue through the monitoring period. |






Appendix G – DWR Stream ID Forms

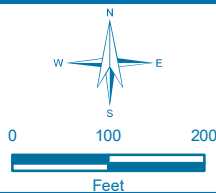
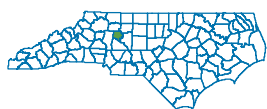
NC DWQ Stream Identification Scores

| | DS1 | DS2-A | DS2-B |
|-----------------------------|-------------|-----------|-----------|
| A. Geomorphology | | | |
| 1. Continuity | 2 | 2 | 3 |
| 2. Sinuosity | 2 | 2 | 2 |
| 3. In-channel structure | 1 | 2 | 2 |
| 4. Particle size | 2 | 2 | 2 |
| 5. Floodplain | 1 | 1 | 1 |
| 6. Depositional bars | 1 | 0 | 1 |
| 7. Alluvial deposits | 1 | 0 | 1 |
| 8. Headcuts | 1 | 1 | 2 |
| 9. Grade control | 1 | 1 | 1.5 |
| 10. Natural valley | 1 | 1 | 1 |
| 11. Second order | 0 | 0 | 0 |
| B. Hydrology | | | |
| 12. Baseflow | 2 | 2 | 3 |
| 13. Iron oxidizing bacteria | 1 | 1 | 2 |
| 14. Leaf litter | 1 | 1 | 1.5 |
| 15. Sediment | 0 | 0.5 | 0.5 |
| 16. Organic debris | 0.5 | 0.5 | 0.5 |
| 17. Hydric soil | 3 | 3 | 3 |
| C. Biology | | | |
| 18. Fibrous roots | 3 | 2 | 3 |
| 19. Rooted upland plants | 3 | 2 | 3 |
| 20. Macrobenthos | 0 | 1 | 1 |
| 21. Aquatic Mollusks | 0 | 0 | 0 |
| 22. Fish | 0 | 0 | 0 |
| 23. Crayfish | 0 | 0 | 0 |
| 24. Amphibians | 0 | 0 | 0 |
| 25. Algae | 0 | 0 | 0 |
| 26. Wetland plants | 0 | 0 | 0 |
| Total | 26.5 | 25 | 34 |



Legend

-  NC DWQ Stream Identification Form Location
-  Proposed Easement
-  Existing Wetlands
-  Parcels
-  Existing Streams



Existing Conditions and Stream ID Map

Catbird Mitigation Site

Davie County, North Carolina

Date: 10/4/2018

Drawn by: SCF

Checked by: MDE

1 inch = 200 feet



Reach DS1

NC DWQ Stream Identification Form Version 4.11

| | | |
|--|---|---|
| Date: 1/25/17 | Project/Site: Catbird | Latitude: |
| Evaluator: Brad Breslow | County: Davie | Longitude: |
| Total Points: Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* 26.5 | Stream Determination (circle one) Ephemeral <u>Intermittent</u> Perennial | Other Clemmons e.g. Quad Name: Farmington |

A. Geomorphology (Subtotal = 13)

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

^aartificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 7.5)

| | | | | |
|--|--------|-------|---------|-----|
| 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)

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

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

Notes:

Sketch:

Reach DS2-A

NC DWQ Stream Identification Form Version 4.11

| | | |
|---|--|-------------------------------------|
| Date: 1/25/17 | Project/Site: Catbird | Latitude: |
| Evaluator: Brad Breslow | County: Davie | Longitude: |
| Total Points: Stream is at least intermittent if ≥ 19 or perennial if $\geq 30^*$ 25 | Stream Determination (circle one) Ephemeral Intermittent Perennial | Other e.g. Quad Name: Farmington |

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 | |

^aartificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 8)

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

C. Biology (Subtotal = 5)

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

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

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Reach DS2-B

| | | |
|--|--|--|
| Date: 1/25/17 | Project/Site: Catbird | Latitude: |
| Evaluator: Brad Breslow | County: Davie | Longitude: |
| Total Points: Stream is at least intermittent if ≥ 19 or perennial if $\geq 30^*$ 34 | Stream Determination (circle one) Ephemeral Intermittent Perennial | Other Clemmons + Farmington 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 | |

^aartificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = _____)

| | | | | |
|--|--------|-----|---------|-----|
| 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 = _____)

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

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

Notes:

Sketch:

Appendix H – USACE District Assessment Forms

Stream Quality Assessment Worksheet Summary

| | | | DS1 | DS2-A | DS2-B |
|------------------|----|--|-----|-------|-------|
| Physical | 1 | Presence of flow / persistent pools in stream | 3 | 1 | 3 |
| | 2 | Evidence of past human alteration | 2 | 2 | 2 |
| | 3 | Riparian zone | 1 | 1 | 1 |
| | 4 | Evidence of nutrient or chemical discharges | 0 | 0 | 0 |
| | 5 | Groundwater discharge | 0 | 0 | 1 |
| | 6 | Presence of adjacent floodplain | 2 | 1 | 3 |
| | 7 | Entrenchment / floodplain access | 0 | 1 | 0 |
| | 8 | Presence of adjacent wetlands | 0 | 0 | 1 |
| | 9 | Channel sinuosity | 2 | 1 | 1 |
| | 10 | Sediment input | 1 | 2 | 2 |
| | 11 | Size & diversity of channel bed substrate | 2 | 1 | 2 |
| Stability | 12 | Evidence of channel incision or widening | 1 | 1 | 0 |
| | 13 | Presence of major bank failures | 1 | 2 | 0 |
| | 14 | Root depth and density on banks | 1 | 2 | 1 |
| | 15 | Impact by agriculture, livestock, or timber production | 0 | 0 | 0 |
| | 16 | Presence of riffle-pool/ripple-pool complexes | 1 | 2 | 2 |
| Habitat | 17 | Habitat complexity | 3 | 3 | 3 |
| | 18 | Canopy coverage over streambed | 1 | 3 | 1 |
| | 19 | Substrate embeddedness | 1 | 1 | 1 |
| Biology | 20 | Presence of stream invertebrates | 2 | 2 | 2 |
| | 21 | Presence of amphibians | 1 | 1 | 1 |
| | 22 | Presence of fish | 0 | 0 | 0 |
| | 23 | Evidence of wildlife use | 2 | 2 | 2 |

Total Score:

27

29

29

2/1/18

CATBIRD
REACH DSI

STREAM QUALITY ASSESSMENT WORKSHEET

| | # | CHARACTERISTICS | ECOREGION POINT RANGE | | | SCORE |
|---|----|---|-----------------------|----------|----------|-------|
| | | | Coastal | Piedmont | Mountain | |
| PHYSICAL | 1 | Presence of flow / persistent pools in stream (no flow or saturation = 0; strong flow = max points) | 0-5 | 0-4 | 0-5 | 3 |
| | 2 | Evidence of past human alteration (extensive alteration = 0; no alteration = max points) | 0-6 | 0-5 | 0-5 | 2 |
| | 3 | Riparian zone (no buffer = 0; contiguous, wide buffer = max points) | 0-6 | 0-4 | 0-5 | 1 |
| | 4 | Evidence of nutrient or chemical discharges (extensive discharges = 0; no discharges = max points) | 0-5 | 0-4 | 0-4 | 0 |
| | 5 | Groundwater discharge (no discharge = 0; springs, seeps, wetlands, etc. = max points) | 0-3 | 0-4 | 0-4 | 0 |
| | 6 | Presence of adjacent floodplain (no floodplain = 0; extensive floodplain = max points) | 0-4 | 0-4 | 0-2 | 2 |
| | 7 | Entrenchment / floodplain access (deeply entrenched = 0; frequent flooding = max points) | 0-5 | 0-4 | 0-2 | 0 |
| | 8 | Presence of adjacent wetlands (no wetlands = 0; large adjacent wetlands = max points) | 0-6 | 0-4 | 0-2 | 0 |
| | 9 | Channel-sinuosity (extensive channelization = 0; natural meander = max points) | 0-5 | 0-4 | 0-3 | 2 |
| | 10 | Sediment input (extensive deposition = 0; little or no sediment = max points) | 0-5 | 0-4 | 0-4 | 1 |
| | 11 | Size & diversity of channel bed substrate (fine, homogenous = 0; large, diverse sizes = max points) | NA* | 0-4 | 0-5 | 2 |
| STABILITY | 12 | Evidence of channel incision or widening (deeply incised = 0; stable bed & banks = max points) | 0-5 | 0-4 | 0-5 | 1 |
| | 13 | Presence of major bank failures (severe erosion = 0; no erosion, stable banks = max points) | 0-5 | 0-5 | 0-5 | 1 |
| | 14 | Root depth and density on banks (no visible roots = 0; dense roots throughout = max points) | 0-3 | 0-4 | 0-5 | 1 |
| | 15 | Impact by agriculture, livestock, or timber production (substantial impact = 0; no evidence = max points) | 0-5 | 0-4 | 0-5 | 0 |
| HABITAT | 16 | Presence of riffle-pool/ripple-pool complexes (no riffles/ripples or pools = 0; well-developed = max points) | 0-3 | 0-5 | 0-6 | 1 |
| | 17 | Habitat complexity (little or no habitat = 0; frequent, varied habitats = max points) | 0-6 | 0-6 | 0-6 | 3 |
| | 18 | Canopy coverage over streambed (no shading vegetation = 0; continuous canopy = max points) | 0-5 | 0-5 | 0-5 | 1 |
| | 19 | Substrate embeddedness (deeply embedded = 0; loose structure = max) | NA* | 0-4 | 0-4 | 1 |
| BIOLOGY | 20 | Presence of stream invertebrates (see page 4) (no evidence = 0; common, numerous types = max points) | 0-4 | 0-5 | 0-5 | 2 |
| | 21 | Presence of amphibians (no evidence = 0; common, numerous types = max points) | 0-4 | 0-4 | 0-4 | 1 |
| | 22 | Presence of fish (no evidence = 0; common, numerous types = max points) | 0-4 | 0-4 | 0-4 | 0 |
| | 23 | Evidence of wildlife use (no evidence = 0; abundant evidence = max points) | 0-6 | 0-5 | 0-5 | 2 |
| Total Points Possible | | | 100 | 100 | 100 | 27 |
| TOTAL SCORE (also enter on first page) | | | | | | |

* These characteristics are not assessed in coastal streams.

2/1/18

CATTBIRD
REACH DS2-A

STREAM QUALITY ASSESSMENT WORKSHEET

| | # | CHARACTERISTICS | ECOREGION POINT RANGE | | | SCORE |
|---|----|---|-----------------------|----------|----------|-------|
| | | | Coastal | Piedmont | Mountain | |
| PHYSICAL | 1 | Presence of flow / persistent pools in stream (no flow or saturation = 0; strong flow = max points) | 0-5 | 0-4 | 0-5 | 1 |
| | 2 | Evidence of past human alteration (extensive alteration = 0; no alteration = max points) | 0-6 | 0-5 | 0-5 | 2 |
| | 3 | Riparian zone (no buffer = 0; contiguous, wide buffer = max points) | 0-6 | 0-4 | 0-5 | 1 |
| | 4 | Evidence of nutrient or chemical discharges (extensive discharges = 0; no discharges = max points) | 0-5 | 0-4 | 0-4 | 0 |
| | 5 | Groundwater discharge (no discharge = 0; springs, seeps, wetlands, etc. = max points) | 0-3 | 0-4 | 0-4 | 0 |
| | 6 | Presence of adjacent floodplain (no floodplain = 0; extensive floodplain = max points) | 0-4 | 0-4 | 0-2 | 1 |
| | 7 | Entrenchment / floodplain access (deeply entrenched = 0; frequent flooding = max points) | 0-5 | 0-4 | 0-2 | 1 |
| | 8 | Presence of adjacent wetlands (no wetlands = 0; large adjacent wetlands = max points) | 0-6 | 0-4 | 0-2 | 0 |
| | 9 | Channel sinuosity (extensive channelization = 0; natural meander = max points) | 0-5 | 0-4 | 0-3 | 1 |
| | 10 | Sediment input (extensive deposition = 0; little or no sediment = max points) | 0-5 | 0-4 | 0-4 | 2 |
| | 11 | Size & diversity of channel bed substrate (fine, homogenous = 0; large, diverse sizes = max points) | NA* | 0-4 | 0-5 | 1 |
| STABILITY | 12 | Evidence of channel incision or widening (deeply incised = 0; stable bed & banks = max points) | 0-5 | 0-4 | 0-5 | 1 |
| | 13 | Presence of major bank failures (severe erosion = 0; no erosion, stable banks = max points) | 0-5 | 0-5 | 0-5 | 2 |
| | 14 | Root depth and density on banks (no visible roots = 0; dense roots throughout = max points) | 0-3 | 0-4 | 0-5 | 2 |
| | 15 | Impact by agriculture, livestock, or timber production (substantial impact = 0; no evidence = max points) | 0-5 | 0-4 | 0-5 | 0 |
| HABITAT | 16 | Presence of riffle-pool/ripple-pool complexes (no riffles/ripples or pools = 0; well-developed = max points) | 0-3 | 0-5 | 0-6 | 2 |
| | 17 | Habitat complexity (little or no habitat = 0; frequent, varied habitats = max points) | 0-6 | 0-6 | 0-6 | 3 |
| | 18 | Canopy coverage over streambed (no shading vegetation = 0; continuous canopy = max points) | 0-5 | 0-5 | 0-5 | 3 |
| | 19 | Substrate embeddedness (deeply embedded = 0; loose structure = max) | NA* | 0-4 | 0-4 | 1 |
| BIOLOGY | 20 | Presence of stream invertebrates (see page 4) (no evidence = 0; common, numerous types = max points) | 0-4 | 0-5 | 0-5 | 2 |
| | 21 | Presence of amphibians (no evidence = 0; common, numerous types = max points) | 0-4 | 0-4 | 0-4 | 1 |
| | 22 | Presence of fish (no evidence = 0; common, numerous types = max points) | 0-4 | 0-4 | 0-4 | 0 |
| | 23 | Evidence of wildlife use (no evidence = 0; abundant evidence = max points) | 0-6 | 0-5 | 0-5 | 2 |
| Total Points Possible | | | 100 | 100 | 100 | 29 |
| TOTAL SCORE (also enter on first page) | | | | | | |

* These characteristics are not assessed in coastal streams.

2/1/18

CATBIRD

REAR/D DS2-B

STREAM QUALITY ASSESSMENT WORKSHEET

| | # | CHARACTERISTICS | ECOREGION POINT RANGE | | | SCORE |
|--|----|---|-----------------------|----------|----------|-------|
| | | | Coastal | Piedmont | Mountain | |
| PHYSICAL | 1 | Presence of flow / persistent pools in stream (no flow or saturation = 0; strong flow = max points) | 0-5 | 0-4 | 0-5 | 3 |
| | 2 | Evidence of past human alteration (extensive alteration = 0; no alteration = max points) | 0-6 | 0-5 | 0-5 | 2 |
| | 3 | Riparian zone (no buffer = 0; contiguous, wide buffer = max points) | 0-6 | 0-4 | 0-5 | 1 |
| | 4 | Evidence of nutrient or chemical discharges (extensive discharges = 0; no discharges = max points) | 0-5 | 0-4 | 0-4 | 0 |
| | 5 | Groundwater discharge (no discharge = 0; springs, seeps, wetlands, etc. = max points) | 0-3 | 0-4 | 0-4 | 1 |
| | 6 | Presence of adjacent floodplain (no floodplain = 0; extensive floodplain = max points) | 0-4 | 0-4 | 0-2 | 3 |
| | 7 | Entrenchment / floodplain access (deeply entrenched = 0; frequent flooding = max points) | 0-5 | 0-4 | 0-2 | 0 |
| | 8 | Presence of adjacent wetlands (no wetlands = 0; large adjacent wetlands = max points) | 0-6 | 0-4 | 0-2 | 1 |
| | 9 | Channel sinuosity (extensive channelization = 0; natural meander = max points) | 0-5 | 0-4 | 0-3 | 1 |
| | 10 | Sediment input (extensive deposition = 0; little or no sediment = max points) | 0-5 | 0-4 | 0-4 | 2 |
| | 11 | Size & diversity of channel bed substrate (fine, homogenous = 0; large, diverse sizes = max points) | NA* | 0-4 | 0-5 | 2 |
| STABILITY | 12 | Evidence of channel incision or widening (deeply incised = 0; stable bed & banks = max points) | 0-5 | 0-4 | 0-5 | 0 |
| | 13 | Presence of major bank failures (severe erosion = 0; no erosion, stable banks = max points) | 0-5 | 0-5 | 0-5 | 0 |
| | 14 | Root depth and density on banks (no visible roots = 0; dense roots throughout = max points) | 0-3 | 0-4 | 0-5 | 1 |
| | 15 | Impact by agriculture, livestock, or timber production (substantial impact = 0; no evidence = max points) | 0-5 | 0-4 | 0-5 | 0 |
| HABITAT | 16 | Presence of riffle-pool/ripple-pool complexes (no riffles/ripples or pools = 0; well-developed = max points) | 0-3 | 0-5 | 0-6 | 2 |
| | 17 | Habitat complexity (little or no habitat = 0; frequent, varied habitats = max points) | 0-6 | 0-6 | 0-6 | 3 |
| | 18 | Canopy coverage over streambed (no shading vegetation = 0; continuous canopy = max points) | 0-5 | 0-5 | 0-5 | 1 |
| | 19 | Substrate embeddedness (deeply embedded = 0; loose structure = max) | NA* | 0-4 | 0-4 | 1 |
| BIOLOGY | 20 | Presence of stream invertebrates (see page 4) (no evidence = 0; common, numerous types = max points) | 0-4 | 0-5 | 0-5 | 2 |
| | 21 | Presence of amphibians (no evidence = 0; common, numerous types = max points) | 0-4 | 0-4 | 0-4 | 1 |
| | 22 | Presence of fish (no evidence = 0; common, numerous types = max points) | 0-4 | 0-4 | 0-4 | 0 |
| | 23 | Evidence of wildlife use (no evidence = 0; abundant evidence = max points) | 0-6 | 0-5 | 0-5 | 2 |
| Total Points Possible | | | 100 | 100 | 100 | 29 |
| TOTAL SCORE (also enter on first page) | | | | | | |

* These characteristics are not assessed in coastal streams.

Appendix I – Wetland JD Forms and Maps

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action Id. SAW-2017-01506 County: Davie U.S.G.S. Quad: NC-Farmington

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owner: North Carolina Department of Environmental Quality, Division of Mitigation Services

Harry Tsomides

Address: 5 Ravenscroft Drive, Suite 102

Asheville, NC 28801

Telephone Number: 828-545-7057

E-mail: harry.tsomides@ncdenr.gov

Size (acres) 6.0

Nearest Town Mocksville

Nearest Waterway Yadkin River

River Basin Upper Pee Dee

USGS HUC 03040101

Coordinates Latitude: 36.0315

Longitude: -80.5007

Location description: The review area is located on the east side of Spillman Road, approximately 1.3 miles north of the intersection of Spillman Road and NC-801. PIN: 585363218. Reference review area description shown in Jurisdictional Determination Package entitled "Potential Wetland or Non-Wetland Waters of the U.S. Map" and Printed Date of 09/29/2017.

Indicate Which of the Following Apply:

A. Preliminary Determination

- There appear to be **waters including wetlands**, on the above described project area/property, that may be subject to Section 404 of the Clean Water Act (CWA)(33 USC § 1344) and/or Section 10 of the Rivers and Harbors Act (RHA) (33 USC § 403). The **waters including wetlands**, have been delineated, and the delineation has been verified by the Corps to be sufficiently accurate and reliable. The approximate boundaries of these waters are shown on the enclosed delineation map dated 9/29/2017. Therefore this preliminary jurisdiction determination may be used in the permit evaluation process, including determining compensatory mitigation. For purposes of computation of impacts, compensatory mitigation requirements, and other resource protection measures, a permit decision made on the basis of a preliminary JD will treat all waters and wetlands that would be affected in any way by the permitted activity on the site as if they are jurisdictional waters of the U.S. This preliminary determination is not an appealable action under the Regulatory Program Administrative Appeal Process (Reference 33 CFR Part 331). However, you may request an approved JD, which is an appealable action, by contacting the Corps district for further instruction.
- There appear to be **waters including wetlands**, on the above described project area/property, that may be subject to Section 404 of the Clean Water Act (CWA)(33 USC § 1344) and/or Section 10 of the Rivers and Harbors Act (RHA) (33 USC § 403). However, since the **waters including wetlands**, have not been properly delineated, this preliminary jurisdiction determination may not be used in the permit evaluation process. Without a verified wetland delineation, this preliminary determination is merely an effective presumption of CWA/RHA jurisdiction over all of the **waters including wetlands**, at the project area, which is not sufficiently accurate and reliable to support an enforceable permit decision. We recommend that you have the **waters including wetlands**, on your project area/property delineated. As the Corps may not be able to accomplish this wetland delineation in a timely manner, you may wish to obtain a consultant to conduct a delineation that can be verified by the Corps.

B. Approved Determination

- There are Navigable Waters of the United States within the above described project area/property subject to the permit requirements of Section 10 of the Rivers and Harbors Act (RHA) (33 USC § 403) and Section 404 of the Clean Water Act (CWA)(33 USC § 1344). Unless there is a change in 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 **waters including wetlands**, on the above described project area/property 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 recommend you have the **waters including wetlands**, on your project area/property delineated. As the Corps may not be able to accomplish this wetland delineation in a timely manner, you may wish to obtain a consultant to conduct a delineation that can be verified by the Corps.

SAW-2017-01506

- The **waters including wetlands**, on your project area/property have been delineated and the delineation has been verified by the Corps. The approximate boundaries of these waters are shown on the enclosed delineation map dated **MAP DATE**. If you wish to have the delineation surveyed, the Corps can review and verify the survey upon completion. Once verified, this survey will provide an accurate depiction of all areas subject to CWA and/or RHA 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 including wetlands**, have been delineated and surveyed and are accurately depicted on the plat signed by the Corps Regulatory Official identified below on **SURVEY SIGNED DATE**. 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/property 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, including wetlands, without a Department of the Army permit may constitute a violation of Section 301 of the Clean Water Act (33 USC § 1311). Placement of dredged or fill material, construction or placement of structures, or work within navigable waters of the United States without a Department of the Army permit may constitute a violation of Sections 9 and/or 10 of the Rivers and Harbors Act (33 USC § 401 and/or 403). If you have any questions regarding this determination and/or the Corps regulatory program, please contact **Bryan Roden-Reynolds at 704-510-1440 or bryan.roden-reynolds@usace.army.mil**.

C. Basis For Determination: Basis For Determination: See the preliminary jurisdictional determination form dated 03/01/2018.

D. Remarks: None.

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 **Not applicable**.

****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: RODEN REYNOLDS.BRYAN.KENNETH.1263385574

Digitally signed by RODEN REYNOLDS.BRYAN.KENNETH.1263385574
 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=RODEN REYNOLDS.BRYAN.KENNETH.1263385574
 Date: 2018.03.26 14:28:30 -0400

Date of JD: **03/01/2018** Expiration Date of JD: **Not applicable**

SAW-2017-01506

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 the Customer Satisfaction Survey located at http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0

Copy furnished:

Agent: **Resource Environmental Solutions**
Jeremy Schmid
Address: **302 Jefferson Street, Suite 100**
Raleigh, NC 27605
Telephone Number: **919-926-1473**
E-mail: **jschmid@res.us**

**NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND
REQUEST FOR APPEAL**

Applicant: **North Carolina Department of
Environmental Quality, Division of Mitigation Services,
Harry Tsomides**

File Number: **SAW-2017-01506**

Date: **03/01/2018**

Attached is:

See Section below

| | | |
|-------------------------------------|--|---|
| <input type="checkbox"/> | INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission) | A |
| <input type="checkbox"/> | PROFFERED PERMIT (Standard Permit or Letter of permission) | B |
| <input type="checkbox"/> | PERMIT DENIAL | C |
| <input type="checkbox"/> | APPROVED JURISDICTIONAL DETERMINATION | D |
| <input checked="" type="checkbox"/> | 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 the 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.

SAW-2017-01506

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: Bryan Roden-Reynolds
Asheville Regulatory Office
U.S Army Corps of Engineers
151 Patton Avenue, Room 208
Asheville, North Carolina 28801

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, Attn: Bryan Roden-Reynolds , 69 Darlington Avenue, Wilmington, North Carolina 28403

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

PRELIMINARY JURISDICTIONAL DETERMINATION (PJD) FORM

BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR PJD: 03/01/2018

B. NAME AND ADDRESS OF PERSON REQUESTING PJD: North Carolina Department of Environmental Quality, Division of Mitigation Services, Harry, Tsomides, 5 Ravenscroft Drive, Suite 102, Asheville, NC, 28801

C. DISTRICT OFFICE, FILE NAME, AND NUMBER: Wilmington District, Catbird Site, SAW-2017-01506

D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION: The review area is located on the east side of Spillman Road, approximately 1.3 miles north of the intersection of Spillman Road and NC-801. PIN: 585363218. Reference review area description shown in Jurisdictional Determination Package entitled "Potential Wetland or Non-Wetland Waters of the U.S. Map" and Printed Date of 09/29/2017.

(USE THE TABLE BELOW TO DOCUMENT MULTIPLE AQUATIC RESOURCES AND/OR AQUATIC RESOURCES AT DIFFERENT SITES)

State: NC County: Davie City: Mocksville
Center coordinates of site (lat/long in degree decimal format): Latitude: 36.0315 Longitude: -80.5007

Universal Transverse Mercator:

Name of nearest waterbody: Yadkin River

E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

- Office (Desk) Determination. Date:
- Field Determination. Date(s): **02/15/18**

TABLE OF AQUATIC RESOURCES IN REVIEW AREA WHICH "MAY BE" SUBJECT TO REGULATORY JURISDICTION.

| Site Number | Latitude (decimal degrees) | Longitude (decimal degrees) | Estimated amount of aquatic resources in review area (acreage and linear feet, if applicable) | Type of aquatic resources (i.e., wetland vs. non-wetland waters) | Geographic authority to which the aquatic resource "may be" subject (i.e., Section 404 or Section 10/404) |
|-------------|----------------------------|-----------------------------|---|--|---|
| Wetland WA | 36.029294 | -80.501398 | 0.01 acres | Wetland | 404 |
| Wetland WB | 36.029076 | -80.501420 | 0.03 acres | Wetland | 404 |
| Stream DS1 | 36.031451 | -80.500724 | 670 linear feet | Non-wetland | 404 |
| Stream DS1 | 36.030674 | -80.499509 | 242 linear feet | Non-wetland | 404 |
| Stream DS2 | 36.028923 | -80.501378 | 1,195 linear feet | Non-wetland | 404 |
| | | | | | |

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

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

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

- Maps, plans, plots or plat submitted by or on behalf of the PJD requestor:
Map: Vicinity Map Dated 10/26/2017
- Data sheets prepared/submitted by or on behalf of the PJD requestor.
 - Office concurs with data sheets/delineation report.
 - Office does not concur with data sheets/delineation report. Rationale: _____
- Data sheets prepared by the Corps: _____
- Corps navigable waters' study: _____
- U.S. Geological Survey Hydrologic Atlas: _____
- USGS NHD data.
- USGS 8 and 12 digit HUC maps.
- U.S. Geological Survey map(s). Cite scale & quad name: USGS Map, 1:24,000 Farmington
- Natural Resources Conservation Service Soil Survey. Citation: Soils Map, Soil Survey of Davie County
- National wetlands inventory map(s). Cite name: National Wetlands Inventory Map, USFWS NWI Mapper Dated 10/26/2017
- State/local wetland inventory map(s): _____
- FEMA/FIRM maps: _____
- 100-year Floodplain Elevation is: _____ (National Geodetic Vertical Datum of 1929)
- Photographs: Aerial (Name & Date): Potential Waters of the U.S. Map Dated 09/29/2017
or Other (Name & Date): _____
- Previous determination(s). File no. and date of response letter: _____
- Other information (please specify): _____

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

RODEN
REYNOLDS.BRYAN.KE
NNETH.1263385574

Digitally signed by RODEN
REYNOLDS.BRYAN.KENNETH.1263385574
DN: c=US, o=U.S. Government, ou=DoD,
ou=PKI, ou=USA, cn=RODEN
REYNOLDS.BRYAN.KENNETH.1263385574
Date: 2018.03.26 14:28:09 -04'00'

Signature and date of Regulatory
staff member completing PJD
03/01/2018

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

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



Potential Wetland or Non-Wetland Waters of the U.S. Map
 Catbird Mitigation Site
 Davie County, North Carolina



| | |
|------------------|------------|
| PROJECT MANAGER: | |
| DRAWN: | ATP |
| JOB NUMBER: | ##### |
| DATE: | 08/28/2017 |
| REVISIONS: | NONE |



Legend

- Wetland Data Points
- Upland Data Points
- Proposed Easement
- Potential Non-Wetland Waters of the US
- Potential Wetland Waters of the US

Appendix J – Invasive Species Plan


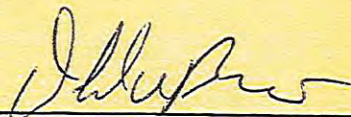
INVASIVE SPECIES PLAN

Annual monitoring and semi-annual site visits will be conducted to assess the condition of the finished project. These site inspections may identify the presence of invasive vegetation. RES will treat invasive species vegetation within the project area and provide remedial action on a case by- case basis. Common invasive species vegetation, such as Chinese privet (*Ligustrum sinense*), multiflora rose (*Rosa multiflora*), tree-of-heaven (*Ailanthus altissima*), and Japanese honeysuckle (*Lonicera japonica*), will be treated to allow native plants to become established within the conservation easement. Invasive species vegetation will be treated by approved mechanical and/or chemical methods such that the percent composition of exotic/invasive species is less than 5% of the total riparian buffer area. Any control methods requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDA) rules and regulations. If areas of invasive species exist within the easement, they will be monitored yearly as part of the monitoring protocol, and treated if necessary. If required, problem areas will continue to be treated until the project easement shows overall trending towards meeting all monitoring requirements.

Appendix K – Approved FHWA Categorical Exclusion Form

Categorical Exclusion Form for Division Mitigation Services
Projects
Version 1.4

| Part 1: General Project Information | |
|---|---|
| Project Name: | Catbird |
| County Name: | Davie |
| DMS ID Number: | 100022 |
| Project Sponsor: | Resource Environmental Solutions, LLC |
| Project Contact Name: | Cara Conder |
| Project Contact Address: | 302 Jefferson Street Suite 110, Raleigh, NC 27605 |
| Project Contact E-mail: | cconder@res.us |
| DMS Project Manager: | Harry Tsomides |
| Project Description | |
| <p>The Catbird site is a stream restoration site in Davie County (Yadkin River: 03040101160010) whose objectives are to restore or enhance 2,220 linear feet of two unnamed tributaries. The project watershed is primarily forested and mixed agricultural land, and has historically served this purpose. Most project reaches are currently being impacted by livestock production, agricultural production, and lack of riparian buffer. A combination of stream restoration and enhancement is proposed to increase hydrologic and ecological function and protect these natural features in perpetuity.</p> | |

| For Official Use Only | |
|---|--|
| Reviewed By: | |
| <u>12/11/2017</u> Date |  DMS Project Manager |
| Conditional Approved By: | |
| _____ Date | _____ For Division Administrator FHWA |
| <input type="checkbox"/> Check this box if there are outstanding issues | |
| Final Approval By: | |
| <u>12-8-17</u> 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? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | |
| 2. Does the project involve ground-disturbing activities within a CAMA Area of Environmental Concern (AEC)? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | |
| 3. Has a CAMA permit been secured? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | |
| 4. Has NCDCEM agreed that the project is consistent with the NC Coastal Management Program? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | |
| Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) | | |
| 1. Is this a "full-delivery" project? | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No | |
| 2. Has the zoning/land use of the subject property and adjacent properties ever been designated as commercial or industrial? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | |
| 3. As a result of a limited Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | |
| 4. As a result of a Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | |
| 5. As a result of a Phase II Site Assessment, are there known or potential hazardous waste sites within the project area? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | |
| 6. Is there an approved hazardous mitigation plan? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | |
| National Historic Preservation Act (Section 106) | | |
| 1. Are there properties listed on, or eligible for listing on, the National Register of Historic Places in the project area? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | |
| 2. Does the project affect such properties and does the SHPO/THPO concur? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | |
| 3. If the effects are adverse, have they been resolved? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A | |
| Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act) | | |
| 1. Is this a "full-delivery" project? | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No | |
| 2. Does the project require the acquisition of real estate? | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | |
| 3. Was the property acquisition completed prior to the intent to use federal funds? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A | |
| 4. Has the owner of the property been informed: * prior to making an offer that the agency does not have condemnation authority; and * what the fair market value is believed to be? | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | |

| Part 3: Ground-Disturbing Activities | |
|--|--|
| Regulation/Question | Response |
| American Indian Religious Freedom Act (AIRFA) | |
| 1. Is the project located in a county claimed as "territory" by the Eastern Band of Cherokee Indians? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 2. Is the site of religious importance to American Indians? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| 3. Is the project listed on, or eligible for listing on, the National Register of Historic Places? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| 4. Have the effects of the project on this site been considered? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| Antiquities Act (AA) | |
| 1. Is the project located on Federal lands? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 2. Will there be loss or destruction of historic or prehistoric ruins, monuments or objects of antiquity? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| 3. Will a permit from the appropriate Federal agency be required? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| 4. Has a permit been obtained? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| Archaeological Resources Protection Act (ARPA) | |
| 1. Is the project located on federal or Indian lands (reservation)? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 2. Will there be a loss or destruction of archaeological resources? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| 3. Will a permit from the appropriate Federal agency be required? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| 4. Has a permit been obtained? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| Endangered Species Act (ESA) | |
| 1. Are federal Threatened and Endangered species and/or Designated Critical Habitat listed for the county? | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| 2. Is Designated Critical Habitat or suitable habitat present for listed species? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A |
| 3. Are T&E species present or is the project being conducted in Designated Critical Habitat? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A |
| 4. Is the project "likely to adversely affect" the specie and/or "likely to adversely modify" Designated Critical Habitat? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| 5. Does the USFWS/NOAA-Fisheries concur in the effects determination? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| 6. Has the USFWS/NOAA-Fisheries rendered a "jeopardy" determination? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |

| Executive Order 13007 (Indian Sacred Sites) | |
|---|--|
| 1. Is the project located on Federal lands that are within a county claimed as "territory" by the EBCI? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 2. Has the EBCI indicated that Indian sacred sites may be impacted by the proposed project? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| 3. Have accommodations been made for access to and ceremonial use of Indian sacred sites? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| Farmland Protection Policy Act (FPPA) | |
| 1. Will real estate be acquired? | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| 2. Has NRCS determined that the project contains prime, unique, statewide or locally important farmland? | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A |
| 3. Has the completed Form AD-1006 been submitted to NRCS? | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A |
| Fish and Wildlife Coordination Act (FWCA) | |
| 1. Will the project impound, divert, channel deepen, or otherwise control/modify any water body? | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| 2. Have the USFWS and the NCWRC been consulted? | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A |
| Land and Water Conservation Fund Act (Section 6(f)) | |
| 1. Will the project require the conversion of such property to a use other than public, outdoor recreation? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 2. Has the NPS approved of the conversion? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| Magnuson-Stevens Fishery Conservation and Management Act (Essential Fish Habitat) | |
| 1. Is the project located in an estuarine system? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 2. Is suitable habitat present for EFH-protected species? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| 3. Is sufficient design information available to make a determination of the effect of the project on EFH? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| 4. Will the project adversely affect EFH? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| 5. Has consultation with NOAA-Fisheries occurred? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| Migratory Bird Treaty Act (MBTA) | |
| 1. Does the USFWS have any recommendations with the project relative to the MBTA? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 2. Have the USFWS recommendations been incorporated? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| Wilderness Act | |
| 1. Is the project in a Wilderness area? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 2. Has a special use permit and/or easement been obtained from the maintaining federal agency? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |

Appendix E – Categorical Exclusion Summary

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, created a tax on the chemical and petroleum industries to clean up abandoned or uncontrolled hazardous waste sites.

As a part of the ERTR and CERCLA compliance, an EDR Radius Map Report with Geocheck was ordered for the Catbird Mitigation Site through Environmental Data Resources, Inc (EDR) on July 7, 2017. According to the EDR report, there were not listed sites located within 1 mile of the project site. In addition to the EDR search, a visual inspection of the Catbird site was conducted to assess the potential for the occurrence of recognized environmental conditions on the property that might not have been revealed in the EDR report. The inspection was conducted to locate and identify any obvious use, storage, or generation of hazardous materials. No hazardous storage containers or substances were observed.

Overall, the EDR assessment revealed no evidence of “recognized environmental conditions” in connection with the target property. The summary of the EDR report is included in the Appendix.

National Historical Preservation Act (Section 106)

The National Historical Preservation Act (NHPA) is legislation intended to preserve historical and archaeological sites in the United States of America. RES requested review and comment from the State Historic Preservation Office (SHPO) with respect to any archaeological and architectural resources related to the Catbird Mitigation Site on October 20th, 2017. SHPO responded on October 24, 2017 and had no objections to the Catbird Project. The correspondence SHPO can be found in the Appendix.

Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)

The Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act) provides important protections and assistance for those people affected by federally funded projects. The Uniform Act applies to the acquisition, rehabilitation, or demolition of real property for federally funded projects. The Catbird Mitigation Site is a full-delivery project that includes land acquisition. Notification of fair market value of the property and the lack of condemnation authority was completed by RES. The landowner was notified of fair market value and condemnation authority was listed in the option agreement.

Endangered Species Act (ESA)

Section 7 of the ESA requires federal agencies, in consultation with and with the assistance of the Secretary of the Interior or of Commerce, as appropriate, to ensure that actions they authorize, fund or carry out are not likely to jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of critical habitat for these species.

Davie County’s list of threatened and endangered species include Michaux’s Sumac (*Rhus michauxii*) and Northern Long Eared Bat (NLEB) (*Myotis septentrionalis*). Other than the NLEB, the Catbird Mitigation Site does not support any habitat related to any of the threatened or endangered species listed above.

During site visits performed by RES, no NLEB individuals were found to exist on the site. A completed NLEB 4(d) Rule Streamline Consultation Form will be submitted by the Federal Highways Administration to the USFWS. The NLEB 4(d) Rules states “that the project may affect the NLEB, but that any resulting incidental take of the NLEB is not prohibited by the final 4(d) rule.” All correspondence with the USFWS is included in the Appendix.

Farmland Protection Policy Act (FPPA)

The Farmland Protection Policy Act (FPPA) is intended to minimize the impact federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. The Catbird Mitigation Site includes the conversion of prime farmland. As such, Form AD-1006 has been completed and submitted to the Natural Resource Conservation Service (NRCS). The completed form and correspondence documenting the submittal is included in the Appendix.

Fish and Wildlife Coordination Act (FWCA)

The Fish and Wildlife Coordination Act (FWCA) of the United States was enacted to protect fish and wildlife when federal actions result in the control or modification of a natural stream or body of water. Since the Catbird Mitigation Site includes stream restoration RES requested comment from the North Carolina Fish and Wildlife Resource Commission (NCWRC). The NCWRC responded on December 1, 2017 and stated there are no records for any listed aquatic species in the vicinity of the project. All correspondence can be found in Appendix F.

Migratory Bird Treaty Act (MBTA)

The MBTA makes it unlawful for anyone to kill, capture, collect, possess, buy, sell, trade, ship import, or extort and migratory bird. The indirect killing of birds by destroying their nests and eggs is covered by the MBTA, so construction in nesting areas during nesting seasons can constitute as taking.

RES requested comment on the Catbird Mitigation Site from the USFWS in regard to migratory birds on October 20th, 2017. The USFWS responded on November 20, 2017 and stated that besides the Northern long-eared bat, there is no record of other federally protected species in the project vicinity. All correspondence with USFWS will be included in the Appendix.

Letters to and from Agencies



October 20, 2017

Renee Gledhill-Earley
North Carolina State Historic Preservation Office
4617 Mail Service Center
Raleigh NC 27699-4617

Dear Ms. Gledhill-Earley,

The Catbird Site has been identified by Resource Environmental Solutions, LLC (RES) to provide compensatory mitigation for unavoidable stream impacts. The proposed project involves the restoration and enhancement of approximately 2,220 linear feet of stream.

RES requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with a potential stream mitigation project on the Catbird Site (a USGS site map with approximate limits of conservation easement is attached).

A review of the N.C. State Historic Preservation Office (SHPO) HPOWEB GIS Service database (<http://gis.ncdcr.gov/hpoweb/>; accessed October 11, 2017) was performed as part of the site due diligence evaluation. The database did not reveal any listed or potentially eligible historic or archeological resources on the proposed properties. In addition, the majority of the site has historically been disturbed due to cattle grazing.

We ask that you review this site based on the attached information to determine the presence of any historic properties. We thank you in advance for your timely response and cooperation. You may return the comment to my attention at the address below, or via email. Please feel free to contact me at mdeangelo@res.us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

A handwritten signature in blue ink that reads "Matt DeAngelo".

Matt DeAngelo
Ecologist

302 Jefferson St., Suite 110
Raleigh, NC 27605
Tel. 984.255.9133

10055 Red Run Blvd.
Suite 130
Owings Mills, MD
21117

412 N. 4th St.
Suite 300
Baton Rouge, LA
70802

100 Calhoun St.
Suite 320
Charleston, SC
29401

5020 Montrose Blvd.
Suite 650
Houston, TX
77006

1200 Camellia Blvd.
Suite 220
Lafayette, LA
70508

137½ East Main St.
Suite 210
Oak Hill, WV
25901

33 Terminal Way
Suite 431
Pittsburgh, PA
15219

302 Jefferson St.
Suite 110
Raleigh, NC
27605

1521 W. Main
2nd Floor
Richmond, VA
23220



North Carolina Department of Natural and Cultural Resources
State Historic Preservation Office

Ramona M. Bartos, Administrator

Governor Roy Cooper
Secretary Susi H. Hamilton

Office of Archives and History
Deputy Secretary Kevin Cherry

October 17, 2017

Kimberly Browning
US Army Corps of Engineers
Wilmington District

Kimberly.D.Browning@usace.army.mil

Re: Catbird Mitigation Site, Davie County, ER 17-1797

Dear Ms. Browning:

Thank you for your public notice of September 20, 2017, concerning the above project.

We have conducted a review of the project and are aware of no historic resources which would be affected by the project. Therefore, we have no comment on the project as proposed.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579 or renee.gledhill-earley@ncdcr.gov. In all future communication concerning this project, please cite the above-referenced tracking number.

Sincerely,

A handwritten signature in blue ink that reads "Renee Gledhill-Earley".

Ramona M. Bartos



October 20, 2017

Mr. Vann Stancil
Habitat Conservation Biologist
North Carolina Wildlife Resources Commission
215 Jerusalem Church Road
Kenly, NC 27542

Subject: Project Scoping for Catbird Stream Mitigation Project in Davie County.

Dear Mr. Stancil,

The purpose of this letter is to request review and comment on any possible issues that might emerge with respect to fish and wildlife associated with a potential stream restoration project on the attached site (USGS site maps with approximate property lines and areas of potential ground disturbance are enclosed). The Catbird Site has been identified by Resource Environmental Solutions, LLC (RES) to provide compensatory mitigation for unavoidable stream impacts. The proposed project involves the restoration and enhancement of approximately 2,220 linear feet of stream. The site is currently used for cattle grazing and the stream channels have been channelized and impounded.

We thank you in advance for your timely response and cooperation. You may return the comment to my attention at the address below. Please feel free to contact me at mdeangelo@res.us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

A handwritten signature in black ink that reads "Matt DeAngelo".

Matt DeAngelo
Ecologist

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302 Jefferson St.
Suite 110
Raleigh, NC
27605

1521 W. Main
2nd Floor
Richmond, VA
23220

From: Stancil, Vann F <vann.stancil@ncwildlife.org>
Sent: Friday, December 1, 2017 1:17 PM
To: Matthew DeAngelo
Subject: RE: [External] Mockingbird Mitigation Site

Matt,

Thanks for the opportunity to review these 3 mitigation project for issues related to fish and wildlife.

The Mockingbird Stream Mitigation Site is located on Hauser Creek and its tributaries in Davie County. Hauser Creek is a direct tributary to the Yadkin River. There's an existing easement downstream of this new mitigation site. There are no records for any listed aquatic species in the vicinity of this project.

The Catbird Stream Mitigation Site appears to be located on an unnamed tributary to the Yadkin River located east of Hauser Creek in Davie County. There are no records for any listed aquatic species in the vicinity of this project.

The Little Sebastian Stream Mitigation Site is located in Surry County on Mill Creek and 3 of it's tributaries. Mill Creek is a tributary to the Mitchell River. While there are no records of listed aquatic species in Mill Creek, there are records for brook floater, *Alasmidonta varicosa*, in the Mitchell River upstream and downstream of the Mill Creek confluence. Brook floater is a state endangered species. I've consulted with our aquatic biologists about the possibility of brook floaters in Mill Creek. There are no records from Mill Creek, but we don't have any records of collection efforts there either. So brook floaters may inhabit Mill Creek, near the area proposed for restoration. Our biologist plan to investigate Mill Creek to see if there are brook floaters present or if the habitat there is likely to support them. If brook floaters, or another listed aquatic species is found, additional measures will be needed to protect these species if restoration efforts are likely to impact them. While restoration efforts are likely to improve habitat conditions in the long term in Mill Creek, and potentially improve conditions downstream in the Mitchell River as well, there may be short term impacts to aquatic species and habitats during restoration. Additional measures during restoration may be needed to minimize these short term impacts.

Regarding terrestrial species, the U.S. Fish and Wildlife Service (USFWS) recently listed the northern long-eared bat (*Myotis septentrionalis*) as threatened under the Endangered Species Act. Davie & Surry counties are within the range (<https://www.fws.gov/midwest/endangered/mammals/nleb/pdf/WNSZone.pdf>) of the northern long-eared bat and may be present or in the vicinity of the project site. As such, consultation with the USFWS may be required. For more information, please see <https://www.fws.gov/midwest/endangered/mammals/nleb/> or https://www.fws.gov/raleigh/NLEB_RFO.html or contact the Asheville office of the USFWS to ensure that potential issues related to this species are addressed.

Please let me know if I can assist further. Also, feel free to follow up on the results of survey efforts in Mill Creek if you have not yet heard from me.

Thanks,
Vann

From: Matthew DeAngelo [<mailto:mdeangelo@res.us>]
Sent: Friday, October 20, 2017 12:50 PM
To: Stancil, Vann F <vann.stancil@ncwildlife.org>
Cc: Brad Breslow <bbreslow@res.us>
Subject: [External] Mockingbird Mitigation Site

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you verify that the attachment and content are safe. Send all suspicious email as an attachment to report.spam@nc.gov.

Dear Mr. Stancil,

The Mockingbird Stream Mitigation Site has been identified by Resource Environmental Solutions, LLC (RES) to provide compensatory mitigation for unavoidable stream and wetland impacts through the North Carolina Division of Mitigation Services. The purpose of this letter is to request, review, and comment on any possible issues that might emerge with respect to fish and wildlife associated with a potential stream restoration project on the attached site (USGS site maps with approximate property lines and areas of potential ground disturbance are enclosed along with a KMZ file). We thank you in advance for your timely response and cooperation. You may return the comment to my attention at the address below. Please feel free to contact me at mdeangelo@res.us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Matt DeAngelo

Ecologist

RES | res.us

Direct: 984.255.9133 | Mobile: 757.202.4471

Email correspondence to and from this sender is subject to the N.C. Public Records Law and may be disclosed to third parties.



October 20, 2017

Mrs. Janet Mizzi
US Fish and Wildlife Service
Asheville Field Office
160 Zillicoa Street
Asheville, NC 28801

Subject: Project Scoping for Catbird Mitigation Site in Davie County

Dear Mrs. Mizzi,

Resource Environmental Solutions (RES) requests review and comment from the United States Fish and Wildlife Service (USFWS) on any possible concerns they may have with regards to the implementation of the Catbird Mitigation Project. Please note that this request is in support of the development of the Categorical Exclusion (CE) for the referenced project. The proposed project involves the restoration and enhancement of approximately 2,220 linear feet of stream. The Site is currently in agricultural use, specifically as pasture and row crops.

The US Fish and Wildlife Service (USFWS) database (accessed 11 October 2017) lists one endangered species for Davie County, North Carolina: Michaux's sumac (*Rhus michauxii*). The database also lists the northern long-eared bat (*Myotis septentrionalis*) as a threatened species. No protected species or potential habitat for protected species was observed during preliminary site evaluations. A review of the NHP database indicates that there are no known occurrences of state threatened or endangered species within a one-mile radius of the project area. Based on initial site investigations, no impacts to federally protected species are anticipated as a result of the proposed project.

Please provide comments on any possible issues that might emerge with respect to endangered species, migratory birds, or other trust resources from the planting of a stream enhancement project on the subject property. Maps showing the location and approximate limits of the conservation easement are enclosed.

We thank you in advance for your timely response and cooperation. You may return the comment to my attention at the address below. Please feel free to contact me at mdeangelo@res.us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

A handwritten signature in black ink that reads "Matt DeAngelo".

Matt DeAngelo
Ecologist

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United States Department of the Interior



FISH AND WILDLIFE SERVICE

Asheville Field Office
160 Zillicoa Street
Asheville, North Carolina 28801

November 20, 2017

Mr. Matt DeAngelo
Resource Environmental Solutions
302 Jefferson Street, Suite 110
Raleigh, North Carolina 27605

Dear Mr. DeAngelo:

Subject: Catbird Mitigation Site; Davie County, North Carolina
Log No. 4-2-18-028

The U.S. Fish and Wildlife Service (Service) has reviewed the information provided in your correspondence received via email dated October 20, 2017. We submit the following comments in accordance with the provisions of the Fish and Wildlife Coordination Act, as amended (16 U.S.C. 661-667e); the National Environmental Policy Act (42 U.S.C. §4321 et seq.); and section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543) (Act).

Project Description

According to your correspondence, you are seeking our scoping comments to inform a NEPA document for a proposed mitigation bank near Farmington, North Carolina. The proposed bank would entail restoration and enhancement of approximately 2,220 linear feet of an unnamed tributary to the Yadkin River. Adjacent land use is dominated by pasture and row crops.

Federally Listed Endangered and Threatened Species

According to Service records, suitable summer roosting habitat may be present in the project area for the federally threatened northern long-eared bat (*Myotis septentrionalis*). However, the final 4(d) rule (effective as of February 16, 2016), exempts incidental take of northern long-eared bat associated with activities that occur greater than 0.25 miles from a known hibernation site, and greater than 150 feet from a known, occupied maternity roost during the pup season (June 1 – July 31). Based on the information provided, the project (which may or may not require tree clearing) would occur at a location where any incidental take that may result from associated activities is exempt under the 4(d) rule. **Although not required, we encourage you to avoid any associated tree clearing activities during the maternity roosting season from May 15 – August 15 if possible.**

The Service has record of no other federally protected species in the project vicinity.

We offer the following comments in the interest of protecting fish and wildlife resources:

Stream Channel and Bank Restoration

A natural, stable stream system is one that is able to transport a wide range of flows and associated bed load (sediment) while maintaining channel features and neither degrading

(accelerating the erosion of banks and scour of the channel bed) nor aggrading (accelerating the deposition of sediment within the channel). Alterations to the dimension (cross-sectional view of the channel), pattern (the sinuosity of the channel), or profile (longitudinal slope) of the stream channel as well as changes to streambank vegetation, floodplains, hydrology, or sediment input can significantly alter this equilibrium. Accordingly, we recommend the following:

1. Only the absolute minimum amount of work should be done within stream channels to accomplish necessary reconstruction. The amount of disturbance to in-stream and riparian areas should not exceed what can be stabilized by the end of the workday. Restoration plans should account for the constraints of the site and the opportunities to improve stream pattern, dimension, and profile with minimal disturbance.
2. All reconstruction work should follow natural channel design methodologies that are based on the bank-full, or channel-forming, stage of the stream. Bank-full stage maintains the natural channel dimensions and transports the bulk of sediment over time (Doll et al. 2003). Natural channel conditions should be identified using a reference reach (nearby stream reaches that exemplify restoration goals). Restoration design should match the pattern, dimension, and profile of the reference reach to ensure the project's success. The Service is available to assist with the identification of reference reaches.
3. All work in or adjacent to stream waters should be conducted in a dry work area to the extent possible. Sandbags, cofferdams, bladder dams, or other diversion structures should be used to prevent excavation in flowing water. These diversion structures should be removed as soon as the work area is stable. When practical, a pump-around operation shall be used to divert flow during construction.
4. Equipment should not be operated in the stream unless absolutely necessary. Machinery should be operated from the banks in a fashion that minimizes disturbance to woody vegetation. Equipment should be: (a) washed to remove any contaminant residue prior to project construction, (b) in good working order, and (c) checked to ensure there are no leaks of potential contaminants (such as oil or other lubricants) prior to and during construction.
5. Streambanks with deep-rooted woody vegetation are the most stable, and stream restoration efforts should incorporate the use of native vegetation adapted to the site conditions. Biodegradable erosion-control materials may be incorporated into bank-restoration design in order to stabilize soils as vegetation becomes established. Live dormant stakes (such as black willow) may be used to reestablish root structure in riparian areas. In areas where banks are severely undercut, high, and steep, whole-tree revetment or rock may be used as a stabilization treatment (small rock, gravel, sand, and dirt are not recommended due to their erosive nature), and it should not extend above the bank-full elevation (the elevation of the channel where the natural floodplain begins). Deep-rooting woody vegetation should be established along banks where any channel work is accomplished. Tree and shrub plantings should be spaced at intervals no greater

than 10 feet along banks. Vegetated riparian zone widths should be as wide as practical but should extend at least 30 feet from the stream channel.

6. Adequate measures to control sediment and erosion must be implemented prior to any ground-disturbing activities in order to minimize effects on downstream aquatic resources. In North Carolina, non-cohesive and erosion-prone soils are most common in the felsic-crystalline terrains of the mountain and upper piedmont regions (Miller and Kochel 2010). Therefore, reconstruction work should be staged such that disturbed areas would be stabilized with seeding, mulch, and/or biodegradable (coir) erosion-control matting prior to the end of each workday. No erosion-control matting or blankets should contain synthetic (netting) materials. Matting should be secured in place with staples; stakes; or, wherever possible, live stakes of native trees. If rain is expected prior to temporary seed establishment, additional measures should be implemented to protect water quality along slopes and overburden stockpiles (for example, stockpiles may be covered with plastic or other geotextile material).
7. Woody debris, detritus, and other vegetative materials are the main sources of nutrients and carbon necessary for primary productivity in stream ecosystems. Removal of this material can impact the production of higher trophic levels, including fish. The Service does not recommend the removal of woody debris within the stream channel or floodplain unless it is causing a debris blockage (logjam) or will affect the ability to achieve bank stability along a specific reach of stream. Woody debris that must be removed should be chipped on the site.
8. At each restoration site, cross-sections (at intervals based on restoration reach size), longitudinal profiles, and stream-pattern plans should be measured and mapped prior to and immediately following any channel work. In addition, photographs should be taken to document the condition of the project site prior to initiating the work and upon completion of the work. However, since a project's restoration success does not necessarily equate to biological success, the ecological goals of the project should be clearly defined and assessed for improvement after construction is completed (Palmer et al. 2005).

The Service appreciates the opportunity to provide these comments. Please contact Mr. Byron Hamstead of our staff at 828/258-3939, Ext. 225, if you have any questions. In any future correspondence concerning this project, please reference our Log Number 4-2-18-028.

Sincerely,

-- original signed --

Janet Mizzi
Field Supervisor

References

- Doll, B.A., G.L. Grabow, K.R. Hall, J. Halley, W.A. Harman, G.D. Jennings, and D.E. Wise. 2003. Stream Restoration: A Natural Channel Design Handbook. North Carolina Stream Restoration Institute, North Carolina State University. 128 pp.
- Hall, K. 2003. Recommended Native Plant Species for Stream Restoration in North Carolina. Raleigh: North Carolina Stream Restoration Institute, North Carolina State University.
- Miller, J.R., and Kochel, R.C. 2010. Assessment of channel dynamics, in-stream structures and post-project channel adjustments in North Carolina and its implications to effective stream restoration. *Environmental Earth Sciences*, 59(8), pp. 1681-1692.
- Palmer, M.A., E.S. Bernhardt, J.D. Allan, P.S. Lake, G. Alexander, S. Brooks, J. Carr, S. Clayton, C.N. Dahm, J. Follstad Shah, and D.L. Galat. 2005. Standards for ecologically successful river restoration. *Journal of Applied Ecology*, 42(2), pp. 208-217.

Northern Long-Eared Bat 4(d) Rule Streamlined Consultation Form

Federal agencies should use this form for the optional streamlined consultation framework for the northern long-eared bat (NLEB). This framework allows federal agencies to rely upon the U.S. Fish and Wildlife Service's (USFWS) January 5, 2016, intra-Service Programmatic Biological Opinion (BO) on the final 4(d) rule for the NLEB for section 7(a)(2) compliance by: (1) notifying the USFWS that an action agency will use the streamlined framework; (2) describing the project with sufficient detail to support the required determination; and (3) enabling the USFWS to track effects and determine if reinitiation of consultation is required per 50 CFR 402.16.

This form is not necessary if an agency determines that a proposed action will have no effect to the NLEB or if the USFWS has concurred in writing with an agency's determination that a proposed action may affect, but is not likely to adversely affect the NLEB (i.e., the standard informal consultation process). Actions that may cause prohibited incidental take require separate formal consultation. Providing this information does not address section 7(a)(2) compliance for any other listed species.

| Information to Determine 4(d) Rule Compliance: | YES | NO |
|--|-------------------------------------|-------------------------------------|
| 1. Does the project occur wholly outside of the WNS Zone ¹ ? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 2. Have you contacted the appropriate agency ² to determine if your project is near known hibernacula or maternity roost trees? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3. Could the project disturb hibernating NLEBs in a known hibernaculum? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 4. Could the project alter the entrance or interior environment of a known hibernaculum? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 5. Does the project remove any trees within 0.25 miles of a known hibernaculum at any time of year? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 6. Would the project cut or destroy known occupied maternity roost trees, or any other trees within a 150-foot radius from the maternity roost tree from June 1 through July 31. | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

You are eligible to use this form if you have answered yes to question #1 **or** yes to question #2 **and** no to questions 3, 4, 5 and 6. The remainder of the form will be used by the USFWS to track our assumptions in the BO.

Agency and Applicant³ (Name, Email, Phone No.):

Donnie Brew, Donnie.brew@dot.gov, 919-747-7017
Federal Highway Administration

Cara Conder, cconder@res.us, 919-209-1052
Resource Environmental Solutions, LLC (EBX is an entity of RES)

¹ <http://www.fws.gov/midwest/endangered/mammals/nleb/pdf/WNSZone.pdf>

² See <http://www.fws.gov/midwest/endangered/mammals/nleb/nhisites.html>

³ If applicable - only needed for federal actions with applicants (e.g., for a permit, etc.) who are party to the consultation.

Project Name: Catbird Stream Mitigation Project, DMS Project #100022

Project Location (include coordinates if known):

The Project is located in Davie County approximately eight miles west of Clemmons and five miles northwest of Bermuda Run. From Raleigh, proceed west on I-40 towards Greensboro. Continue on I-40 West for 115 miles. Take exit 180B to merge onto NC-801. Stay on NC-801 for 4 miles. Take a right onto Spillman Road and continue for approximately one mile and the project will be on the right. Coordinates for the site are as follows: 36.030644 N, -80.500865 W.

Basic Project Description (provide narrative below or attach additional information):

The Catbird Stream Mitigation Site is located in Davie County, approximately eight miles west of Clemmons and five miles northwest of Bermuda Run (Figure 1). The Project is located in the Yadkin River Basin within Cataloging Unit 03040101 and TLW 03040101160010. The Project's watershed is primarily active cattle pasture. The Project area includes two unnamed tributaries that eventually drain to the Yadkin River. Water quality stressors currently affecting the Project include livestock production, agricultural production, and lack of riparian buffer. The Project's watershed is primarily forested and mixed agricultural land, and has historically served this purpose. Field evaluations determined all reaches to be either intermittent or perennial. A combination of stream restoration and enhancement is proposed to increase hydrologic and ecological function and protect these features in perpetuity (Figure 2). All reaches proposed for inclusion in the Project include a minimum 50-foot buffer on each bank.

The Project will include Priority I stream restoration and stream Enhancement II on two stream reaches (DS1, DS2-A, and DS2-B). Restoration activities will include constructing an E/C type stream with appropriate dimensions and pattern, reconnecting the channel to the floodplain, and backfilling the abandoned channel. In-stream structures such as log sills and brush toes will be installed for vertical stability and to improve habitat. Buffer improvements will filter runoff from agricultural fields, thereby reducing nutrient and sediment loads to the channel. The widening and restoration of the riparian areas will also provide wildlife corridors throughout the project area.

Enhancement II activities will include the re-establishment of a riparian buffer and live-staking the channel banks with native vegetation. Proposed buffer activities will improve riparian areas that will filter runoff from adjacent pastures, thereby reducing nutrient and sediment loads to the channel. Livestock exclusion fencing will be installed per current Natural Resource Conservation Services specifications.

One agricultural BMP will be installed at the upper end of the reach (DS1, Figure 2) to provide nutrient/sediment control and flow attenuation from the adjacent pasture.

Any tree removal due to the construction of the stream mitigation site will be limited to the area along the channel banks. An effort will be made to conduct any tree cutting of suitable summer roosting tree species between August 1 and May 31, but will ultimately depend on the construction/contractor timeline.

The following objectives are proposed for accomplishing project goals:

- a. Provide an estimated 2,095 stream mitigation units (SMUs) through Priority I restoration of approximately 2,011 linear feet and Enhancement II on 209 linear feet of existing stream (see table below).
- b. Restore stable channel morphology and proper sediment transport capacity.
- c. Create and improve stream bed form and improve aquatic and benthic macroinvertebrate habitat.
- d. Construct a floodplain bench that is accessible at the proposed bankfull channel elevation.
- e. Improve channel and stream bank stabilization by integrating in-stream structures and native bank vegetation.

- f. Provide approximately 5.95 acres of riparian buffer restoration by establishing a native forested and herbaceous riparian buffer plant community with a minimum width of 50 feet from the edge of the restored channels. This new community will be established in conjunction with the eradication of any existing exotic or undesirable plant species.

| Proposed Mitigation | | | | |
|----------------------------|--------------------------|--------------------|-------------------------|---------------------------------------|
| Reach | Restoration Level | Linear Feet | Mitigation Ratio | Stream Mitigation Units (SMUS) |
| DS1 | Restoration | 940 | 1:1 | 940 |
| DS2-A | Enhancement II | 209 | 2.5:1 | 209 |
| DS2-B | Restoration | 1,071 | 1: 1 | 1,071 |
| Stream Totals | | 2,220 | | 2,095 |

| General Project Information | YES | NO |
|--|-------------------------------------|-------------------------------------|
| Does the project occur within 0.25 miles of a known hibernaculum? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Does the project occur within 150 feet of a known maternity roost tree? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Does the project include forest conversion ⁴ ? (if yes, report acreage below) | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Estimated total acres of forest conversion | 1.7 ac | |
| If known, estimated acres ⁵ of forest conversion from April 1 to October 31 | 1.7 ac | |
| If known, estimated acres of forest conversion from June 1 to July 31 ⁶ | | |
| Does the project include timber harvest? (if yes, report acreage below) | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Estimated total acres of timber harvest | | |
| If known, estimated acres of timber harvest from April 1 to October 31 | | |
| If known, estimated acres of timber harvest from June 1 to July 31 | | |
| Does the project include prescribed fire? (if yes, report acreage below) | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Estimated total acres of prescribed fire | | |
| If known, estimated acres of prescribed fire from April 1 to October 31 | | |
| If known, estimated acres of prescribed fire from June 1 to July 31 | | |
| Does the project install new wind turbines? (if yes, report capacity in MW below) | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Estimated wind capacity (MW) | | |

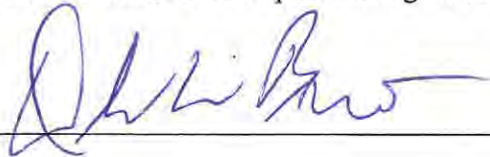
Agency Determination:

By signing this form, the action agency determines that this project may affect the NLEB, but that any resulting incidental take of the NLEB is not prohibited by the final 4(d) rule.

If the USFWS does not respond within 30 days from submittal of this form, the action agency may presume that its determination is informed by the best available information and that its project responsibilities under 7(a)(2) with respect to the NLEB are fulfilled through the USFWS January 5, 2016, Programmatic BO. The action agency will update this determination annually for multi-year activities.

The action agency understands that the USFWS presumes that all activities are implemented as described herein. The action agency will promptly report any departures from the described activities to the appropriate USFWS Field Office. The action agency will provide the appropriate USFWS Field Office with the results of any surveys conducted for the NLEB. Involved parties will promptly notify the appropriate USFWS Field Office upon finding a dead, injured, or sick NLEB.

Signature: _____



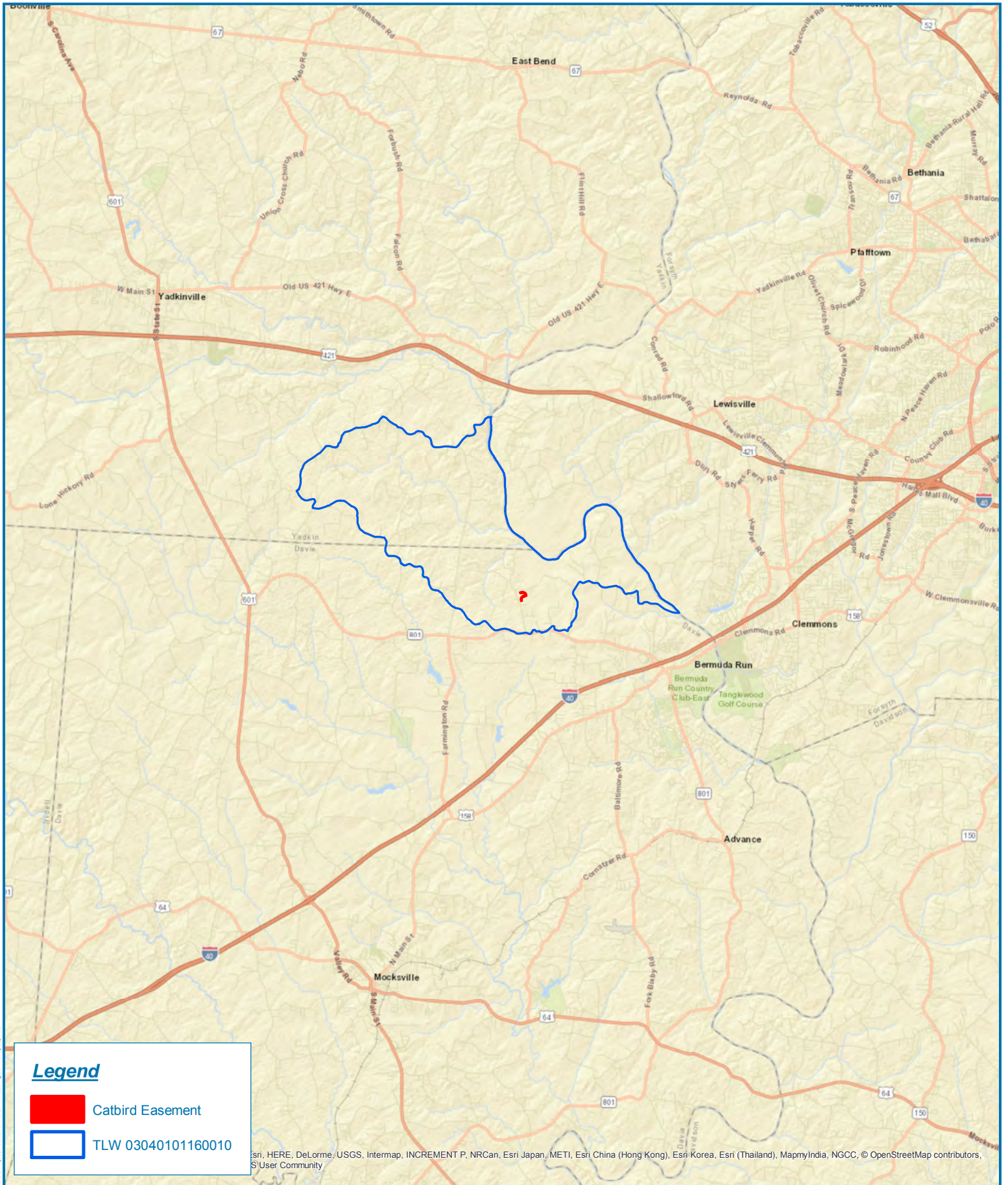
Date Submitted: _____

12-4-17

⁴ Any activity that temporarily or permanently removes suitable forested habitat, including, but not limited to, tree removal from development, energy production and transmission, mining, agriculture, etc. (see page 48 of the BO).

⁵ If the project removes less than 10 trees and the acreage is unknown, report the acreage as less than 0.1 acre.

⁶ If the activity includes tree clearing in June and July, also include those acreage in April to October.



Legend

- Catbird Easement
- TLW 03040101160010

Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, SUser Community

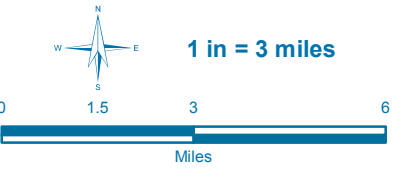


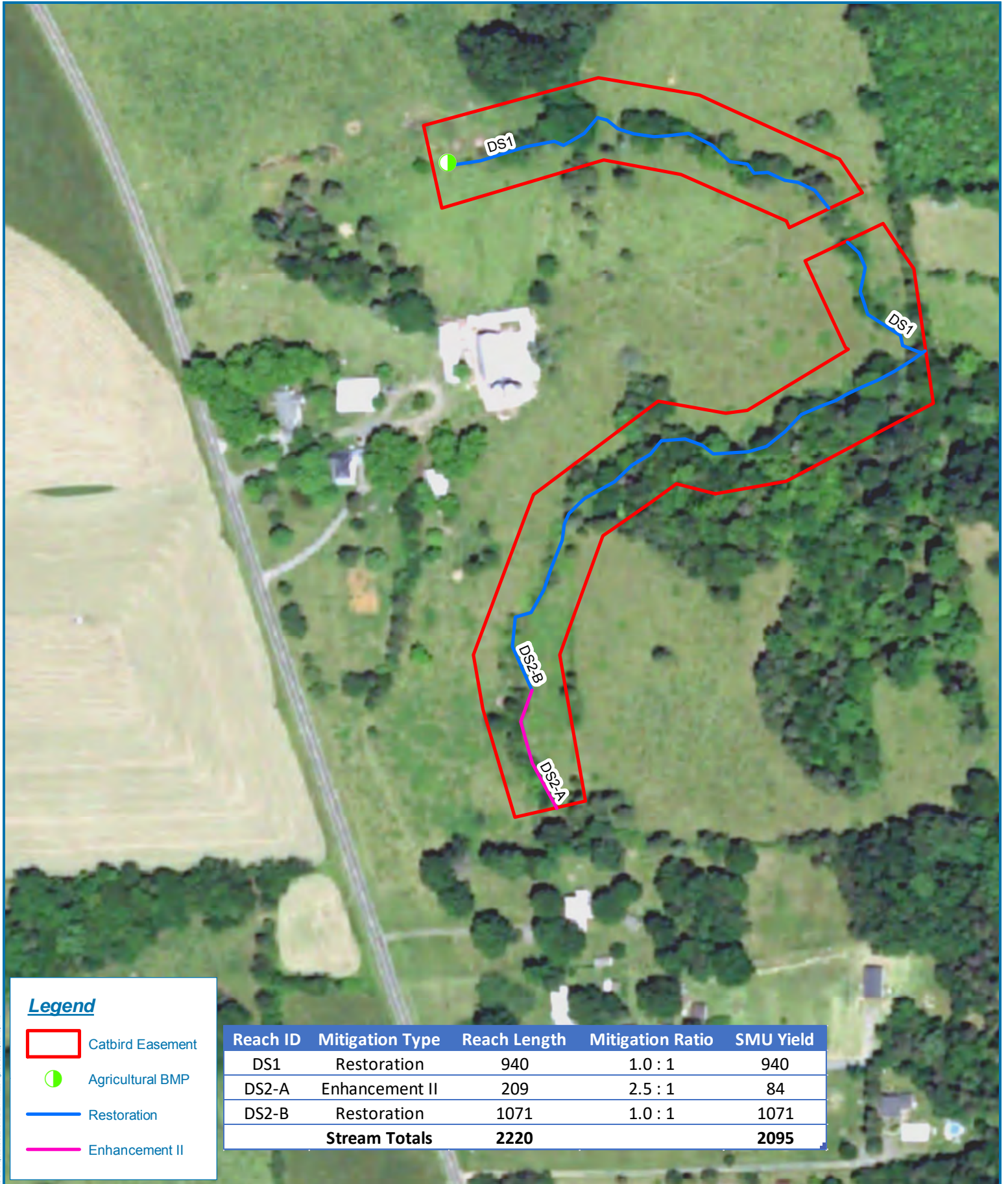
Figure 1
Watershed Map
Catbird Stream Mitigation Site
Davie County, North Carolina

Date: 11/13/2017

Drawn by: MDE



Document Path: C:\Users\mgall\Dropbox (RES)\GIS\Projects\Catbird\MapServer\TLW03040101160010.mxd



Legend

- Catbird Easement
- Agricultural BMP
- Restoration
- Enhancement II

| Reach ID | Mitigation Type | Reach Length | Mitigation Ratio | SMU Yield |
|----------------------|-----------------|--------------|------------------|-------------|
| DS1 | Restoration | 940 | 1.0 : 1 | 940 |
| DS2-A | Enhancement II | 209 | 2.5 : 1 | 84 |
| DS2-B | Restoration | 1071 | 1.0 : 1 | 1071 |
| Stream Totals | | 2220 | | 2095 |



1 inch = 200 feet

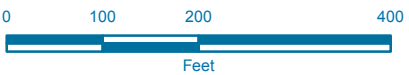


Figure 2

**Conceptual Design Map
Catbird Stream Mitigation Site**

Davie County, North Carolina

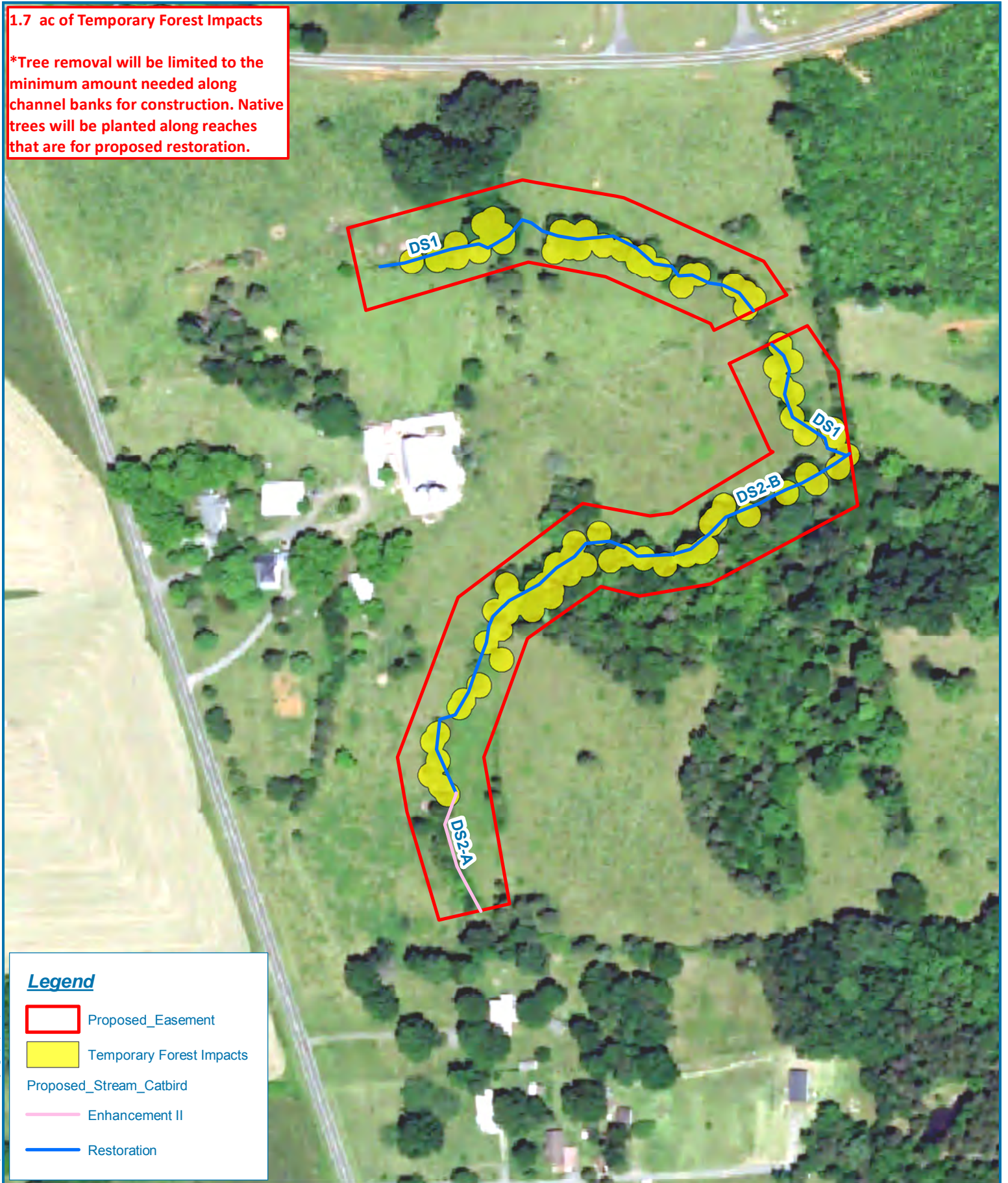
Date: 11/13/2017

Drawn by: MDE



1.7 ac of Temporary Forest Impacts

*Tree removal will be limited to the minimum amount needed along channel banks for construction. Native trees will be planted along reaches that are for proposed restoration.



Legend

- Proposed_Easement
- Temporary Forest Impacts
- Proposed_Stream_Catbird
- Enhancement II
- Restoration

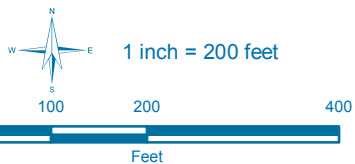


Figure 3

**Temporary Forest Impacts Map
Catbird Stream Mitigation Site**

Davie County, North Carolina

Date: 11/10/2017

Drawn by: MDE





October 20, 2017

Randy Blackwood
Natural Resources Conservation Service
301 E Center St.
Lexington, NC 27292-4107

Subject: AD-1006 Request for the Catbird Mitigation Site in Davie County

Dear Mr. Blackwood,

Resource Environmental Solutions (RES) requests review and comment from the Natural Resources Conservation Service on any possible concerns that may emerge with respect to farmland resources including prime, unique, statewide or local important farmland associated with the Catbird stream mitigation project. This project is being developed for the North Carolina Division of Mitigation Services. Please note that this request is in support of the development of the Categorical Exclusion (CE) and an Environmental Resource Technical Report for the referenced project.

The Catbird Site has been identified for the purposes of providing mitigation for unavoidable stream channel impacts in the Yadkin River Basin. RES has been awarded the contract to design and implement the Mockingbird project. A requirement of the project is to prepare and Environmental Resource Technical Document that describes resources present on the project site.

The Project is located in the Turner and Hauser Creeks Watershed (03040101160010), a Targeted Local Watershed (TLW). The Project supports many of the Upper Yadkin River Basin Restoration Priorities (RBRP) goals and presents an opportunity to restore 2,100 linear feet and enhance 209 linear feet of warm water stream and riparian corridor. The Project will provide numerous ecological and water quality benefits within the Yadkin River Basin. These benefits are not limited to the project area, but have more far-reaching effects throughout the Yadkin River Basin. The Project will provide improvements to water quality, hydrologic function, and habitat. Coordinates for the site are as follows: 36.030644 N, -80.500865 W.

An inventory of soils data was completed by RES utilizing Web Soil Survey to determine prime farmland classifications for the project area. Two soil map units in the project area are classified as farmland of state importance, making up approximately 37% of the site. One soil map unit in the project area is classified as not prime farmland, making up 62% of the site.

Enclosed is Form AD-1006 with Parts I and III Completed and maps of the Mockingbird Site. We ask that you review the site information and complete Parts II, IV, and V as required by NRCS. Please email (mengel@res.us), or mail your reply to the address below.

10055 Red Run Blvd.
Suite 130
Owings Mills, MD
21117

412 N. 4th St.
Suite 300
Baton Rouge, LA
70802

100 Calhoun St.
Suite 320
Charleston, SC
29401

5020 Montrose Blvd.
Suite 650
Houston, TX
77006

1200 Camellia Blvd.
Suite 220
Lafayette, LA
70508

137½ East Main St.
Suite 210
Oak Hill, WV
25901

33 Terminal Way
Suite 431
Pittsburgh, PA
15219

302 Jefferson St.
Suite 110
Raleigh, NC
27605

1521 W. Main
2nd Floor
Richmond, VA
23220

We thank you in advance for your timely response and cooperation. Please feel free to contact me with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

A handwritten signature in black ink, appearing to read "Megan D Engel". The signature is written in a cursive style with a large, stylized "M" and "E".

Megan D Engel
Field Ecologist

302 Jefferson St., Suite 110
Raleigh, NC 27605
Tel. 919.209.1052
Fax: 919.829.9913

Attachments: Vicinity Map (Figure 1), USGS topographic map (Figure 2), Conceptual Plan Maps (Figure 7), & AD-1006

Megan Engel

From: Cortes, Milton - NRCS, Raleigh, NC <Milton.Cortes@nc.usda.gov>
Sent: Tuesday, November 14, 2017 2:55 PM
To: Megan Engel; Blackwood, Randy - NRCS, Asheboro, NC
Cc: Brad Breslow
Subject: RE: AD1006 requests, Davie County, NC
Attachments: AD1006_Catbird_Mitigation.pdf; Letter_Catbird_Mitigation_DavieCo.pdf

Importance: High

Megan:

Please, find attached the Farmland Conversion Impact Rating for the Catbird Conservation Easement, Davie County, NC.

If we can be of further assistance please let us know.

Cordially;

Milton Cortes

Assistant State Soil Scientist

USDA Natural Resources Conservation Service

4407 Bland Rd, Suite 117

Raleigh, NC 27609

Phone: 919-873-2171

milton.cortes@nc.usda.gov



From: Megan Engel [mailto:mengel@res.us]
Sent: Monday, October 23, 2017 10:52 AM
To: Cortes, Milton - NRCS, Raleigh, NC <Milton.Cortes@nc.usda.gov>; Blackwood, Randy - NRCS, Asheboro, NC <Randy.Blackwood@nc.usda.gov>
Cc: Brad Breslow <bbreslow@res.us>
Subject: RE: AD1006 requests, Davie County, NC

Milton,

Good morning, and thank you for providing me with the updated FY2018 FPPA guidance. I have attached the two AD-1006 requests for Davie County (Mockingbird and Catbird mitigation sites) and they now include the WSS maps as per your email below.

Please let me know if you need anything else, and have a great day.

Megan D Engel

Field Ecologist

RES | res.us

Mobile: 909.844.7122

From: Cortes, Milton - NRCS, Raleigh, NC [<mailto:Milton.Cortes@nc.usda.gov>]
Sent: Monday, October 23, 2017 10:29 AM
To: Megan Engel <mengel@res.us>
Cc: Blackwood, Randy - NRCS, Asheboro, NC <Randy.Blackwood@nc.usda.gov>
Subject: AD1006 requests, Davie County, NC
Importance: High

Hi Megan:

I received the attached Farmland Conversion Impact Rating Requests from Randy Blackwood, Supervisory Soil Conservationist, Team 9.

I have attached a document with some instructions on what it is required to complete this type of request. All I need, at this time, is the soils map as described in the included instructions. Now, an alternative would be to get the GIS boundary shape file in a zip file so that I can import the file to WSS and generate the map and the mapunit inventory I need to complete the farmland evaluation.

If you have any question, please let me know.

Cordially:

Milton Cortes

Assistant State Soil Scientist

USDA Natural Resources Conservation Service

4407 Bland Rd, Suite 117

Raleigh, NC 27609

Phone: 919-873-2171

milton.cortes@nc.usda.gov



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Natural Resources
Conservation Service

November 14, 2017

North Carolina
State Office

4407 Bland Road
Suite 117
Raleigh, NC 27609
Voice 919-873-2171
Fax (844) 325-2156

Megan D Engel
Field Ecologist
Res
302 Jefferson St., Suite 110
Raleigh, NC 27605

Dear Megan D Engel:

Thank you for your letter dated October 25, 2017, Subject: Catbird Conservation Easement, Davie County, NC. The following guidance is provided for your information.

Projects are subject to the Farmland Protection Policy Act (FPPA) requirements if they may irreversibly convert farmland (directly or indirectly) to non-agricultural use and are completed by a federal agency or with assistance from a federal agency. Farmland means prime or unique farmlands as defined in section 1540(c)(1) of the FPPA or farmland that is determined by the appropriate state or unit of local government agency or agencies with concurrence of the Secretary of Agriculture to be farmland of statewide local importance.

For the purpose of FPPA, farmland includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to FPPA requirements does not have to be currently used for cropland. It can be forestland, pastureland, cropland, or other land, but not water or urban built-up land.

Farmland does not include land already in or committed to urban development or water storage. Farmland *already in* urban development or water storage includes all such land with a density of 30 structures per 40-acre area. Farmland already in urban development also includes lands identified as *urbanized area* (UA) on the Census Bureau Map, or as urban area mapped with a *tint overprint* on the United States Geological Survey (USGS) topographical maps, or as *urban-built-up* on the United States Department of Agriculture (USDA) Important Farmland Maps.

The area in question meets one or more of the above criteria for Farmland. Farmland area will be affected or converted. Enclosed is the Farmland Conversion Impact Rating form AD1006 with PARTS II, IV and V completed by NRCS. The corresponding agency will need to complete the evaluation, according to the Code of Federal Regulation 7CFR 658, Farmland Protection Policy Act.

Megan D Engel

Page 2

If you have any questions, please contact Milton Cortes, Assistant State Soil Scientist at 919-873-2171 or by email: milton.cortes@nc.usda.gov.

Again, thank you for inquiry. If we can be of further assistance, please do not hesitate to contact us.

Sincerely,

Milton Cortes
Assistant State Soil Scientist

cc:

Kent Clary, State Soil Scientist, NRCS, Raleigh, NC



November 20, 2017

Dwight Sparks
231 Hidden Creek Drive
Advance, NC 27006

Re: Catbird Mitigation Project

Dear Dwight,

As part of the environmental documentation process in preparation for the stream mitigation project on your property, this letter is to inform you of provisions in the Federal Highway Administration Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended, referred to as the Uniform Act.

The Uniform Act requires that we inform you in writing that this conservation easement transaction is voluntary and that the project is being developed by Environmental Banc & Exchange, LLC for the North Carolina Division of Mitigation Services (NCDMS). Neither EBX nor NCDMS have the authority to acquire the property by eminent domain. In addition, EBX believes that the agreed purchase price for the conservation easement area represents the fair market value.

This letter is for your information, and you do not need to respond. As always, please feel free to call me at 919-817-7378 with any questions.

Sincerely,

A handwritten signature in blue ink that reads 'Daniel B. Ramsay'.

Daniel Ramsay
Land Representative

412 N. 4th St. #300
Baton Rouge, LA 70802

1200 Camellia Blvd. #220
Lafayette, LA 70508

1434 Odenton Rd.
Odenton, MD 21113

10055 Red Run Blvd. #130
Owings Mills, MD 21117

302 Jefferson St. #110
Raleigh, NC 27605

33 Terminal Way #431
Pittsburgh, PA 15219

701 E. Bay St. #306
Charleston, SC 29403

5020 Montrose Blvd. #650
Houston, TX 77006

2750 Prosperity Ave. #220
Fairfax, VA 22031

1521 W. Main 2nd Floor
Richmond, VA 23233

3751 Westerre Pkwy. #A
Richmond, VA 23220

5367 Telephone Rd.
Warrenton, VA 20187

137½ East Main St. #210
Oak Hill, WV 25901

FARMLAND CONVERSION IMPACT RATING

| | | | | | |
|---|--|---------------------------------|--|---|-------------------|
| PART I (To be completed by Federal Agency) | | Date Of Land Evaluation Request | | | |
| Name of Project | | Federal Agency Involved | | | |
| Proposed Land Use | | County and State | | | |
| PART II (To be completed by NRCS) | | Date Request Received By NRCS | | Person Completing Form: | |
| Does the site contain Prime, Unique, Statewide or Local Important Farmland? <i>(If no, the FPPA does not apply - do not complete additional parts of this form)</i> | | YES <input type="checkbox"/> | NO <input type="checkbox"/> | Acres Irrigated | Average Farm Size |
| Major Crop(s) | Farmable Land In Govt. Jurisdiction Acres: % | | Amount of Farmland As Defined in FPPA Acres: % | | |
| Name of Land Evaluation System Used | Name of State or Local Site Assessment System | | Date Land Evaluation Returned by NRCS | | |
| PART III (To be completed by Federal Agency) | | Alternative Site Rating | | | |
| | | Site A | Site B | Site C | Site D |
| A. Total Acres To Be Converted Directly | | | | | |
| B. Total Acres To Be Converted Indirectly | | | | | |
| C. Total Acres In Site | | | | | |
| PART IV (To be completed by NRCS) Land Evaluation Information | | | | | |
| A. Total Acres Prime And Unique Farmland | | | | | |
| B. Total Acres Statewide Important or Local Important Farmland | | | | | |
| C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted | | | | | |
| D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value | | | | | |
| PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value of Farmland To Be Converted (Scale of 0 to 100 Points) | | | | | |
| PART VI (To be completed by Federal Agency) Site Assessment Criteria <i>(Criteria are explained in 7 CFR 658.5 b. For Corridor project use form NRCS-CPA-106)</i> | | Maximum Points | Site A | Site B | Site C |
| 1. Area In Non-urban Use | | (15) | | | |
| 2. Perimeter In Non-urban Use | | (10) | | | |
| 3. Percent Of Site Being Farmed | | (20) | | | |
| 4. Protection Provided By State and Local Government | | (20) | | | |
| 5. Distance From Urban Built-up Area | | (15) | | | |
| 6. Distance To Urban Support Services | | (15) | | | |
| 7. Size Of Present Farm Unit Compared To Average | | (10) | | | |
| 8. Creation Of Non-farmable Farmland | | (10) | | | |
| 9. Availability Of Farm Support Services | | (5) | | | |
| 10. On-Farm Investments | | (20) | | | |
| 11. Effects Of Conversion On Farm Support Services | | (10) | | | |
| 12. Compatibility With Existing Agricultural Use | | (10) | | | |
| TOTAL SITE ASSESSMENT POINTS | | 160 | | | |
| PART VII (To be completed by Federal Agency) | | | | | |
| Relative Value Of Farmland (From Part V) | | 100 | | | |
| Total Site Assessment (From Part VI above or local site assessment) | | 160 | | | |
| TOTAL POINTS (Total of above 2 lines) | | 260 | | | |
| Site Selected: | | Date Of Selection | | Was A Local Site Assessment Used? YES <input type="checkbox"/> NO <input type="checkbox"/> | |
| Reason For Selection: | | | | | |
| Name of Federal agency representative completing this form: | | | | | Date: |

(See Instructions on reverse side)

STEPS IN THE PROCESSING THE FARMLAND AND CONVERSION IMPACT RATING FORM

- Step 1 - Federal agencies (or Federally funded projects) involved in proposed projects that may convert farmland, as defined in the Farmland Protection Policy Act (FPPA) to nonagricultural uses, will initially complete Parts I and III of the form. For Corridor type projects, the Federal agency shall use form NRCS-CPA-106 in place of form AD-1006. The Land Evaluation and Site Assessment (LESA) process may also be accessed by visiting the FPPA website, <http://fppa.nrcs.usda.gov/lesa/>.
- Step 2 - Originator (Federal Agency) will send one original copy of the form together with appropriate scaled maps indicating location(s) of project site(s), to the Natural Resources Conservation Service (NRCS) local Field Office or USDA Service Center and retain a copy for their files. (NRCS has offices in most counties in the U.S. The USDA Office Information Locator may be found at http://offices.usda.gov/scripts/ndISAPI.dll/oip_public/USA_map, or the offices can usually be found in the Phone Book under U.S. Government, Department of Agriculture. A list of field offices is available from the NRCS State Conservationist and State Office in each State.)
- Step 3 - NRCS will, within 10 working days after receipt of the completed form, make a determination as to whether the site(s) of the proposed project contains prime, unique, statewide or local important farmland. (When a site visit or land evaluation system design is needed, NRCS will respond within 30 working days.
- Step 4 - For sites where farmland covered by the FPPA will be converted by the proposed project, NRCS will complete Parts II, IV and V of the form.
- Step 5 - NRCS will return the original copy of the form to the Federal agency involved in the project, and retain a file copy for NRCS records.
- Step 6 - The Federal agency involved in the proposed project will complete Parts VI and VII of the form and return the form with the final selected site to the servicing NRCS office.
- Step 7 - The Federal agency providing financial or technical assistance to the proposed project will make a determination as to whether the proposed conversion is consistent with the FPPA.

INSTRUCTIONS FOR COMPLETING THE FARMLAND CONVERSION IMPACT RATING FORM

(For Federal Agency)

Part I: When completing the "County and State" questions, list all the local governments that are responsible for local land use controls where site(s) are to be evaluated.

Part III: When completing item B (Total Acres To Be Converted Indirectly), include the following:

1. Acres not being directly converted but that would no longer be capable of being farmed after the conversion, because the conversion would restrict access to them or other major change in the ability to use the land for agriculture.
2. Acres planned to receive services from an infrastructure project as indicated in the project justification (e.g. highways, utilities planned build out capacity) that will cause a direct conversion.

Part VI: Do not complete Part VI using the standard format if a State or Local site assessment is used. With local and NRCS assistance, use the local Land Evaluation and Site Assessment (LESA).

1. Assign the maximum points for each site assessment criterion as shown in § 658.5(b) of CFR. In cases of corridor-type project such as transportation, power line and flood control, criteria #5 and #6 will not apply and will, be weighted zero, however, criterion #8 will be weighed a maximum of 25 points and criterion #11 a maximum of 25 points.
2. Federal agencies may assign relative weights among the 12 site assessment criteria other than those shown on the FPPA rule after submitting individual agency FPPA policy for review and comment to NRCS. In all cases where other weights are assigned, relative adjustments must be made to maintain the maximum total points at 160. For project sites where the total points equal or exceed 160, consider alternative actions, as appropriate, that could reduce adverse impacts (e.g. Alternative Sites, Modifications or Mitigation).

Part VII: In computing the "Total Site Assessment Points" where a State or local site assessment is used and the total maximum number of points is other than 160, convert the site assessment points to a base of 160.

Example: if the Site Assessment maximum is 200 points, and the alternative Site "A" is rated 180 points:

$$\frac{\text{Total points assigned Site A}}{\text{Maximum points possible}} = \frac{180}{200} \times 160 = 144 \text{ points for Site A}$$

For assistance in completing this form or FPPA process, contact the local NRCS Field Office or USDA Service Center.

NRCS employees, consult the FPPA Manual and/or policy for additional instructions to complete the AD-1006 form.

Appendix L – DMS Floodplain Requirements Checklist



EEP Floodplain Requirements Checklist

This form was developed by the National Flood Insurance program, NC Floodplain Mapping program and Ecosystem Enhancement Program to be filled for all EEP projects. The form is intended to summarize the floodplain requirements during the design phase of the projects. The form should be submitted to the Local Floodplain Administrator with three copies submitted to NFIP (attn. State NFIP Engineer), NC Floodplain Mapping Unit (attn. State NFIP Coordinator) and NC Ecosystem Enhancement Program.

Project Location

| | |
|---|---|
| Name of project: | Catbird |
| Name if stream or feature: | Unnamed Tributary to Yadkin Creek |
| County: | Davie County |
| Name of river basin: | Yadkin – Pee Dee River Basin |
| Is project urban or rural? | Rural |
| Name of Jurisdictional municipality/county: | Davie County |
| DFIRM panel number for entire site: | 5842 (map number 3710584200L, effective date May 18, 2009) |
| Consultant name: | Resource Environmental Solutions |
| Phone number: | (919) 209-1052 |
| Address: | 302 Jefferson Street, Suite 110 Raleigh, NC 27605 |

Design Information

The Catbird Mitigation Site is located within a rural watershed in Davie County, within the Yadkin River Basin and USGS 14-digit HUC 03040101160010. The Project proposes to restore 1,987 linear feet (LF), enhance 237 LF of stream, and provide water quality benefit for 53 acres of drainage area. The stream mitigation components are summarized in the table below. The purpose of the Project is to meet water quality improvements addressed in the River Basin Restoration Priorities and improve overall stream health.

| Reach | Length | Mitigation Type |
|--------------|---------------|------------------------|
| DS1 | 949 | Restoration |
| DS2-A | 78 | Enhancement II |
| DS2-B | 526 | Restoration |
| DS2-B | 159 | Enhancement II |
| DS2-B | 512 | Restoration |

Floodplain Information

| |
|--|
| Is project located in a Special Flood Hazard Area (SFHA)? <input type="radio"/> Yes <input checked="" type="radio"/> No |
| If project is located in a SFHA, check how it was determined: <input type="checkbox"/> Redelineation <input type="checkbox"/> Detailed Study <input type="checkbox"/> Limited Detail Study <input type="checkbox"/> Approximate Study <input type="checkbox"/> Don't know |
| List flood zone designation: Zone X (outside 0.2% floodplain) |
| Check if applies: <input type="checkbox"/> AE Zone <input type="radio"/> Floodway <input type="radio"/> Non-Encroachment <input checked="" type="radio"/> None <input type="checkbox"/> A Zone <input type="radio"/> Local Setbacks Required <input type="radio"/> No Local Setbacks Required |
| If local setbacks are required, list how many feet: |
| Does proposed channel boundary encroach outside floodway/non-encroachment/setbacks? <input type="radio"/> Yes <input checked="" type="radio"/> No |
| Land Acquisition (Check) <input type="checkbox"/> State owned (fee simple) <input type="checkbox"/> Conservation easment (Design Bid Build) <input checked="" type="checkbox"/> Conservation Easement (Full Delivery Project) Note: if the project property is state-owned, then all requirements should be addressed to the Department of Administration, State Construction Office (attn: Herbert Neily, (919) 807-4101) |
| Is community/county participating in the NFIP program? |

Is community/county participating in the NFIP program?
 Yes No

Note: if community is not participating, then all requirements should be addressed to NFIP (attn: State NFIP Engineer, (919) 715-8000)

Name of Local Floodplain Administrator: Andrew Meadwell
Phone Number: (336)753-6050


Floodplain Requirements

This section to be filled by designer/applicant following verification with the LFPA

- No Action
- No Rise
- Letter of Map Revision
- Conditional Letter of Map Revision
- Other Requirements

List other requirements:

Comments:

Name: Olivia L. Pilkington Signature: 

Title: Engineer II Date: 08.31.2018