DRAFT MITIGATION PLAN

The John Deere Stream and Wetland Mitigation Site

Rutherford County, North Carolina
Project No. 96917
Contract No. 6402

Broad River Basin
HUC 03050105

Prepared for:

NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
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M E M O R A N D U M

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TO: **Paul Wiesner- Western Project Management Supervisor, NCDMS**

FROM: **Brad Breslow, Daniel Ingram- RES**

DATE: **May 12, 2017**

RE: **Response to John Deere Mitigation Plan Comments, Received February 13, 2017**
John Deere Draft Mitigation Plan, Project No. 96917, Contract No. 6402

Listed below are comments provided by the NCDEQ Division of Mitigation Services regarding the John Deere Mitigation Plan and RES' responses:

NCDEQ – Division of Mitigation Services

GENERAL

1. This draft document needs substantial QA/QC for facts, consistency and accuracy. Please complete this task for the entire document prior to resubmittal to DMS.

2. Please refer to the June 4, 2015 RES memo that references the John Deere's site's May 25, 2015 IRT site evaluation (post contract IRT site visit). The revised mitigation plan needs to acknowledge and clearly justify any deviations from the post contract IRT site visit discussion and associated memo:

   i. Grading micro topography is referenced several times in the executive summary. The memo indicates that the IRT discouraged the grading of "micro topography" and recommended slight hummocks be left intact for habitat variability. Please revise or justify.
   The text throughout the document has been revised to say, "…selective grading of micro-topography to provide for additional retention of surface water while incorporating existing hummocks to increase habitat diversity."

   ii. The IRT requested that the wetland rehabilitation area presented in the FD technical proposal be changed to wetland enhancement at a ratio of 2:1. RES needs to acknowledge the post contract IRT site visit request and provide sufficient justification to support a 1:1 credit ratio for the wetland rehabilitation in the mitigation plan.
   The wetland rehabilitation area presented in the FD technical proposal has been changed to enhancement with a 2:1 ratio.

Also, rehabilitation area has been changed to include the majority of jurisdictional wetland area that is "actively managed" and considered hydric soil based on the hydric soil investigation, and the credit ratio has been adjusted to 1.25:1.

iii. The IRT expressed concern that the Carson Branch existing condition was relatively high, particularly mid-reach. A lower mitigation ratio was suggested on Carson Branch. It was additionally suggested that bed material be harvested from the existing channel to jump start the Carson Branch benthic community. Please address the suggestion of harvesting bed material and justify the full mitigation ratio of 1:1 on Carson Branch.
The work proposed on Carson Branch meets the definition of "restoration" per the 2003 Stream Mitigation Guidelines and 1:1 is the appropriate ratio for stream restoration. The constructed channel will be sized appropriately and located in the proper landscape position.

Harvesting bed material from the existing Carson Branch channel to jump start the benthic community in the proposed channel has been incorporated in the Design Parameters for Carson Branch. The revised text reads, "Additionally, reconstruction will provide the opportunity to harvest the gravel bed material from the existing channel and utilize it to construct proper, functional riffles. Riffles constructed from native gravel material along with in-stream structures will provide immediate habitat features for a benthic community and a dramatic functional uplift."

3. Wetland "Re-establishment" is the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/ historic functions to a former aquatic resource. "Re-establishment" results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions.

Wetland "Rehabilitation" is the manipulation of the physical, chemical or biological characteristics of a site with the goal of returning natural/ historic functions to a degraded aquatic resource. "Rehabilitation" results in a gain in aquatic resource functions, but does not result in a gain in aquatic resource area.

The John Deere draft mitigation plan does not currently follow the wetland category definitions. Wetland Rehabilitation is associated with existing wetlands with the goal of returning natural/ historic functions to the degraded aquatic resource. Table 6 & Figure 7 identify four (4) existing wetland areas on the site that total 6.28 acres.

Most of these existing wetland areas are incorrectly identified as wetland re-establishment in the determination of credits and the associated conceptual design map (Figure 9). This needs to be corrected in the revised mitigation plan. If RES proposes a 1:1 mitigation ratio for wetland rehabilitation, the approach needs to clearly justify the ratio based on the level of anticipated intervention and the proposed functional uplift to the aquatic resource. Please keep in mind that separate areas of wetland rehabilitation may not all justify a 1:1 ratio.

Furthermore, an existing wetland that has relatively high existing function but requires minimal enhancement (invasive removal & limited planting) should be considered wetland enhancement at a 2:1 mitigation ratio.
Mitigation types and corresponding credits have been re-worked and clarified for the John Deere Mitigation Plan based on conclusions from the hydric soil investigation, existing jurisdictional wetlands, and levels of land management. Re-establishment is proposed for entire area of floodplain that consists of buried hydric soils and active management (3.66 ac.), and the credit ratio is 1:1. Also,

Rehabilitation area has been changed to include most of the jurisdictional wetland area that is "actively managed" and considered hydric soil based on the hydric soil investigation (5.34 ac.), and the credit ratio has been adjusted to 1.25:1. In addition, jurisdictional wetland areas that are currently undisturbed (0.69 ac.) have been changed to enhancement at a 2:1 credit ratio. All text, tables, and figures have been revised accordingly.

4. Unless the mitigation plan can demonstrate that fill material was brought to the site and placed in existing wetlands, removal of greater than 12 inches of overburden has historically been considered wetland Creation at a 3:1 mitigation ratio by the regulatory agencies. The regulatory agencies have historically considered removal of greater than 12 inches of colluvial and/ or alluvial deposits, associated with past land uses, as wetland Creation. This regulatory determination should be taken into consideration when revising the mitigation plan for IRT review and approval.
The project will not remove more than 12" of overburden. The Mitigation Plan has been revised to say, "Grading activities, including removal of overburden resulting from historic on-site agricultural practices, performed for wetland restoration will not exceed 12 inches."

5. Conceptually there are points not adequately addressed in the report such as:

    i. The stream design is based on references that do not seem appropriate for the channel proposed and the project points plotted for comparison to the regional curves also warrant additional discussion.
    The reference stream type was mistakenly listed as Type E in the report narrative. This has been corrected to indicate the stream type as C4/C5. Reference data will be included in the appendix of the final report. Regarding the project points plotted on the hydraulic geometry curves; most of the project points were collected within the project limits and thus reflect the degraded or altered condition of the channels. As such, the degraded metrics depart substantially from the regional and watershed curves. There were two points where measurements were taken upstream of the project limits and in less degraded conditions. These are the project points that plot more consistent with the regional and watershed data.

    ii. The wetland mitigation proposed has not been clearly presented. The nomenclature is confusing and the mapping inadequate to allow the reader to understand the current extent of hydrologic manipulation as stated in the text. The method(s) to be used to restore hydrology on the eastern side of Puzzle Creek is unclear.
    Wetland mitigation types and corresponding credits have been re-worked and clarified for the John Deere Mitigation Plan, as described above. All text, tables, and figures have been revised accordingly.

    The methods to be used to restore hydrology on the eastern side of Puzzle Creek has been added to the document. The text reads, "Re-establishment of the wetlands on the floodplain east of Puzzle Creek and adjacent to Carson Branch will involve the removal of overburden material in select locations to expose the underlying soils that were historically hydric. By removing the overburden and exposing the buried hydric soil, hydrology in terms of water level, hydropattern, and residence time will be restored within the upper soil profile."

6. The mitigation plan proposes a wetland hydrology success criterion of 8%. Based on numerous wetland mitigation plan reviews and recent interaction with the IRT, RES can expect the IRT to request at least a 10-12% wetland hydrology success criteria. Please elaborate and clearly justify the

requested 8% success criteria.
The mitigation plan has been revised to include a 10% wetland hydrology success criteria.

7. The draft mitigation plan proposes a mitigation ratio of 1:1 for wetland Rehabilitation on the project site. RES/ EBX had proposed a 1.5:1 mitigation ratio for wetland rehabilitation in the FD technical proposal (2014). Additionally; during the post contract IRT site visit, the IRT requested that the wetland rehabilitation area (presented in the FD technical proposal) be changed to wetland enhancement at a ratio of 2:1. If RES proposes a 1:1 mitigation ratio for wetland rehabilitation, the approach needs to clearly justify the ratio based on the level of anticipated intervention and the proposed functional uplift to the aquatic resource. Separate areas of wetland rehabilitation may not all justify a 1:1 ratio. Please revise the draft document accordingly.
Rehabilitation area has been changed to include most of the jurisdictional wetland area that is "actively managed" and considered hydric soil based on the hydric soil investigation (5.34 ac.), and the credit ratio has been adjusted to 1.25:1.

8. DMS strongly suggests not including an average vegetation height requirement (10 feet) as a success criterion in the revised mitigation plan.
An average vegetation height requirement (10 feet) as a success criterion has been deleted from the mitigation plan.

9. Please provide a detailed monitoring plan (with layout of proposed monitoring equipment) in the revised mitigation plan. The proposed mapped location of the project cross sections, vegetation plots, ground water wells, etc. will be required for IRT mitigation plan approval.
*A detailed monitoring map has been added to the Mitigation Plan. See **Figure 10: Monitoring Plan Map**.*

EXECUTIVE SUMMARY

1. Floodplain re-connection is not necessarily easy or convenient, suggest a word choice other than feasible for this sentence.
Statement has been revised to say, "The floodplain areas will be hydrologically reconnected to the channels where suitable to provide natural exchange and storage during flooding events."

2. C and E stream types typically have high to very high sinuosity.
The channel design (dimensions, profile and plan form configuration) has been developed based on what is appropriate for the given site conditions (valley form, slope, bed material, watershed, etc.). While C and E stream types typically have high sinuosity, this would not be appropriate for the valley forms that are present within the site since the majority of the valleys contain a slight, but distinguishable cross-slope. Exaggerating the sinuosity would require needless grading into these cross-slopes and imposing an unnatural valley form. One solution to this classification dilemma would be to classify the proposed streams as Type B4/5c. However, the cross-slope is so subtle that the entrenchment ratio would be significantly higher than typical B streams. This would then suggest the channels should be slightly countersunk in order to grade in an unnatural valley cross-slope. Ultimately the problem lies in the application of the Rosgen classification system to these headwater streams (drainage areas less than 0.2 sq. mi.). The classification system was developed based on data from much larger streams where fluvial process plays a dominate role in the channel form. At the headwater margin, the influence of fluvial processes becomes more and more diminished and the more dominate influences of vegetation and landform processes impose on the channel form. The design configuration was selected to accommodate the valley forms that are present within the site. Additionally, the reference stream, which is also a low sinuosity C stream in a slightly cross-sloped valley, provides validation of this approach.

3. Bed Elevations & Filling in ditches: Ditches are not located or characterized.
   The Mitigation Plan has been revised to specify one main ditch. The ditch is characterized in ***Section 4.3.1*** *and reads, "…One main ditch is cut through the extant wetlands east of Puzzle Creek near the valley low and runs north to south towards Carson Branch. There are pronounced spoil piles along this ditch with sufficient evidence to suggest that the ditch has been maintained in the fairly recent past… The Carson Branch channel invert and the main ditch draining to it is approximately 2 to 3 feet below the floodplain surface." In addition,* ***Figure 7: Existing Conditions Map*** *and* ***Figure 9: Conceptual Design Map*** *have been revised to digitize and locate the ditch.*

4. If the drain tiles are functioning as intended, locating and disabling them will be required for wetland hydrologic success.
   Mentions of the supposition of drainage tiles in the Mitigation Plan have been removed. The Mitigation Plan has been revised to say, "Additionally, drainage tiles discovered during the construction phase will be excavated and removed to prevent drainage of wetland areas."

5. Please describe the type and method of vegetation proposed to be stockpiled and reinstalled.
   Mentions of stockpiling vegetation have been removed from the Mitigation Plan. The Mitigation Plan has been revised to say, "Vegetation transplants, such as tag alder shrubs and/or sod mats, will be determined during the construction phase of the Project."

6. Performance standards for streams are not typically as general as 'no change in channel classification'.
   Statement has been removed from the mitigation plan.

7. The executive summary references USACE guidance (USACE, 2005). Are you referring to the 2003 Stream Mitigation Guidelines? Please revise or clarify.
   Reference has been updated to, "Stream Mitigation Guidelines issued in April 2003 by USACE and NCDWQ, Wetland Mitigation Guidelines issued in November 2013 by the North Carolina Interagency Review Team (NCIRT), the Wilmington District Stream and Wetland Compensatory Mitigation Update issued in October 2016 by the NCIRT,"

TABLE 1

1. The channel length of Thelma's Branch is proposed to increase almost four times the current length in a valley that has been characterized as confined and is to be located in an area depicted on figure 7 as existing wetland. Please address in the revised report.
   "Confined" was mistakenly input to ***Table 1*** *for all stream reaches. These have been replaced with "Slightly confined." Also, Thelma Branch currently exists as an excavated channel, off-line from its natural valley. Therefore, the relocation of the channel to its natural valley justifies the large increase in stream length.*

   Additionally, The proposed channel location within the existing jurisdictional wetland has been addressed. The Mitigation Plan has been updated to say, "Relocating the channel to its natural valley will result in the stream flowing through a jurisdictional wetland. Therefore, stream work and the associated wetland impacts are allowable under Nationwide Permit 27 and will be addressed in the Pre-Construction Notification (PCN). Channel relocation to its natural valley will result in net ecological uplift."

USGS MAP

1. The scale that this is presented at makes interpretation of all reaches with the exception of Puzzle Creek impossible. The three smaller tributaries are not discernable on the map.
   The Mitigation Plan has been revised to include an additional USGS map with a larger scale to assist in discerning the smaller tributaries. However, the USGS layer does not have these smaller tributaries digitized.

WATERSHED APPROACH

1. Project goals include nutrient and sediment removal and filtration of runoff; what is gained by filtration of runoff other than nutrient and sediment removal? This may be redundant. Please update the draft report accordingly.
   "Filtration of runoff" has been removed from the list of project goals.

2. Loam and Sandy Loam is not typically covered by saprolite and subsoil.
   Text has been revised to clarify intended statement.

3. The soils map has the hydric indicator seeming to bisect hydric A soils, Wehadkee, and making no distinction between the hydric B soil, Chewacla. The current Websoil survey indicates Wehadkee undrained has an average of 85% hydric soils, Chewacla has 5%.
   The Soils Map has been modified to differentiate Chewacla soils from Wehadkee soils. The map now indicates Chewacla as soil with hydric inclusions, and Wehadkee as hydric soil.

BASELINE INFORMATION – WETLAND SUMMARY

1. Referring to stream bed elevation in relationship to the existing surface of the floodplain does not indicate that wetland hydrology has been impacted. Streams that have been manipulated, and/or have become incised do have a negative impact on wetland hydrology. Statements referring to 'the lower channel and ditch elevations' need to include metric/definition of "lower".
   The paragraph currently includes a metric. It reads, "The effect of dredging, floodplain ditching and re-aligning of Carson Branch, David Branch, and Thelma Branch, has severely impacted the groundwater hydrology of the floodplains. The Carson Branch channel invert and the main ditch draining to it is approximately 2 to 3 feet below the floodplain surface. The Thelma Branch and David Branch channel inverts are approximately 1 to 3 feet and 3 to 4 feet below the floodplain surface, respectively. These lower channel and ditch elevations not only facilitate the removal of surface water from the floodplain and reduce retention time, they also affect hydrology by drawing down groundwater adjacent to these features."

2. Supposition that drain tiles exist without any evidence of their current affect is not sufficient evidence to assume hydrologic restoration will occur if they can be located and plugged. This information should be included in the mitigation plan which is intended to propose and justify the level of intervention best suited for the site.
   Mentions of the supposition of drainage tiles in the Mitigation Plan have been removed. The Mitigation Plan has been revised to say, "Additionally, if any drainage tiles are discovered during the construction phase, they will be excavated and removed to prevent drainage of wetland restoration areas."

3. The location of floodplain ditches has not been depicted, LIDAR data has not been presented to allow the reader to understand the location and impact of ditch effect on the wetland hydrology.

The Mitigation Plan has been revised to specify one main ditch. The ditch is characterized in ***Section 4.3.1*** *and reads, "…One main ditch is cut through the extant wetlands east of Puzzle Creek near the valley low and runs north to south towards Carson Branch. There are pronounced spoil piles along this ditch with sufficient evidence to suggest that the ditch has been maintained in the fairly recent past… The Carson Branch channel invert and the main ditch draining to it is approximately 2 to 3 feet below the floodplain surface." In addition,* ***Figure 7: Existing Conditions Map*** *and* ***Figure 9: Conceptual Design Map*** *have been revised to digitize and locate the ditch*

4. In the past, the oversight agencies have viewed deposition through time via past land use differently from overburden deposited during a single incident. The former is typically related to wetland creation, the latter wetland restoration.
   The project will not involve the removal of more than 12" of overburden. The Mitigation Plan has been revised to say, "As a rule, grading activities, including removal of overburden, performed for wetland restoration will not exceed a depth of 12 inches."

5. Figure 7.0. Characterizing Wetlands A, B, C, D as existing wetlands indicates that they are only eligible for wetland enhancement or wetland rehabilitation.
   The mitigation plan has been revised. Wetland A is proposed for Enhancement and Rehabilitation, Wetlands B and C are proposed for Rehabilitation, and Wetland D is proposed for Enhancement and Rehabilitation. However, wetland mitigation treatments are based on results from the detailed hydric soil investigation, and therefore small areas of jurisdictional wetland overlap into areas proposed for Re-establishment.

FUNCTIONAL BENEFITS

1. Please describe the type of bioremediation that is being proposed for the sediment removal objective.
   "Bioremediation" has been removed as a method for sediment removal.

2. Runoff filtration is accomplished by nutrient and sediment removal.
   "Runoff filtration" has been removed from Functional Benefits and Improvements Objectives.

3. Habitat improvement may not be limited to terrestrial habitat; changes in substrate texture may improve aquatic habitat.
   Functional Benefits and Improvements Objectives have been revised to include improved aquatic habitats. Its corresponding description has been added and says, "Coarser substrate and implementation of riffle sequences will promote instream habitat."

DETERMINATION OF CREDITS

1. The text indicates that there are .75 ac of jurisdictional wetlands, rehabilitation is indicated to be .54 ac.
   Mitigation types and corresponding credits have been re-worked and clarified for the John Deere Mitigation Plan based on conclusions from the hydric soil investigation, existing jurisdictional wetlands, and levels of land management. Re-establishment is proposed for entire area of floodplain that consists of buried hydric soils and active management (3.66 ac.), and the credit ratio is 1:1. Also, Rehabilitation area has been changed to include most of the jurisdictional wetland area that is "actively managed" and considered hydric soil based on the hydric soil investigation (5.34 ac.), and the credit ratio has been adjusted to 1.25:1. In addition, jurisdictional wetland areas that are currently undisturbed (0.69 ac.) have been changed to enhancement at a 2:1 credit ratio. All text, tables, and figures have been revised accordingly.

MITIGATION WORKPLAN

1. Please indicate how an E channel will be used to inform design on a C stream channel. How will the reference data be interpolated to be useful in design of a stream that is to be constructed at an earlier stage of evolution?
   The reference stream type was mistakenly listed as Type E in the report narrative. This has been corrected to indicate the stream type as C4/C5. Reference data will be included in the appendix of the final report.

2. The difficulty of finding appropriate reference reaches indicates the streams are in the Piedmont region of the State and the wetlands are in the Mountain region. The plan states that a reference wetland will be located and instrumented prior to completion of construction. The reference wetland should be identified and characterized in the mitigation plan to ensure that oversight agencies concur with the choice of reference.
   The statement referencing the location of the reference stream has been deleted.

   Additionally, the Mitigation Plan has been revised to include a reference wetland. The following paragraph has been inserted to ***Section 8.1.4****:*

   "Reference Wetland Studies

   *A reference wetland was identified in the Project area in the southern area of the easement, adjacent to the existing Carson Branch stream channel, and is depicted as the forested portion of Wetland A in the Existing Conditions Map (****Figure 7****). This is a jurisdictional, riparian wetland and is classified as a palustrine forested (PFO) wetland. It displays periods of high water table and, at times, surface water. The vegetation composition portrays an immature piedmont/mountain bottomland hardwoods community. The restoration of the vegetation will be based on descriptions provided in the literature for piedmont/mountain bottomland communities. Groundwater monitoring gauges will be installed in the reference wetland at the baseline monitoring stage for hydrological comparison with the restored wetland areas."*

DESIGN PARAMETERS

1. Wetland enhancement is proposed for the existing wetlands located in the floodplain, Figure 7 indicates that wetlands A, B, C, and D are existing wetlands. The asset table differs from this approach. DMS suggests revising the document to use existing wetlands to refer to the currently jurisdictional wetlands only and deciding on how wetland work will be proposed, either restoration and enhancement or re-establishment and re-habilitation.
   Mitigation types and corresponding credits have been re-worked and clarified for the John Deere Mitigation Plan based on conclusions from the hydric soil investigation, existing jurisdictional wetlands, and levels of land management. Re-establishment is proposed for entire area of floodplain that consists of buried hydric soils and active management (3.66 ac.), and the credit ratio is 1:1. Also, Rehabilitation area has been changed to include most of the jurisdictional wetland area that is "actively managed" and considered hydric soil based on the hydric soil investigation (5.34 ac.), and the credit ratio has been adjusted to 1.25:1. In addition, jurisdictional wetland areas that are currently undisturbed (0.69 ac.) have been changed to enhancement at a 2:1 credit ratio. All text, tables, and figures have been revised accordingly.

2. DMS recommends not disturbing the jurisdictional wetlands adjacent to Carson Branch. Ripping, stockpiling topsoil and vegetation may not be effective.

Stockpiling of topsoil and vegetation will not occur in jurisdictional wetland areas adjacent to Carson Branch. However, ripping is appropriate in order to break-up compacted soil that has resulted from long-term agricultural activities. The Mitigation Plan text has been revised to clarify: "All Re-establishment and Rehabilitation areas will be ripped to remove negative effects of past compaction from long-term agricultural activities and will be planted with native wetland vegetation."

BEST MANAGEMENT PRACTICES

1. Stream design should consider projected watershed development where possible.
   Stream design has incorporated projected development within the watershed, however current low-density residential, agricultural, and forested land use are not expected to change significantly in the foreseeable future. For clarification, the Mitigation Plan has been revised to say, "Stream design has incorporated projected development within the watershed, though current low-density residential, agricultural, and forested land use are not expected to change significantly in the foreseeable future. However, stormwater management issues resulting from future development of adjacent properties will be governed by the applicable state and local ordinances and regulations, and it is recommended that any future stormwater entering the site maintain pre-development peak flow. Any future stormwater diverted into the project should be done in a manner as to prevent erosion, adverse conditions, or degradation of the project in any way."

SOIL RESORATION

1. Suggest post construction/pre planting soil fertility test to determine if amendments are recommended. The stockpiled top soil may not be adequate.
   The mitigation plan has been revised to incorporate a soil fertility test prior to planting. The text now reads, "Additionally, a post construction/pre-planting soil fertility test will be performed to determine if soil amendments are recommended for ultimate vegetation success."

PERFORMANCE STANDARDS

1. Surface flow measurements should not be necessary on channels designated as perennial. If the channels have intermittent/perennial sections suggest indicating the break point in the mitigation plan.
   Stream Restoration Success Criteria has been revised to exclude surface water measurements, as all Project streams are classified as perennial.

SPECIFIC COMMENTS

1. **Section 2:** One of the project objectives is "Elimination and control of exotic invasive species". Please remove the word Elimination. It is highly unlikely that exotic invasives will be completely "eliminated" within the project boundary. Control of exotic invasive species is a more reasonable objective.
   Objectives have been revised to remove the term "Elimination". They now state, "Control of exotic invasive species,"

2. **Section 2:** One of the project objectives is, "Restoration of appropriate pattern, dimension, and profile in stream channels. Will any work be completed on Puzzle creek to accomplish this objective?

No. Restoration is only proposed for Carson Branch, David Branch, and Thelma Branch. To clarify, the Mitigation Plan has been revised to say, "Restoration of Rosgen Stream type C pattern, dimension, and profile in select stream channels."

3. **Section 6 – Determination of Credits:** The "Reach" and "Mitigation Type" in Table 9 do not correspond with Figure 9. HB1; HB2; and HB3 should correspond with Carson Branch; David Branch; and Thelma Branch. Table 2 indicates an enhancement level II approach on David Branch. Enhancement High and Enhancement Low are not mitigation types. Please QA/QC Table 9 and Figure 9 to confirm that they are correct and synonymous.
Table 8 (previously Table 9) has been updated with the correct information and is synonymous with the rest of the document and Figure 9.

4. **Page 11:** "Project Goals address stressors & will be address through…objectives."
   i. Where are your specific and measureable project goals? Text above suggest you have goals, but they are not listed.
   Specific and measurable goals are listed above the project objectives. The text states,

   "The project goals address stressors identified in the RBRP and include the following:

   - *Nutrient removal*
   - *Sediment reduction*
   - *Invasive species removal*
   - *Improved aquatic and terrestrial habitat."*

   ii. Elimination of exotic and invasive species is not reasonable, please rephrase.
   Objectives have been revised to remove the term "Elimination". They now state, "Control of exotic invasive species,"

   iii. Sediment removal is not reasonable; please consider rephrasing to reflect your plan to reduce the local sediment source within the bounds of your project.
   The goal of "Sediment removal" has been revised to say, "Sediment reduction."

   iv. What is the "appropriate" pattern, dimension and profile?
   The restoration of pattern, dimension, and profile is intended to depict type C stream channels. The Mitigation Plan has been revised to say, "Restoration of Rosgen Stream type C pattern, dimension, and profile in select stream channels."

5. **Table 3:** Table 3 is not a useful table. Please consider revising or removing.
*Table 3 has been removed from the mitigation plan document along with the corresponding precluding text. *All following tables have been re-numbered.*

6. **Page 12:** Rock types are not soils and do belong in a section titled "soil survey." Ecoregion is not a suitable source for rock units. Why are the rock units important to mention?
**Now Page 11. Rock types have been removed from the Soil Survey section.*

7. **Page 14:** The photos reference streams that have not been shown on a map or mentioned in the text until much later in the document.
**Now Page 15. The streams referenced in the photos are previously mentioned in the text in Table 2 within Section 1.2.*

8. **Page 19:** Please include a map for the stream and wetland boundary prior to all the info in Table 6.
*Existing Features Map (**Figure 6**) has been inserted prior to **Table 5**. *Was **Table 6**.*

9. **Table 6:**

   Now **Table 5*

   i. Valley confinement is noted as “confined” but stream class is G with proposed C. These stream classes are usually not associated with confined channels, please explain.
   The table has been revised to indicate “slightly confined”, however please refer to the discussion above in comment number 2 under the Executive Summary.

   ii. The Simon Evolutionary trend is requested and stated in the table, but C, G, and F are not from Simon.
   Simon Evolutionary trend for each project stream has been changed to “Stage IV.”

10. **Page 20 - Reach Summary:**

    i. The “actively managed” floodplain (crop and grazing) are not mentioned in the previous land use section. The only mention of change in land use in “farm”. Please provide a consistent and accurate land use description in one document location.
    Previous changes in land use are mentioned previously in Section 2.1. The paragraph has been revised to include row crop production and cattle grazing for clarification. The paragraph in Section 2.1 now reads,

    “Aerial imagery indicates that the subject site has been used extensively for agricultural purposes. (Figure 3). Before 1993 much of the property was forested. Since 1998 little has changed in regards to the development of the project site and nearby surrounding property. Several watershed characteristics, such as groundwater, vegetation, surface drainage, and soil parameters have been modified. Soil structure and surface texture have been altered from intensive agricultural operations that include, but are not limited to, row crop production and cattle grazing.”

    ii. The “unstable” banks mentioned in this section are attributed to cropland, but attributed to hoof shear in the goals section.
    The Watershed Approach goals section (Section 2) has been revised to include row crop management as a source of bank erosion. The text now reads, “Stabilization of eroding stream banks due to row crop management, lack of deep-rooted vegetation, and livestock hoof shear,

    iii. What is an “unstable channel characteristic”?
    This phrase has been revised for clarification and now reads, “…unstable channel banks…”

11. **Page 21:** Reference stream is mentioned, but not discussed yet.
    The narrative discusses the existing channel dimensions compared to “reference width.” The basis of this comparison is explained in Section 4.2 on the previous page of the narrative. Reference channel widths and depths were developed from data collected on naturalized streams in the surrounding watersheds and from the reference stream.

12. **Appendix 5:** The hydric soil report misinterprets the definition of wetland Re- establishment and wetland Rehabilitation. See comment and definitions above.
    Proposed wetland mitigation types have been reworked in the Mitigation Plan to adhere to the corresponding USACE definitions.

13. **Appendix 5:** The jurisdictional determination in the revised mitigation plan should include the existing wetland map associated with the JD approval. Please include a copy of Figure 7 with the JD in Appendix 5.
    The mitigation plan has been revised to include the existing wetland map with the JD in Appendix 5.

14. **Appendix 8 – Categorical Exclusion:** Please provide a full copy of the **signed** Categorical Exclusion Form and a full copy of the Task I ERTR in Appendix 8. The USACE has asked that a full set of this information be included with the mitigation plan as the final mitigation plan will act as the 404/ 401 permitting document for the project.
The mitigation plan has been revised to include the signed Categorical Exclusion Form and a full copy of the Task I ERTR in Appendix 8.

DESIGN SHEETS

1. Is the area to be filled at approximately 200+50 on David Branch a ditch or a natural crenulation with hillside/headwater seepage?
It appears to be an area where long-term cattle congregation has resulted in erosional feature.

2. The areas of wetland re-establishment, rehabilitation, and enhancement are depicted on the plan sheets but the rational for the differentiation of each treatment is not clear in the document text.
Mitigation types and corresponding credits have been re-worked and clarified for the John Deere Mitigation Plan based on conclusions from the hydric soil investigation, existing jurisdictional wetlands, and levels of land management. Re-establishment is proposed for entire area of floodplain that consists of buried hydric soils and active management (3.66 ac.), and the credit ratio is 1:1. Also, Rehabilitation area has been changed to include most of the jurisdictional wetland area that is "actively managed" and considered hydric soil based on the hydric soil investigation (5.34 ac.), and the credit ratio has been adjusted to 1.25:1. In addition, jurisdictional wetland areas that are currently undisturbed (0.69 ac.) have been changed to enhancement at a 2:1 credit ratio. All text, tables, and figures have been revised accordingly.

HYDRIC SOIL ASSESSMENT

1. The fill indicated in soil boring 137 is likely from past land use and would be viewed differently than spoil or recent disturbance as stated above.
Implications of this comment have ultimately been addressed in the revised Mitigation Plan. The project will not involve the removal of more than 12" of overburden. The Mitigation Plan has been revised to say, "As a rule, grading activities, including removal of overburden, performed for wetland restoration will not exceed a depth of 12 inches."

JURISDICTIONAL DETERMINATION

1. A preliminary JD has been submitted without the map or figure which delineates the extent of the existing wetland. No acreage is listed in the JD and the sample points do not coincide with any map or bore log submitted.
The mitigation plan has been revised to include the existing wetland map with the JD in Appendix 5. Also, considering that the JD has already been issued by the USACE, no changes can be made to the existing document. However, acreages for the jurisdictional wetlands described in the JD are given in the Mitigation Plan in ***Table 5: Project Attribute Table****. Furthermore, the sub-consultant who performed the wetland delineation for the JD did not provide data point locations on the map.*

   Additionally, bore log locations and descriptions can be found in the Hydric Soil Report in ***Appendix 5.***

June 30, 2017

Mr. Daniel Ingram
Resource Environmental Solutions, LLC (RES)
302 Jefferson St.; Suite 110
Raleigh, N.C. 27605

Subject: Revised DRAFT Mitigation Plan for the
John Deere Stream and Wetland Mitigation Site
Broad River Basin – CU# 03050105– Rutherford
County DMS Project ID No. 96917
Contract #

006402 Dear Mr. Ingram:

On May 12, 2017, the Division of Mitigation Services (DMS) received the Revised DRAFT Mitigation Plan for the John Deere Stream and Wetland Mitigation Site from Resource Environmental Solutions, LLC (RES). The report establishes the proposed mitigation activities on the project site. Anticipated mitigation on the site includes 1,783 linear feet of stream Restoration; 3.61 acres of wetland Re-establishment; 5.22 acres of wetlands rehabilitation, and
0.68 ac of wetland enhancement for a total of 1,783 Stream Mitigation Units (SMUs) (R) and 8.13 Wetland Mitigation Units (WMUs) (R& RE).

DMS still has concerns regarding the revised draft mitigation plan. Accordingly, DMS and RES met on 6/30/17 to discuss the remaining project concerns. Based on the 6/30/17 meeting and our review of the revised draft mitigation plan, our comments are as follows:

General:

Please QA/ QC the revised document and resolve data discrepancies.

Mitigation Plan has undergone a QA/QC review.

In the report narrative, please provide additional discussion regarding the design departure from the regional curve.

This is included in the technical approach section of the Mitigation Plan.

In the report narrative, please provide additional discussion regarding the proposed location of Thelma Branch and the associated existing topography.

Additional discussion has been included regarding the alignment.

Executive Summary:

The 2013 Guidance referenced in the document is non-binding. DMS suggests removing this from the document. The project was contracted prior to the 2016 Mitigation Guidance so is not technically subject to these requirements. The binding requirements for this project are the 2003 Stream Mitigation Guidance. It is important to determine which guidance will be used as it will determine the required performance standards and frequency of monitoring.

The other guidance's have been removed with only the 2003 Stream Mitigation Guidance as the only remaining binding document.

The original comment letter states that the IRT discourages the grading of microtopography. The response to the question does not adequately address the comment. The IRT does not support creating microtopography. Please address in the revised document and plan set as necessary.

The language of impacting microtopography has been removed.

C and E streams typically have moderate to high sinuosity. Please explain in further detail in the report narrative.

This is included in the technical approach section of the Mitigation Plan.

The measure of stream success must include parameters other than bankfull flow.

The document now includes the following stream success criteria: 30 days of continuous flow, two bankfull flows, stable cross section surveys, and visual assessments.

The original comment letter states the IRT would like a lower mitigation ratio for Carson Branch. Your response is that the work proposed meets the definition of restoration. Please include a clear justification for the 1:1 ratio for Carson Branch as this reach is directly referenced in the IRT post contract site visit memo.

This is included in the technical approach section of the Mitigation Plan.

Your original approach to wetland restoration included removal of greater than 12" of overburden. If more than 12" removal was required to restore the wetland, is the removal of no more than 12" going to provide adequate conditions for a wetland and the associated 10% hydroperiod success criteria?

Buried historic hydric soils were discovered at 18 inches which is why the initial mitigation plan stated that the soil would be removed greater than 12 inches. The intent was to expose the buried hydric soil. However, the removal of no more than 12 inches should be adequate with the restoration of hydrology to meet the success criteria of a restored wetland.

Watershed Approach:

Invasive species removal is too limited in scope to be a project goal; goals and objectives are related but the same bullet should not appear in both lists.

The goal is now addressed as restoration of natural flora with objectives of removing invasive species and restoration of forested riparian buffers in support of that goal.

Historical Land Use and Development Trends

Chewacla loam is found in the Piedmont and Coastal Plain river valleys, if only found in the Coastal Plain it would not have been mapped at John Deere.

The description has been updated accordingly.

Site Photographs:

The site streams are characterized as exhibiting evidence of Simon stage IV stream evolution, being G channels in slightly confined valleys, and having BHRs as high as 15.2. Are these photos truly representative of the measured channel conditions?

Generally BHR's for the site are in the range of 1 to 3. The exception is Thelma Branch and this is the result of having a very small stream in a dredged-out ditch. The ditch is approximately 3 feet deep at the upstream and almost 4 feet deep at the downstream. Since the bankfull depth for this stream is estimated to be 0.25 feet deep the result is a very high BHR (3.8'/0.25'=15.2).

Site Protection Instrument:

Has this process been delayed to allow for the project design to be finalized? Please briefly explain in the mitigation plan.

Option agreements have been secured so that when the project design has been finalized the easement can be recorded at the will of RES. This explanation has been added to the mitigation plan.

Baseline Information:

Was a watershed map drafted? Thelma Branch does not appear to have an easily defined watershed.

The watersheds were delineated with USGS StreamStats and verified with additional site topographic data.

The Wetland Summary Information is conflicting; the wetlands are characterized as riparian riverine and the predominate source of hydrology is listed as groundwater. If groundwater is the primary source of hydrology the wetlands should be characterized as riparian non-riverine.

The wetland type has been revised to Riparian Non-Riverine.

Reach Summary Information

Unstable channel banks have contributed to degradation of stream banks? Explain and address accordingly.

The paragraph containing that sentence has been reworked so that it reads more cohesively and accurately.

Suggest including existing condition cross section graphs for comparison to design parameters.

The appendices include detailed geomorph parameters for all project reaches. The Engineer did not provide cross section graphs for this submittal.

The narrative for these streams seem to conflict somewhat with data presented; David's branch is lowering the adjacent water table but the current depth is indicated to be .2 - .3 feet and the design depths are .6 to .7 feet.

The David Branch data have been corrected to accurately reflect the existing channel bed elevation of 2-4 feet below the valley floor.

Wetland Summary Information:

This section lists the extent of existing wetlands as 0.75 acres. This conflicts with the proposed mitigation scheme and approved Jurisdictional determination map in the appendices; all wetlands proposed for rehabilitation should be jurisdictional.

The number has been updated to reflect the correct amount of jurisdictional wetland on site.

This project is in the Piedmont, the regional supplement used should be the Eastern Mountain and Piedmont version.

The appropriate regional supplement has been referenced.

The area west of Puzzle Creek does not have any ditches or fill identified on the site map.

The sentence in question now reads, "The agricultural field shows evidence of being highly manipulated by past tillage and farming applications. The area west of Puzzle creek shows evidence of historical ditching and filling based on the soil profiles." The ditching on the west side of the stream is not current and is not verified on the site map.

Mitigation Credits:

The 5.22 acres of mitigation credit identified as rehabilitation are at risk if the current extent of wetlands is 0.75 ac.

The wetland credit scheme has been updated per DMS comments.

The soil profile for the areas indicated for wetland re-establishment identified a buried hydric layer at 18 inches. No means other than removing overburden have been proposed to restore hydrology for a portion of this area. It is unlikely that the IRT will view this deposition as fill which will require that they allow this to yield re-establishment credit as opposed to creation credit.

The amount of fill to be removed from the top of the soil profile will be kept underneath the threshold of 12 inches set by the IRT so that the areas of re-establishment will not be considered creation. Hydrology for the site will be positively affected by the plugging of the ditch and reconnection of the streams to the floodplain and should provide all wetlands with increased hydrology.

What functional uplift (other than planting) is planned in the north-eastern portion of the site. If no ditches will be filled and no drain tiles have been documented at the mitigation plan stage; what will support wetland hydrology in this area?

This area of the wetland reestablishment and rehabilitation will be improved through removal of some overburden, discontinuation of land management practices, surface roughening, and planting. It is anticipated a functional wetland habitat will result. If drainage tiles are revealed during the construction phase they will be removed or plugged to further improve hydrology.

Will the proposed stream restoration channels provide functional stream assets after 7 years of monitoring? This may be an issue due to their small drainage area and low slope on the proposed project streams. If the proposed stream channels are silted in and vegetated with a dense herbaceous layer, they will likely function more as a wetland and may not receive full stream mitigation credit during credit release and/ or project closeout.

The comment is noted. For all streams the cross section, sinuosity, and profile are being constructed based upon reference reaches for similarly sized streams and watersheds so that they should be appropriately engineered for the size of drainage area and for the grade of slope to be in dynamic equilibrium. While the amount of sediment input into smaller streams can be worrisome, the addition of a buffer on all streams should greatly reduce the need for the stream to transport the sediment it had been required to in the past. The chemical and biological integrity will also be greatly uplifted due to the removal of disturbance from a regularly ditched system to a protected natural riffle-pool or step-pool system. Therefore, the streams should function not as wetlands but as restored streams.

Success Criteria

If 2016 guidance is used; a height requirement will be required for the vegetation performance standard. The IRT has warned providers that they cannot pick and choose portions of the 2016 guidance. If one portion is utilized, the entire 2016 guidance should be utilized. This guidance also includes a different submission schedule.

RES is not proposing to use the 2016 guidance. Therefore a height criteria is not included.

Asset Map:

The re-establishment areas of the map cannot be determined by the soil profile, they must be the same as the jurisdictional map. If an area has been deemed jurisdictional, it cannot be re-established.

This has been updated and the areas have been precisely broken down by jurisdictional and non-jurisdictional wetlands.

Figure 7 is the jurisdictional wetland map. It does not coincide with the conceptual design map. Some non-jurisdictional areas are referenced as wetland re-habilitation and some jurisdictional areas are referenced as wetland re-establishment in the Conceptual Design map. Revise as necessary.

Revisions have been made as requested.

Appendices:

There are some missing/unclear data in the appendices:

It is unclear where the representative soil bores are located because two maps have been included and the bore holes re-labeled.

The first map identifies where the soil borings are and are numbered sequentially. However, the second map's labels are not the soil borings number but how deep to hydric soil in inches.

No existing cross sections have been included, nor any existing data for the reference reach other than the points plotted on the curves. Including the existing conditions survey could alleviate concerns relating to photos appearing different than measured parameters.

The exiting morphologic data is included in the appendices and labeled assessment data. Existing cross section graphs were not provided by the Engineer, however, detailed geomorph data for all existing channels and reference reach is provided.

The difference between max depth and thalweg depth reported in the existing conditions survey data is unclear.

The thalweg depth is measured from the water surface down to the bed. The max depth is the depth from bankfull to the channel bed at the thalweg.

Please provide a written response to the comments provided and a revised electronic copy of the updated draft mitigation plan.

If you have any questions, please contact me at any time at (828) 273-1673 or email me at paul.wiesner@ncdenr.gov .

Sincerely,

Paul Wiesner
Western Regional Supervisor
NCDEQ – Division of Mitigation
Services 5 Ravenscroft Dr., Suite 102
Asheville, NC 28801
(828)273-1673 Mobile

cc: file

Paul Wiesner

Draft Mitigation Plan

John Deere Mitigation Site
Rutherford County, NC
Project No. 96917
Contract No. 6402

Broad River Basin
HUC 03050105

Prepared for:

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

Prepared by:

Environmental Banc and Exchange, LLC,
a wholly owned subsidiary of Resource Environmental Solutions
302 Jefferson Street, Suite 110
Raleigh, NC 27605
919-209-1056

EXECUTIVE SUMMARY

The John Deere Stream Mitigation Site (the "Site") is located within a watershed dominated by agricultural and residential land use in Rutherford County, North Carolina, about one mile South of Bostic. The project streams and wetlands proposed for restoration have been significantly impacted by channelization and agricultural practices. The project will involve the restoration and protection of streams and wetlands in the Broad River watershed. The purpose of this mitigation site is to restore and enhance a stream/wetland complex located within the Broad River Basin.

The site is located within the Broad River Basin, NCDWR sub-basin 03-08-02 and USGS 14-digit HUC 03050105070050. The 2009 Broad River Basin River Basin Restoration Priorities (RBRP) identified several restoration needs for the entire Broad River Basin. The Puzzle Creek watershed (HUC 03050105070050) was not identified as a Targeted Local Watershed (TLW), however because of the projects ability to meet stressor related goals it will still be beneficial and applicable. Twenty-seven percent of the watershed is used for agricultural purposes and nine percent is currently developed.

The proposed Site is centrally located within HUC 03050105 and includes streams that discharge into the Second Broad River. Due to its location and proposed improvements, the site will provide numerous ecological and water quality benefits within the Broad River Basin. While many of these benefits are limited to the project area, others, such as pollutant removal and improved aquatic and terrestrial habitat, have more far-reaching effects.

The project presents **1,783** linear feet of Stream Restoration generating **1,386** Stream Mitigation Units (SMU) as well as **9.43** ac of re-established, rehabilitated, and enhanced wetland generating **8.03** Wetland Mitigation Units (WMU). Benefits include the storage of excess water during flood events, preventing erosion of stream banks, reducing in-stream sedimentation, and nutrient reductions.

The Site encompasses 15.37 acres of actively managed floodplain with a single easement area that is split into an east and west side with Puzzle Creek being the boundary between the two areas. The east side consists of cropland while the west side is actively grazed during summer months. Grazing livestock have historically had access to most stream reaches on the west side of the project. On the east side of the project, active cropland management have led to unstable banks as well as drained and disturbed wetlands. The lack of deep-rooted vegetation and unstable channel characteristics appears to have contributed to the degradation of stream banks on both sides of the project.

The objective for this Site is to restore and design natural waterways through stream/wetland complexes with appropriate cross-sectional dimension and slope that will provide function and meet the appropriate success criteria for the existing streams. Accomplishing this objective entails the restoration of natural stream characteristics, such as stable cross sections, planform, and in-stream habitat. The floodplain areas will be hydrologically reconnected to the channels where suitable to provide natural exchange and storage during flooding events. The design is based on reference conditions, Stream Mitigation Guidelines issued in April 2003 by USACE and NCDWQ, and criteria that developed during this project to achieve success. Additional site objectives, such as restoring the riparian buffer with native vegetation, ensuring hydraulic stability, and controlling invasive species, are listed in Section 1.

Restoration of Type C4b, C4, and C5 streams will consist of constructing low to moderate sinuosity streams. Each stream type will be constructed with a moderate width-depth ratio that accesses the floodplain at greater-than-bankfull flows. For stream reaches with average channel slopes from 1.5% to 4.0% the bed profile form is in a range that is transitioning from riffle-pool morphology at the lower slopes to step-pool morphology at the steeper slopes. The profile is therefore a combination of riffles, rapids, and step-pool features. For stream reaches with average slopes less than 1.5% the bed profile form is dominated by riffle-pool morphology.

Wetland hydrology will be restored by raising the bed elevation of Carson Branch, David Branch, and Thelma Branch and filling in existing channels and a floodplain drainage ditch. Additionally, re-establishment of the wetlands on the floodplain east of Puzzle Creek and adjacent to Carson Branch will involve the removal of overburden material in select locations to expose the underlying soils that were historically hydric. By removing overburden and exposing the buried hydric soil, hydrology in terms of water level, hydropattern, and residence time will be restored within the upper soil profile. Re-establishment of the wetlands on the floodplain adjacent to the existing David Branch will involve the removal of overburden material in the location of an alluvial fan to expose the underlying hydric soils. Additional grading activities will include harvesting usable topsoil material in selective areas for re-use on the re-graded floodplain, removal of spoil berms, and incorporating existing hummocks to increase habitat diversity.

In addition to raising bed elevations of project streams, rehabilitation of existing wetlands will also involve plugging and/or filling of drainage features that are currently impacting wetland hydrology and improving micro-topography to improve surface water retention and habitat diversity. Where re-grading is determined feasible, the topsoil will be removed first and stockpiled for redistribution on the new floodplain surface. As for jurisdictional wetland areas adjacent to Carson Branch, no stockpiling of topsoil will occur. Vegetation transplants, such as tag alder shrubs and/or sod mats, will be determined during the construction phase of the Project.

Grading activities, including removal of overburden resulting from historic on-site agricultural practices, performed for wetland restoration will not exceed 12 inches. Additionally, drainage tiles discovered during the construction phase will be excavated and removed to prevent drainage of wetland areas. All Re-establishment and Rehabilitation areas will be ripped to remove negative effects of past compaction from long-term agricultural activities and will be planted with native wetland vegetation.

Wetland enhancement along David Branch and Carson Branch will involve plugging and/or filling the existing stream channels to promote natural toe slope hydrology as well as treatment of invasive species. For the enhancement area along Carson Branch, an additional floodplain ditch will be filled to prevent further floodplain drainage.

After completion of all construction and planting activities, the site will be monitored on a regular basis and a physical inspection of the site will be conducted at a minimum of twice per year throughout the seven-year post-construction monitoring period, or until performance standards are met. These site inspections will identify site components and features that require routine maintenance. The measure of stream restoration success will be documented by monitoring baseflow duration, bankfull flows, cross section surveys, and visual observations. Sand bed channels are dynamic and minor adjustments to dimension and profile are expected. The hydrology success criterion for the site is to restore the water table at the site so that it will remain continuously within 12 inches of the soil surface for at least ten percent of the growing season (approximately 22 days), during normal rainfall years. The measure of vegetative success for the site will be the survival of at least 210 seven-year old planted trees per acre.

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1 PROJECT INTRODUCTION

The John Deere Stream and Wetland Mitigation Site (the "Site") is located within a watershed dominated by agricultural and forested land use in Rutherford County, North Carolina. The project streams and wetlands proposed for restoration have been significantly impacted by channelization and agricultural practices. Due to its location and proposed improvements, the site will provide numerous ecological and water quality benefits within the Broad River Basin.

1.1 Site Location

The Site is located in central Rutherford County approximately 1.2 miles south of Bostic, North Carolina (**Figure 1**). From Raleigh, proceed west on I-40 towards Greensboro. Follow I-85 south toward Charlotte. Exit I-85 onto US 74 (Exit 10B) west towards Shelby. Near Forest City take Exit 184 for Old Caroleen Road (SR 1901). Turn right onto Old Caroleen Road (SR 1901), then take the first right onto Riverside Drive (SR 1814). Follow Riverside Drive until it intersects with East Main Street (Business US 74). Turn right onto East Main Street, then take the first left onto Bostic Sunshine Highway (SR 1006). Travel approximately 1.4 miles; then turn right onto Wood Creek Lane (Private); the project area is at the end of the road. The Site is located within the Broad River Basin, NCDWR sub-basin 03-08-02 and USGS 14-digit HUC 03050105070050 (**Figure 2a and 2b**). The Site is located in the Southern Outer Piedmont sub-region of the Piedmont ecoregion (Griffith et al. 2002).

1.2 Project Components

The Site is comprised of a single easement area along Puzzle Creek which drains to the Second Broad River approximately 1.1 miles downstream of the project. The Site is split into an east and west side with Puzzle Creek being the boundary between the two areas. The stream and wetland components are summarized in **Tables 1** and **2**.

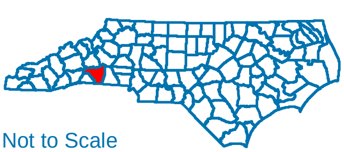
Table 1. John Deere Site Project Components – Stream Mitigation

Proposed Reach	Mitigation Type	Proposed Stationing			Existing Length (LF)	Proposed Length (LF)	Mitigation Ratio	SMUs
Carson Branch	Restoration	101+14	to	108+80	565	766	1 : 1	715*
David Branch	Restoration	200+24	to	206+29	671	605	1 : 1	258*
Thelma Branch	Restoration	300+60	to	304+72	108	412	1 : 1	412
Total					**1,344**	**1,783**		**1,385***

*These numbers are smaller than the proposed length due to sections that are being restoring but not credited due to a lack of minimum stream buffer.

Table 2. John Deere Site Project Components – Wetland Mitigation

Mitigation Type	Total Acres	Mitigation Ratio	WMUs
Re-establishment	3.59	1 : 1	3.59
Rehabilitation	5.06	1.25 : 1	4.05
Enhancement	0.78	2 : 1	0.39
TOTAL	**9.43**		**8.03**



Not to Scale

FIGURE 1

Project Vicinity Map
John Deere Mitigation Site

Rutherford County, NC

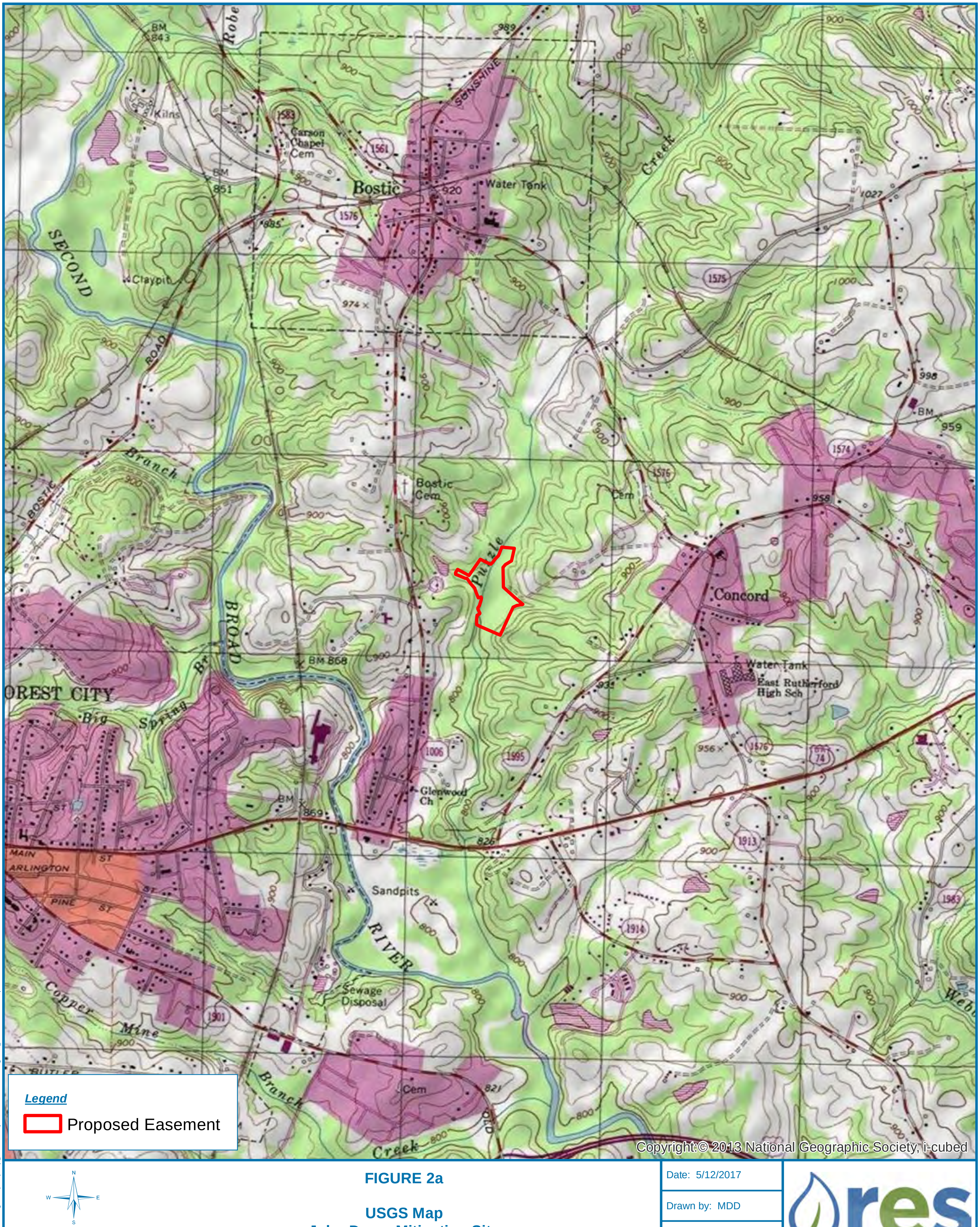
0 1 2
Miles

Date: 7/27/2016

Drawn by: BPB

Checked by: DPI

Document Path: C:\Users\Brad\Dropbox (RES)\RES Projects\North Carolina\John Deere\Maps\GIS\MXD\Figure 1_Project Vicinity Map.mxd



N
W E
S

0 1,000 2,000

Feet

FIGURE 2a

USGS Map
John Deere Mitigation Site

Rutherford County, NC

Date: 5/12/2017

Drawn by: MDD

Checked by: DPI

res

Document Path: C:\Users\mdeangelo\Dropbox (RES)\@RES GIS\Projects\nc\John Deere\MXD\Figure 2a_John Deere USGS Map.mxd

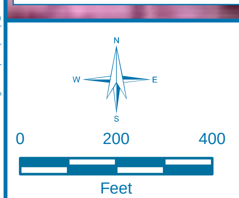


FIGURE 2b

USGS Map
John Deere Mitigation Site

Rutherford County, NC

Date: 5/12/2017	
Drawn by: MDD	
Checked by: DPI	

Document Path: C:\Users\mdeangelo\Dropbox (RES)\@RES GIS\Projects\nc\John Deere\MXD\Figure 2b_John Deere USGS Map.mxd

2 WATERSHED APPROACH

The 2009 Broad River Basin Restoration Priorities (RBRP) identified several restoration needs for the entire Broad River Basin. Twenty-seven percent of the watershed is used for agricultural purposes and nine percent is currently developed. The Puzzle Creek watershed (HUC 03050105070050) was not identified as a Targeted Local Watershed (TLW), however because of the projects ability to meet stressor related goals it will still be beneficial to the Broad River watershed.

The John Deere Stream and Wetland Mitigation Site is located within the middle of HUC 03050105 and includes streams that discharge into the Second Broad River. The Site achieves the goals set forth for the Broad River Basin in the 2009 Broad RBRP, to implement wetland and stream restoration projects that reduce sources of sediment and nutrients by restoring riparian buffer vegetation, stabilizing banks, excluding livestock, and restoring natural geomorphology, especially in headwater streams.

The project goals address stressors identified in the RBRP and include the following:

- Nutrient removal
- Sediment reduction
- Restoration of natural flora
- Improved aquatic and terrestrial habitat.

The project goals will be addressed through the following project objectives:

- Control of exotic invasive species,
- Restoration of forested riparian stream buffers,
- Stabilization of eroding stream banks due to row crop management, lack of deep-rooted vegetation, and livestock hoof shear,
- Addition of large woody debris, such as log vanes, log weirs, root wads,
- Restoration of hydrology in disturbed and existing riparian wetlands, and
- Restoration of Rosgen Stream type C pattern, dimension, and profile in select stream channels.

2.1 Historical Land Use and Development Trends

Aerial imagery indicates that the subject site has been used extensively for agricultural purposes. (**Figure 3**). Before 1993 much of the property was forested. Since 1998 little has changed in regards to the development of the project site and nearby surrounding property. Several watershed characteristics, such as groundwater, vegetation, surface drainage, and soil parameters have been modified. Soil structure and surface texture have been altered from intensive agricultural operations that include, but are not limited to, row crop production and cattle grazing.

2.2 Soil Survey

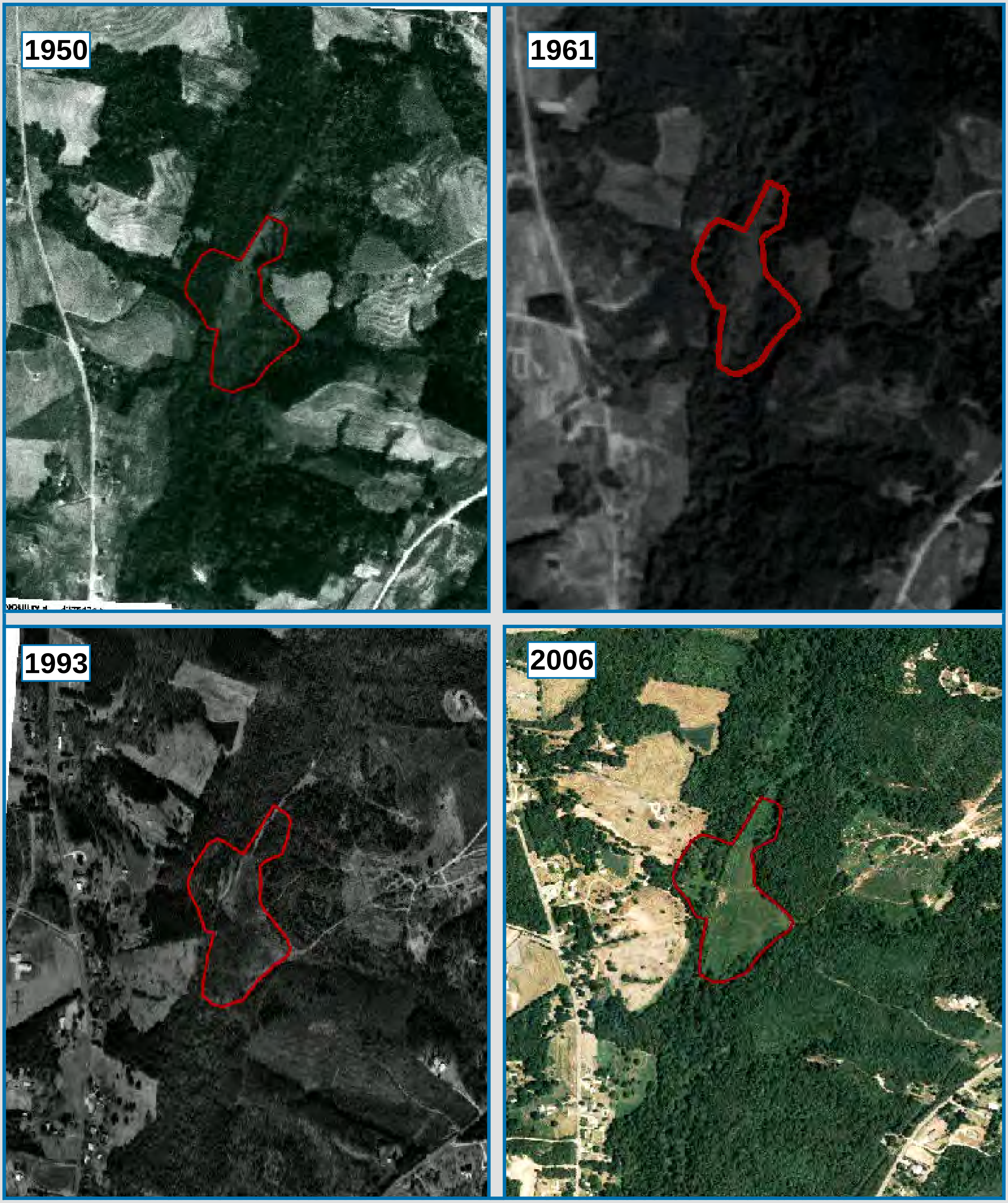
The Site is located in the Southern Outer Piedmont sub-region of the Piedmont ecoregion (Griffith et al. 2002). The bedrock in this ecoregion is generally covered with deep saprolite and red, clayey subsoils. Loam and sandy loam soils are typical in this region.

The Rutherford County Soil Survey shows a singular soil surrounding Puzzle Creek (**Figure 4**). The soil found occurs throughout the proposed conservation easement. The soil series found on the site are described below and summarized in **Table 3.**

Chewacla loam. This is a very deep, poorly drained soil found in the Piedmont and Coastal Plain river valleys. Soils formed in Alluvium deposits, and generally occur on slopes between 0-2 percent. Runoff is negligible to low and permeability is moderate. Major uses are cropland.

Table 3. Mapped Soil Series

Map Unit Symbol	Map Unit Name	Percent Hydric	Drainage Class	Hydrologic Soil Group	Landscape Setting
ChA	Chewacla loam, 0 to 2 percent slopes	2%	Poor	B/D	Floodplain



Legend

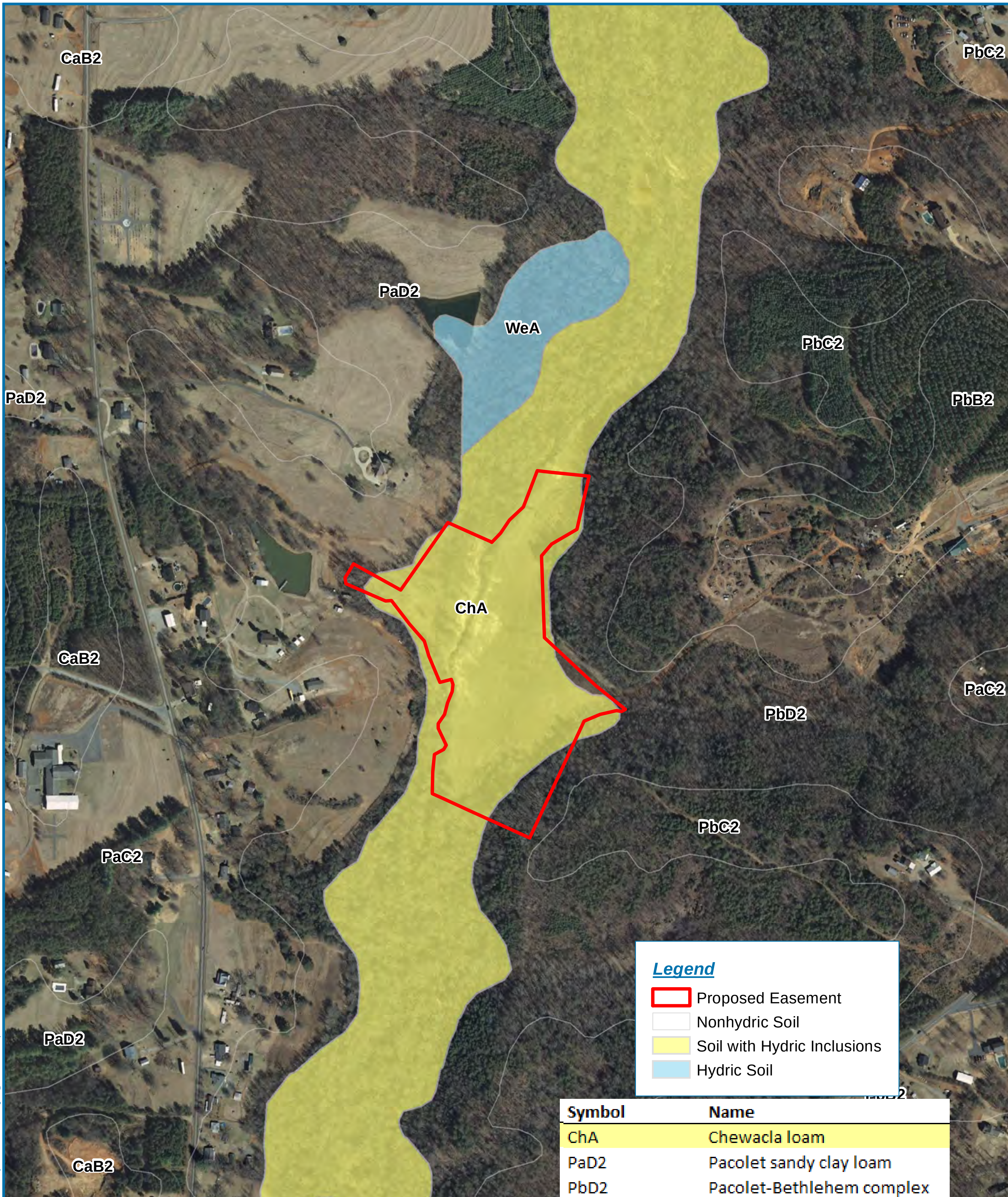
Approximate Project Area

N

Figure 3.
Historical Aerial Photography
John Deere Mitigation Site

0 500 1,000 2,000 Feet

1 in. = 2,000 ft.



Symbol	Name
ChA	Chewacla loam
PaD2	Pacolet sandy clay loam
PbD2	Pacolet-Bethlehem complex

0 250 500

Feet

FIGURE 4

Soils Map
John Deere Mitigation Site

Rutherford County, NC

Date: 5/11/2017

Drawn by: MDD

Checked by: DPI

2.3 Site Photographs

 Photo 1. Carson Branch looking upstream.	 Photo 2. Carson Branch looking downstream.
 Photo 3. Looking downstream at David Branch.	 Photo 4. Looking upstream at David Branch.
 Photo 5. Thelma Branch looking upstream.	 Photo 6. Thelma Branch looking downstream.

 Photo 7. Drained and degraded wetland on east side.	 Photo 8. Drained wetland on west side.

3 SITE PROTECTION INSTRUMENT

3.1 Site Protection Instrument(s) Summary Information

The land required for the construction, management, and stewardship of this mitigation site includes portions of the following parcels (**Figure 5**). A copy of the land protection instrument and draft easement plat is included in **Appendix 3**.

Table 4. Project Parcel and Landowner Information

Landowner	Pin	County	Site Protection Instrument	Deed Book and Page Number	Parcel Acreage	Protected Acreage
James S. and Rebecca Carson	1611051	Rutherford	Conservation Easement	00403-0453	93.8	12.1
David C. and Thelma Melton	1645500	Rutherford	Conservation Easement	00500-0078	22.3	3.2

When available, the recorded document(s) will be provided. If the recorded document(s) are not available, the template documents will be provided. The easement closing process has been delayed due to the adjustments to project design. However, the option contracts have been extended and arestill viable. Theeasement is ready to be recorded upon finalization of the design and regulatory approval.

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

FIGURE 5

Landowner Map
John Deere Mitigation Site

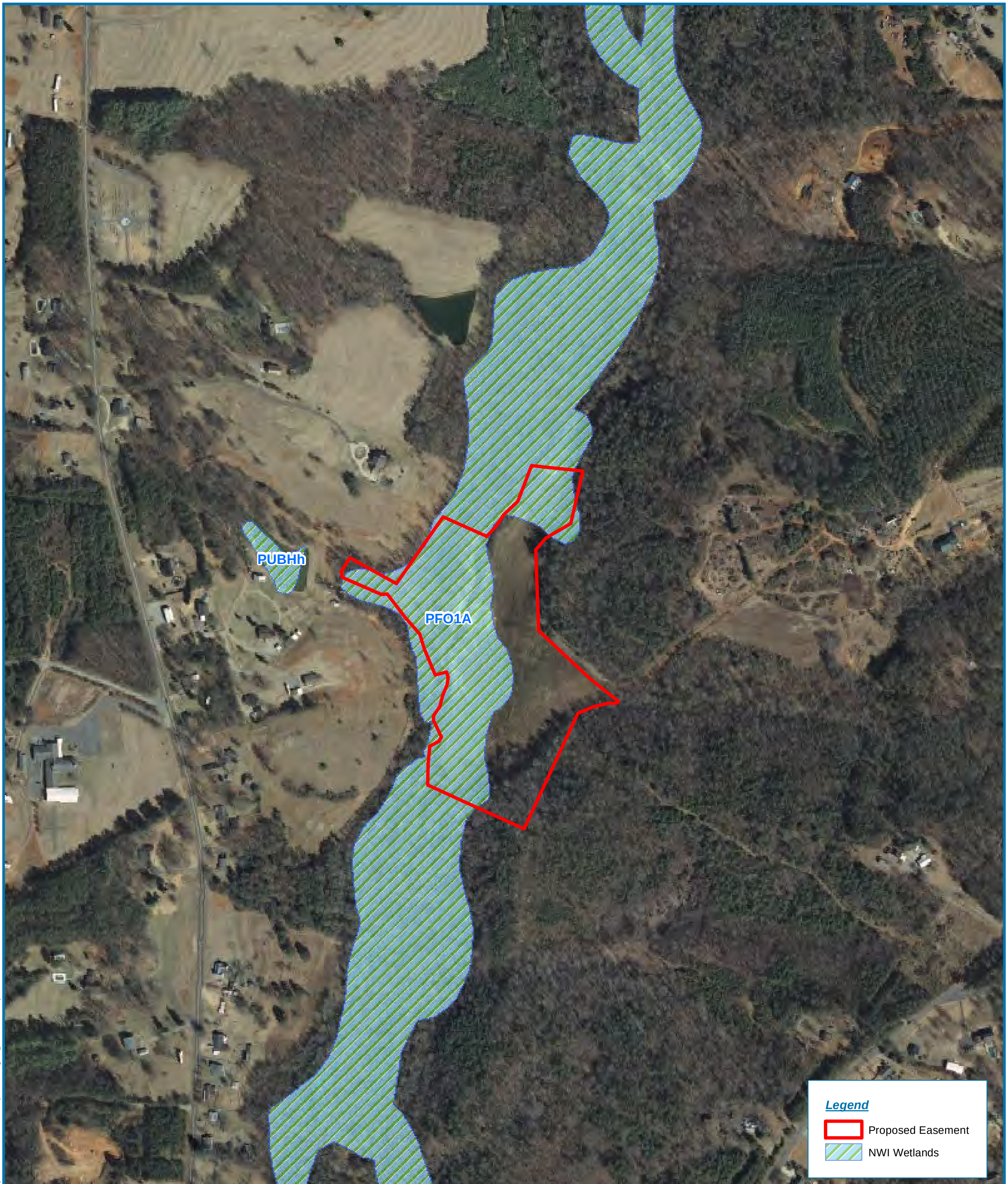
Rutherford County, NC

Date: 7/27/2016

Drawn by: BPB

Checked by: DPI

res



N
W E
S

0 250 500
Feet

FIGURE 6

NWI Map
John Deere Mitigation Site

Rutherford County, NC

Date: 8/4/2016	
Drawn by: BPB	
Checked by: DPI	

res

Document Path: C:\Users\Brad\Dropbox (RES)\@RES Projects\North Carolina\John Deere\Maps\GIS\MXD\Figure 8_John Deere NWI Map.mxd

4 BASELINE INFORMATION

Table 5. Project Attribute Table

<table>
<tr><th colspan="6">Project Information</th></tr>
<tr><td colspan="2">Project Name</td><td colspan="4">John Deere</td></tr>
<tr><td colspan="2">County</td><td colspan="4">Rutherford</td></tr>
<tr><td colspan="2">Project Area (acres)</td><td colspan="4">15.37</td></tr>
<tr><td colspan="2">Project Coordinates (latitude and longitude)</td><td colspan="4">Latitude: 35°20'39.89"N Longitude: 81°49'53.71"W</td></tr>
<tr><td colspan="2">Planted Acreage (Acres of Woody Stems Planted)</td><td colspan="4">12.6</td></tr>
<tr><th colspan="6">Project Watershed Summary Information</th></tr>
<tr><td colspan="2">Physiographic Province</td><td colspan="4">Southern Outer Piedmont</td></tr>
<tr><td colspan="2">River Basin</td><td colspan="4">Broad</td></tr>
<tr><td>USGS Hydrologic Unit 8-digit</td><td>03050105</td><td colspan="2">USGS Hydrologic Unit 14-digit</td><td colspan="2">03050105070050</td></tr>
<tr><td colspan="2">DWR Sub-basin</td><td colspan="4">3/8/2002</td></tr>
<tr><td colspan="2">Project Drainage Area (acres)</td><td colspan="4">202</td></tr>
<tr><td colspan="2">Project Drainage Area Percentage of Impervious Area</td><td colspan="4">< 1%</td></tr>
<tr><td colspan="2">CGIA Land Use Classification</td><td colspan="4">Mixed Hardwoods/Conifers</td></tr>
<tr><th colspan="6">Reach Summary Information</th></tr>
<tr><th colspan="2">Parameters</th><th>Carson Branch</th><th>David Branch</th><th colspan="2">Thelma Branch</th></tr>
<tr><td colspan="2">Length of reach (linear feet)</td><td>565</td><td>671</td><td colspan="2">108</td></tr>
<tr><td colspan="2">Valley confinement (Confined, moderately confined, unconfined)</td><td>Slightly Confined</td><td>Slightly Confined</td><td colspan="2">Slightly Confined</td></tr>
<tr><td colspan="2">Drainage area (acres)</td><td>115</td><td>92</td><td colspan="2">36</td></tr>
<tr><td colspan="2">Perennial, Intermittent, Ephemeral</td><td>Perennial</td><td>Perennial</td><td colspan="2">Perennial</td></tr>
<tr><td colspan="2">NCDWR Water Quality Classification</td><td>WS V</td><td>WS V</td><td colspan="2">WS V</td></tr>
<tr><td colspan="2">Stream Classification (existing and proposed)</td><td>G/C</td><td>G/C</td><td colspan="2">G/C</td></tr>
<tr><td colspan="2">Evolutionary trend (Simon)</td><td>Stage IV</td><td>Stage IV</td><td colspan="2">Stage IV</td></tr>
<tr><td colspan="2">FEMA classification</td><td>AE</td><td>AE</td><td colspan="2">AE</td></tr>
<tr><th colspan="6">Wetland Summary Information</th></tr>
<tr><th colspan="2">Parameters</th><th>Wetland A</th><th>Wetland B</th><th>Wetland C</th><th>Wetland D</th></tr>
<tr><td colspan="2">Size of Wetland (acres)</td><td>0.75</td><td>3.24</td><td>1.04</td><td>1.25</td></tr>
<tr><td colspan="2">Wetland Type (non-riparian, riparian riverine or riparian non-riverine)</td><td>riparian riverine</td><td>riparian riverine</td><td>riparian riverine</td><td>riparian riverine</td></tr>
<tr><td colspan="2">Mapped Soil Series</td><td>Chewacla</td><td>Chewacla</td><td>Chewacla</td><td>Chewacla</td></tr>
<tr><td colspan="2">Drainage class</td><td>Somewhat poorly drained</td><td>Somewhat poorly drained</td><td>Somewhat poorly drained</td><td>Somewhat poorly drained</td></tr>
<tr><td colspan="2">Soil Hydric Status</td><td>Hydric</td><td>Hydric</td><td>Hydric</td><td>Hydric</td></tr>
<tr><td colspan="2">Source of Hydrology</td><td>Groundwater</td><td>Groundwater</td><td>Groundwater</td><td>Groundwater</td></tr>
</table>

Restoration or enhancement method (hydrologic, vegetative etc.)	Hydrologic; Vegetative	Hydrologic; Vegetative	Hydrologic; Vegetative	Hydrologic; Vegetative
Regulatory Considerations				
Parameters	**Applicable?**	**Resolved?**	**Supporting Docs?**	
Water of the United States - Section 404	Yes	To be permitted	Jurisdictional Determination	
Water of the United States - Section 401	Yes	To be permitted	Jurisdictional Determination	
Endangered Species Act	Yes	Yes	Appendix 9	
Historic Preservation Act	Yes	Yes	Appendix 9	
Coastal Zone Management Act (CZMA or CAMA)	No	N/A		
FEMA Floodplain Compliance	N/A	N/A		
Essential Fisheries Habitat	No	N/A		

4.1 Watershed Summary Information

4.1.1 Drainage Area

The drainage area at the downstream limits of the project is 202 acres (0.32 $mi.^2$). Land use within the watershed consists of 48% forest, 8% low-density residential, and 40% agricultural land. Impervious area covers less than 1% of the total watershed. Baseline information is summarized in **Table 5**.

4.1.2 Surface Water Classification

Puzzle Creek has been assigned a Water Supply-V classification (WS-V; NCDWQ 2013). Waters classified as WS-V are protected as water supplies. They are generally upstream and draining to Class WS-IV waters or waters used by industry to supply their employees with drinking water or as waters formerly used as a water supply. 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).

4.2 Reach Summary Information

The Site encompasses approximately 11.7 acres of actively managed floodplain. The east side consists of cropland while the west side consists of pasture. Grazing livestock have historically had access to most stream reaches on the west side of the project. On the east side of the project, active management of the cropland including draining wetlands has led to easily erodible soils and unstable banks. The lack of deep-rooted vegetation and unstable channel banks appears to have contributed to the degradation of the stream on both sides of the project.

In order to assess existing geomorphic conditions, cross section measurements were taken at nine (9) locations within the site. These measurements were used to evaluate existing width-depth ratios, bank-height ratios, entrenchment ratios and stream classification (See **Appendix 2**). Additionally, a bed-width index and a maximum depth index were calculated to assess departure from reference conditions. Data collected from naturalized streams in the surrounding watersheds, the reference reach surveys and the regional curve sites were used to develop regional hydraulic geometry relationships for reference channel bed width and reference maximum bankfull.

Vertical and lateral stability were further evaluated by mapping existing erosional and depositional features throughout the site and calculating bank erosion hazard index (BEHI) and near-bank stress (NBS) rating (**Appendix 2**). Channel cross sectional data are presented in the appendices.

4.2.1 Carson Branch

The majority of Carson Branch classifies as a Type G stream characterized by low width-depth ratios ranging from 5.1 to 8.2, with the exception of one on-site section having a width-depth ratio of 15.9. Entrenchment ratios typically range from 1.1 to 1.9. The bank-height ratios on Carson Branch are typically within the range of 1.6 – 2.8. Additionally, the BWI values range from 0.4 to 0.8; the MDI values range from 0.8 to 0.9; and the bankfull width of the existing channel is approximately 50% of the reference width. This suggests that future adjustments of the channel will occur in the form of widening of the bed width and pattern adjustments resulting in additional bank erosion.

Carson Branch enters the site from the east flowing through a steep, confined valley. Maintaining its east to west direction and steep profile, Carson Branch runs over a gravel and cobble bed along the toe of a ridge to the south. Adjacent to the streams present location, the valley bottom opens up into a pasture to the north. Along this location the channel is entrenched and straight, a characteristic that is maintained through the remainder of the Site. As the channel proceeds over the next 400 feet, the slope decreases from approximately 1.7% to 1%. Carson Branch flows approximately 930 feet along the edge of a wooded forest and adjacent to the vegetated pasture to the north until its confluence with Puzzle Creek.

Inspection of the site topography suggests that the channel was realigned from its historic position along the center of the valley to the southern edge of the valley bottom. The contour mapping indicates that the center of the valley bottom is slightly lower to the north of the existing channel and there is evidence of remnant spoil piles on the north bank of the channel. At the upstream end of Carson Branch, a coarse bed composed of immobile cobble and mixed sand indicates a low to moderate bed load. Throughput consists primarily of sand generated from the head of the watershed and on-site. At the downstream end of Carson Branch, the average particle size decreases to small gravel and sand. Additionally, minimal point bars are evident indicating a low to moderate bedload of sand and gravel.

Subsequent to the initial channel relocation and straightening, the channel has continuously eroded its banks in an effort to re-establish proper dimension and pattern. Bank erosion has been further aggravated by adjacent agricultural practices and logging.

4.2.2 David Branch

David Branch classifies as a Type G stream with low width-depth ratios typically ranging from 4.8 to 11.9 and entrenchment ratios of 1.4 to 1.8. The bank-height ratios on David Branch are typically within the range of 1.1 to 2.3. Additionally, the BWI values through this reach range from 0.4 to 0.6 and the MDI values range from 0.5 to 0.6 indicating the potential for lateral bed widening and a relatively low risk for significant adjustment in the vertical direction.

A pond outfall at the western extent of the Site forms the upstream end of David Branch. The stream flows through a narrow valley as the entrenched channel is situated approximately 2 to 4 feet below the valley floor. Approximately 250 feet downstream, a 36-inch corrugated metal pipe (CMP) acts as a grade control for the channel. Further downstream the base flow passes through a 6-inch polyvinyl chloride pipe (PVC) and the defined channel is less evident as water disperses through a vegetated depression. Along the lower reach of David Branch the channel has down-cut into the valley floor and is highly entrenched before its confluence with Puzzle Creek.

The heavily impacted state of David Branch has resulted in a poorly functioning, entrenched channel that is disconnected from the adjacent floodplain wetlands. The BWI and existing evolutionary state of the channel indicate a continuing risk of the channel bed widening and the current state imposes a negative impact on the surrounding floodplain by lowering the adjacent groundwater elevation.

4.2.3 Thelma Branch

Thelma Branch classifies as a Type G stream with low width-depth ratios typically ranging from 7.0 to 12.9 and entrenchment ratios of 1.2 to 1.5. The bank-height ratios on Thelma Branch are typically within the range of 4.2 to 15.2. Additionally, the BWI values through this reach are typically 0.6 and the MDI values range from 0.4 to 1.0 indicating the potential for lateral bed widening and adjustment in the vertical direction.

Thelma Branch enters the site from a forested area to the north and immediately makes a right-angle bend to the east flowing towards its confluence with Puzzle Creek 80 feet downstream. Downstream of the bend, Thelma Branch is highly entrenched and situated 3 to 4 feet below the valley floor. A nick point exists approximately 30 feet downstream of the bend, and the bed elevation of Thelma Branch increases in the downstream direction to this nick point.

The pattern and position of Thelma Branch in the valley floor indicates that the channel was realigned from its historic position. Additionally, investigation of the channel geometry yields conclusive evidence of past ditching. The presence of an existing nick point suggests further channel degradation, exacerbating negative impacts to the surrounding floodplain and wetlands.

4.2.4 Vegetation

Current land use in the vicinity of the project is primarily pasture, hay production, and disturbed hardwood fringes. Exotic species are also present throughout, including Chinese privet (*Ligustrum sinense*) and Japanese honeysuckle (*Lonicera japonica*). Adjacent agricultural practices, cattle grazing and logging have contributed to highly eroded channels throughout the easement, therefore part of the rehabilitation/re-establishment is expected to entail re-vegetation of wetland species.

4.3 Wetland Summary Information

4.3.1 Existing Wetlands and Floodplain

The U.S. Fish & Wildlife Service (USFWS) National Wetland Inventory (NWI) Map maps the western portion of the easement area as a Freshwater Forested/Shrub Wetland (PFO1A) (**Figure 6**).

The combined valley bottom on both sides of Puzzle Creek, which constitutes the historic alluvial floodplain, is approximately 12.7 acres, of which approximately 6.32 acres remain as jurisdictional wetlands. The floodplain has a down-valley slope of approximately 0.3% in the north to south direction and is bisected by Puzzle Creek with Carson Branch, David Branch, and Thelma Branch flowing cross-valley to Puzzle Creek. Although the floodplain has been severely impacted by past land use practices there is substantial evidence that a majority of this area was historically wetlands.

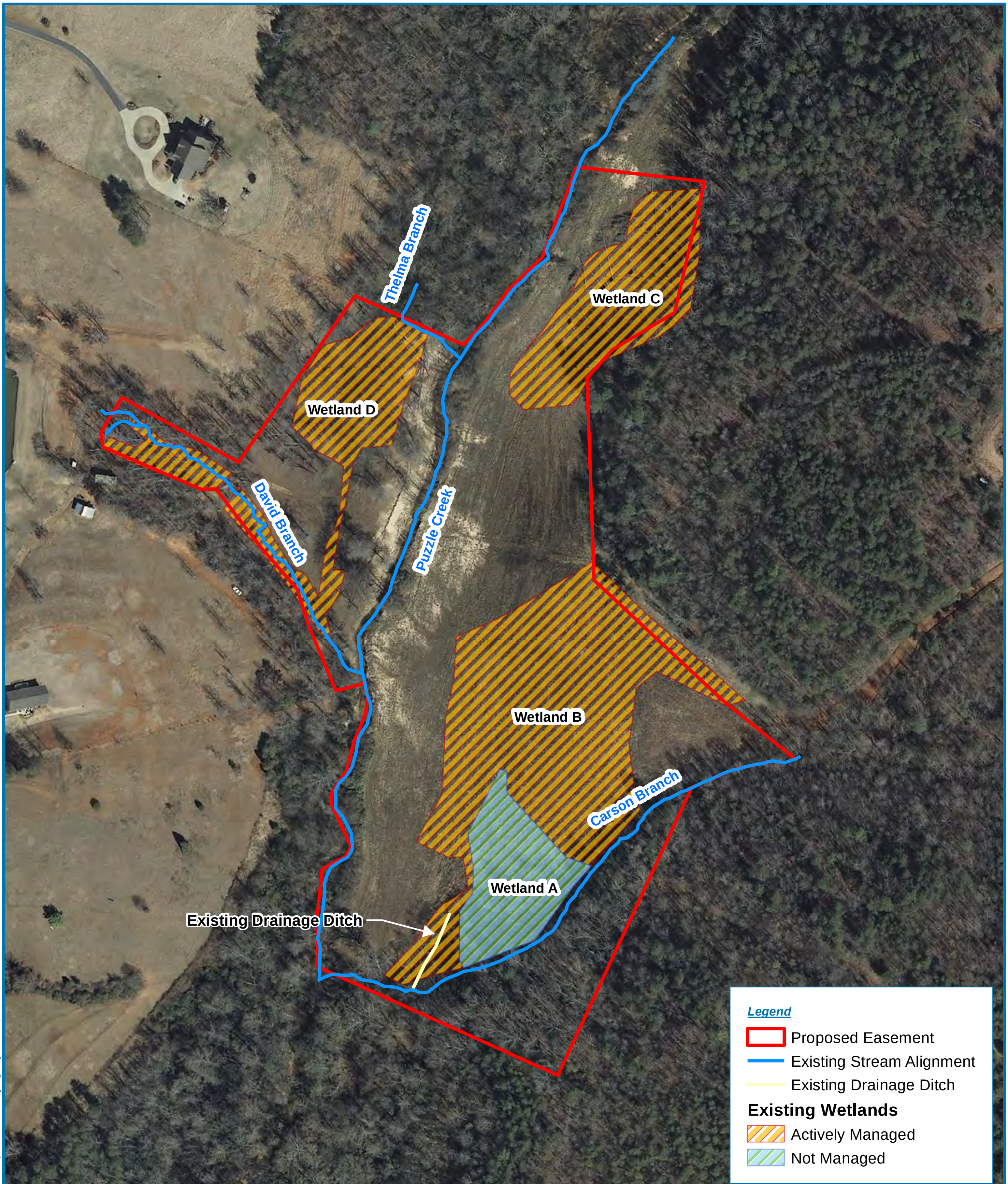
There is strong evidence that Carson Branch and David Branch were relocated to the extreme south side of the floodplain along the toe of a ridge. It is likely that Thelma Branch historically flowed along the length of the valley bottom before it's confluence with Puzzle Creek. However, Thelma Branch was relocated to the extreme north end of the valley eliminating a substantial portion of its length along the valley.

In addition to the channel relocation, drainage ditching affects site drainage conditions. One main ditch is cut through the extant wetlands east of Puzzle Creek near the valley low and runs north to south towards Carson Branch. There are pronounced spoil piles along this ditch with sufficient evidence to suggest that the ditch has been maintained in the fairly recent past.

The effect of dredging, floodplain ditching and re-aligning of Carson Branch, David Branch, and Thelma Branch, has severely impacted the groundwater hydrology of the floodplains. The Carson Branch channel invert and the main ditch draining to it is approximately 2 to 3 feet below the floodplain surface. The Thelma Branch and David Branch channel inverts are approximately 1 to 3 feet and 3 to 4 feet below the floodplain surface, respectively. These lower channel and ditch elevations not only facilitate the removal of surface water from the floodplain and reduce retention time, they also affect hydrology by drawing down groundwater adjacent to these features.

In addition to lowering of the groundwater table and reduction in surface water retention, the former wetlands have been impacted by the deposition of soil, silt, and sediment on top of the former floodplain surface. The presence of this overburden is obvious in many locations across the floodplain by the occurrence of distinct buried hydric soils. Historically, the surrounding hill sides were likely subject to agriculture and cultivation. Once mechanized equipment became available, wetlands were drained and agricultural practices extended into the valley bottoms resulting in both colluvial and alluvial deposits. Past heavy sediment loads in the streams and sediment production from logging and agriculture could easily account for the majority of the observed overburden. Added to that would be the wasting and grading out of material produced from the dredging of Carson Branch, David Branch, Thelma Branch and the primary drainage ditch.

A wetland delineation was performed in July 2015. Wetland boundaries were delineated using current methodology outlined in the 1987 U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual (DOA 1987) and Regional Supplement to the U.S. Army Corps of Engineers Wetland Delineation Manual: Eastern Mountain and Piedmont Region (Version 2.0) (U.S. Army Corps of Engineers 2010). Soils were characterized and classified using the Field Indicators of Hydric Soils in the United States, Version 7.0 (USDA-NRCS 2010). Wetland boundaries were marked with sequentially numbered wetland survey tape (pink/black striped). Flag locations were surveyed under the direction of a Professional Licensed Surveyor (PLS) with GPS and conventional survey (**Figure 7; Table 5**). The approved Jurisdictional Determination (JD) is included in **Appendix 6**.



N W E S

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FIGURE 7

Existing Hydrologic Features Map
John Deere Mitigation Site

Rutherford County, NC

Date: 5/11/2017

Drawn by: BPB

Checked by: DPI

Document Path: C:\Users\mdeangelo\Dropbox (RES)\@RES GIS\Projects\nc\John Deere\MXD\Figure 7_Existing Conditions Map.mxd

4.3.2 Hydric Soil Investigation

A hydric soil investigation was conducted by a licensed soil scientist on July 7, 2015 in order to assess the presence of hydric soils and determine areas suitable for wetland restoration. Prior to performing the evaluation, NRCS maps and USGS topographic maps were reviewed to determine where borings should be taken. During the investigation, over two hundred hand-turned soil auger borings were sampled throughout the Site on a fifty-foot by fifty-foot grid. Hydric soil status is based upon the NRCS Field indicators of Hydric Soils in the United States – A guide for Identifying and Delineating Hydric Soils (Version 7.0, 2007). The study area included approximately ten acres within the flood plain of Puzzle Creek and is comprised of agricultural field to the east and a pasture to the west. The agricultural field shows evidence of being highly manipulated by past tillage and farming applications. The area west of Puzzle creek shows evidence of historical ditching and filling based on the soil profiles. See **Appendix 5** for the detailed hydric soil report.

4.4 Regulatory Considerations and Potential Constraints

4.4.1 Property Ownership, Boundary, and Utilities

No utilities are located within The Site. Additionally, no exclusions are included in the easement.

4.4.2 FEMA/Hydrologic Trespass

Hydrologic trespass is a not a concern for this project. According to the North Carolina Floodplain Mapping Information System, streams on the Site lie within the 100-year flood zone **(Figure 8);** however, it does not contain a regulated floodway (NCFMP 2008). Hydraulic modeling will be required to determine that restoration activities will have no effect on 100-year flood elevations downstream. No hydrologic trespass will be permitted to adjacent properties upstream or downstream of the project without approval of the affected landowners.

4.4.3 Environmental Screening and Documentation

4.4.3.1 Threatened and Endangered Species

A desktop analysis and field investigation were conducted to evaluate federally protected species potentially occurring on the Site. The USFWS Information for Planning and Conservation (IPAC) online tool was consulted to determine if any threatened or endangered species managed or regulated by the USFWS may be affected by project-related activities at the Site. In addition to the USFWS IPAC tool, the October 2014 North Carolina Natural Heritage Program (NCNHP 2011) database of natural heritage element occurrences was also reviewed in GIS to identify rare species or unique habitats on-site, especially those listed in the USFWS database. According to the USFWS IPAC database review tool (USFWS 2015), six federally listed species may occur in proximity to the Site **(Table 6**).

Table 6. Threatened and Endangered Species List

Common Name	Scientific Name	Federal Status	Record Status
Flowering Plants:			
Dwarf-Flowerd heartleaf	*Hexastylis naniflora*	T	Current
Small whorled pogonia	*Isotria medeoloides*	T	Current
White irisette	*Sisyrinchium dichotomum*	E	Current
Lichens:			
Rock gnome lichen	*Gymnoderma lineare*	E	Current
Mammals:			
Northern long-eared bat	*Myotis septentrionalis*	T	Current
Indiana bat	*Myotis sodalis*	E	Current

Species and species habitat listed in the USFWS database were inspected for, during the field investigation to determine whether or not they occur at the Site. Potential impacts to species and species habitat off site, downstream, and within the vicinity of the project were also considered. In summation, the biological conclusion for all threatened and endangered species listed in the USFWS database that could be potentially affected by John Deere project activities is "No Effect". Because the database search and field investigations determined that the biological conclusion for each species is "No Effect", no written concurrence from the USFWS is required.

In addition to screening for federally protected species, 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." Equinox Environmental, acting as an agent of RES, submitted a request to NCWRC for review and comments on the Site on July 8, 2015 in regards to any potential impacts to fish and wildlife resources. They replied with the affirmative that there is no significant impact. Documentation is included in **Appendix 9.**

4.4.3.1 Cultural Resources

A review of the North Carolina State Historic Preservation Office (SHPO) GIS Web Service database revealed that there are 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.

Equinox Environmental, acting as an agent of RES submitted letters to the NC SHPO, the Eastern Band of Cherokee Indian, Tribal Historic Preservation Office (EBCI-THPO), and the Catawba Indian Nation Tribal Historic Preservation (CIN-THPO) office on July 8th, 2015. The letters requested a search of records to determine the presence of any areas of architectural, historic, or archaeological significance that may be affected by the Site. THE CIN-THPO response dated July 22, 2015 states they "have no immediate concerns with regard to traditional cultural properties, sacred sites, or Native American archaeological sites within the boundaries" of the Site. Documentation is included in **Appendix 9.**

N
W E
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0 250 500
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FIGURE 8

FEMA Map
John Deere Mitigation Site

Rutherford County, NC

Date: 8/4/2016

Drawn by: BPB

Checked by: DPI

res

5 FUNCTIONAL UPLIFT POTENTIAL

The Stream Functions Pyramid Framework (Harman et. al. 2012) 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, physiochemical and geomorphology) on lower level functions (hydrology and hydraulics). Anticipated functional benefits and improvements within the project area, as based on the Function-Based Framework are outlined in **Table 8.**

Table 7. Functional Benefits and Improvements

Objective	Description	Functional Level (1-5)
Nutrient removal	Benefit will be achieved through cattle exclusion and direct removal of fecal inputs, filtering of runoff through buffer areas, the conversion of active farm fields to forested buffers, and improved denitrification and nutrient uptake through buffer zones.	**3,4**
Sediment removal	Benefit will be achieved through the stabilization of eroding stream banks through cattle exclusion (passive), bed loss will be arrested with grade control structures, and reduction of sediment loss from re-forested pasture.	**3**
Water storage	Benefit will be achieved through the enhancement of floodplain connectivity which will store more water during precipitation events than under current drainage conditions.	**1, 2**
Improved groundwater recharge	Benefit will be achieved through the increased storage of precipitation in floodplain wetlands. Greater storage of water will lead to improved infiltration and groundwater recharge.	**2**
Restoration of terrestrial and aquatic habitats	Benefit will be achieved by restoring riparian buffer and wetland buffers to hardwood ecosystems. Coarser substrate and implementation of riffle sequences will promote instream habitat.	**3**
Improved substrate and instream cover	Substrate will become coarser as a result of the stabilization of stream banks and an overall decrease in the amount fine materials deposited in the stream.	**3**
Addition of large woody debris	Benefit will be achieved through the addition of wood structures as part of the restoration design. Such structures may include log vanes, root wads, log weirs, and log toes.	**3, 4**
Reduced water temperature due to shading	Benefit will be achieved through the restoration of canopy tree species to the stream buffer areas.	**4**

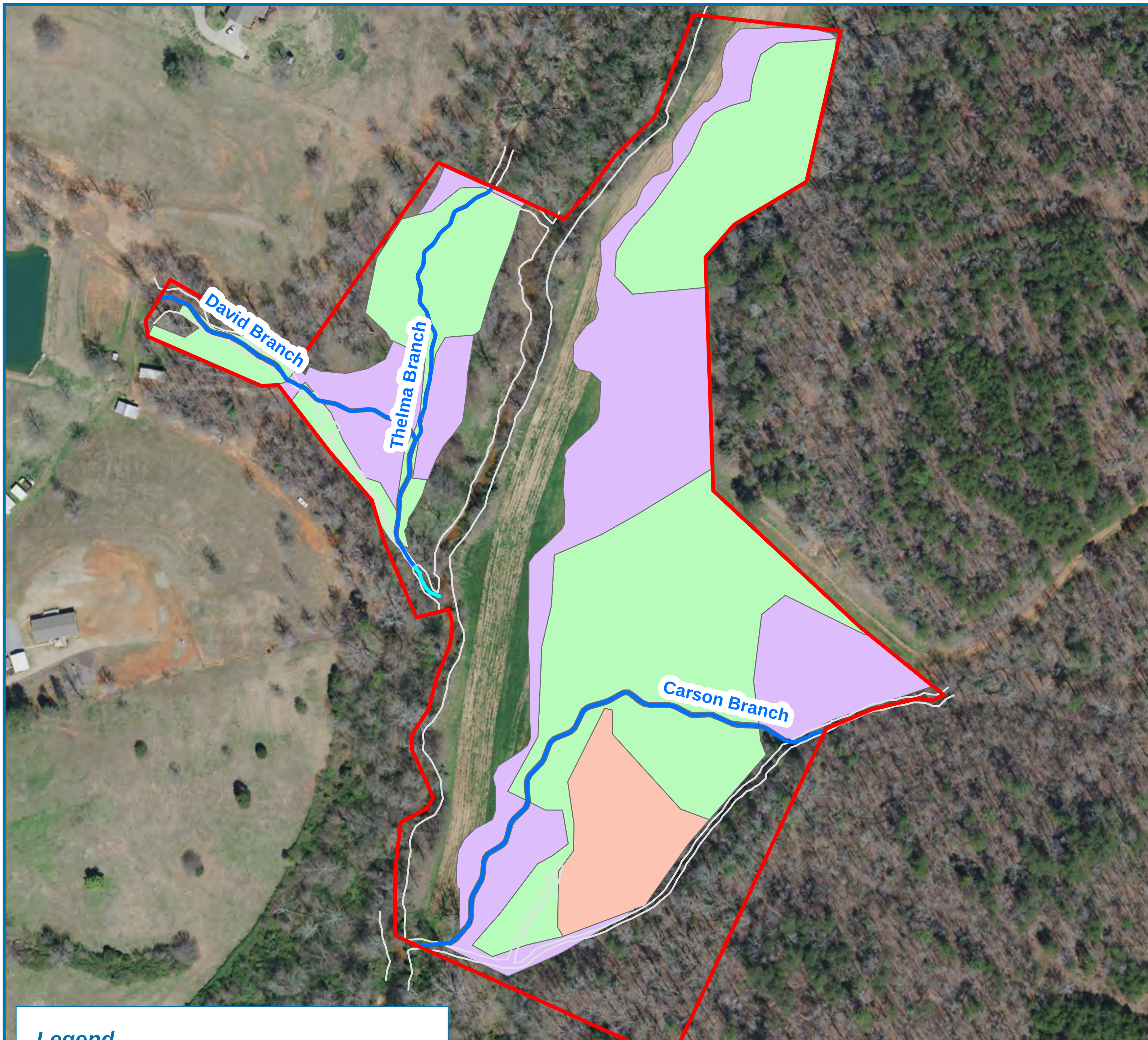
6 DETERMINATION OF CREDITS

Mitigation credits presented in these tables are projections based upon site design (**Figure 9**). Upon completion of site construction, the project components and credits data will be revised to be consistent with the as-built condition.

Table 8. Mitigation Credits

The John Deere Site Mitigation Credits								
Mitigation Credits								
	Stream	**Riparian Wetland**					**Non-Riparian Wetland**	
Totals	**1,386**	**8.03**					**N/A**	
STREAM								
Reach	**Mitigation Type**	**Stationing (Proposed)**			**Existing Length (LF)**	**Proposed Length (LF)**	**Mitigation Ratio**	**Base SMUs**
Carson Branch	Restoration	101+14	to	108+80	565	766	1:1	715*
David Branch	Restoration	200+24	to	206+29	671	605	1:1	258*
Thelma Branch	Restoration	300+60	to	304+72	108	412	1:1	412
		Total			**1,344**	**1,783**		**1,386***
WETLAND								
Mitigation Type		**Existing Acreage**	**Mitigation**			**WMUs**		
Re-establishment		3.59	1:1			3.59		
Rehabilitation		5.06	1.25:1			4.05		
Enhancement		0.78	2:1			0.39		
Total		**9.51**				**8.03**		

*These numbers are smaller than the proposed length due to sections that are being restoring but not credited due to a lack of minimum stream buffer.



Legend

- Proposed Easement (15.37 ac)
- Proposed Streams (1783 LF)
- Existing Top of Bank

Mitigation Type

- Wetland Re-Establishment (3.59 ac)
- Wetland Rehabilitation (5.06 ac)
- Wetland Enhancement (.78 ac)

Wetland Assets			
Mitigation Type	**Total Acres**	**Mitigation Ratio**	**WMUs**
Re-establishment	3.59	1:1	3.59
Rehabilitation	5.06	1.25:1	4.05
Enhancement	0.78	2:1	0.39
Total	**9.43**		**8.03**

Stream Assets				
Proposed Reach	**Proposed Length (LF)**	**Mitigation Type**	**Mitigation Ratio**	**SMUs**
Carson Branch	766	Restoration	1:1	766
David Branch	605	Restoration	1:1	605
Thelma Branch	412	Restoration	1:1	412
Total	**1,783**			**1,783**

N W E S

0 100 200
Feet

Figure 9 - Conceptual Map

John Deere Mitigation Site

Rutherford County, North Carolina

Date: 7/12/2017

Drawn by: ATP

7 CREDIT RELEASE SCHEDULE

All credit releases will be based on the total credit generated as reported by the as-built survey of the mitigation site. Under no circumstances shall any mitigation project be debited until the necessary Department of the Army (DA) authorization has been received for its construction or the District Engineer (DE) has otherwise provided written approval for the project in the case where no DA authorization is required for construction of the mitigation project. The DE, in consultation with the Interagency Review Team (IRT), will determine if performance standards have been satisfied sufficiently to meet the requirements of the release schedules below. In cases where some performance standards have not been met, credits may still be released depending on the specifics of the case. Monitoring may be required to restart or be extended, depending on the extent to which the site fails to meet the specified performance standard. The release of project credits will be subject to the criteria described as follows:

Table 9. Stream Credit Release Schedule

Monitoring Year	Credit Release Activity	Interim Release	Total Released
0	Initial Allocation- See requirements below	30%	30%
1	First year monitoring report demonstrates performance standards are being met.	10%	40%
2	Second year monitoring report demonstrates performance standards are being met. (additional 10% released at second bankfull event in a separate year)	10%	50% (60%)
3	Third year monitoring report demonstrates performance standards are being met.	10%	60% (70%)
4	Fourth year monitoring report demonstrates performance standards are being met.	5%	65% (75%)
5	Fifth year monitoring report demonstrates performance standards are being met.	10%	75% (85%)
6	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 close-out approval.	10%	90% (100%)

Table 10. Wetland Credit Release Schedule

Monitoring Year	Credit Release Activity	Interim Release	Total Released
0	Initial Allocation- See requirements below	30%	30%
1	First year monitoring report demonstrates performance standards are being met.	10%	40%
2	Second year monitoring report demonstrates performance standards are being met.	10%	50%
3	Third year monitoring report demonstrates performance standards are being met.	10%	60%
4	Fourth year monitoring report demonstrates performance standards are being met.	10%	70%
5	Fifth year monitoring report demonstrates performance standards are being met; Provided that all performance standards are met. The IRT may allow DMS to discontinue hydrologic monitoring after the fifth year, but vegetation monitoring must continue for an additional two years after the fifth year for a total of seven years.	10%	80%
6	Sixth year monitoring report demonstrates performance standards are being met.	10%	90%
7	Seventh year monitoring report demonstrates performance standards are being met, and project has received close-out approval.	10%	100%

7.1 Initial Allocation of Released Credits

The initial allocation of released credits, as specified in the mitigation plan can be released by the IRT with written approval of the DE upon satisfactory completion of the following activities:

a) Approval of the final Mitigation Plan
b) Recordation of the Conservation Easement, as well as a title opinion acceptable to the USACE covering the property
c) 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; and
d) Receipt of necessary DA permit authorization or written DA approval for projects where DA permit issuance is not required.

7.2 Subsequent Credit Releases

All subsequent credit releases must be approved by the DE, in consultation with the IRT, based on a determination that required performance standards have been achieved. For stream projects a reserve of 10% of a site's total stream credits shall be released after two bankfull events have occurred, in separate years, provided the channel is stable and all other performance standards are met. In the event that less than two bankfull events occur during the monitoring period, release of these reserve credits shall be at the discretion of the IRT. As projects approach milestones associated with credit release, the DMS will submit a request for credit release to the DE along with documentation substantiating achievement of criteria required for release to occur. This documentation will be included with the annual monitoring report.

8 MITIGATION WORK PLAN

8.1 Description of Target Stream, Wetland and Vegetation Communities

Reference reaches were sought to provide a target for design of the proposed streams. Searches were conducted first upstream and downstream of the Site and then into surrounding watersheds to find suitable references that contained comparable slope, bed material, and valley type. One type C4/C5 stream reference was located in the South Mountain Game Lands.

The reference reach was selected to represent the probable configurations for the proposed streams. Detailed geomorphic survey and Level II Rosgen classifications were conducted on two reaches at Henry Fork Creek (**See Appendix 2**).

Henry Fork Creek Reference
The Henry Fork Creek reference reach is located in the Piedmont hydro-physiographic region of North Carolina. The Henry Fork watershed has many characteristics in common with the Carson Branch and David Branch watersheds including average annual rainfall, elevation changes and valley type. The reference watershed is located in the South Mountains Game Lands area and is entirely forested. The drainage area for the Henry Fork Creek reference is 0.094 square miles.

The Henry Fork reach is representative of an C4/C5 channel in a moderately sloped valley with a moderately, constrained floodplain. Bed material, channel slope and valley form of this stream are consistent with the Site and provide reasonable analogues for the potential channel forms that can be expected at the Site.

8.1.1 Reference Discharge and Bankfull Verification

Bankfull was readily identified on the reference reaches as it exhibited consistent indicators throughout the reaches. Verification of bankfull was accomplished by plotting the bankfull cross sectional area against the regional curve data. The data indicates that the bankfull identified in the surveyed reach is slightly lower than the line of the regional curve but consistent with the range of data collected in the regional curve study.

After verification of bankfull cross sectional area, bankfull discharge was calculated for the surveyed reach using a single-section analysis. Manning's 'n' was estimated from relative roughness calculations of the bed material and from observation of the channel form and vegetation conditions. Water surface slope was assumed to be consistent with the slope of the bed profile. Discharge was then compared to the regional curve data which indicated that the calculated bankfull discharges were consistent with the regional curve data.

8.1.2 Reference Channel Stability Assessment

A detailed channel stability assessment was not performed for these reaches since the bank and bed stability was apparent from observation. Subsequent review of the surveyed dimensions confirmed that width-depth ratios and bank-height ratios were within the appropriate range for stable, self-maintaining streams. Additional observations included significant upstream and downstream reconnaissance to identify any past, present, or future signs or sources of degradation.

8.1.3 Limited Reach References

Through the course of conducting the reference reach searches, several streams were identified as possessing qualities of stability and natural form. However, these reaches were determined not to be suitable references for the project due to incompatible stream type, valley form, or insufficient reach length. In these locations morphological measurements were taken to supplement the data acquired from the reference reach sites. Measurements on ten individual reaches included bankfull width, bed width, depth of bankfull, toe depth, and width of thalweg. This data along with the reference reach data was plotted on hydraulic geometry relationships to establish the local watershed curves which are the basis for developing the design channel dimensions. The published regional curves are plotted on these graphs and indicate that the watershed data has a slightly lower cross sectional area and slightly higher bankfull width. This differential is probably associated with the fact that the watershed data is from a select stream type and region and not from a broader variety of stream types and across the entire piedmont.

8.1.4 Reference Wetland and Vegetation Communities

Reference Wetland Studies
A reference wetland was identified in the Project area in the southern area of the easement, adjacent to the existing Carson Branch stream channel, and is depicted as the forested portion of Wetland A in the Existing Conditions Map (**Figure 7**). This is a jurisdictional, riparian wetland and is classified as a palustrine forested (PFO) wetland. It displays periods of high water table and, at times, surface water. The vegetation composition portrays an immature piedmont/mountain bottomland hardwoods community. The restoration of the vegetation will be based on descriptions provided in the literature for piedmont/mountain bottomland communities. Groundwater monitoring gauges will be installed in the reference wetland at the baseline monitoring stage for hydrological comparison with the restored wetland areas.

Vegetation Communities
The target vegetation communities for the Site will be *Piedmont/Mountain Bottomland Forest* in the riparian wetlands and riparian areas. According to Schafale and Weakley the Piedmont/Mountain Bottomland Forest canopy is comprised primarily of mesic bottomland species such as tulip poplar (*Liriodendron tulipifera*), sweetgum (*Liquidambar styraciflua*), hackberry or sugarberry (*Celtic occidentalis/laevigata*), green ash (*Fraxinus pennsylvanica*), and bitternut hickory (*Carya cordiformis*). The understory can be diverse, and includes species such as ironwood (*Carpinus caroliniana*), American holly (*Ilex opaca*), and red maple (*Acer rubrum*). Vines are prominent, and include poison ivy (*Toxicodendron radicans*), various greenbriers (*Smilax spp*.), grapes (*Vitis spp*.), and Virginia creeper (*Parthenocissus virginianus*). Herbs are also diverse, and can include multiple types of sedges (*Carex spp*.), river oats (*Chasmanthium latifolium*), violets (*Viola spp*.), jumpseed (P*ersicaria virginiana*), jack-in-the-pulpit (*Arisaema triphyllum*), and Virginia rye grass (*Elymus virginicus*).

8.2 Design Parameters

8.2.1 Stream and Wetland Restoration Approach

<u>Carson Branch</u>
Carson Branch is divided into two sub-reaches; Reach 1A is the steeper upstream reach and Reach 1B is downstream from the steeper reach. Reach 1A is proposed for Priority I restoration as a type C4b stream with low sinuosity and a maximum slope of 2.7%. Reach 1B is proposed for Priority I restoration as a type C4 stream with moderate sinuosity and an average slope of 0.1%. The alignment was selected to follow the natural low in the valley and optimize hydrologic connection with the proposed wetlands. A short length of stream at the downstream end of Reach 1B will require Priority II restoration in order to transition back to the existing Carson Branch. The existing degraded stream conditions sufficiently warrant complete reconstruction of the reach, however, equally as important is raising the stream profile to reconnect it to the floodplain, which is integral to the success and function of the proposed wetland

restoration. Reconstruction of the channel will provide for configuration of proper cross sectional geometry that will reduce stress on the banks and eliminate bank scour. Additionally, reconstruction will provide the opportunity to harvest the gravel bed material from the existing channel and utilize it to construct proper, functional riffles. Riffles constructed from native gravel material along with in-stream structures will provide immediate habitat features for a benthic community and a dramatic functional uplift.

David Branch

David Branch is divided into two reaches; Reach 1 is the steeper upstream reach and Reach 2 is downstream of the steeper reach and the confluence of Thelma Branch. Full restoration is required for both reaches to address the degraded conditions of severe channel incision, improper channel dimensions, and the resulting negative impacts on stream functions. Along Reach 1 and Reach 2 a Priority I approach is proposed for a type C4 stream. The downstream portion of Reach 1 and the full length of Reach 2 will be realigned to the center of the valley. A short length of stream at the downstream end of Reach 2 will require Priority II restoration in order to transition back to the existing David Branch and Puzzle Creek. Reach 1 is proposed as a low sinuosity stream with a slope of 2.5%, while Reach 2 is proposed as a moderate sinuosity stream with a slope of 0.5%. Although low sinuosity is not considered typical for C type streams, the relative confinement and low cross slope of the valley necessitate the proposed pattern. Additionally, low sinuosity, headwater C streams are often found in the piedmont region as illustrated in the reference reach data. Realigning the channel to the center of the valley and raising the bed profile is a key factor in restoring wetland hydrology to the surrounding floodplain.

Thelma Branch

Thelma Branch is proposed as Priority I restoration for a type C5 stream with low to moderate sinuosity and an average channel slope of 0.1%. As stated with David Branch, the relative confinement and low cross slope of the valley necessitate a low sinuosity pattern. Full restoration is required for the upstream portion of Thelma Branch due to the topography of the existing valley bottom. A defined valley low, well connected with the surrounding floodplain, will serve as the proposed channel for a majority of the reach in order to minimize construction impacts while maximizing ecological function in a stream-wetland complex. In order to connect Thelma Branch to the valley low, it will be necessary to grade out the first 50 feet of the alignment. The majority of the area that will need to be graded out consists of previously placed fill material. Relocating the channel to its natural valley will result in the stream flowing through a jurisdictional wetland. Therefore, stream work and the associated wetland impacts are allowable under Nationwide Permit 27 and will be addressed in the Pre-Construction Notification (PCN). Channel relocation to its natural valley will result in net ecological uplift.

Wetland Re-establishment, Rehabilitation, and Enhancement

Wetland re-establishment is proposed for blocks of hydric soils within non-jurisdictional areas under active management. These soil groups present a variety of conditions including relatively disturbed and undisturbed profiles and buried and unburied horizons (**Appendix 5**). Wetland rehabilitation is proposed for most of the jurisdictional wetland area that is "actively managed" and considered hydric soil based on the hydric soil investigation. Wetland enhancement is proposed for existing jurisdictional wetlands located within the floodplain that are not actively managed. However, wetland mitigation treatments are based on results from the detailed hydric soil investigation, and therefore small areas of jurisdictional wetland overlap into areas proposed for Re-establishment. Using the NCWAM designations, the proposed re-establishment and rehabilitation would convert the existing agricultural land to a *Bottomland Hardwood Forest*. The re-establishment and rehabilitation of the Puzzle Creek floodplain as a *Bottomland Hardwood Forrest* corresponds with the *Montane Alluvial Forrest* community (NCWFAT 2010).

8.2.1.1 Design Methods

Stream Restoration

Restoration of Type C4b, C4, and E5 streams will consist of constructing a low to moderate sinuosity (1.05-1.10) streams. Each stream type will be constructed with a moderate width-depth ratio (12.5-14) that accesses the floodplain at greater-than-bankfull flows. For stream reaches with average channel slopes from 1.5% to 4.0% the bed profile form is in a range that is transitioning from riffle-pool morphology at the lower slopes to step-pool morphology at the steeper slopes. The profile is therefore a combination of riffles, rapids, and step-pool features. For stream reaches with average slopes less than 1.5% the bed profile form is dominated by riffle-pool morphology.

Exploration for buried bed material will be conducted in proximity of the channel work to harvest available bed material for reuse in the constructed channel. Where the quantity of existing bed material is insufficient it will be supplemented with off-site material of appropriate size.

In some locations topographic constraints prevent Priority I restoration and it will be necessary to construct a bankfull bench. Along these reaches, topsoil will be removed prior to excavation and stockpiled. After completion of grading operations, topsoil will be redistributed across the floodplain bench to facilitate vegetation success.

Log structures will be used to provide vertical stability to the channel, assist in maintaining riffle, run and pool features, and to provide habitat features. Log sills will generally be placed at the tail-of-riffle location to support the upstream riffle grade and to shift the flow away from the outside banks on selected meander bends. Small brush-toe structures will be installed on the downstream side of log sills at inside meander bends to provide an anchor for log sill structures, bank stability, increase bank roughness, and provide aquatic habitat. Trees with diameters in the range of 12” to 24” will be harvested from the site or nearby property for use as in-stream structures. Small diameter (less than 6”) woody plants suitable for transplanting will be harvested on-site where available.

Earthwork activities will include excavation of the proposed channels, partial or complete backfilling of existing channels and removal of existing spoil berms. Grading work is designed to restore or mimic natural contours.

Wetland Re-establishment, Rehabilitation, and Enhancement

Wetland hydrology will be restored by raising the bed elevation of Carson Branch, David Branch, and Thelma Branch and filling in existing channels and a primary floodplain drainage ditch. Additionally, re-establishment of the wetlands on the floodplain east of Puzzle Creek and adjacent to Carson Branch will involve the removal of overburden material in select locations to expose the underlying soils that were historically hydric. By removing overburden resulting from historic on-site agricultural practices and exposing the buried hydric soil, hydrology in terms of water level, hydropattern, and residence time will be restored within the upper soil profile. Re-establishment of the wetlands on the floodplain adjacent to the existing David Branch will involve the removal of overburden material in the location of an alluvial fan to expose the underlying hydric soils. The alluvial fan is resultant from historic on-site agricultural practices that resulted in excessive erosion within the hydric soil area. Additional grading activities will include harvesting usable topsoil material in selective areas for re-use on the re-graded floodplain, removal of spoil berms, and selective grading of micro-topography to provide for additional retention of surface water while incorporating existing hummocks to increase habitat diversity.

In addition to raising bed elevations of project streams, rehabilitation of existing wetlands will also involve plugging and/or filling of drainage features that are currently impacting wetland hydrology and improving micro-topography to improve surface water retention and habitat diversity. Where re-grading is determined feasible, the topsoil will be removed first and stockpiled for redistribution on the new floodplain surface. As for jurisdictional wetland areas adjacent to Carson Branch, no stockpiling of topsoil or vegetation will occur. Vegetation transplants, such as tag alder shrubs and/or sod mats, will be determined during the construction phase of the Project

Wetland grading activities, including removal of overburden resulting from on-site agricultural practices, performed for wetland restoration will not exceed 12 inches in depth. Additionally, drainage tiles discovered during the construction phase will be excavated and removed to prevent drainage of restoration areas.

All Re-establishment and Rehabilitation areas will be ripped to remove negative effects of past compaction from long-term agricultural activities and will be planted with native wetland vegetation.

Wetland enhancement along David Branch and Carson Branch will involve plugging and/or filling the existing stream channels to promote natural toe slope hydrology as well as treatment of invasive species. For the enhancement area along Carson Branch, an additional floodplain ditch will be filled to prevent further floodplain drainage.

General

All disturbed areas will be stabilized with temporary and permanent seed and covered with straw or mulch. Stream banks will be stabilized using a combination of erosion matting, bare-root plantings, and bio-engineering techniques in accordance with the plans in **Appendix 1**. The entire conservation easement area will be planted with bare root seedlings in accordance with the planting plan.

The restored stream channels will be protected by a conservation easement that includes a riparian buffer of at least 50 feet and the restored and enhanced wetland areas will be included in the conservation easement. The easement boundary for the stream and wetlands will be delineated by 10-foot metal poles labeled with conservation easement signs. The restored buffer and easement boundaries are shown in **Figure 9; Appendix 1.**

8.2.2 On-Site Invasive Species Treatment

Treatment of invasive species will be performed within the easement area. Invasive species will require different and multiple treatment methods, depending on plant phenology and the location of the species being treated. All treatment will be conducted so as to maximize its effectiveness and reduce chances of detriment to surrounding native vegetation. Treatment methods will include mechanical control (cutting with loppers, clippers, or chain saw and chemical control (foliar spray, cut stump, and hack and squirt techniques). Plants containing mature, viable seeds will be removed from the site and properly disposed of. 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.

8.2.3 Best Management Practices (BMPs)

Diffuse flow structures will be applied at locations where ditches or other forms of concentrated flow enter the conservation easement. All diffuse flow structures will be installed within the conservation easement so that landowners will not have access to the structures. Failure or maintenance of the structures is not anticipated as these structures will be installed in low-gradient areas, and the areas proposed to diffuse flow will be well vegetated and matted.

The stream design has incorporated projected development within the watershed, though current low-density residential, agricultural, and forested land use are not expected to change significantly in the foreseeable future. However, stormwater management issues resulting from future development of adjacent properties will be governed by the applicable state and local ordinances and regulations, and it is recommended that any future stormwater entering the site maintain pre-development peak flow. Any future stormwater diverted into the project should be done in a manner as to prevent erosion, adverse conditions, or degradation of the project in any way.

8.2.4 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 site. Any topsoil that is removed during construction will be stockpiled and placed over the site during final soil preparation. Topsoil will not be removed and stockpiled in jurisdictional wetlands adjacent to Carson Branch. This process should provide favorable soil conditions for plant growth. Rapid establishment of vegetation will provide natural stabilization for the site. Additionally, a post construction/pre-planting soil fertility test will be performed to determine if soil amendments are recommended for ultimate vegetation success.

8.3 Data Analysis

8.3.1 Hydraulic and Hydrologic Analysis

The proposed channel sections were evaluated for their ability to convey the bankfull flows and the flood flows of the watershed by performing a hydraulic analysis. Flood flow hydrology was based on USGS Regional Regression equations for the Blue Ridge-Piedmont hydrologic area. Bankfull discharge was based on the NRCS revised regional curves for the North Carolina Mountain and Piedmont hydrologic area. The analysis consisted of first modeling the existing conditions with the HEC-RAS water surface profile model. Cross sections were taken through the channel and the adjacent valley at representative locations throughout the project reach. Existing hydraulic conditions were evaluated and the model calibrated based on available site data.

The ability to accurately verify bankfull discharge within the site is limited by the degraded channel conditions and the lack of clear bankfull indicators. On a coarse scale, the existing HEC-RAS model does indicate bankfull water surface elevations within the channel banks where the channel is incised and above inner berm features where present. Additional bankfull verification is provided through the hydraulic geometry curves assembled from locations on site, immediately adjacent to the site, within the watershed and the neighboring watersheds (See **Appendix 2**).

Proposed conditions were analyzed by revising the existing sections based on the proposed channel geometry and by revising the model to reflect proposed pattern conditions and anticipated future roughness coefficients. Comparison of the existing and proposed HEC-RAS models provided assistance in the analysis of the sediment transport, bankfull flow capacity and confirmation that there will be no hydraulic trespass onto adjacent properties.

8.3.2 Sediment Transport Analysis

Data collection for sediment competence analyses included bar and bulk samples on Carson Branch. The bed material consists of a mix of sand, gravel and cobble with a large constituent being composed of sand (40%-50%). Bulk bed material samples indicate the D_{50} to be 3 mm and D_{84} to be 9 to 19 mm. However, this may underestimate the particle size in the steeper, upstream portion of Carson Branch and overestimate the particle size in the silt/sand dominated David Branch and Thelma Branch. In any case, shear stress calculations for particle sizes less than 10 to 20 mm should always be considered suspect as this represents the practical limit for competence calculations. For Carson Branch Reach 1A and Reach 1B D_{50} of 3 mm was selected for the representative particle size which results in a design riffle slope range of 0.16% to 0.17%. For David Branch Reach 1 and Reach 2 D_{50} of 3 mm was selected for the representative particle size. This results in a riffle design slope range of 0.17% to 0.18% and 0.14%, respectively. For Thelma Branch a D_{50} of 3 mm was selected for the representative particle size which results in a design riffle slope of 0.19%.

9 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:

Table 11. 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.
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 controlled by mechanical and/or chemical methods. Any vegetation control 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.
Livestock Fencing	Livestock Fencing is to be placed outside the easement limits. Maintenance of fencing is the responsibility of the landowner.
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.

10 PERFORMANCE STANDARDS

The success criteria for the John Deere Site will follow approved performance criteria presented in the DMS Mitigation Plan Template, the DMS Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation, Stream Mitigation Guidelines issued in April 2003 by USACE and NCDWQ, Wetland Mitigation Guidelines issued in November 2013 by the North Carolina Interagency Review Team (NCIRT), the Wilmington District Stream and Wetland Compensatory Mitigation Update issued in October 2016 by the NCIRT. Specific success criteria components are presented below.

10.1 Stream Restoration Success Criteria

10.1.1 Baseflow and Bankfull Events

Stream flow monitoring gauges will be installed to document minimum 30 continuous days of stream flow in normal precipitation years. Two bankfull flow events must be documented within the seven-year monitoring period. The two bankfull events must occur in separate years. Otherwise, the stream monitoring will continue until two bankfull events have been documented in separate years.

10.1.2 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.
Digital Image StationsDigital 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. Digital images will be recorded at all cross section locations (lateral and longitudinal images) and vegetation plot locations (cardinal directions).

10.2 Wetland Restoration Success Criteria

The Natural Resource Conservation Service (NRCS) does not have a current WETs table for Rutherford County upon which to base a normal rainfall amount and average growing season. The closest comparable data was determined to be from Cleveland County. The growing season for Cleveland County is 217 days long, extending from March 28 to November 1, and is based on a daily minimum temperature greater than 28 degrees Fahrenheit.

Because of the surface roughing and shallow depressions, a range of hydroperiods are expected. The hydrology success criterion for the Site is to restore the water table at the Site so that it will remain continuously within the 12 inches of the soil surface for at least ten percent of the growing season (approximately 22 days) at each groundwater gauge location.

Gauge data will be compared to reference wetland well data in growing seasons with less than normal rainfall. In periods of low rainfall, if a restoration gauge hydroperiod exceeds the reference gauge hydroperiod, and both exceed five percent of the growing season, then the gauge will be deemed successful. If a gauge location fails to meet these success criteria in the seven-year monitoring period, then monitoring may be extended, remedial actions may be undertaken, or the limits of wetland restoration will be determined.

10.3 Vegetation Success Criteria

Specific and measurable success criteria for plant density within the riparian buffers on the site will follow IRT Guidance. Vegetation monitoring plots will be a minimum of 0.02 acres in size, and cover a minimum of two percent of the planted area. Vegetation monitoring will occur annually in the fall of each year. The interim measures of vegetative success for the site will be the survival of at least 320 planted three-year old trees per acre at the end of Year 3, 260 five-year old trees at the end of Year 5, and the final vegetative success criteria will be 210 trees per acre at the end of Year 7. The site will include 10 monitoring plots to monitor the 12.4 planted acres. 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.

11 MONITORING REQUIREMENTS

Annual monitoring data will be reported using the DMS Baseline and Monitoring Report Templates. 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. The success criteria for the Site will follow current accepted and approved success criteria presented in the USACE Stream Mitigation Guidelines, and subsequent agency guidance. Specific success criteria components are presented in **Table 13**. Monitoring reports will be prepared annually and submitted to NC DMS.

Table 12. Monitoring Requirements

Required	Parameter	Quantity	Frequency	Notes
	Pattern	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	Baseline	Additional surveys will be performed if monitoring indicates instability or significant channel migration
	Dimension	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	Baseline, Years 1,2,3,5, and 7	Surveyed cross sections and bank pins
	Profile	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	Baseline	Additional surveys will be performed if monitoring indicates instability
	Surface Water Hydrology	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	Annual	Crest gauges and/or pressure transducers will be installed on site; the devices will be inspected on a quarterly basis to document the occurrence of baseflow andbankfull events
	Vegetation		Annual	Vegetation will be monitored per IRT guidelines
	Exotic and Nuisance Vegetation		Annual	Locations of exotic and nuisance vegetation will be mapped
	Project Boundary		Semi-annual	Locations of fence damage, vegetation damage, boundary encroachments, etc. will be mapped
	Stream Visual		Annual	Semi-annual visual assessments

11.1 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.

11.2 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.

11.3 Cross Sections

Permanent cross-sections will be installed at a minimum of one per 20 bankfull widths with half in pools and half in riffles. All cross-section measurements will include bank height ratio and entrenchment ratio. Cross-sections will be monitored annually. There should be little change in as-built cross-sections. If changes do take place, they should be evaluated to determine if they represent 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). Bank height ratio shall not exceed 1.2, and the entrenchment ratio shall be no less than 2.2 within restored reaches. Channel stability should be demonstrated through a minimum of two bankfull events documented in the seven-year monitoring period.

11.4 Vegetative Success Criteria

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 13 plots within the planted area (12.57 acres). Existing wooded areas are not included in the planted area. The following data will be recorded for all trees in the plots: species, height, planting date (or volunteer), and grid location. Monitoring will occur each year during the monitoring period.

11.5 Scheduling/Reporting

As-built drawings documenting stream and wetland restoration activities will be developed within 60 days of the planting completion on the mitigation site. The report will include all information required by IRT 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 NC DMS guidelines.

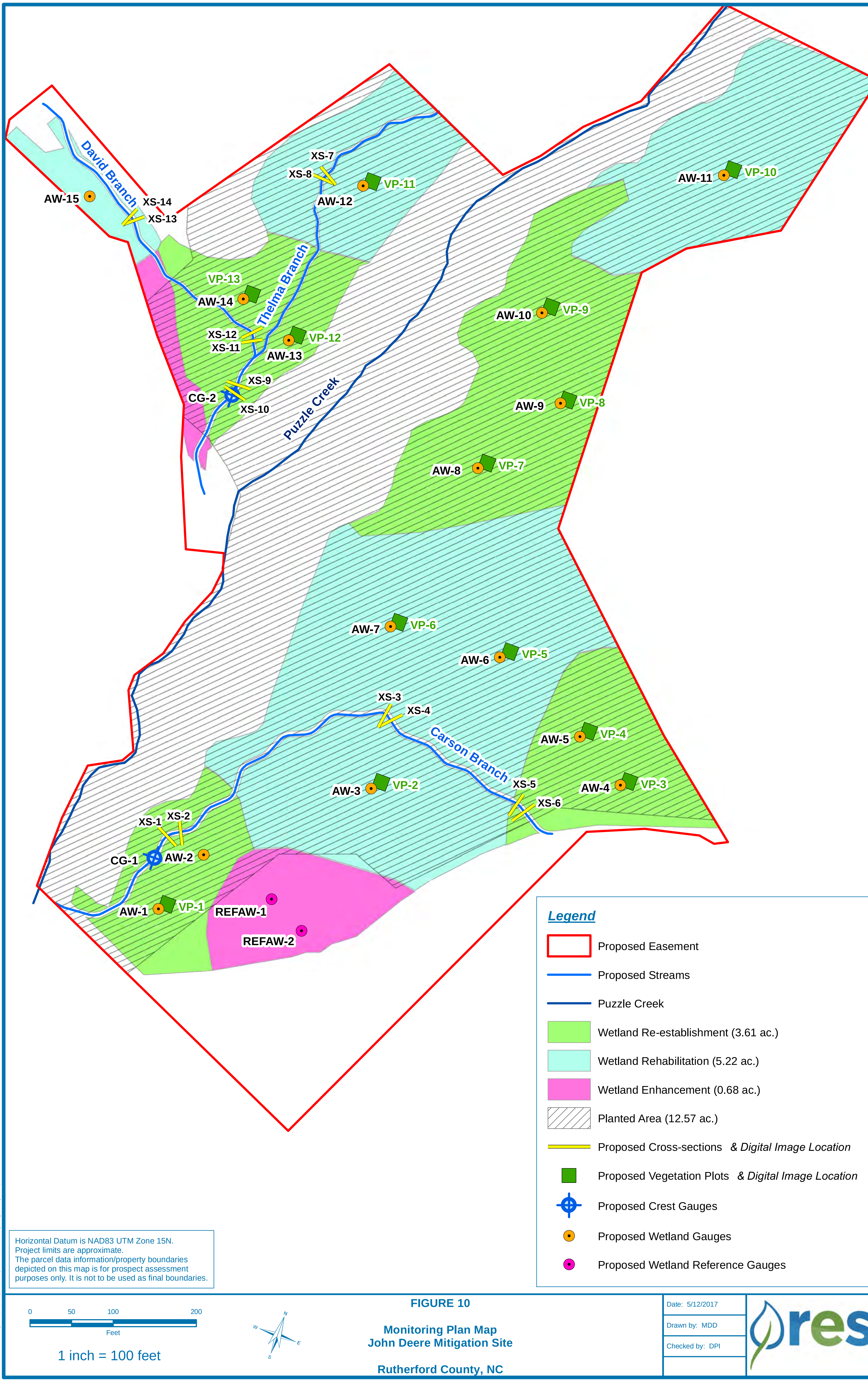


FIGURE 10

Monitoring Plan Map
John Deere Mitigation Site

Rutherford County, NC

Date: 5/12/2017
Drawn by: MDD
Checked by: DPI

res

12 LONG-TERM MANAGEMENT PLAN

Upon approval for closeout by the IRT, the site will be transferred to the NCDEQ Division of Natural Resource Planning and Conservation's Stewardship Program. This party shall be responsible for periodic inspection of the Site to ensure that restrictions required in the Conservation Easement or the deed restriction document(s) are upheld. Endowment funds required to uphold easement and deed restrictions shall be negotiated prior to site transfer to the responsible party. The Stewardship Program will periodically install signage as needed to identify boundary markings.

13 ADAPTIVE MANAGEMENT PLAN

Upon completion of site construction, RES will implement the post-construction monitoring protocols previously defined in this document. Project maintenance will be performed as described previously in this document. If, during the course of annual monitoring, it is determined that the Site's ability to achieve site performance standards are jeopardized, RES will notify the NCDMS of the need to develop a Plan of Corrective Action. Once the Corrective Action Plan is prepared and finalized RES will:

1. Notify the NCDMS.
2. Revise performance standards, maintenance requirements, and monitoring requirements as necessary and/or required by the NCDMS.
3. Obtain other permits as necessary.
4. Implement the Corrective Action Plan.
5. Provide the NCDMS a Record Drawing of Corrective Actions. This document shall depict the extent and nature of the work performed.

14 FINANCIAL ASSURANCES

Pursuant to Section IV H and Appendix III of the Division of Mitigation Services In-Lieu Fee Instrument dated July 28, 2010, the North Carolina Department of Environment and Natural Resources has provided the U.S. Army Corps of Engineers Wilmington District with a formal commitment to fund projects to satisfy mitigation requirements assumed by DMS. This commitment provides financial assurance for all mitigation projects implemented by the program.

15 OTHER INFORMATION

15.1 References

Amoroso, J.L., ed. 1999. Natural Heritage Program List of the Rare Plant Species of North Carolina. North Carolina Natural Heritage Program, Division of Parks and Recreation, North Carolina Department of Environment and Natural Resources. Raleigh, North Carolina.

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

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

North Carolina Division of Mitigation Services (NCDMS). “Broad River Basin Restoration Priorities 2009.” (September 2014).

North Carolina Division of Water Quality (NCDWQ). *Surface Water Classifications*. http://portal.ncdenr.org/web/wq/ps/csu/classifications Raleigh, NC.

North Carolina Floodplain Mapping Program. *Floodplain Mapping Information System*. http://floodmaps.nc.gov/FMIS/Default.aspx Raleigh, NC.

North Carolina Wetland Functional Assessment Team (2010), *North Carolina Wetland Assessment Method User Manual*, version 4.1.

Peet, R.K., Wentworth, T.S., and White, P.S. (1998), *A flexible, multipurpose method for recording vegetation composition and structure*. Castanea 63:262-274

Rosgen, D. (1996), *Applied River Morphology, 2nd edition*, Wildland Hydrology, Pagosa Springs, CO.

Rutherford County, North Carolina. Available online at http://www.fws.gov/raleigh/.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina, Third Approximation. North Carolina Natural Heritage Program, Division of Parks and Recreation, NCDENR, Raleigh, NC.

US Army Corps of Engineers (USACE), 2003. April 2003 NC Stream Mitigation Guidelines.

U.S. Army Corps of Engineers (USACE). 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0), ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-10-20. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), Web Soil Survey; http://websoilsurvey.nrcs.usda.gov

United States Department of Agriculture, Natural Resources Conservation Service. 2010. Field Indicators of Hydric Soils in the United States, Version 7.0. L.M. Vasilas, G.W. Hurt, and C.V. Noble (eds.). USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils.

United States Fish and Wildlife Service. “Threatened and Endangered Species in North Carolina.” North Carolina Ecological Services. http://www.fws.gov/raleigh/.

Appendix 1. Plan Sheets

John Deere Design Plans

NC DMS PROJECT 96917

STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS
NC	1080-JNDR	1	14

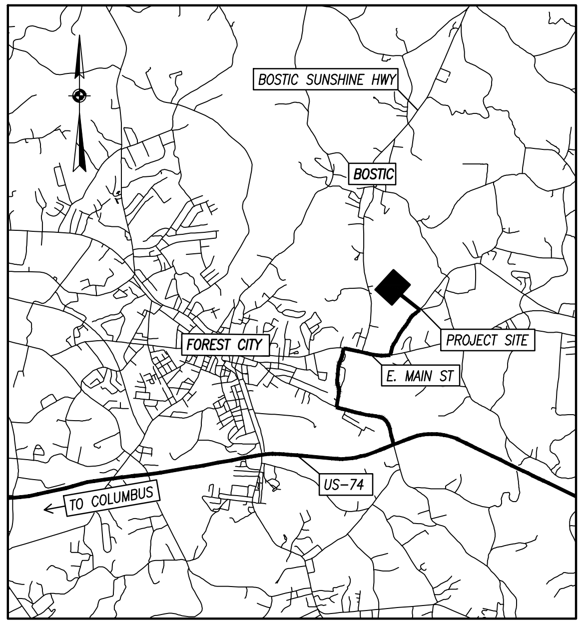
SYM.	DESCRIPTION	DATE
	30% PLANS	5/24/16

REVISIONS

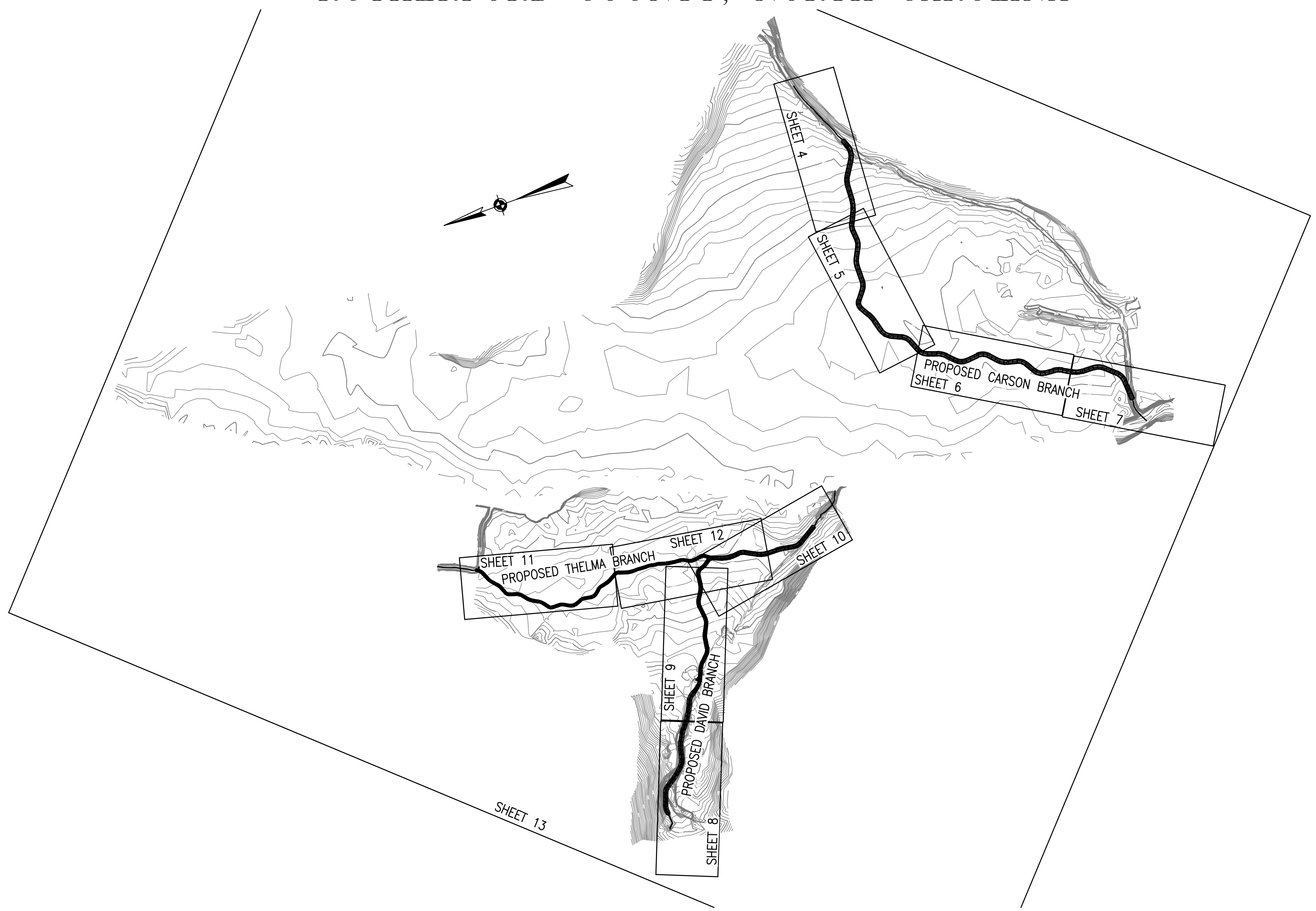
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

JOHN DEERE MITIGATION BANK

CARSON BRANCH
RUTHERFORD COUNTY, NORTH CAROLINA



VICINITY MAP
NOT TO SCALE



SHEET INDEX

SHEET NO.	DESCRIPTION
1	TITLE SHEET
1A	SITE PLAN
2	TYPICAL SECTIONS
3-3A	DETAILS
4-12	PLAN AND PROFILE
13	WETLAND GRADING PLAN

PRELIMINARY PLANS

GRAPHIC SCALES (SCALE IN FEET)

10 0 10 30
PLAN & HORIZONTAL PROFILE - SHEETS 4-12

50 0 50 150
WETLAND GRADING PLAN - SHEET 13

2 0 2 6
VERTICAL PROFILE - SHEETS 4-12

PROJECT LENGTHS

PROPOSED RESTORATION: CARSON BRANCH	= 766 FT
PROPOSED RESTORATION: DAVID BRANCH	= 605 FT
PROPOSED RESTORATION: THELMA BRANCH	= 412 FT
TOTAL	**=1783 FT**
PROPOSED WETLAND ENHANCEMENT	= 0.75 ACRES
PROPOSED WETLAND RE-ESTABLISHMENT	= 4.7 ACRES
PROPOSED WETLAND REHABILITATION	= 5.1 ACRES
TOTAL	**= 10.5 ACRES**

Prepared by:

Wolf Creek Engineering

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Phone: 828-449-1930
www.wolfcreekeng.com

PRELIMINARY PLANS
NOT FOR CONSTRUCTION

PROJECT ENGINEER

Prepared for:

Resource Environmental Solutions

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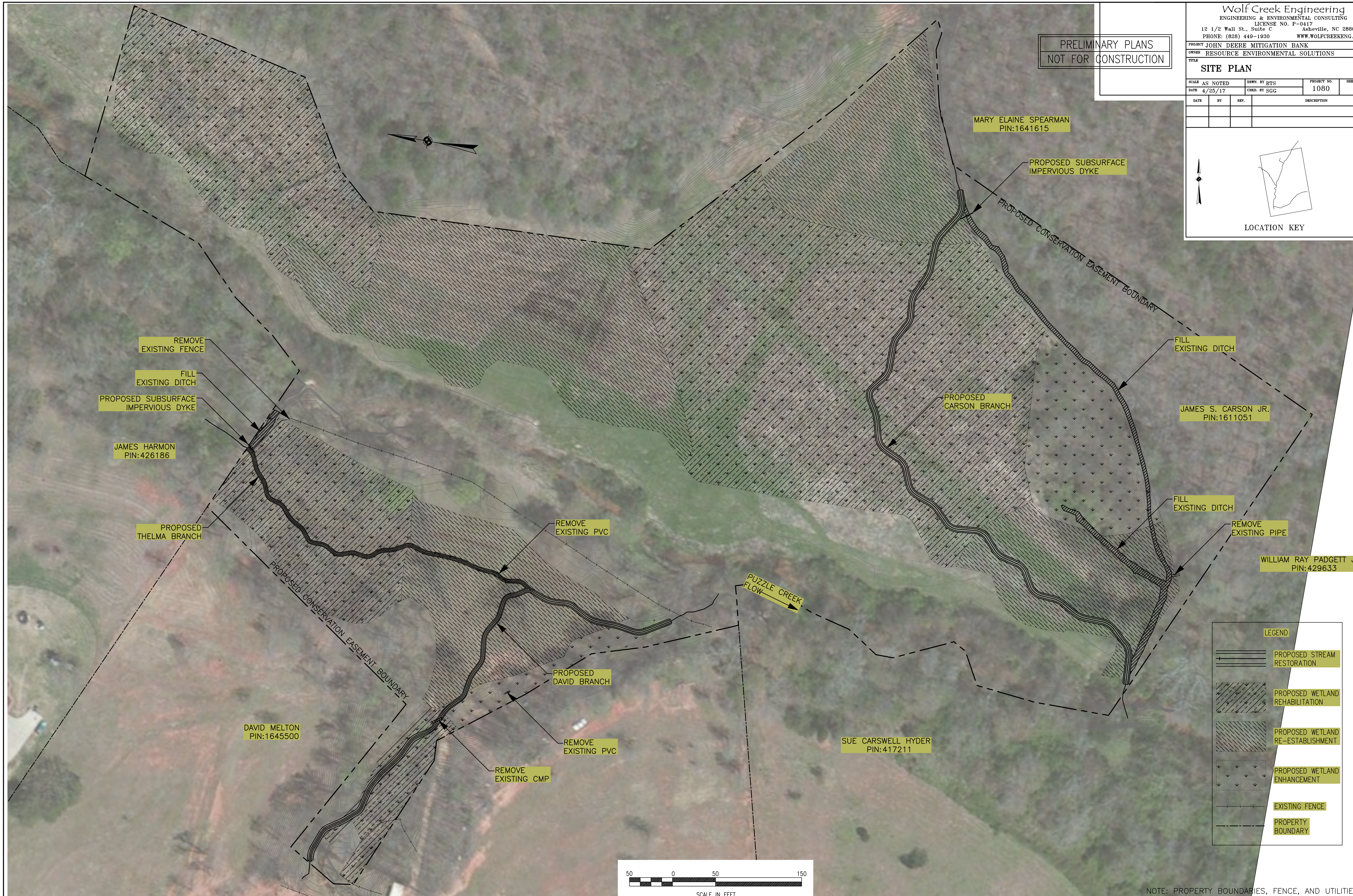
PROJECT JOHN DEERE MITIGATION BANK
OWNER RESOURCE ENVIRONMENTAL SOLUTIONS
TITLE **SITE PLAN**

SCALE	AS NOTED	DRWN. BY	RTS	PROJECT NO.	SHEET NUMBER
DATE	4/25/17	CHKD. BY	SGG	1080	1A

DATE	BY	REV.	DESCRIPTION

PRELIMINARY PLANS
NOT FOR CONSTRUCTION



NOTE: PROPERTY BOUNDARIES, FENCE, AND UTILITIES
NOT SURVEYED. APPROXIMATE LOCATIONS ONLY.

PRELIMINARY PLANS
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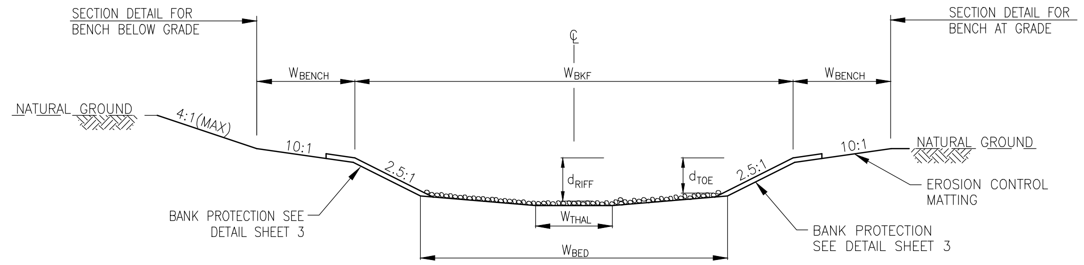
PROJECT JOHN DEERE MITIGATION BANK
OWNER RESOURCE ENVIRONMENTAL SOLUTIONS
TITLE

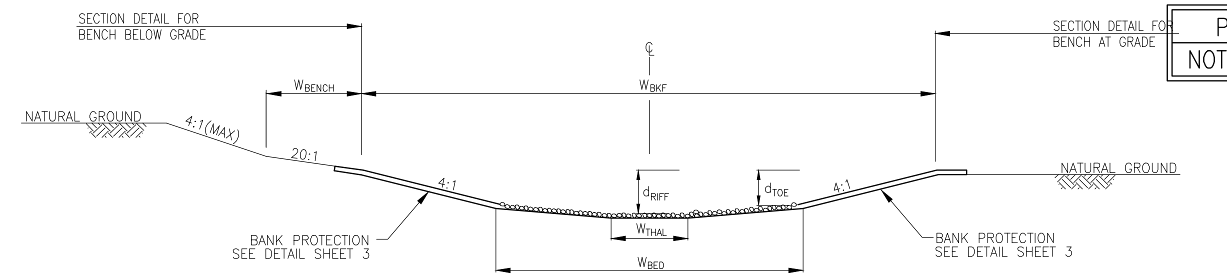
TYPICAL SECTIONS

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	TAS	1080	2
DATE 5/24/16	CHKD. BY SGG		

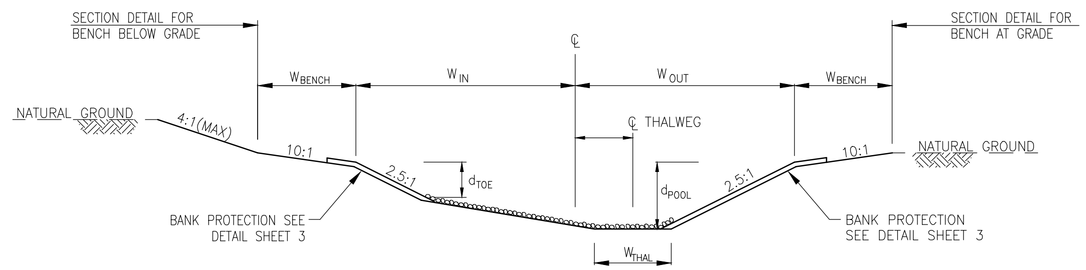
DATE	BY	REV.	DESCRIPTION



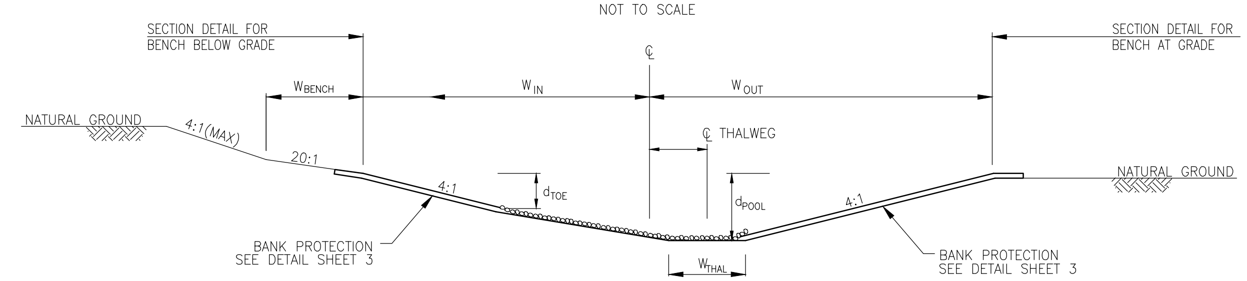
SECTION 1
TYPICAL RIFFLE
NOT TO SCALE



SECTION 2
TYPICAL RIFFLE
NOT TO SCALE



SECTION 1
TYPICAL POOL
NOT TO SCALE



SECTION 2
TYPICAL POOL
NOT TO SCALE

TABLE 1: SECTION DIMENSIONS

REACH	TYPICAL SECTION	STATION	RIFFLE DIMENSIONS W_{BKF} (ft)	W_{BED} (ft)	W_{THAL} (ft)	W_{BENCH} (ft)	d_{RIFF} (ft)	d_{TOE} (ft)	POOL DIMENSIONS W_{IN} (ft)	W_{OUT} (ft)	d_{POOL} (ft)	APPROX. POOL DEPTH (ft)
CARSON BRANCH REACH 1A	1	101+14 TO 103+50	7.0	4.2	1.3	3	0.70	0.56	4.17	3.48	1.04	0.5
CARSON BRANCH REACH 1B	1	103+50 TO 109+12	7.0	4.2	1.3	3	0.70	0.56	4.17	3.48	1.04	0.5
DAVID BRANCH REACH 1A	2	200+00 TO 202+50	6.7	3.0	0.9	3	0.59	0.47	4.02	3.35	0.88	0.5
DAVID BRANCH REACH 1B	1	202+50 TO 204+66	5.3	3.0	0.9	3	0.59	0.47	3.18	2.65	0.88	0.5
DAVID BRANCH REACH 2	1	204+66 TO 206+55	6.4	3.7	1.1	3	0.66	0.53	3.83	3.19	0.99	0.5
THELMA BRANCH REACH 1	1	300+61 TO 304+67	4.5	2.4	0.7	2	0.53	0.42	2.69	2.24	0.79	0.5

NOTE: APPROXIMATE POOL DEPTH IS DEPTH OF POOL RELATIVE TO DOWNSTREAM HEAD OF RIFFLE

TABLE 2: SUPPLEMENTAL BED MATERIAL (WITH HARVESTED GRAVEL)

REACH	PERCENT OF TOTAL MIX: ON-SITE HARVEST MATERIAL	1/2" STONE (NO. 57)	3/4" STONE (NO. 5)	2" STONE (SURGE)	6" STONE NCDOT (CLASS A)	12" STONE NCDOT (CLASS B)	DEPTH OF BED MATERIAL (FT)
CARSON BRANCH REACH 1A	100%	-	-	-	-	-	0.4
CARSON BRANCH REACH 1B	100%	-	-	-	-	-	0.4
DAVID BRANCH REACH 1A	100%	-	-	-	-	-	0.4
DAVID BRANCH REACH 1B	100%	-	-	-	-	-	0.4
DAVID BRANCH REACH 2	100%	-	-	-	-	-	0.4
THELMA BRANCH REACH 1	100%	-	-	-	-	-	0.4

TABLE 3: MORPHOLOGIC TABLE

REACH	CARSON BRANCH REACH 1A	CARSON BRANCH REACH 1B	DAVID BRANCH REACH 1A	DAVID BRANCH REACH 1B	DAVID BRANCH REACH 2	THELMA BRANCH REACH 1
STREAM TYPE	C4b	C4	C4	C4	C6	E6
DRAINAGE AREA (mi²)	0.18	0.19	0.09	0.09	14%	6%
W_{BKF} (ft)	7.0	7.0	6.7	5.3	6.4	4.5
XS_{BKF} (ft²)	3.5	3.5	2.5	2.2	3.0	1.6
d_{BKF} (ft)	0.5	0.5	0.4	0.4	0.5	0.4
d_{MAX} (ft)	0.7	0.7	0.6	0.6	0.7	0.5
S_{AVG} (ft/ft)	0.026	0.001	0.020	0.020	0.005	0.001
S_{VALLEY} (ft/ft)	0.027	0.003	0.025	0.025	0.006	0.004
W/D RATIO	13.9	13.9	18.1	13.0	13.6	12.5
ENTRENCHMENT RATIO	5.6	5.8	6.0	7.5	6.3	9.9
SINUOSITY	1.04	1.06	1.07	1.1	1.1	1.1
POOL-POOL RATIO	5 - 7	4 - 6	5 - 7	5 - 7	5 - 7	4 - 6
MEANDER WIDTH RATIO	4.0	4.0	3.4	4.0	4.0	4.0

CONSTRUCTION SEQUENCE
THE CONTRACTOR SHALL FOLLOW THE SEQUENCE OF CONSTRUCTION IN ACCORDANCE WITH THE PLANS AND AS DIRECTED BY THE ENGINEER.

THE CONTRACTOR SHALL CONDUCT STREAM WORK, INCLUDING INSTALLATION OF IN-STREAM STRUCTURES, GRADING, STABILIZATION MEASURES, AND SEEDING AND MULCHING, ON A SECTION OF STREAM THAT CAN BE ENTIRELY COMPLETED IN A SINGLE DAY.

1. THE CONTRACTOR SHALL IDENTIFY THE PROJECT BOUNDARY, LIMITS OF DISTURBANCE, SENSITIVE AREAS, STAGING AREAS, AND CONSTRUCTION ENTRANCES WITH THE ENGINEER.
2. THE CONTRACTOR SHALL PREPARE STABILIZED CONSTRUCTION ENTRANCES.
3. THE CONTRACTOR SHALL MOBILIZE EQUIPMENT, MATERIALS, PREPARE STAGING AREAS, AND STOCKPILE AREAS.
4. CONSTRUCTION TRAFFIC TO BE LIMITED TO "LIMITS OF DISTURBANCE" AS INDICATED ON THE CONSTRUCTION PLANS OR AS DIRECTED BY THE ENGINEER.
5. THE CONTRACTOR SHALL INSTALL ALL TEMPORARY ROCK CHECK DAMS, SILT FENCE, AND MULCHING AROUND ALL CONSTRUCTION AREAS INCLUDING STAGING AND STOCKPILE AREAS AS INDICATED ON THE CONSTRUCTION PLANS OR AS DIRECTED BY THE ENGINEER.
6. THE CONTRACTOR SHALL INSTALL ALL TEMPORARY STREAM CROSSINGS. DITCHES AND STREAM REACHES WILL BE LEFT OPEN DURING INITIAL PHASES OF CONSTRUCTION TO ALLOW FOR DRAINAGE AND TO KEEP SITE ACCESSIBLE.
7. PUMP-AROUND OPERATION SHALL BE USED TO DIVERT FLOW DURING CONSTRUCTION EXCEPT AS ALLOWED BY THE ENGINEER. **ALL EXCAVATION SHALL BE PERFORMED IN THE DRY** OR IN ISOLATED REACHES EXCEPT AS ALLOWED BY THE ENGINEER.
8. THE CONTRACTOR SHALL BEGIN CLEARING, FLOODPLAIN EXCAVATION, AND GRADING WORK TO DESIGN GRADES AT THE UPSTREAM END OF THE CHANNEL AS INDICATED ON THE CONSTRUCTION PLANS. THE CONTRACTOR SHALL NOT DISTURB ANY MORE FLOODPLAIN AREA LARGER AND STREAM REACH LONGER THAN CAN STABILIZED IN ONE DAY.
9. ONCE A SECTION OF STREAM AND FLOODPLAIN HAVE BEEN EXCAVATED TO DESIGN GRADES, IN-STREAM STRUCTURES, MATTING, AND TRANSPLANTS SHALL BE INSTALLED IN THAT SECTION. EXISTING BED MATERIAL SHALL BE HARVESTED AND PLACED IN THE CONSTRUCTED CHANNEL DURING PUMP-AROUND OPERATIONS SO THAT BOTH CHANNELS ARE IN THE DRY DURING CONSTRUCTION ACTIVITIES.
10. THE CONTRACTOR SHALL BEGIN INSTALLING IN-STREAM STRUCTURES FROM THE UPSTREAM SECTION WORKING DOWNSTREAM. **ALL CONSTRUCTION WORK IS TO BE PERFORMED IN THE DRY** UNLESS OTHERWISE DIRECTED BY THE ENGINEER OR OTHER REGULATORY AGENCY. IF EXCESSIVE SEDIMENTATION DOWNSTREAM BECOMES A CONCERN, THE ENGINEER OR PROJECT MANAGER IN CHARGE MAY DIRECT THE CONTRACTOR TO INSTALL A TEMPORARY ROCK CHECK DAM AND SETTLING BASIN DOWNSTREAM. THIS AREA IS TO BE MAINTAINED ON A REGULAR BASIS BY THE CONTRACTOR.
11. ONCE A STREAM WORK PHASE IS COMPLETE, THE CONTRACTOR WILL APPLY TEMPORARY SEEDING, PERMANENT SEEDING, AND MULCH TO ALL AREAS DISTURBED DURING CONSTRUCTION. TEMPORARY AND PERMANENT SEEDING MIXTURES WILL BE APPLIED AS SHOWN ON THE PLANTING PLAN. TEMPORARY SEEDING WILL BE APPLIED IN ALL AREAS SUSCEPTIBLE TO EROSION SUCH THAT GROUND COVER IS ESTABLISHED WITHIN 7 WORKING DAYS FOLLOWING COMPLETION OF ANY GRADING PHASE. PERMANENT GROUND COVER WILL BE ESTABLISHED FOR ALL DISTURBED AREAS WITHIN 15 WORKING DAYS FOLLOWING COMPLETION OF CONSTRUCTION.
12. ALL SEEDING AND MULCHING SHALL BE COMPLETED BEFORE LEAVING THE PROJECT SITE ALONG WITH REMOVAL OF ANY TEMPORARY STREAM CROSSINGS AND TEMPORARY CHECK DAMS.
13. THE CONTRACTOR OR OTHER QUALIFIED PERSONNEL SHALL PLANT ALL WOODY VEGETATION AND INSTALL LIVE STAKING ACCORDING TO THE PLANTING DETAILS AND SPECIFICATIONS. ALL PERMANENT SEEDING AND PLANTINGS SHALL BE PERFORMED DURING THE APPROPRIATE TIME OF YEAR.
14. THE CONTRACTOR SHALL ENSURE THAT THE SITE IS FREE OF TRASH AND LEFTOVER MATERIALS PRIOR TO DEMOBILIZATION OF EQUIPMENT FROM THE SITE.

GENERAL NOTES:
1. CONTRACTOR SHALL PERFORM ALL NECESSARY SUBSURFACE UTILITY INVESTIGATIONS PRIOR TO COMMENCING CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD VERIFICATION OF EXISTING CONDITIONS, OBSTRUCTIONS, AND UTILITIES WHICH MAY AFFECT PROPOSED WORK.
2. ALL MECHANIZED EQUIPMENT OPERATED IN OR NEAR THE STREAM OR ITS TRIBUTARIES SHALL BE INSPECTED REGULARLY AND MAINTAINED TO PREVENT CONTAMINATION OF STREAM WATERS FROM FUELS, LUBRICANTS, HYDRAULIC FLUIDS, OR OTHER TOXIC MATERIALS.
3. CLEARING AND GRUBBING SHALL BE LIMITED TO THAT WHICH IS NECESSARY FOR CONSTRUCTION OF THE PROPOSED CHANNEL AND SHALL BE APPROVED BY THE ENGINEER.
4. CONTRACTOR IS RESPONSIBLE FOR PROVIDING SAFE INGRESS AND EGRESS FROM SITE FOR ALL VEHICLES INCLUDING, BUT NOT LIMITED TO, TRAFFIC ON ADJACENT PUBLIC ROADS AFFECTED BY CONSTRUCTION TRAFFIC.
5. CONTRACTOR SHALL DISPOSE OF ALL WASTE MATERIALS GENERATED BY CONSTRUCTION ACTIVITIES IN ACCORDANCE WITH ALL FEDERAL, STATE AND LOCAL REGULATIONS.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRS TO EXISTING FACILITIES FROM DAMAGES OCCURRING AS A RESULT OF CONSTRUCTION ACTIVITIES.
7. THE INSTALLATION OF EROSION CONTROL MEASURES AND PRACTICES SHALL OCCUR PRIOR TO LAND DISTURBING ACTIVITIES.

SURVEY:
THE COORDINATE SYSTEM IS THE NAD83 NORTH CAROLINA STATE PLANE GRID.

THE VERTICAL DATUM IS NAVD88.

CHANNEL CONSTRUCTION NOTES:
1. CONSTRUCTION SHALL BEGIN AT THE UPSTREAM END OF EACH CHANNEL REACH AND PROCEED DOWNSTREAM UNLESS APPROVED OTHERWISE BY THE ENGINEER.
2. BED MATERIAL ON RIFFLE SECTIONS SHALL CONSIST OF BED MATERIAL EXCAVATED FROM EXISTING CHANNEL. WHERE INSUFFICIENT BED MATERIAL IS PRESENT IT SHALL BE SUPPLEMENTED WITH MATERIAL ACCORDING TO TABLE 2 AND AS DIRECTED BY THE ENGINEER.
3. THE CHANNEL BANKS SHALL BE STABILIZED ACCORDING TO THE BANK PROTECTION DETAILS ON SHEET 3.
4. DIMENSION TOLERANCES SHALL BE AS FOLLOWS:
   WIDTH: +/- 0.5 FT
   DEPTH: +/- 0.2 FT
   RIFFLE ELEVATIONS: +/- 0.1 FT
   POOL ELEVATIONS: + 0.1 FT, - 0.5 FT
   STRUCTURE ELEVATIONS: +/- 0.1 FT
5. EXISTING CHANNEL INDICATED TO BE FILLED ON PLANS SHALL BE BACKFILLED WITH 1-FOOT LIFTS AND COMPACTED TO IN-SITU SOIL DENSITY. CHANNEL SHALL BE FREE FROM BRUSH AND ORGANIC DEBRIS PRIOR TO BACKFILLING.
6. PUMP AROUND OPERATION SHALL BE USED TO DIVERT FLOW DURING CONSTRUCTION WHEN PRACTICAL.

TREE SURVEY/HARVEST/PROTECTION NOTES:
1. WOODY MATERIAL WILL BE HARVESTED ON-SITE FOR USE AS IN-STREAM STRUCTURES FOR STREAMBANK STABILITY, GRADE CONTROL, AND AQUATIC HABITAT ENHANCEMENT/RESTORATION. WOODY MATERIAL INCLUDES BOTH LARGE AND SMALL SIZE DIAMETER TREES INCLUDING STEM AND ROOT MASS. TREES WILL BE HARVESTED FROM UPLAND AREAS AS WELL AS ALONG RECONSTRUCTED STREAM BANKS DURING THE RESTORATION CONSTRUCTION PROCESS.
2. PREFERRED HARVEST TREES TO BE SELECTED FOR RESTORATION PURPOSES SHALL FIRST INCLUDE ALL DISEASED, DAMAGED, HAZARD, AND UNDESIRABLE TREE SPECIES UNTIL THE QUANTITIES NEEDED FOR STREAM RESTORATION ARE MET. AREAS SELECTED FOR HARVEST SHALL OCCUR WITHIN THE LIMITS OF DISTURBANCE AND DELINEATED BY A CERTIFIED ARBORIST OR OTHER PROFESSIONAL ECOLOGIST/BIOLOGIST.
3. ALL WOODY MATERIALS WILL BE STOCKPILED IN THE APPROVED STAGING AND STOCKPILE AREAS.
4. IN ALL AREAS WHERE TREES ARE HARVESTED PROPER BMP AND EROSION AND SEDIMENT CONTROL WILL BE IMPLEMENTED AND THE AREA IMMEDIATELY STABILIZED WITH TEMPORARY AND PERMANENT SEEDING/MULCH AS HARVESTING OCCURS.

TABLE 4: STRUCTURE DIMENSIONS						
REACH	STRUCTURES		BOULDERS			TOTAL LOG LENGTH (FT)
	L (FT)	X (FT)	LENGTH (FT)	WIDTH (FT)	DEPTH (FT)	
CARSON BRANCH REACH 1	7.0	3.0	2.0–3.0	1.5–2.0	1.0–1.5	13
DAVID BRANCH REACH 1A	5.0	3.0	2.0–3.0	1.5–2.0	1.0–1.5	11
DAVID BRANCH REACH 1B	5.0	3.0	2.0–3.0	1.5–2.0	1.0–1.5	11
DAVID BRANCH REACH 2	6.0	3.0	2.0–3.0	1.5–2.0	1.0–1.5	12
THELMA BRANCH REACH 1	4.0	3.0	2.0–3.0	1.5–2.0	1.0–1.5	10

TABLE 5: LOG DIAMETERS		
TOTAL LOG LENGTH (FT)	MIN DIAMETER (IN)	MAX DIAMETER (IN)
< 20	12	18
20–40	18	24
40–60	24	30

PRELIMINARY PLANS
NOT FOR CONSTRUCTION

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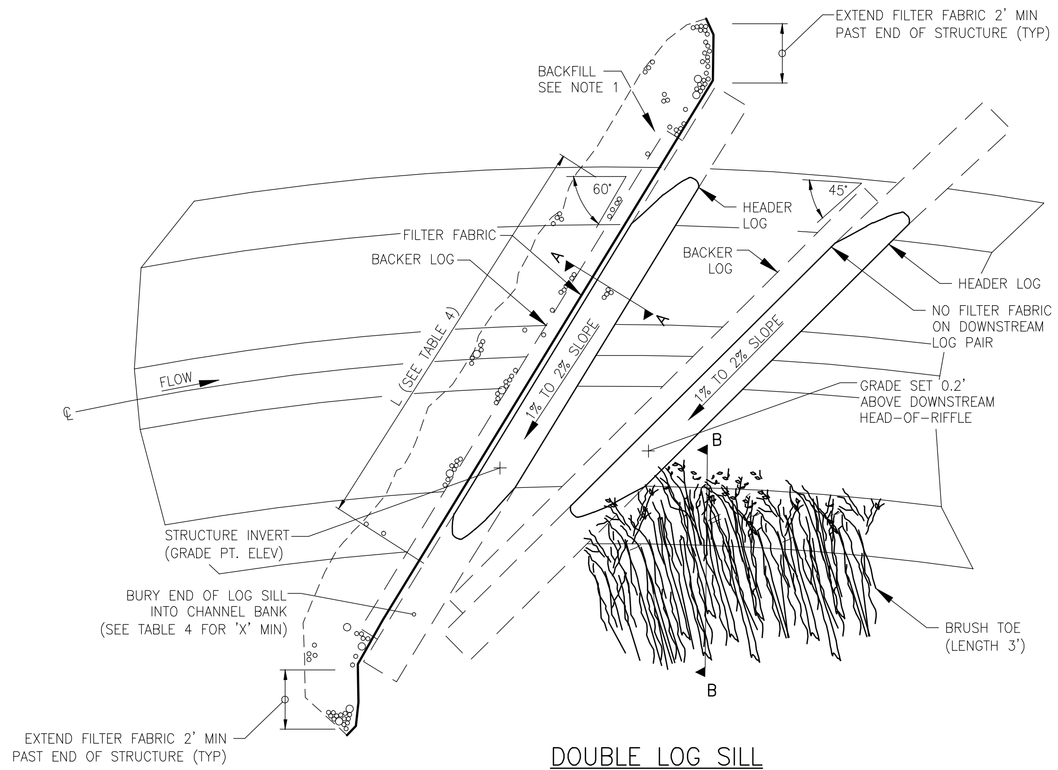
PROJECT JOHN DEERE MITIGATION BANK
OWNER RESOURCE ENVIRONMENTAL SOLUTIONS
TITLE **DETAILS**

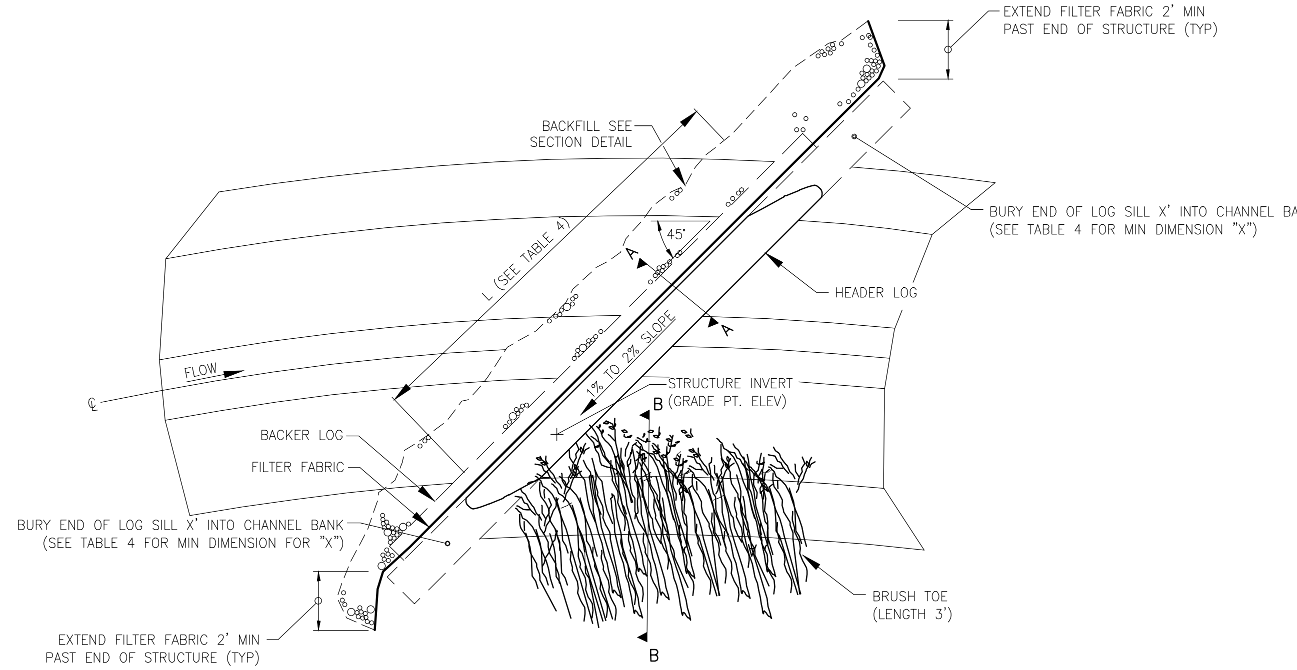
SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	TAS	1080	3
DATE 3/15/16	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

NOTES:
1. STRUCTURE BACKFILL MATERIAL SHALL CONSIST OF ON-SITE SOIL COMPACTED TO IN-SITU DENSITY.
2. STRUCTURE BACKFILL CAP SHALL CONSIST OF ON-SITE STONE/GRAVEL.
3. ALL VOIDS AND GAPS BETWEEN BOULDERS AND LOGS SHALL BE CHINKED WITH STONE PRIOR TO INSTALLATION OF FILTER FABRIC.



DOUBLE LOG SILL
PLAN VIEW
NOT TO SCALE



LOG SILL– NO BAFFLE
PLAN VIEW
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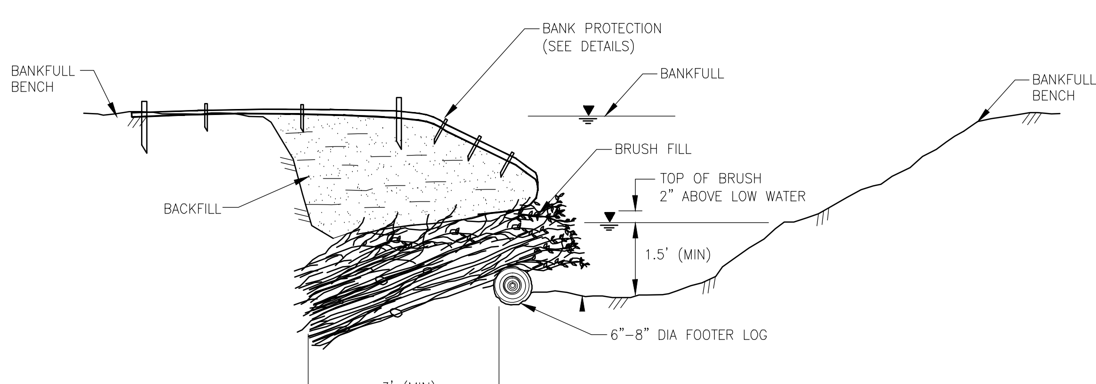

SECTION B–B
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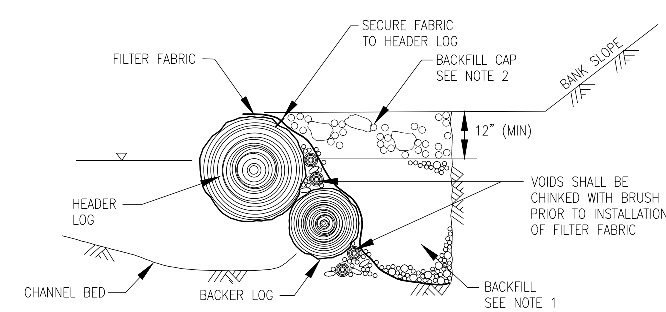

SECTION A–A
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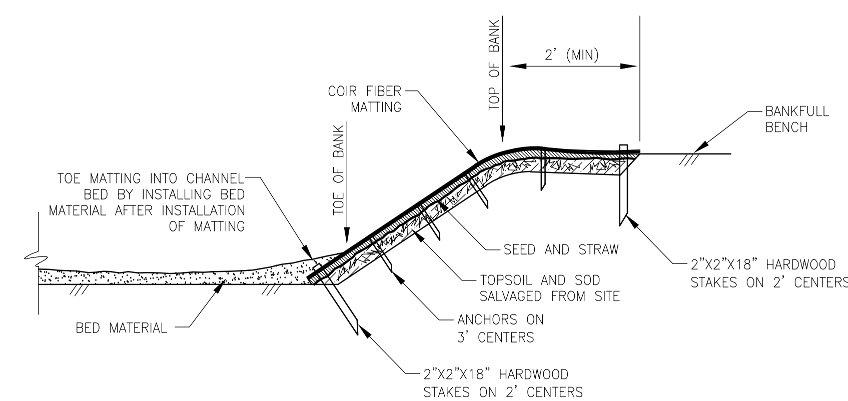
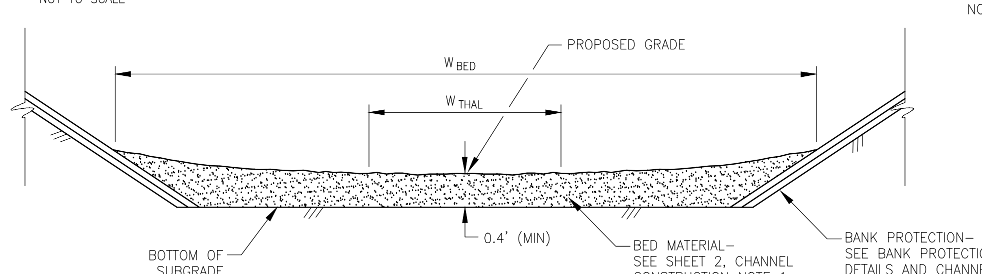


BANK PROTECTION – METHOD 1
SOD AND MAT
NOT TO SCALE



BED MATERIAL DETAIL
NOT TO SCALE

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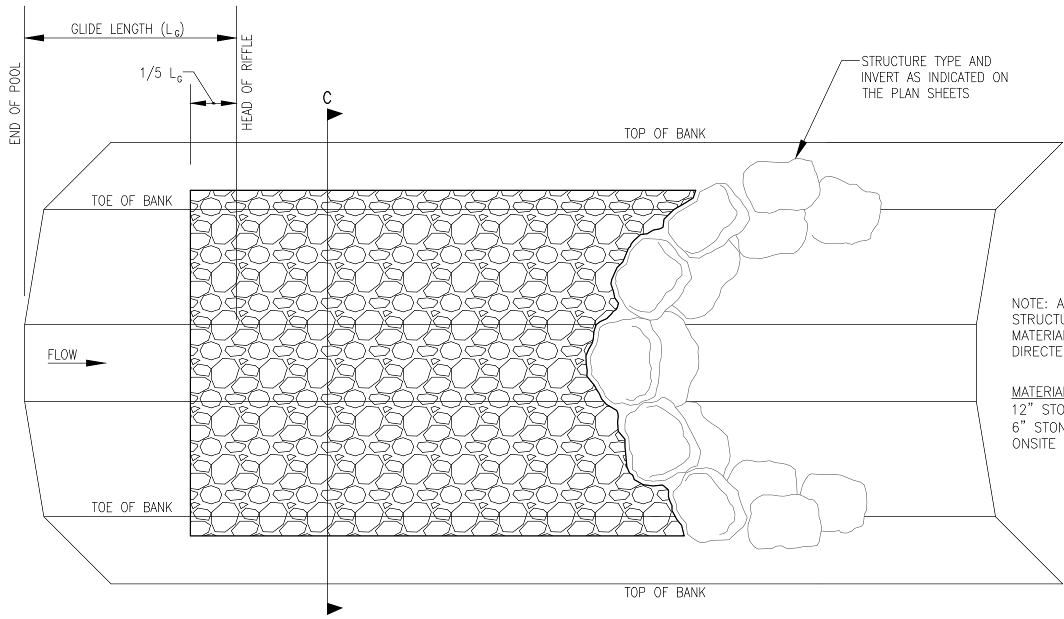
PRELIMINARY PLANS
NOT FOR CONSTRUCTION

PROJECT	JOHN DEERE MITIGATION BANK
OWNER	RESOURCE ENVIRONMENTAL SOLUTIONS
TITLE	DETAILS

SCALE	DRWN. BY	PROJECT NO.	DRAWING NUMBER
AS NOTED	TAS	1080	3A
DATE 5/24/16	CHKD. BY SGG		

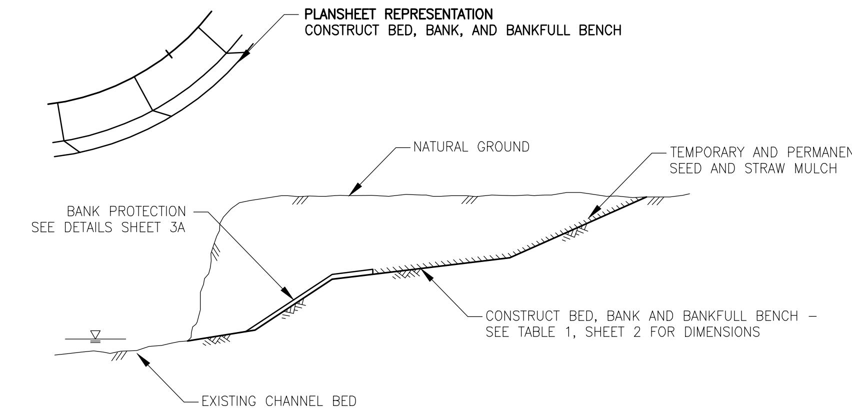
DATE	BY	REV.	DESCRIPTION



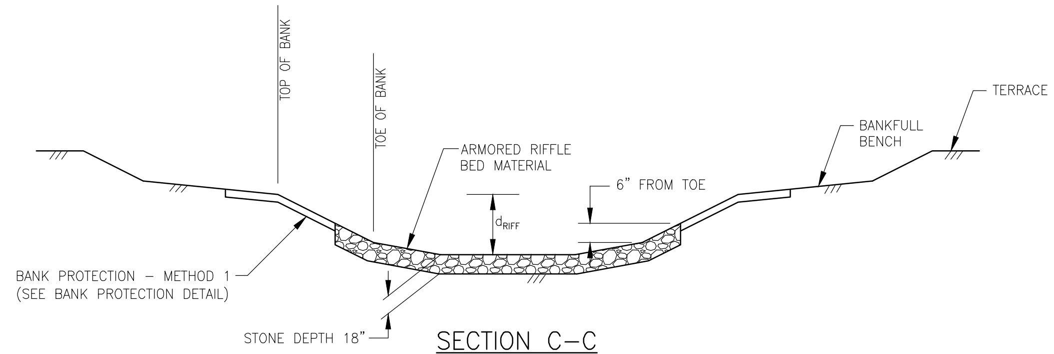
NOTE: ARMORED RIFFLE MATERIAL AND STRUCTURE BACKFILL SHALL BE COMPOSED OF MATERIAL IN THE FOLLOWING PROPORTIONS AS DIRECTED BY THE ENGINEER:

MATERIAL	% BY VOLUME
12" STONE (CLASS B)	60%
6" STONE (CLASS A)	30%
ONSITE SOIL	10%

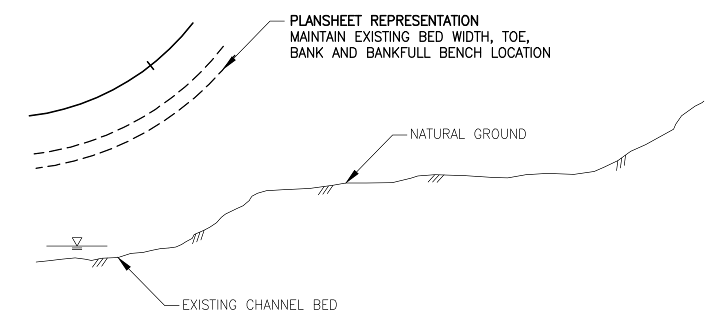
ARMORED RIFFLE DETAIL
NOT TO SCALE



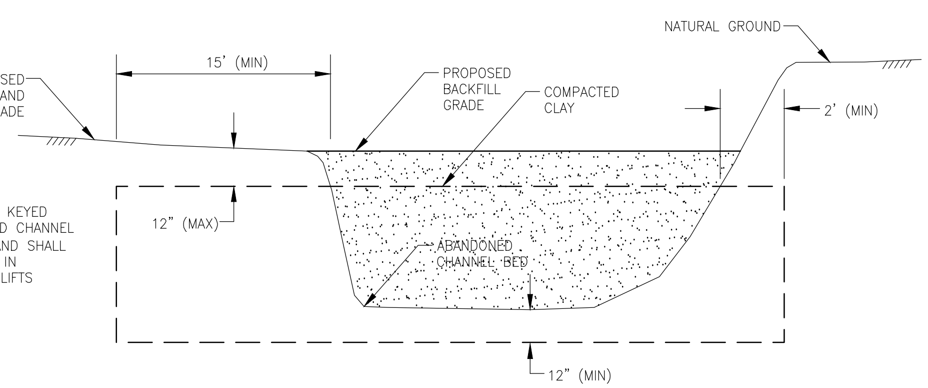
CONSTRUCT BED, BANK AND BANKFULL BENCH
(ABANDON EXISTING BANK FEATURE)
NOT TO SCALE



SECTION C–C
NOT TO SCALE

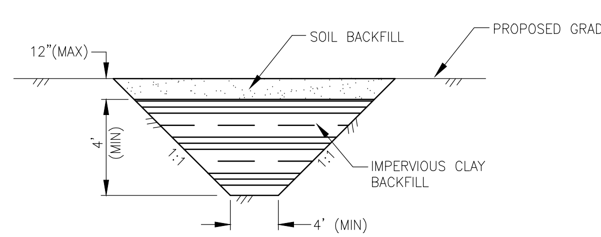


MAINTAIN EXISTING CHANNEL AND BANKFULL BENCH
NOT TO SCALE



NOTE:
CLAY SHALL BE KEYED INTO ABANDONED CHANNEL BED 12"(MIN) AND SHALL BE COMPACTED IN 8-INCH-THINK LIFTS

SUBSURFACE IMPERVIOUS DYKE
ELEVATION
NOT TO SCALE



SUBSURFACE IMPERVIOUS CLAY DIKE
SECTION
NOT TO SCALE

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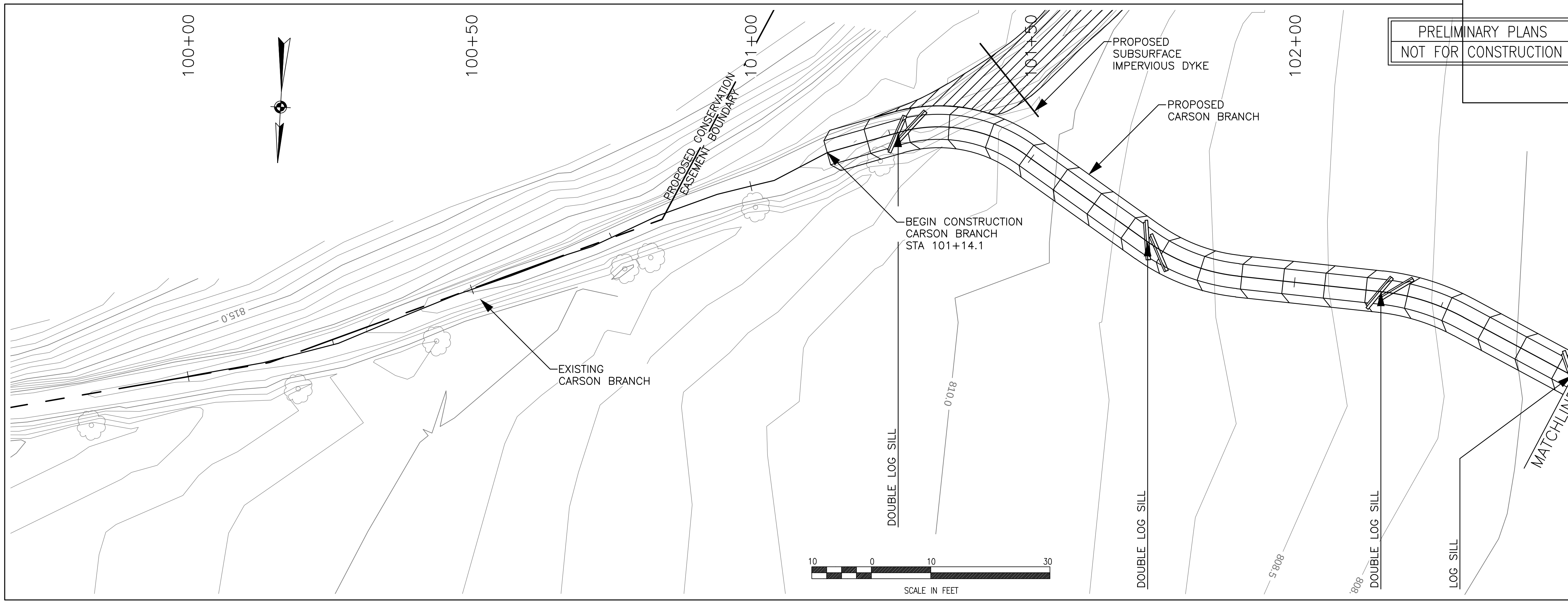
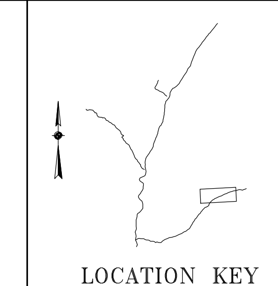
PROJECT: JOHN DEERE MITIGATION BANK
OWNER: RESOURCE ENVIRONMENTAL SOLUTIONS
TITLE: **PLAN & PROFILE**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	TAS	1080	4
DATE 5/24/16	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

PRELIMINARY PLANS
NOT FOR CONSTRUCTION





LEGEND
PROPOSED STREAM RESTORATION
IN-LINE STREAM RESTORATION
ARMORED RIFFLE
EXISTING TREE
SAVE TREE
PROPERTY BOUNDARY
EXISTING FENCE
FILL

FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1' HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

CARSON BRANCH

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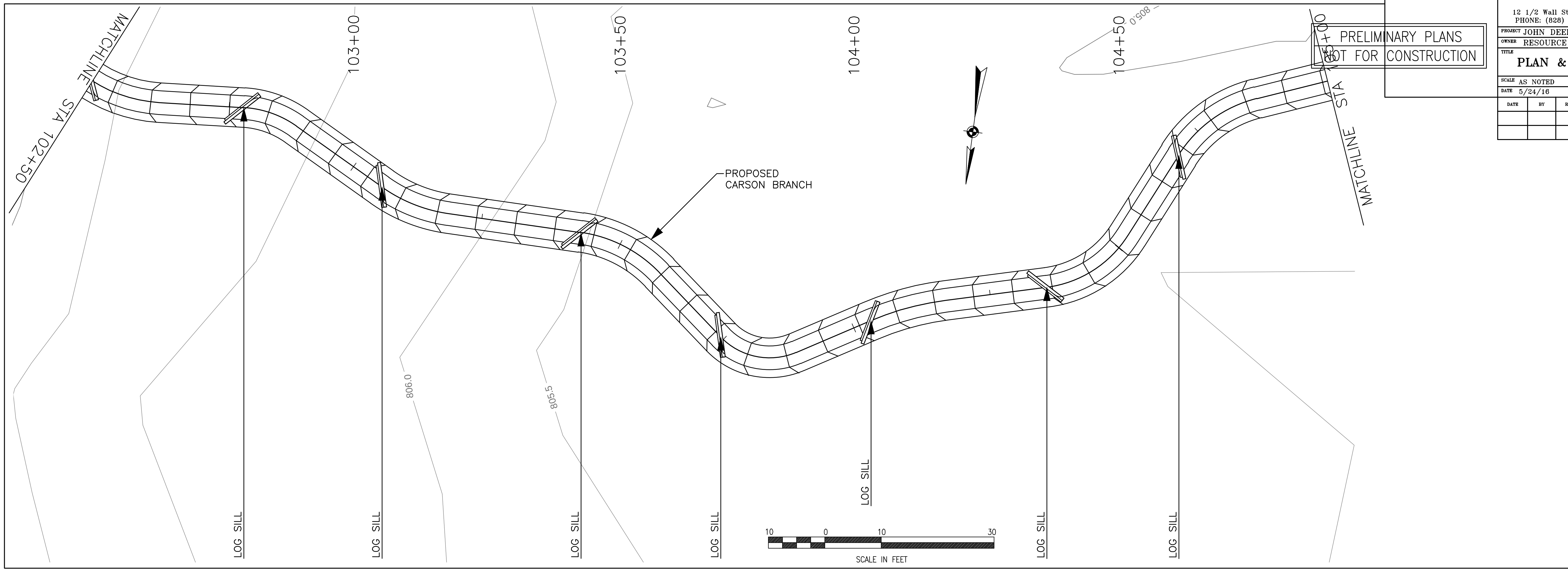
PROJECT JOHN DEERE MITIGATION BANK
OWNER RESOURCE ENVIRONMENTAL SOLUTIONS

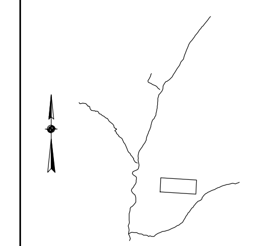
TITLE **PLAN & PROFILE**

SCALE AS NOTED	DRWN. BY TAS	PROJECT NO. 1080	SHEET NUMBER 5
DATE 5/24/16	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

PRELIMINARY PLANS
NOT FOR CONSTRUCTION

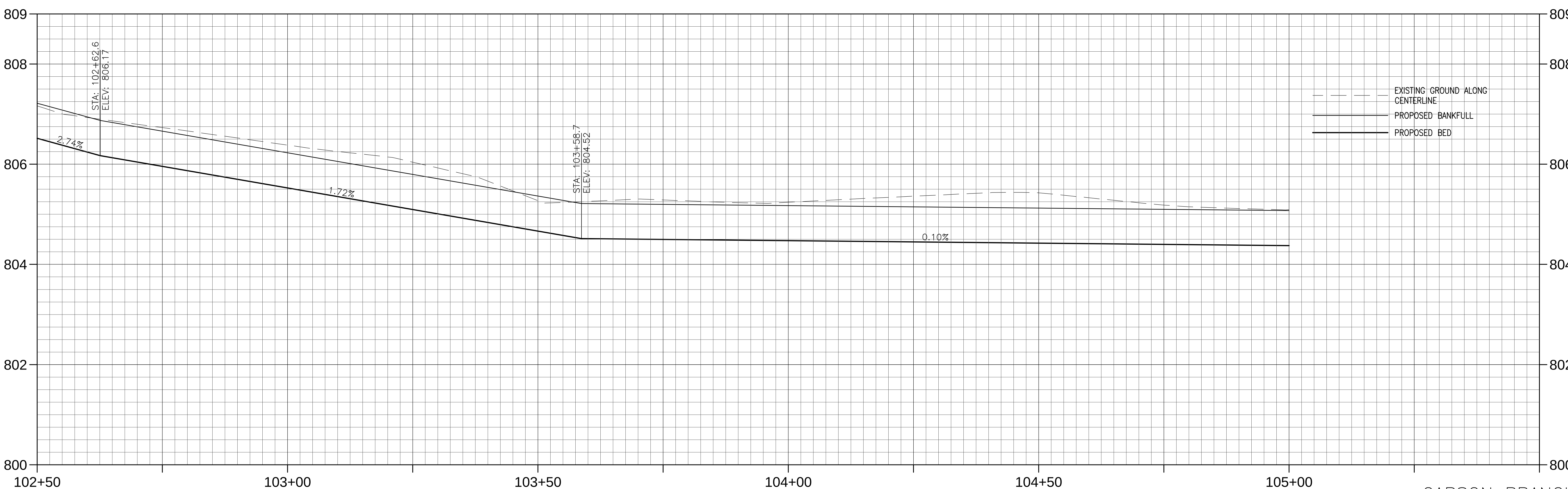




LOCATION KEY

LEGEND

- PROPOSED STREAM RESTORATION
- IN-LINE STREAM RESTORATION
- ARMORED RIFFLE
- EXISTING TREE
- SAVE TREE
- PROPERTY BOUNDARY
- EXISTING FENCE
- FILL



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1' HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL: 1" = 2'

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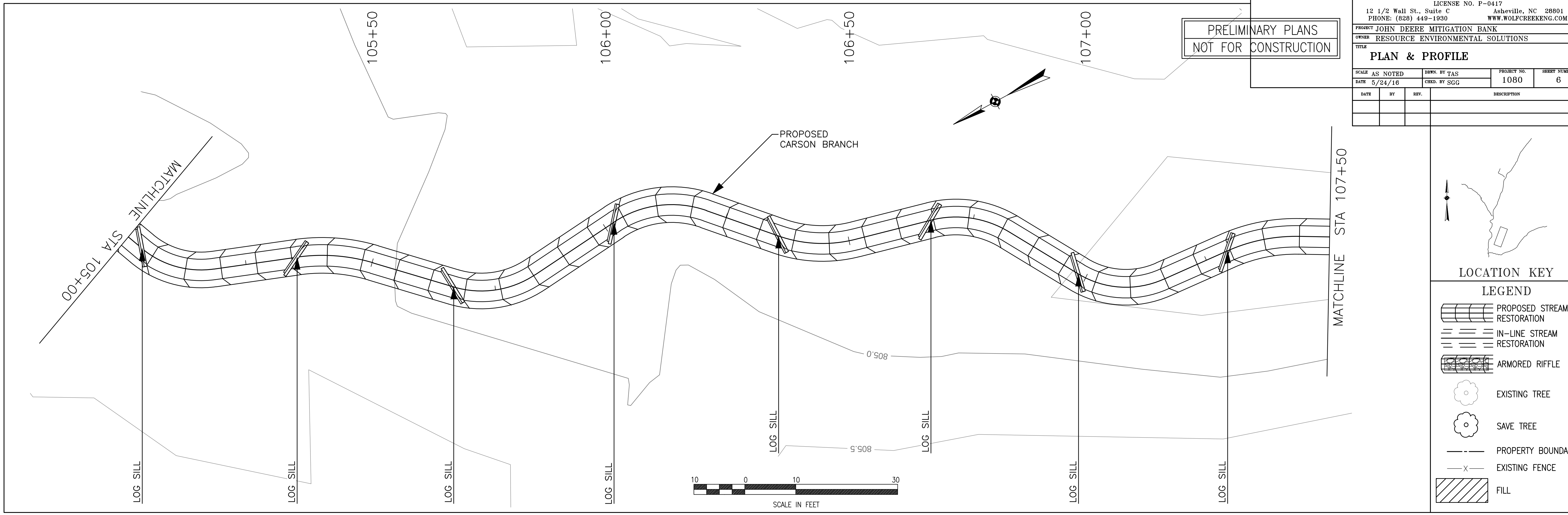
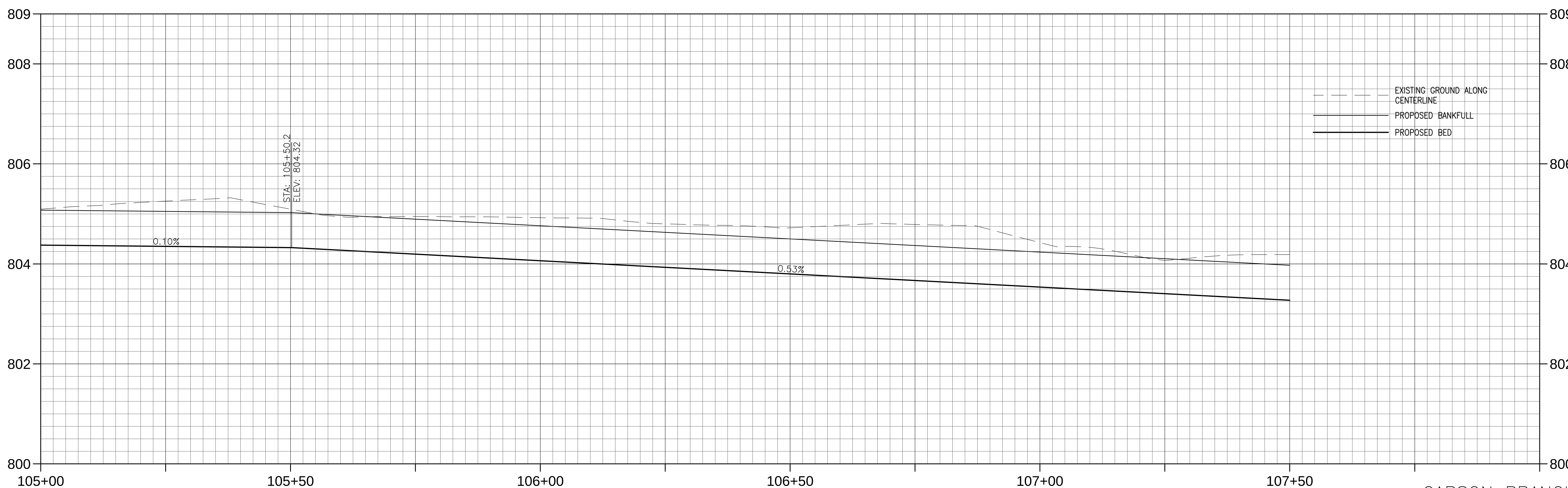
PROJECT: JOHN DEERE MITIGATION BANK
OWNER: RESOURCE ENVIRONMENTAL SOLUTIONS
TITLE: PLAN & PROFILE

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	TAS	1080	6
DATE 5/24/16	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

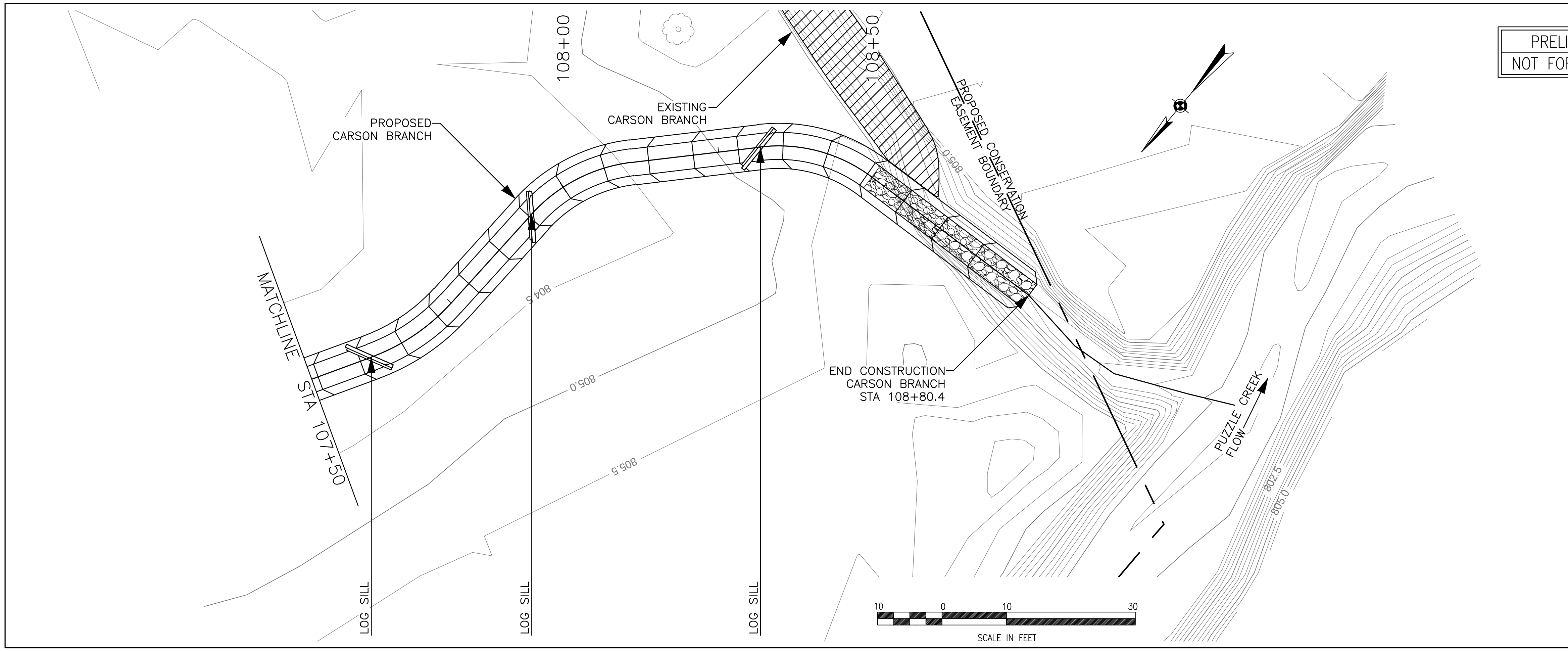
PRELIMINARY PLANS
NOT FOR CONSTRUCTION





FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1' HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL: 1" = 2'

CARSON BRANCH



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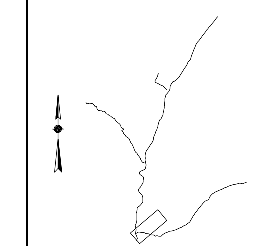
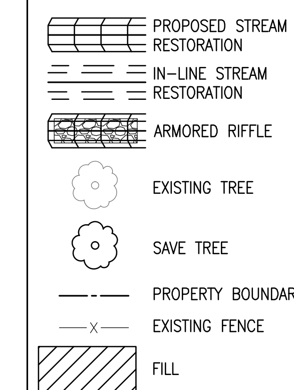
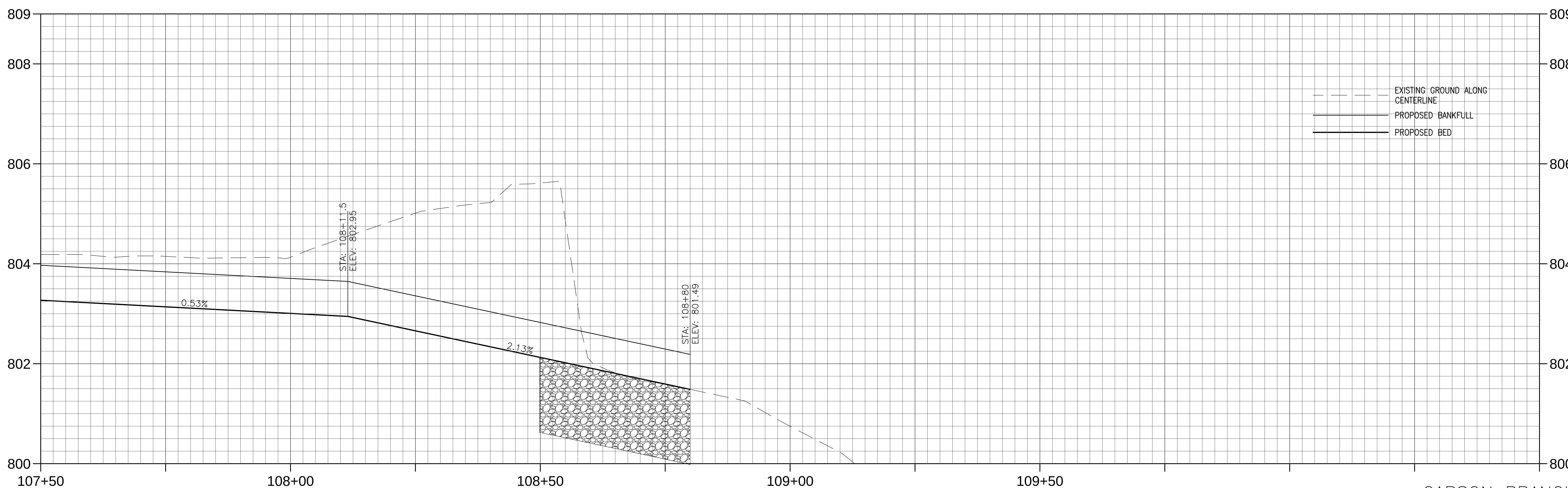
PROJECT JOHN DEERE MITIGATION BANK
OWNER RESOURCE ENVIRONMENTAL SOLUTIONS
TITLE **PLAN & PROFILE**

SCALE AS NOTED	DRWN. BY TAS	PROJECT NO. 1080	SHEET NUMBER 7
DATE 5/24/16	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION


LOCATION KEY

LEGEND




FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1' HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

CARSON BRANCH

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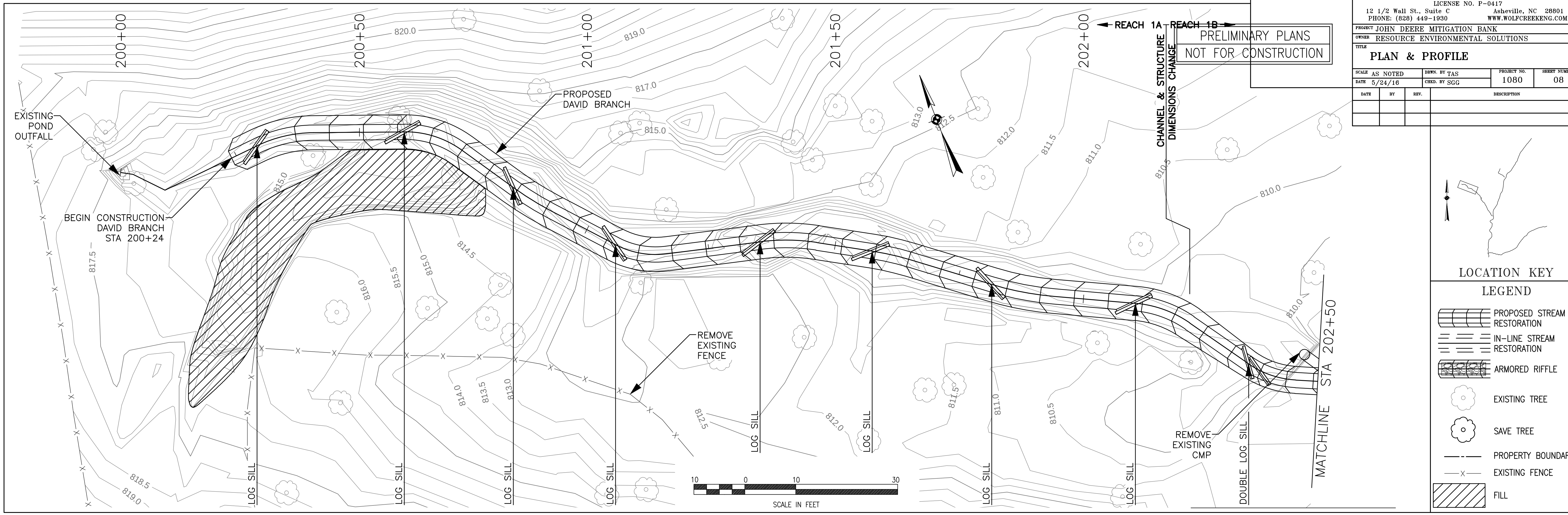
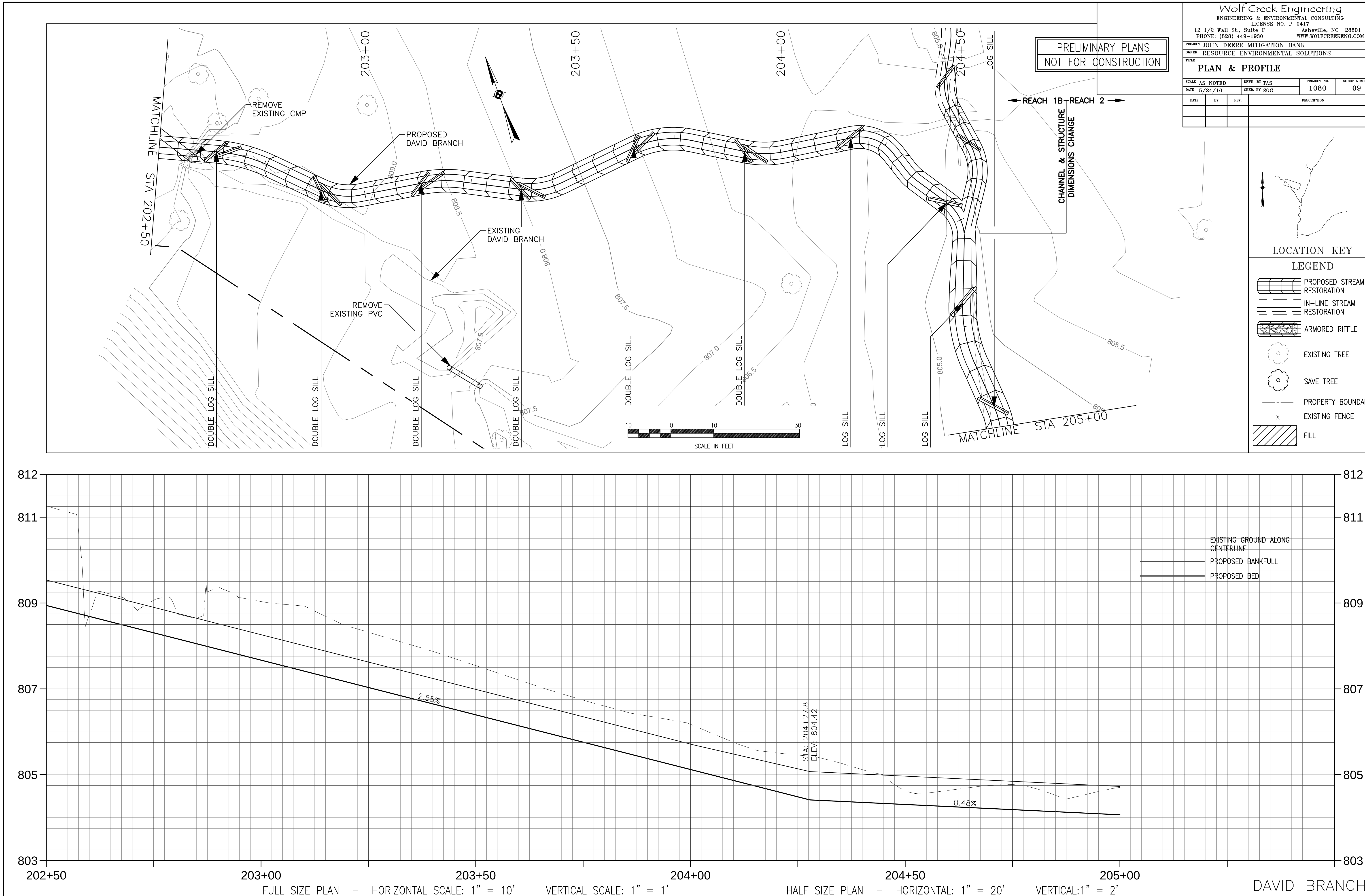
PROJECT	JOHN DEERE MITIGATION BANK		
OWNER	RESOURCE ENVIRONMENTAL SOLUTIONS		
TITLE	PLAN & PROFILE		
SCALE AS NOTED	DRWN. BY TAS	PROJECT NO. 1080	SHEET NUMBER 08
DATE 5/24/16	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1' HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL: 1" = 2'

DAVID BRANCH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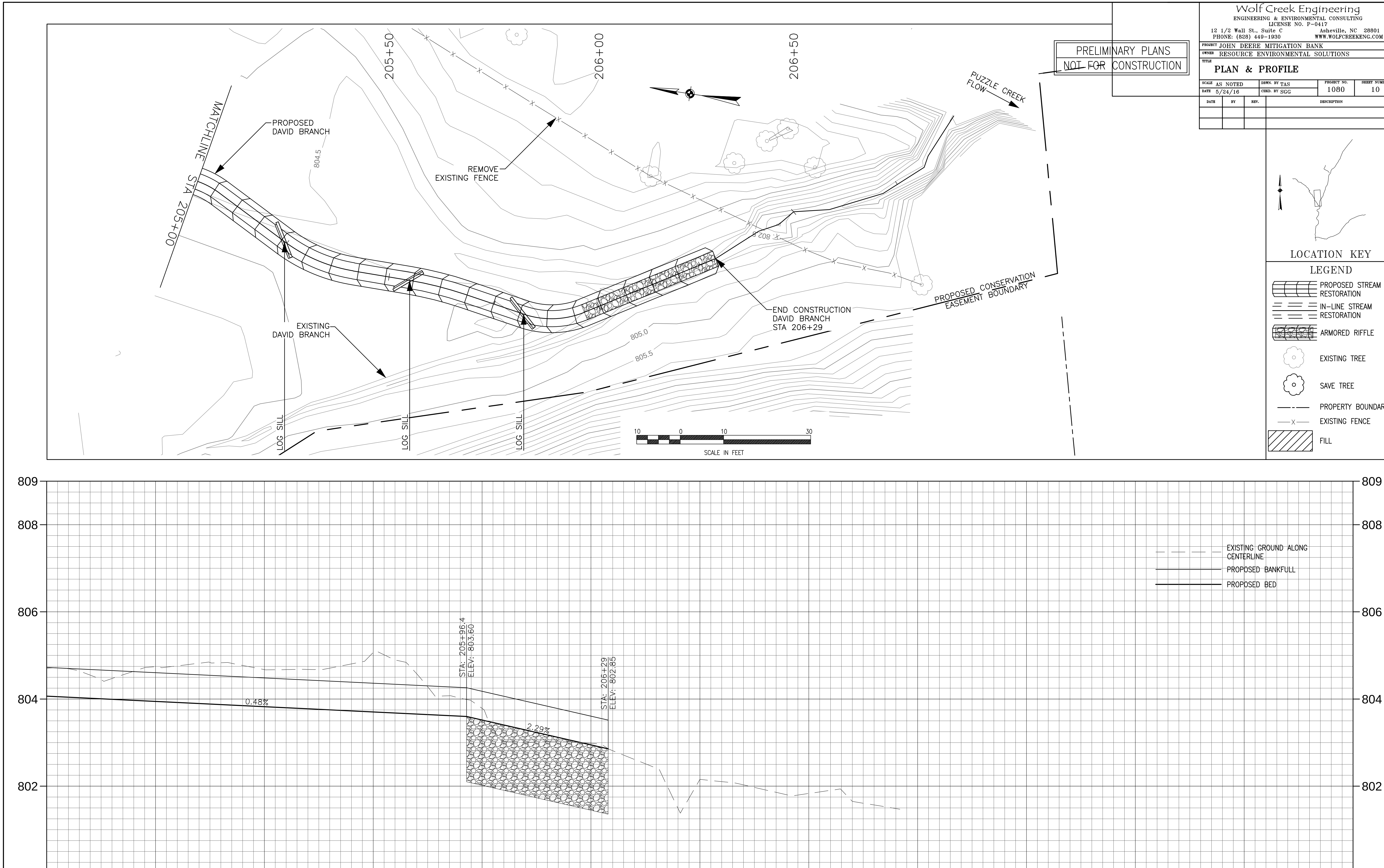
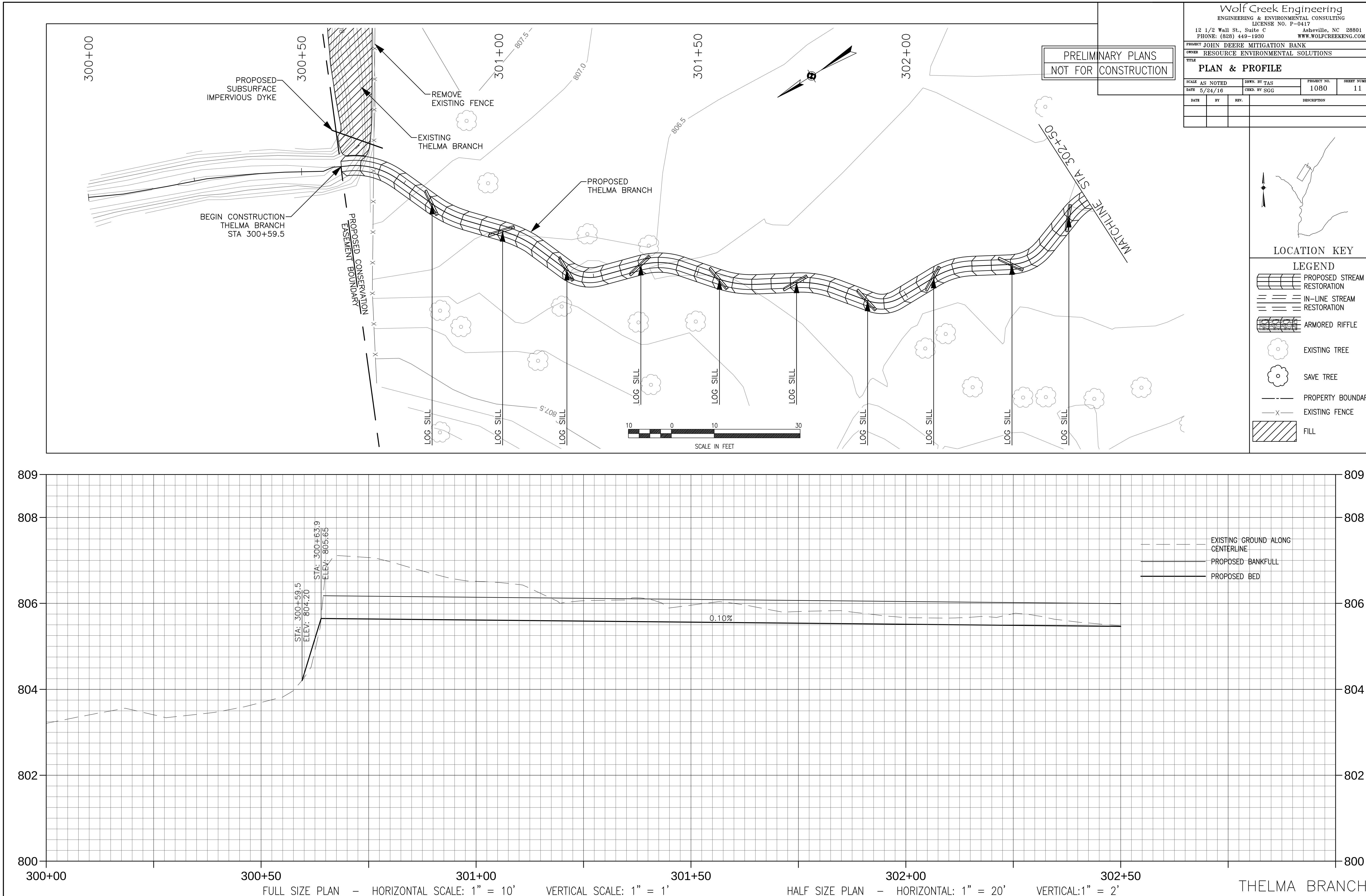
OWNER RESOURCE ENVIRONMENTAL SOLUTIONS
TITLE PLAN & PROFILE
SCALE AS NOTED
DATE 5/24/16
DRWN. BY TAS
CHKD. BY SGG
PROJECT NO. 1080
SHEET NUMBER 09
DATE
BY
REV.
DESCRIPTION
PRELIMINARY PLANS
NOT FOR CONSTRUCTION
LOCATION KEY
LEGEND
PROPOSED STREAM RESTORATION
IN-LINE STREAM RESTORATION
ARMORED RIFFLE
EXISTING TREE
SAVE TREE
PROPERTY BOUNDARY
EXISTING FENCE
FILL
MATCHLINE STA 202+50
MATCHLINE STA 205+00
203+00
203+50
204+00
204+50
REMOVE EXISTING CMP
PROPOSED DAVID BRANCH
EXISTING DAVID BRANCH
REMOVE EXISTING PVC
REACH 1B
REACH 2
CHANNEL & STRUCTURE DIMENSIONS CHANGE
DOUBLE LOG SILL
DOUBLE LOG SILL
DOUBLE LOG SILL
DOUBLE LOG SILL
DOUBLE LOG SILL
DOUBLE LOG SILL
LOG SILL
LOG SILL
LOG SILL
LOG SILL
809.0
808.5
808.0
807.5
807.0
806.5
805.0
805.5
SCALE IN FEET
10
0
10
30
812
811
809
807
805
803
EXISTING GROUND ALONG CENTERLINE
PROPOSED BANKFULL
PROPOSED BED
2.55%
0.48%
STA: 204+27.8
ELEV: 804.42
202+50
203+00
203+50
204+00
204+50
205+00
FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'
DAVID BRANCH



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1' HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL:1" = 2'

DAVID BRANCH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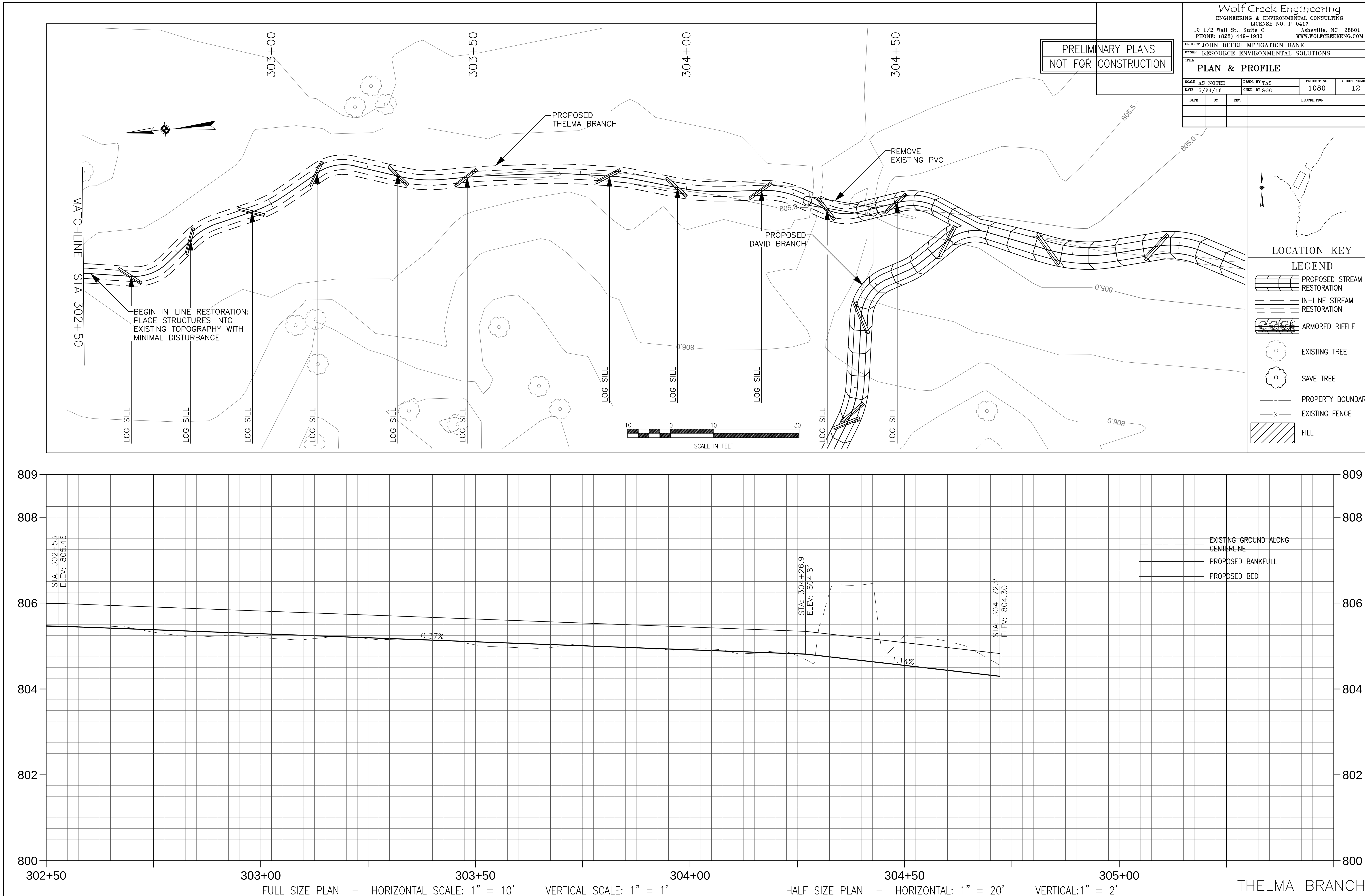
OWNER RESOURCE ENVIRONMENTAL SOLUTIONS
TITLE PLAN & PROFILE
SCALE AS NOTED
DATE 5/24/16
DRWN. BY TAS
CHKD. BY SGG
PROJECT NO. 1080
SHEET NUMBER 11
DATE
BY
REV.
DESCRIPTION
PRELIMINARY PLANS
NOT FOR CONSTRUCTION
LOCATION KEY
LEGEND
PROPOSED STREAM RESTORATION
IN-LINE STREAM RESTORATION
ARMORED RIFFLE
EXISTING TREE
SAVE TREE
PROPERTY BOUNDARY
EXISTING FENCE
FILL
300+00
300+50
301+00
301+50
302+00
PROPOSED SUBSURFACE IMPERVIOUS DYKE
REMOVE EXISTING FENCE
EXISTING THELMA BRANCH
PROPOSED THELMA BRANCH
BEGIN CONSTRUCTION THELMA BRANCH STA 300+59.5
PROPOSED CONSERVATION EASEMENT BOUNDARY
MATCHLINE STA 302+50
807.5
807.0
806.5
LOG SILL
10 0 10 30
SCALE IN FEET
809
808
806
804
802
800
STA: 300+59.5
ELEV: 804.20
STA: 300+63.9
ELEV: 805.65
0.10%
EXISTING GROUND ALONG CENTERLINE
PROPOSED BANKFULL
PROPOSED BED
300+00
300+50
301+00
301+50
302+00
302+50
FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN – HORIZONTAL: 1" = 20' VERTICAL: 1" = 2'
THELMA BRANCH



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OWNER RESOURCE ENVIRONMENTAL SOLUTIONS
TITLE PLAN & PROFILE
SCALE AS NOTED
DATE 5/24/16
DRWN. BY TAS
CHKD. BY SGG
PROJECT NO. 1080
SHEET NUMBER 12
DATE
BY
REV.
DESCRIPTION
PRELIMINARY PLANS
NOT FOR CONSTRUCTION
303+00
303+50
304+00
304+50
PROPOSED THELMA BRANCH
REMOVE EXISTING PVC
PROPOSED DAVID BRANCH
MATCHLINE STA 302+50
BEGIN IN-LINE RESTORATION: PLACE STRUCTURES INTO EXISTING TOPOGRAPHY WITH MINIMAL DISTURBANCE
LOG SILL
805.5
805.0
806.0
10
0
10
30
SCALE IN FEET
LOCATION KEY
LEGEND
PROPOSED STREAM RESTORATION
IN-LINE STREAM RESTORATION
ARMORED RIFFLE
EXISTING TREE
SAVE TREE
PROPERTY BOUNDARY
EXISTING FENCE
FILL
809
808
806
804
802
800
STA: 302+53
ELEV: 805.46
0.37%
STA: 304+26.9
ELEV: 804.81
1.14%
STA: 304+72.2
ELEV: 804.30
EXISTING GROUND ALONG CENTERLINE
PROPOSED BANKFULL
PROPOSED BED
302+50
303+00
303+50
304+00
304+50
305+00
FULL SIZE PLAN - HORIZONTAL SCALE: 1" = 10' VERTICAL SCALE: 1" = 1'
HALF SIZE PLAN - HORIZONTAL: 1" = 20' VERTICAL:1" = 2'
THELMA BRANCH

Appendix 2. Data Analysis

Design Calculations

- Conceptual Design Calculations
- Discharge Calculations
- Hydraulic Geometry
- Sediment Regime
- Design Section Calculations
- Typical Section Dimensions
- Morphologic Tables
- Structure Dimensions
- Transition Reach Design
- Bed Material Design

Assessment Data

- BEHI Calculations
- Existing Geomorphology Data
- Existing Bed Material Data
- Morphologic Site Map

Henry Fork Reference Reach Data

1.0 Conceptual Design

Estimated Channel Values from Regional Curves

Design Status

Complete
5/16/16
TAS

Project: John Deere Site
Project No.: 1080-JNDR
Client: RES
Contract No.: 96917
County/State: Rutherford County, NC

Hydro-Physio Province: NC Piedmont

Regional Curve Equations

	Coefficient	Exponent
W_{BKF} :	11.89	0.43
A_{BKF} :	21.43	0.68
d_{MEAN} :	1.5	0.32
Q_{BKF} :	89.04	0.72
W_{BED} :	12	0.45
d_{MAX} :	1.5	0.27

Approximate Equations

	Coefficient	Exponent	
W_{BKF} :	8.29	0.45	(Not Used in Calculations)
d_{MAX} :	2.1	0.32	(Not Used in Calculations)

Reach	Estimated Dimensions from Regional Curves								
	Drain. Area (mi^2)	W_{BKF} (ft)	A_{BKF} (ft^2)	d_{MEAN} (ft)	W_{BED} (ft)	d_{MAX} (ft)	Pool Spacing (ft)	Rc (ft)	Tangent Length (ft)
CARSON BRANCH REACH 1A	0.18	5.7	6.7	0.9	5.5	0.9	28	11	11
CARSON BRANCH REACH 1B	0.18	5.7	6.7	0.9	5.5	0.9	28	11	11
DAVID BRANCH REACH 1A	0.0879	4.2	4.1	0.7	4.0	0.8	21	8	8
DAVID BRANCH REACH 1B	0.0879	4.2	4.1	0.7	4.0	0.8	21	8	8
DAVID BRANCH REACH 2	0.144	5.2	5.7	0.8	5.0	0.9	26	10	10
THELMA BRANCH REACH 1	0.0561	3.4	3.0	0.6	3.3	0.7	17	7	7

1.1 Reach Locations

Project: John Deere Site
Project No.: 1080-JNDR
Client: RES
Contract No.: 96917
County/State: Rutherford County, NC

Reach	Existing Thalweg Stationing		Proposed Design Stationing		Description
	Begin	End	Begin	End	
CARSON BRANCH REACH 1A	100+00	104+50	101+14	103+50	Upstream steeper reach
CARSON BRANCH REACH 1B	104+50	109+26	103+50	108+80	Flatter reach
DAVID BRANCH REACH 1A	200+00	202+62	200+24	202+50	U/S of existing culvert crossing
DAVID BRANCH REACH 1B	202+62	205+63	202+50	204+66	U/S of Thelma Branch confluence
DAVID BRANCH REACH 2	205+63	206+54	204+66	206+29	Follows swale
THELMA BRANCH REACH 1	300+00	301+65	300+60	304+72	U/S of David Branch confluence

2.0 Discharge Calculations

Design Status

Complete
5/16/16
TAS

Project: John Deere Site
Project No.: 1080-JNDR
Client: RES
Contract No.: 96917
County/State: Rutherford County, NC

Estimated Discharges										
Reach	Drainage Area (mi^2)	Bankfull (cfs)	2-yr (cfs)	5-yr (cfs)	10-yr (cfs)	50-yr (cfs)	100-yr (cfs)			
CARSON BRANCH REACH 1A	0.18	26	41	76	107	203	255			
CARSON BRANCH REACH 1B	0.18	26	41	76	107	203	255			
DAVID BRANCH REACH 1A	0.0879	15	24	47	67	129	163			
DAVID BRANCH REACH 1B	0.0879	15	24	47	67	129	163			
DAVID BRANCH REACH 2	0.144	22	35	65	93	176	222			
THELMA BRANCH REACH 1	0.0561	11	18	34	50	97	123			

2.1 Discharge Calculation Input

Discharge Method Used: USGS Regional Regression

Hydro-Physio Province: NC Piedmont

NCDOT Rural Equations

Hydrologic Contour:	7.00
Watershed Length:	N/A
Watershed Width:	N/A
Percent Forest:	N/A

Regional Regression Equations

Event	Coef	Exp
2-yr	135	0.702
5-yr	242	0.677
10-yr	334	0.662
25-yr	476	0.645
50-yr	602	0.635
100-yr	745	0.625
200-yr	908	0.616
500-yr	1160	0.605

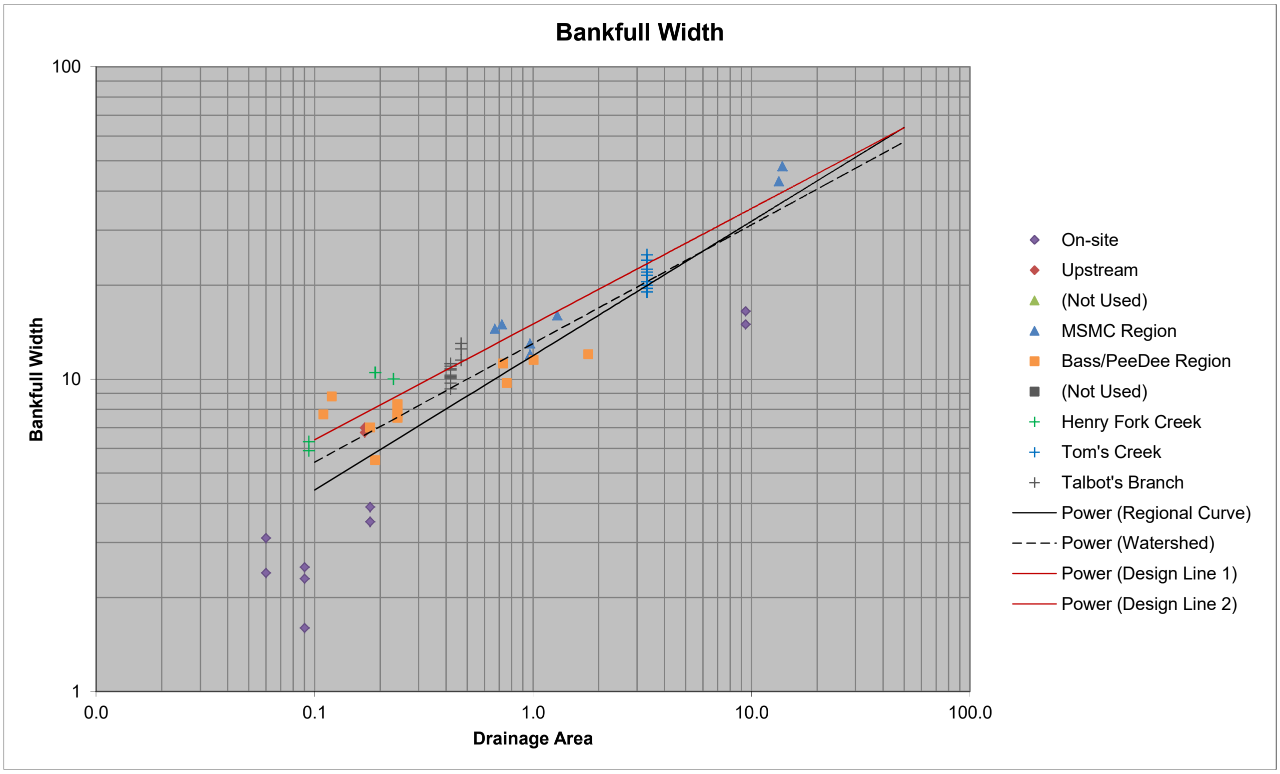
Bankfull Regional Equation

Event	Coef	Exp
Bankfull	89.04	0.72

3.0 Hydraulic Geometry

Project: John Deere Site
Project No.: 1080-JNDR
Client: RES
Contract No.: 96917
County/State: Rutherford County, NC

Design Status
Complete
8/3/16
SGG

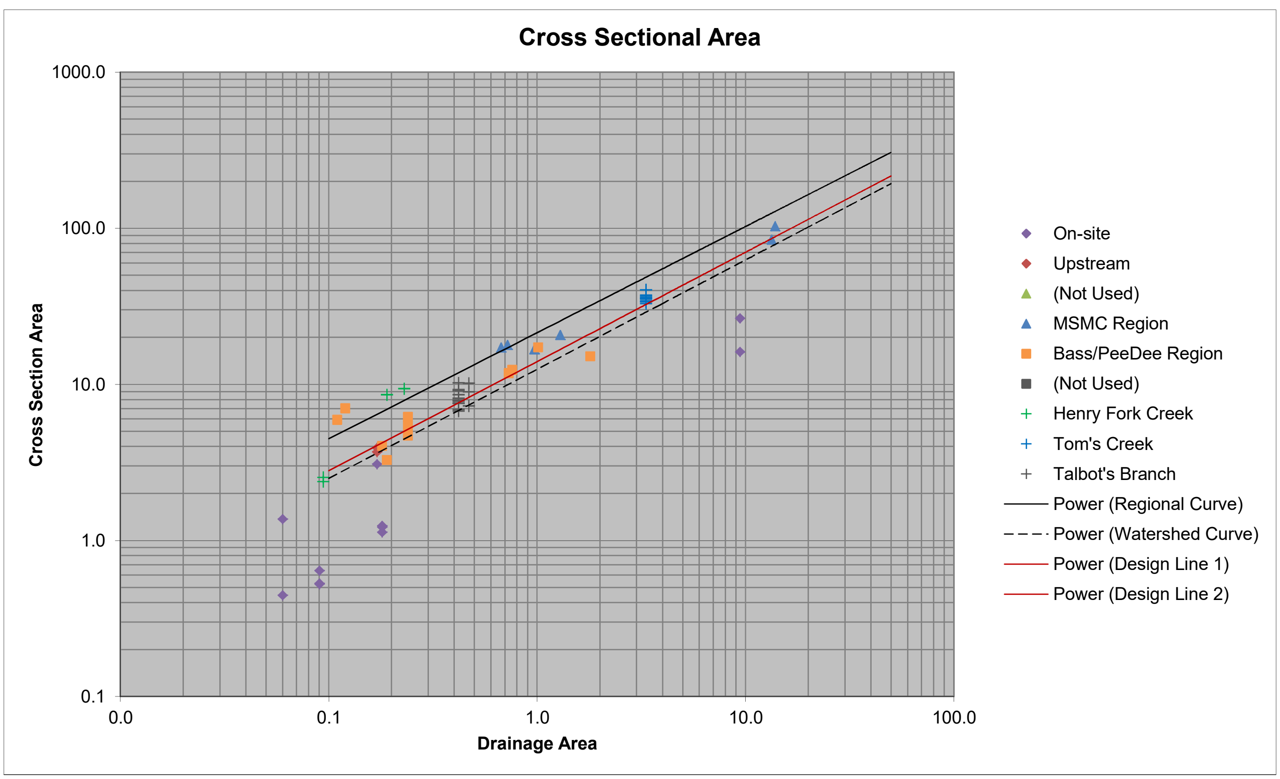


Design Equations

	Coef	Exp
Design Line 1 :	15.0	0.37
Design Line 2 :		

Regional Regression Equations

	Coef	Exp	
Regional Curve :	11.9	0.43	(NC Piedmont)
Watershed Curve :	13.0	0.38	



Design Equations

	Coef	Exp
Design Line 1 :	14.0	0.70
Design Line 2 :		

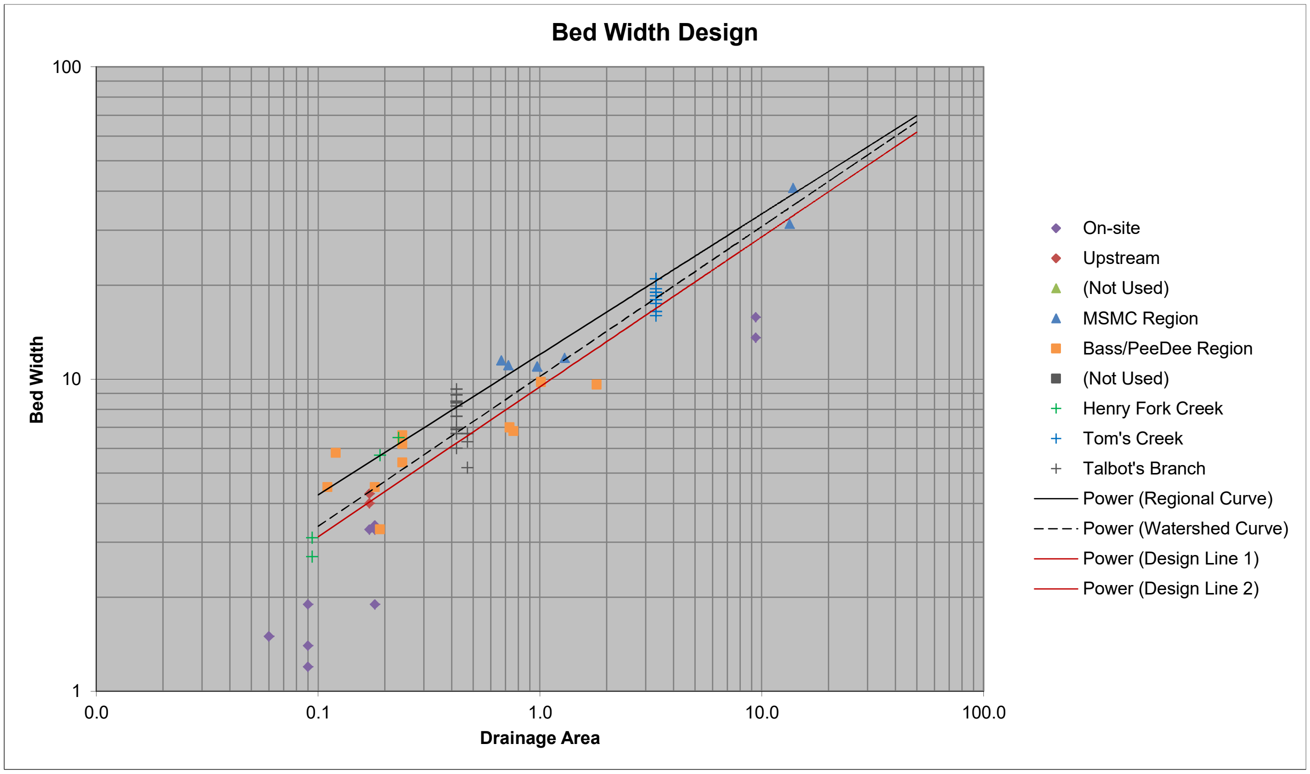
Regional Regression Equations

	Coef	Exp	
Regional Curve :	21.4	0.68	(NC Piedmont)
Watershed Curve :	12.5	0.70	

3.1 Hydraulic Geometry

Design Status
Complete
8/3/16
SGG

Project: John Deere Site
Project No.: 1080-JNDR
Client: RES
Contract No.: 96917
County/State: Rutherford County, NC

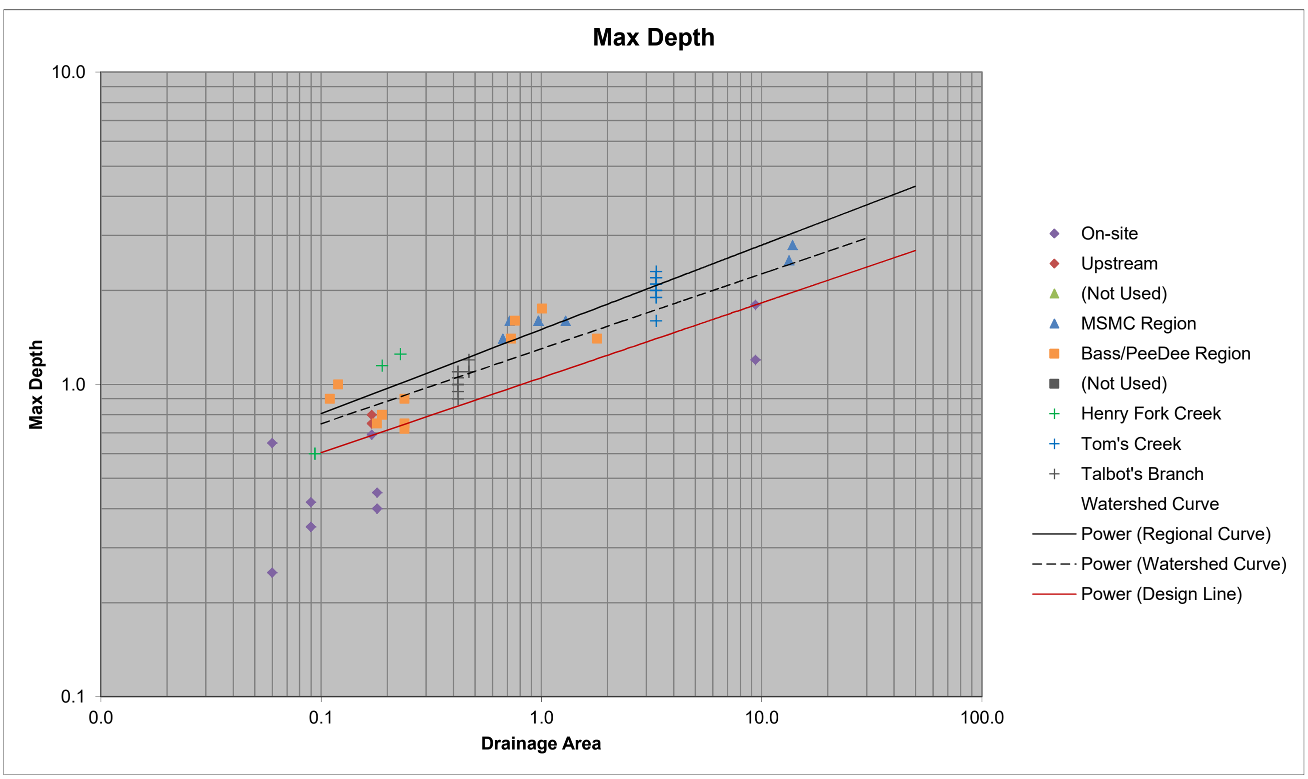


Design Equations

	Coef	Exp
Design Line 1 :	9.5	0.48
Design Line 2 :		

Regional Regression Equations

	Coef	Exp	
Regional Curve :	12.0	0.45	(NC Piedmont)
Watershed Curve :	10.2	0.48	



Design Equations

	Coef	Exp
Design Line :	1.1	0.24

Regional Regression Equations

	Coef	Exp	
Regional Curve :	1.5	0.27	(NC Piedmont)
Watershed Curve :	1.3	0.24	

4.0 Sediment Regime

Project: John Deere Site
Project No.: 1080-JNDR
Client: RES
Contract No.: 96917
County/State: Rutherford County, NC

Design Status
Complete
7/27/16
SGG

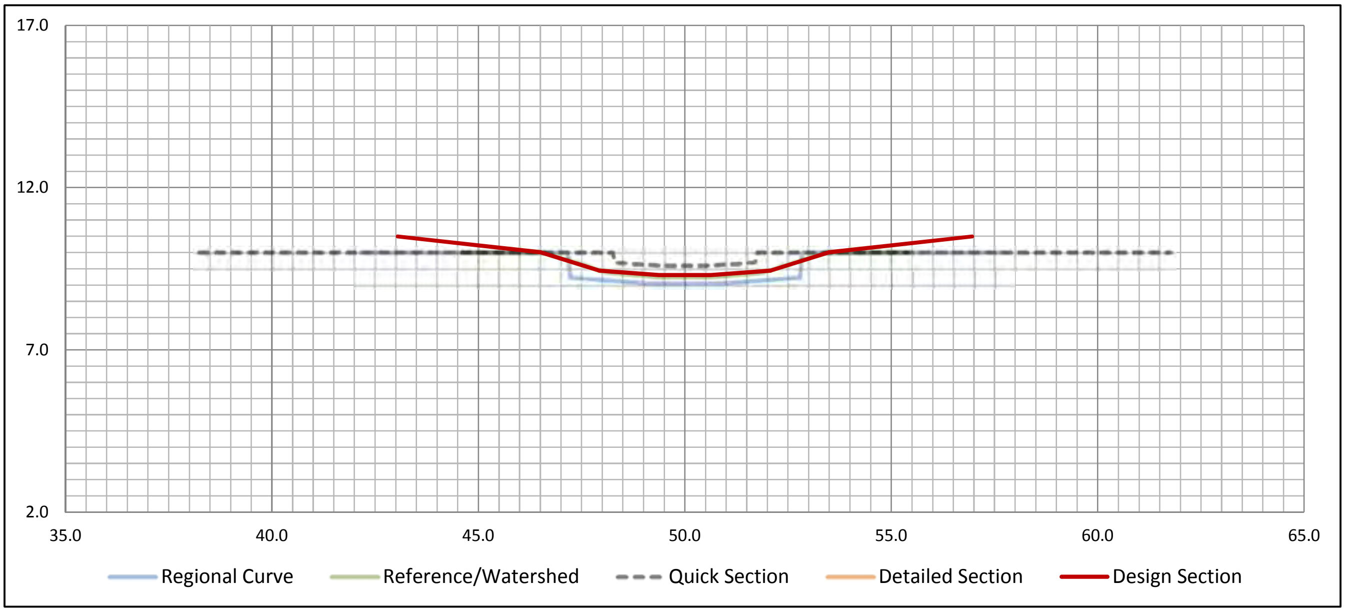
Reach	Carson Branch	David Branch	Thelma Branch				
Bed Material Nature							
Depth of Bed Probe (ft)	< 0.1	< 0.1	N/A				
Matrix Bonding	Loose	Loose	Loose				
Parent Material Exposure	No	No	No				
Well Graded	Yes	No	No				
Depositional Patterns							
Point Bars	Moderate	Minimal	None				
Mid-channel Bars	Moderate	None	None				
Side-channel Bars	None	None	None				
Diagonal Bars	Minimal	None	None				
Bar Length/W_{BED}	1-2	2-3	N/A				
Dune Presentation of Bars	Moderate	Moderate	N/A				
Channel Branching	None	None	None				
Tributary Deltas	None	None	None				
Dune Length/Height (ft)	N/A	N/A	N/A				
Ripple Length/Height (ft)	N/A	N/A	N/A				
Sediment Measurements							
Pebble Count (Riffle) % Sand							
D_{50}							
D_{84}							
D_{95}							
Pebble Count (Reach) % Sand							
D_{50}							
D_{84}							
D_{95}							
Bar Sample % Sand	47%						
D_{50}	6						
D_{84}	13						
D_{95}	18						
D_{MAX}	29						
Bed Sample % Sand	38%						
D_{50}	8						
D_{84}	22						
D_{95}	30						
Sediment Regime							
Sediment Load	Low	Low	Low				
Sediment Mobility	Mod. Low	Mod. Low	Low				

5.0 Design Section 1

Project: John Deere Site
Project No.: 1080-JNDR
Client: RES
Contract No.: 96917
County/State: Rutherford County, NC

Design Status

Complete
5/16/16
TAS



Design Section

	Coef	Exp
W_{BED}	9.50	0.48
d_{MAX}	1.05	0.24
Bank Slope	2.5	(H:1)
Thalweg Ratio	0.3	
Toe Depth Ratio	0.8	
Bench Width Ratio	0.5	
Bench Slope	7	(H:1)
Drainage Area	0.18	(sq. mi.)

Point of Comparison
Approximate Existing STA 104+15

Section Comparisons

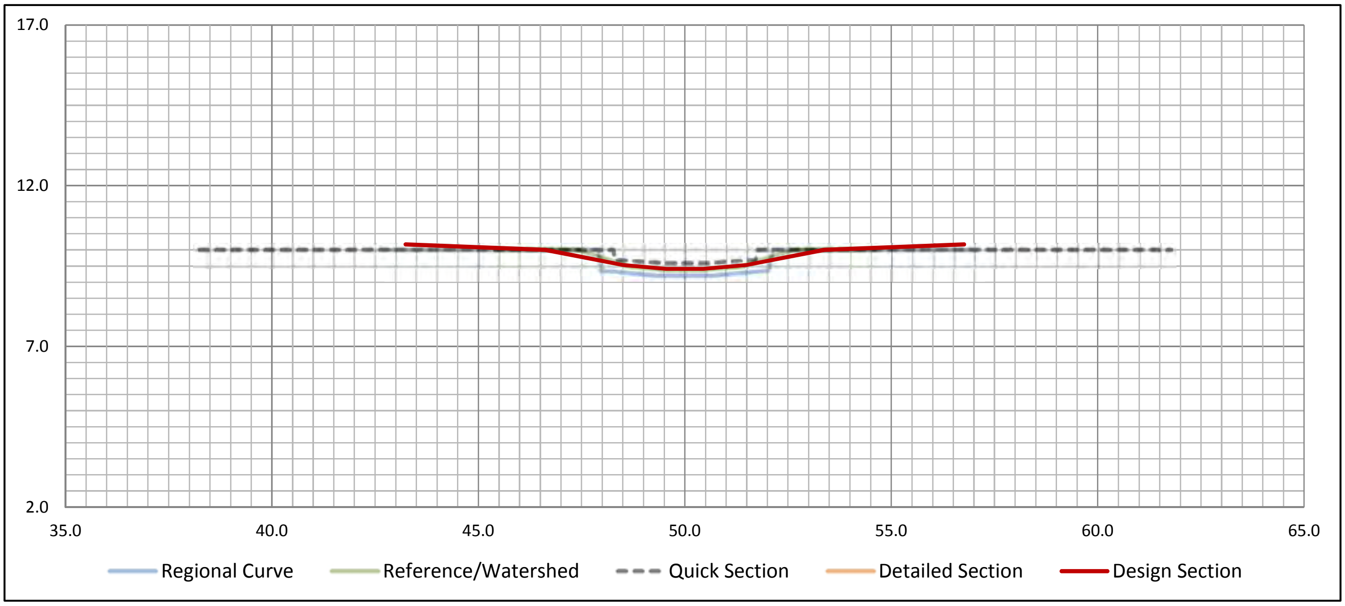
	Regional Curve	Ref/ Wtrshed	Quick Section	Detailed Section	Design Section
W_{BKF}	5.7	6.8	3.5	12.5	7.0
	122%	103%	199%	56%	
W_{BED}	5.5	3.8	3.4		4.2
	75%	111%	123%		
W_{THL}	1.7	1.1	0.9		1.3
	75%	111%	139%		
d_{MAX}	0.9	0.8	0.4	0.0	0.7
	74%	92%	174%	#DIV/0!	
d_{TOE}	0.8	0.6	0.3		0.6
	74%	92%	186%		
A_{BKF}	6.7	3.6	1.3		3.5
	52%	97%	278%	#VALUE!	
d_{MEAN}	1.17	0.53	0.36		0.50
	43%	94%	140%	#VALUE!	
P	7.1	7.0	4.0		7.2
	101%	102%	179%	#VALUE!	
Hydr. R	0.94	0.51	0.31		0.48
	51%	95%	155%	#VALUE!	
W/d Ratio	4.8	12.8	9.8		13.9
	287%	109%	142%	#VALUE!	

5.1 Design Section 2

Project:	John Deere Site
Project No.:	1080-JNDR
Client:	RES
Contract No.:	96917
County/State:	Rutherford County, NC

Design Status

Complete
5/16/2016
TAS



Design Section

	Coef	Exp
W_{BED}	9.50	0.48
d_{MAX}	1.05	0.24
Bank Slope	4.0	(H:1)
Thalweg Ratio	0.3	
Toe Depth Ratio	0.8	
Bench Width Ratio	0.5	
Bench Slope	20	(H:1)
Drainage Area	0.09	(sq. mi.)

Point of Comparison
Approximate Existing STA 104+15

Section Comparisons

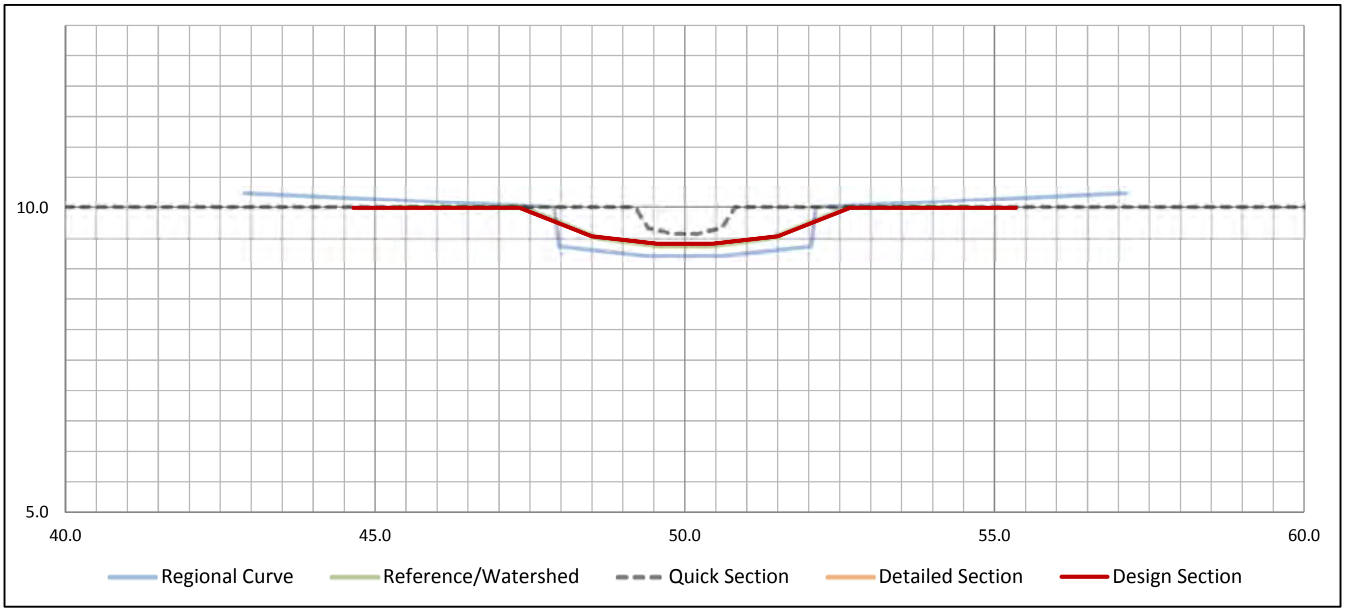
	Regional Curve	Ref/ Wtrshed	Quick Section	Detailed Section	Design Section
W_{BKF}	4.2	5.2	3.5	12.5	6.8
	160%	130%	193%	54%	
W_{BED}	4.1	2.7	3.4		3.0
	74%	110%	88%		
W_{THL}	1.2	0.8	0.9		0.9
	74%	110%	100%		
d_{MAX}	0.8	0.6	0.4	0.0	0.6
	75%	94%	147%	#DIV/0!	
d_{TOE}	0.6	0.5	0.3		0.5
	75%	94%	157%		
A_{BKF}	4.2	2.2	1.3		2.5
	61%	113%	202%	#VALUE!	
d_{MEAN}	0.99	0.43	0.36		0.37
	38%	87%	105%	#VALUE!	
P	5.3	5.4	4.0		6.9
	129%	127%	172%	#VALUE!	
Hydr. R	0.78	0.41	0.31		0.37
	47%	89%	118%	#VALUE!	
W/d Ratio	4.3	12.1	9.8		18.1
	423%	149%	185%	#VALUE!	

5.2 Design Section 3

Project: John Deere Site
Project No.: 1080-JNDR
Client: RES
Contract No.: 96917
County/State: Rutherford County, NC

Design Status

Complete
5/16/2016
TAS



Design Section

	Coef	Exp
W_{BED}	9.50	0.48
d_{MAX}	1.05	0.24
Bank Slope	2.5	(H:1)
Thalweg Ratio	0.3	
Toe Depth Ratio	0.8	
Bench Width Ratio	0.5	
Bench Slope	0	(H:1)
Drainage Area	0.09	(sq. mi.)

Point of Comparison
Mid-Reach d/s of pvc

Section Comparisons

	Regional Curve	Ref/ Wtrshed	Quick Section	Detailed Section	Design Section
W_{BKF}	4.2	5.2	1.6	0.0	5.3
	127%	103%	334%	#DIV/0!	
W_{BED}	4.1	2.7	1.2		3.0
	74%	110%	249%		
W_{THL}	1.2	0.8	0.4		0.9
	74%	110%	224%		
d_{MAX}	0.8	0.6	0.4	#VALUE!	0.6
	75%	94%	140%	#VALUE!	
d_{TOE}	0.6	0.5	0.3		0.5
	75%	94%	143%		
A_{BKF}	4.2	2.2	0.5		2.2
	53%	98%	411%	#VALUE!	
d_{MEAN}	0.99	0.43	0.33		0.41
	42%	96%	123%	#VALUE!	
P	5.3	5.4	2.0		5.5
	104%	102%	278%	#VALUE!	
Hydr. R	0.78	0.41	0.27		0.40
	51%	96%	148%	#VALUE!	
W/d Ratio	4.3	12.1	4.8		13.0
	305%	108%	272%	#VALUE!	

6.0 Typical Section Dimensions

Design Status

Complete
7/27/16
SGG

Project: John Deere Site
Project No.: 1080-JNDR
Client: RES
Contract No.: 96917
County/State: Rutherford County, NC

Reach	Drainage Area (mi^2)	Design Section	W_{BKF}	W_{BED}	W_{THAL}	W_{BENCH}	d_{MAX}	d_{TOE}	Bank Slope (H:1)
CARSON BRANCH REACH 1A	0.18	1	7.0	4.2	1.3	3	0.70	0.56	2.5
CARSON BRANCH REACH 1B	0.18	1	7.0	4.2	1.3	3	0.70	0.56	2.5
DAVID BRANCH REACH 1A	0.09	2	6.7	3.0	0.9	3	0.59	0.47	4
DAVID BRANCH REACH 1B	0.09	1	5.3	3.0	0.9	3	0.59	0.47	2.5
DAVID BRANCH REACH 2	0.144	1	6.4	3.7	1.1	3	0.66	0.53	2.5
THELMA BRANCH REACH 1	0.0561	2	5.7	2.4	0.7	3	0.53	0.42	4

Reach	Pool Dimensions				
	Width Ratio	W_{IN}	W_{OUT}	d_{POOL}/d_{MAX} Ratio	d_{POOL}
CARSON BRANCH REACH 1A	1.1	4.2	3.5	1.5	1.04
CARSON BRANCH REACH 1B	1.1	4.2	3.5	1.5	1.04
DAVID BRANCH REACH 1A	1.1	4.0	3.4	1.5	0.88
DAVID BRANCH REACH 1B	1.1	3.2	2.7	1.5	0.88
DAVID BRANCH REACH 2	1.1	3.8	3.2	1.5	0.99
THELMA BRANCH REACH 1	1.1	3.4	2.9	1.5	0.79

6.1 Hydraulic Dimensions

Project:	John Deere Site
Project No.:	1080-JNDR
Client:	RES
Contract No.:	96917
County/State:	Rutherford County, NC

Design Status
Complete
42578
SGG

Reach	Stream Type	A_{BKF}	P_{WET}	R_{HYD}	d_{MEAN}	W/D Ratio	Entrench Ratio
CARSON BRANCH REACH 1A	C4b	3.5	7.2	0.48	0.50	13.9	5.8
CARSON BRANCH REACH 1B	C4	3.5	7.2	0.48	0.50	13.9	5.8
DAVID BRANCH REACH 1A	C4	2.5	6.8	0.36	0.37	18.1	6.0
DAVID BRANCH REACH 1B	C4	2.2	5.5	0.39	0.41	13.0	7.5
DAVID BRANCH REACH 2	C4	3.0	6.6	0.45	0.47	13.6	6.3
THELMA BRANCH REACH 1	E6	1.9	5.9	0.32	0.33	17.6	7.0

6.2 Morphologic Dimensions

Reach	Pool Spacing/W_{AVG}			Pool Spacing				Belt Width	
	min	target	max	min	target	max	min	target	max
CARSON BRANCH REACH 1A	5.0	6.0	7.0	27.8	**33.4**	38.9	11.1	**22.3**	27.8
CARSON BRANCH REACH 1B	4.0	5.0	6.0	22.3	**27.8**	33.4	11.1	**22.3**	27.8
DAVID BRANCH REACH 1A	5.0	6.0	7.0	24.2	**29.0**	33.8	9.7	**19.3**	24.2
DAVID BRANCH REACH 1B	5.0	6.0	7.0	20.6	**24.8**	28.9	8.3	**16.5**	20.6
DAVID BRANCH REACH 2	5.0	6.0	7.0	25.3	**30.4**	35.5	10.1	**20.3**	25.3
THELMA BRANCH REACH 1	4.0	5.0	6.0	16.3	**20.3**	24.4	8.1	**16.3**	20.3

6.3 Morphologic Dimensions

Project: John Deere Site
Project No.: 1080-JNDR
Client: RES
Contract No.: 96917
County/State: Rutherford County, NC

Design Status
Complete
5/16/16
TAS

Reach	R_C/W_{AVG}		Radius of Curvature	
	min	max	min	max
CARSON BRANCH REACH 1A	1.5	2.5	8	14
CARSON BRANCH REACH 1B	1.0	2.0	6	11
DAVID BRANCH REACH 1A	1.5	2.5	7	12
DAVID BRANCH REACH 1B	1.5	2.5	6	10
DAVID BRANCH REACH 2	1.5	2.5	8	13
THELMA BRANCH REACH 1	1.0	2.0	4	8

S_{AVG}	S_{VALLEY}	Sinuosity	Meander Width Ratio
0.025	0.027	1.04	4.0
0.001	0.003	1.06	4.0
0.020	0.025	1.07	3.4
0.020	0.025	1.07	4.0
0.005	0.006	1.07	4.0
0.001	0.004	1.08	3.4

Reach	Percent Tangent	Percent Curve	Feature Length					
			Minimum		Target		Maximum	
			Tangent	Curve	Tangent	Curve	Tangent	Curve
CARSON BRANCH REACH 1A	65%	35%	18.1	9.7	22	12	25	14
CARSON BRANCH REACH 1B	50%	50%	11.1	11.1	14	14	17	17
DAVID BRANCH REACH 1A	60%	40%	14.5	9.7	17	12	20	14
DAVID BRANCH REACH 1B	60%	40%	12.4	8.3	15	10	17	12
DAVID BRANCH REACH 2	50%	50%	12.7	12.7	15	15	18	18
THELMA BRANCH REACH 1	50%	50%	8.1	8.1	10	10	12	12

6.4 Structure Dimensions

Design Status

Complete
7/27/16
SGG

Project: John Deere Site
Project No.: 1080-JNDR
Client: RES
Contract No.: 96917
County/State: Rutherford County, NC

Reach	Arm Length (L)	Throat Width (W)	Buried Length (X)	Total Log Length
CARSON BRANCH REACH 1A	7.0	2.0	3	13
CARSON BRANCH REACH 1B	7.0	2.0	3	13
DAVID BRANCH REACH 1A	5.0	2.0	3	11
DAVID BRANCH REACH 1B	5.0	2.0	3	11
DAVID BRANCH REACH 2	6.0	2.0	3	12
THELMA BRANCH REACH 1	4.0	2.0	3	10

Boulder Size		
Length	Width	Depth
2.0 - 3.0	1.5 - 2.0	1.0 - 1.5
2.0 - 3.0	1.5 - 2.0	1.0 - 1.5
2.0 - 3.0	1.5 - 2.0	1.0 - 1.5
2.0 - 3.0	1.5 - 2.0	1.0 - 1.5
2.0 - 3.0	1.5 - 2.0	1.0 - 1.5
2.0 - 3.0	1.5 - 2.0	1.0 - 1.5

7.0 Competence Calculations

Project: John Deere Site
Project No.: 1080-JNDR
Client: RES
Contract No.: 96917
County/State: Rutherford County, NC

Design Status
Complete
7/27/16
SGG

Reach	Hydraulic Radius (ft)	Largest Particle Calculations				Representative Particle Calculations			
		τ*	γ_S	D_{MAX} (mm)	S (ft/ft)	τ*	γ_S	D_{50} (mm)	S (ft/ft)
CARSON BRANCH REACH 1A	0.48	0.028	1.65	29	0.0091	0.028	1.65	8	0.0025
CARSON BRANCH REACH 1B	0.48	0.030	1.65	3	0.0010	0.040	1.65	3	0.0013
DAVID BRANCH REACH 1A	0.36	0.030	1.65	3	0.0013	0.040	1.65	3	0.0018
DAVID BRANCH REACH 1B	0.39	0.030	1.65	3	0.0012	0.040	1.65	3	0.0017
DAVID BRANCH REACH 2	0.45	0.030	1.65	3	0.0011	0.040	1.65	3	0.0014
THELMA BRANCH REACH 1	0.32	0.030	1.65	3	0.0015	0.040	1.65	3	0.0020

Reach	Calculation Method	Sediment Load	Percent Calculated Slope		Design Slope Range (ft/ft)		
			Min	Max			
CARSON BRANCH REACH 1A	Representative Particle	Low	80%	100%	0.0020	to	0.0025
CARSON BRANCH REACH 1B	Representative Particle	Low	80%	100%	0.0011	to	0.0013
DAVID BRANCH REACH 1A	Representative Particle	Low	80%	100%	0.0014	to	0.0018
DAVID BRANCH REACH 1B	Representative Particle	Low	80%	100%	0.0013	to	0.0017
DAVID BRANCH REACH 2	Representative Particle	Low	80%	100%	0.0011	to	0.0014
THELMA BRANCH REACH 1	Representative Particle	Low	80%	100%	0.0016	to	0.0020

10.0 Transition Reach Design

Project: John Deere Site
Project No.: 1080-JNDR
Client: RES
Contract No.: 96917
County/State: Rutherford County, NC

Design Status
Draft
7/26/16
SGG

Stone Specification:	NCDOT

Stone Class	Nominal Size (in)	D50 (mm)
Class A	6	118
Class B	12	219
Class I	18	247
Class II	24	350

Reach	Location	Design Discharge (cfs)	Transition Slope (ft/ft)	Design Size (mm)	Selected Stone D_{50} (mm)	Shear Factor of Safety	Nominal Stone Size (in)	Armor Stone Class
CARSON BRANCH REACH 1A	108+00	203	0.03	222	219	2.1	12	Class B
DAVID BRANCH REACH 2	205+95	176	0.02	165	219	3.1	12	Class B

11.0 Supplemental Bed Material Design
(Off-site Material)

Design Status

Draft
3/28/16
TAS

Project: John Deere Site
Project No.: 1080-JNDR
Client: RES
Contract No.: 96917
County/State: Rutherford County, NC

Material Gradation Percentage of Total by Weight						
Material Size	ON-SITE SAND / CLAY	1/2" STONE (NO. 57)	3/4" STONE (NO. 5)	2" STONE (SURGE)	6" STONE NCDOT (CLASS A)	12" STONE NCDOT (CLASS B)
Sand	100					
#16						
#10		2				
#8		3				
#4		12	2			
3/8"		25	3			
1/2"		48	32			
3/4"		7	58			
1"		3	5			
1.5"					19	
2"				50	19	
3"				50	19	
4"					19	19
5"					19	19
6"					5	19
8"						19
9"						19
10"						5
12"						
14"						
16"						
18"						
24"						
Total %	100	100	100	100	100	100

11.1 Supplemental Bed Material Design

(Off-site Material)

Project: John Deere Site
Project No.: 1080-JNDR
Client: RES
Contract No.: 96917
County/State: Rutherford County, NC

Design Status
Draft
3/28/2016
TAS

Material Composition							
Reach	ON-SITE SAND / CLAY	1/2" STONE (NO. 57)	3/4" STONE (NO. 5)	2" STONE (SURGE)	6" STONE NCDOT (CLASS A)	12" STONE NCDOT (CLASS B)	Depth of Material (ft)
CARSON BRANCH REACH 1A	20%	40%		40%			0.4
CARSON BRANCH REACH 1B	30%	70%					0.4
DAVID BRANCH REACH 1A	30%	70%					0.4
DAVID BRANCH REACH 1B	30%	70%					0.4
DAVID BRANCH REACH 2	30%	70%					0.4
THELMA BRANCH REACH 1	100%						0.4

Design Size Distribution (mm)						
Reach	D_{16}	D_{35}	D_{50}	D_{65}	D_{84}	D_{95}
CARSON BRANCH REACH 1A	<1	9	12	41	56	70
CARSON BRANCH REACH 1B	<1	3	7	11	12	15
DAVID BRANCH REACH 1A	<1	3	7	11	12	15
DAVID BRANCH REACH 1B	<1	3	7	11	12	15
DAVID BRANCH REACH 2	<1	3	7	11	12	15
THELMA BRANCH REACH 1	<1	<1	<1	<1	<1	<1

11.2 Supplemental Bed Material Design

(With Harvested Bed Material)

Design Status

Draft
3/28/2016
TAS

Project: John Deere Site
Project No.: 1080-JNDR
Client: RES
Contract No.: 96917
County/State: Rutherford County, NC

Material Gradation Percentage of Total by Weight						
Material Size	ON-SITE HARVEST MATERIAL	1/2" STONE (NO. 57)	3/4" STONE (NO. 5)	2" STONE (SURGE)	6" STONE NCDOT (CLASS A)	12" STONE NCDOT (CLASS B)
Sand						
#16	5					
#10	5	2				
#8	15	3				
#4	20	12	2			
3/8"	25	25	3			
1/2"	10	48	32			
3/4"	10	7	58			
1"	10	3	5			
1.5"					19	
2"				50	19	
3"				50	19	
4"					19	19
5"					19	19
6"					5	19
8"						19
9"						19
10"						5
12"						
14"						
16"						
18"						
24"						
Total %	100	100	100	100	100	100

11.3 Supplemental Bed Material Design

(With Harvested Bed Material)

Project: John Deere Site
Project No.: 1080-JNDR
Client: RES
Contract No.: 96917
County/State: Rutherford County, NC

Design Status
Draft
3/28/2016
TAS

Material Composition							
Reach	ON-SITE HARVEST MATERIAL	1/2" STONE (NO. 57)	3/4" STONE (NO. 5)	2" STONE (SURGE)	6" STONE NCDOT (CLASS A)	12" STONE NCDOT (CLASS B)	Depth of Material (ft)
CARSON BRANCH REACH 1A	100%						0.4
CARSON BRANCH REACH 1B	100%						0.4
DAVID BRANCH REACH 1A	100%						0.4
DAVID BRANCH REACH 1B	100%						0.4
DAVID BRANCH REACH 2	100%						0.4
THELMA BRANCH REACH 1	100%						0.4

Design Size Distribution (mm)						
Reach	D_{16}	D_{35}	D_{50}	D_{65}	D_{84}	D_{95}
CARSON BRANCH REACH 1A	2	4	6	9	15	22
CARSON BRANCH REACH 1B	2	4	6	9	15	22
DAVID BRANCH REACH 1A	2	4	6	9	15	22
DAVID BRANCH REACH 1B	2	4	6	9	15	22
DAVID BRANCH REACH 2	2	4	6	9	15	22
THELMA BRANCH REACH 1	2	4	6	9	15	22

Erosion Rate Calculations

Project: John Deere
Project No.: 1080-JNDR
Stream: Carson Branch
Reach: Description

Date: 9/10/15
Observer: TAS
Page: 1

Observed Values

Reach Name	1	2	3	4	5		
Station/Location	400+00	400+00	400+50	400+75	401+00		
Photo No.							
Reach Length	50	50	25	25	25		
Bank	Right	Left	Lt & Rt	Lt & Rt	Lt & Rt		
Bank Height	0.75	3.7	3	2	1.5		
Bankfull Height	0.35	0.35	0.4	0.4	0.35		
Root Depth	0.76	1.5	3.1	2.1	1.6		
Root Density	0.75	0.8	0.05	0.2	0.6		
Bank Angle	75	80	90	90	90		
Surface Protection	0.85	0.05	0.05	0.15	0.75		
Bank Material	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay		
Stratification	None	None	None	None	None		
Thalweg Position	Off-center	Off-center	Center	Center	Center		
DTOE/DMEAN	< 1	< 1	< 1	< 1	< 1		
Local Slope > Avg	Yes	Yes	No	No	No		

BEHI Calculation

Bnk Ht / Bkf Ht	2.14	10.57	7.50	5.00	4.29		
BEHI Score	8.2	10.0	10.0	10.0	10.0		
Root Depth / Bnk Ht	1.0	0.4	1.0	1.1	1.1		
BEHI Score	0.0	5.1	0.0	0.0	0.0		
Weighted Root Density	0.8	0.3	0.1	0.2	0.6		
BEHI Score	2.1	5.8	9.3	7.2	3.1		
Bank Angle	75.0	80.0	90.0	90.0	90.0		
BEHI Score	5.5	6.0	8.0	8.0	8.0		
Surface Protection	0.9	0.1	0.1	0.2	0.8		
BEHI Score	1.3	10.0	10.0	8.0	2.1		
Bank Material Adjustment	0.0	0.0	0.0	0.0	0.0		
Stratification Adjustment	0	0	0	0	0		
Total BEHI Score	17.1	36.9	37.3	33.2	23.2		
Rating	Low	High	High	High	Moderate		

NBS Calculation

Thalweg Position Score	2	2	1	1	1		
Toe Depth Ratio Score	0	0	0	0	0		
Local Slope Score	1	1	0	0	0		
Total NBS Rating	3	3	1	1	1		
WARSS NBS Rating	4	4	1	1	1		
Rating	High	High	Very Low	Very Low	Very Low		

Erosion Rate Prediction

State	NC						
Erosion Rate (ft/yr)	0.0	0.1	0.1	0.1	0.0		
Erosion Total (ft^3/yr)	1	22	14	9	1		

Total Erosion (Sheet Total)	48

Erosion Rate Calculations

Project:	John Deere	Date:	9/10/15
Project No.:	1080-JNDR	Observer:	TAS
Stream:	Carson Branch	Page:	2
Reach:	Description		

Observed Values

Reach Name	6	7	8	9	10	11	
Station/Location	401+25	401+25	402+00	402+80	403+25	403+25	
Photo No.							
Reach Length	75	75	80	45	50	50	
Bank	Right	Left	Lt & Rt	Lt & Rt	Right	Left	
Bank Height	1.7	1.31	0.9	0.9	1.5	1.3	
Bankfull Height	0.4	0.4	0.35	0.35	0.35	0.35	
Root Depth	1.8	1.4	0.91	0.91	1.6	1.4	
Root Density	0.7	0.5	0.6	0.7	0.3	0.3	
Bank Angle	75	90	65	90	80	90	
Surface Protection	0.5	0.7	0.6	0.5	0.5	0.4	
Bank Material	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay	
Stratification	None	None	None	None	None	None	
Thalweg Position	Toe	Toe	Center	Off-center	Off-center	Off-center	
DTOE/DMEAN	< 1	> 1	< 1	< 1	< 1	< 1	
Local Slope > Avg	No	No	No	No	No	No	

BEHI Calculation

Bnk Ht / Bkf Ht	4.3	3.3	2.6	2.6	4.3	3.7	
BEHI Score	10.0	10.0	8.9	8.9	10.0	10.0	
Root Depth / Bnk Ht	1.1	1.1	1.0	1.0	1.1	1.1	
BEHI Score	0.0	0.0	0.0	0.0	0.0	0.0	
Weighted Root Density	0.7	0.5	0.6	0.7	0.3	0.3	
BEHI Score	2.2	4.0	3.4	2.5	5.8	5.8	
Bank Angle	75.0	90.0	65.0	90.0	80.0	90.0	
BEHI Score	5.5	8.0	4.5	8.0	6.0	8.0	
Surface Protection	0.5	0.7	0.6	0.5	0.5	0.4	
BEHI Score	4.3	2.6	3.4	4.3	4.3	5.1	
Bank Material Adjustment	0.0	0.0	0.0	0.0	0.0	0.0	
Stratification Adjustment	0	0	0	0	0	0	
Total BEHI Score	22.0	24.6	20.2	23.7	26.1	28.9	
Rating	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	

NBS Calculation

Thalweg Position Score	2	2	1	2	2	2	
Toe Depth Ratio Score	0	1	0	0	0	0	
Local Slope Score	0	0	0	0	0	0	
Total NBS Rating	2	3	1	2	2	2	
WARSS NBS Rating	3	5	1	2	2	2	
Rating	Moderate	Very High	Very Low	Low	Low	Low	

Erosion Rate Prediction

State	NC						
Erosion Rate (ft/yr)	0.1	0.2	0.0	0.0	0.0	0.0	
Erosion Total (ft^3/yr)	8	21	2	3	2	2	

Total Erosion (Sheet Total)	38

Erosion Rate Calculations

Project: John Deere
Project No.: 1080-JNDR
Stream: Carson Branch
Reach: Description

Date: 9/10/15
Observer: TAS
Page: 3

Observed Values

Reach Name	12	13	14	15	16	17	
Station/Location	403+75	403+75	404+25	404+25	405+00	405+00	
Photo No.							
Reach Length	50	50	75	75	25	25	
Bank	Right	Left	Right	Left	Right	Left	
Bank Height	1.9	1.6	1.6	1	1	1.8	
Bankfull Height	0.3	0.3	0.4	0.4	0.35	0.35	
Root Depth	2	1.7	1.7	1.1	1.1	0.9	
Root Density	0.5	0.5	0.7	0.5	0.5	0.3	
Bank Angle	85	90	80	90	80	90	
Surface Protection	0.8	0.5	0.5	0.6	0.1	0.5	
Bank Material	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay	
Stratification	None	None	None	None	None	None	
Thalweg Position	Off-center	Off-center	Center	Center	Off-center	Off-center	
DTOE/DMEAN	< 1	< 1	< 1	< 1	< 1	< 1	
Local Slope > Avg	No	No	No	No	No	No	

BEHI Calculation

Bnk Ht / Bkf Ht	6.3	5.3	4.0	2.5	2.9	5.1	
BEHI Score	10.0	10.0	10.0	8.8	9.4	10.0	
Root Depth / Bnk Ht	1.1	1.1	1.1	1.1	1.1	0.5	
BEHI Score	0.0	0.0	0.0	0.0	0.0	4.0	
Weighted Root Density	0.5	0.5	0.7	0.6	0.6	0.2	
BEHI Score	4.1	4.0	2.2	3.9	3.9	8.0	
Bank Angle	85.0	90.0	80.0	90.0	80.0	90.0	
BEHI Score	7.0	8.0	6.0	8.0	6.0	8.0	
Surface Protection	0.8	0.5	0.5	0.6	0.1	0.5	
BEHI Score	1.7	4.3	4.3	3.4	10.0	4.3	
Bank Material Adjustment	0.0	0.0	0.0	0.0	0.0	0.0	
Stratification Adjustment	0	0	0	0	0	0	
Total BEHI Score	22.8	26.3	22.5	24.1	29.2	34.3	
Rating	Moderate	Moderate	Moderate	Moderate	Moderate	High	

NBS Calculation

Thalweg Position Score	2	2	1	1	2	2	
Toe Depth Ratio Score	0	0	0	0	0	0	
Local Slope Score	0	0	0	0	0	0	
Total NBS Rating	2	2	1	1	2	2	
WARSS NBS Rating	2	2	1	1	2	2	
Rating	Low	Low	Very Low	Very Low	Low	Low	

Erosion Rate Prediction

State	NC						
Erosion Rate (ft/yr)	0.0	0.0	0.0	0.0	0.0	0.1	
Erosion Total (ft^3/yr)	3	3	2	1	1	5	

Total Erosion (Sheet Total)	14

Erosion Rate Calculations

Project:	John Deere	Date:	9/10/15
Project No.:	1080-JNDR	Observer:	TAS
Stream:	Carson Branch	Page:	4
Reach:	Description		

Observed Values

Reach Name	18	19	20	21	22		
Station/Location	405+25	405+75	406+00	406+00	406+50		
Photo No.							
Reach Length	50	25	50	50	50		
Bank	Lt & Rt	Lt & Rt	Right	Left	Lt & Rt		
Bank Height	1.3	1.9	1.4	1	1.7		
Bankfull Height	0.35	0.4	0.4	0.4	0.35		
Root Depth	1.4	2	1.41	1.1	1.8		
Root Density	0.5	0.1	0.5	0.3	0.4		
Bank Angle	90	90	85	90	90		
Surface Protection	0.6	0.05	0.3	0.7	0.3		
Bank Material	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay		
Stratification	None	None	None	None	None		
Thalweg Position	Off-center	Center	Off-center	Off-center	Off-center		
DTOE/DMEAN	< 1	< 1	< 1	> 1	< 1		
Local Slope > Avg	No	No	No	No	No		

BEHI Calculation

Bnk Ht / Bkf Ht	3.7	4.8	3.5	2.5	4.9		
BEHI Score	10.0	10.0	10.0	8.8	10.0		
Root Depth / Bnk Ht	1.1	1.1	1.0	1.1	1.1		
BEHI Score	0.0	0.0	0.0	0.0	0.0		
Weighted Root Density	0.5	0.1	0.5	0.3	0.4		
BEHI Score	4.0	8.6	4.3	5.7	4.9		
Bank Angle	90.0	90.0	85.0	90.0	90.0		
BEHI Score	8.0	8.0	7.0	8.0	8.0		
Surface Protection	0.6	0.1	0.3	0.7	0.3		
BEHI Score	3.4	10.0	6.0	2.6	6.0		
Bank Material Adjustment	0.0	0.0	0.0	0.0	0.0		
Stratification Adjustment	0	0	0	0	0		
Total BEHI Score	25.4	36.6	27.3	25.1	28.9		
Rating	Moderate	High	Moderate	Moderate	Moderate		

NBS Calculation

Thalweg Position Score	2	1	2	2	2		
Toe Depth Ratio Score	0	0	0	1	0		
Local Slope Score	0	0	0	0	0		
Total NBS Rating	2	1	2	3	2		
WARSS NBS Rating	2	1	2	4	2		
Rating	Low	Very Low	Low	High	Low		

Erosion Rate Prediction

State	NC						
Erosion Rate (ft/yr)	0.0	0.1	0.0	0.1	0.0		
Erosion Total (ft^3/yr)	4	9	2	6	5		

Total Erosion (Sheet Total)	26

Erosion Rate Calculations

Project: John Deere
Project No.: 1080-JNDR
Stream: Carson Branch
Reach: Description

Date: 9/10/15
Observer: TAS
Page: 5

Observed Values

Reach Name	23	24	25	26	27	28	
Station/Location	407+00	407+00	407+50	407+50	407+75	407+75	
Photo No.							
Reach Length	50	50	25	25	50	50	
Bank	Right	Left	Right	Left	Right	Left	
Bank Height	1.31	1	2	2	1.9	1.7	
Bankfull Height	0.4	0.4	0.45	0.45	0.35	0.35	
Root Depth	1.4	1.1	1	1	1.5	1.8	
Root Density	0.5	0.5	0.05	0.05	0.45	0.5	
Bank Angle	85	45	30	90	45	90	
Surface Protection	0.5	0.6	0.05	0.05	0.65	0.5	
Bank Material	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay	
Stratification	None	None	None	None	None	None	
Thalweg Position	Center	Center	Off-center	Off-center	Off-center	Off-center	
DTOE/DMEAN	< 1	< 1	< 1	< 1	< 1	< 1	
Local Slope > Avg	No	No	No	No	No	No	

BEHI Calculation

Bnk Ht / Bkf Ht	3.3	2.5	4.4	4.4	5.4	4.9	
BEHI Score	10.0	8.8	10.0	10.0	10.0	10.0	
Root Depth / Bnk Ht	1.1	1.1	0.5	0.5	0.8	1.1	
BEHI Score	0.0	0.0	4.0	4.0	2.6	0.0	
Weighted Root Density	0.5	0.6	0.0	0.0	0.4	0.5	
BEHI Score	4.0	3.9	9.7	9.7	5.5	4.0	
Bank Angle	85.0	45.0	30.0	90.0	45.0	90.0	
BEHI Score	7.0	3.3	2.5	8.0	3.3	8.0	
Surface Protection	0.5	0.6	0.1	0.1	0.7	0.5	
BEHI Score	4.3	3.4	10.0	10.0	3.0	4.3	
Bank Material Adjustment	0.0	0.0	0.0	0.0	0.0	0.0	
Stratification Adjustment	0	0	0	0	0	0	
Total BEHI Score	25.3	19.3	36.2	41.7	24.3	26.3	
Rating	Moderate	Low	High	Very High	Moderate	Moderate	

NBS Calculation

Thalweg Position Score	1	1	2	2	2	2	
Toe Depth Ratio Score	0	0	0	0	0	0	
Local Slope Score	0	0	0	0	0	0	
Total NBS Rating	1	1	2	2	2	2	
WARSS NBS Rating	1	1	2	2	2	2	
Rating	Very Low	Very Low	Low	Low	Low	Low	

Erosion Rate Prediction

State	NC						
Erosion Rate (ft/yr)	0.0	0.0	0.1	0.6	0.0	0.0	
Erosion Total (ft^3/yr)	1	0	5	30	3	3	

Total Erosion (Sheet Total)	42

Erosion Rate Calculations

Project:	John Deere	Date:	9/10/15
Project No.:	1080-JNDR	Observer:	TAS
Stream:	Carson Branch	Page:	6
Reach:	Description		

Observed Values

Reach Name	29	30	31	32	33		
Station/Location	408+25	408+25	408+50	408+50	408+75		
Photo No.							
Reach Length	25	25	25	25	50		
Bank	Right	Left	Right	Left	Lt & Rt		
Bank Height	2.5	3	4	4	5		
Bankfull Height	0.4	0.4	0.35	0.35	0.35		
Root Depth	2.6	3.1	1	2	2		
Root Density	0.4	0.4	0.6	0.6	0.5		
Bank Angle	80	85	90	75	90		
Surface Protection	0.5	0.5	0.5	0.75	0.5		
Bank Material	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay		
Stratification	None	None	None	None	None		
Thalweg Position	Off-center	Off-center	Off-center	Off-center	Center		
DTOE/DMEAN	< 1	< 1	> 1	> 1	> 1		
Local Slope > Avg	No	No	No	No	No		

BEHI Calculation

Bnk Ht / Bkf Ht	6.3	7.5	11.4	11.4	14.3		
BEHI Score	10.0	10.0	10.0	10.0	10.0		
Root Depth / Bnk Ht	1.0	1.0	0.3	0.5	0.4		
BEHI Score	0.0	0.0	7.0	4.0	5.2		
Weighted Root Density	0.4	0.4	0.2	0.3	0.2		
BEHI Score	5.0	5.0	8.0	6.0	7.3		
Bank Angle	80.0	85.0	90.0	75.0	90.0		
BEHI Score	6.0	7.0	8.0	5.5	8.0		
Surface Protection	0.5	0.5	0.5	0.8	0.5		
BEHI Score	4.3	4.3	4.3	2.1	4.3		
Bank Material Adjustment	0.0	0.0	0.0	0.0	0.0		
Stratification Adjustment	0	0	0	0	0		
Total BEHI Score	25.3	26.3	37.3	27.6	34.8		
Rating	Moderate	Moderate	High	Moderate	High		

NBS Calculation

Thalweg Position Score	2	2	2	2	1		
Toe Depth Ratio Score	0	0	1	1	1		
Local Slope Score	0	0	0	0	0		
Total NBS Rating	2	2	3	3	2		
WARSS NBS Rating	2	2	4	4	3		
Rating	Low	Low	High	High	Moderate		

Erosion Rate Prediction

State	NC						
Erosion Rate (ft/yr)	0.0	0.0	0.1	0.1	0.1		
Erosion Total (ft^3/yr)	2	2	12	11	55		

Total Erosion (Sheet Total)	83

Erosion Rate Calculations

Project:	John Deere	Date:	9/2/15
Project No.:	1080-JNDR	Observer:	RTS
Stream:	David Branch	Page:	7
Reach:	Description		

Observed Values

Reach Name	1	2	3	4	5	6	7
Station/Location	300+00	300+50	300+60	301+30	301+30	301+40	301+50
Photo No.							
Reach Length	50	10	70	10	20	10	5
Bank	Lt & Rt	Lt & Rt	Lt & Rt	Left	Right	Left	Lt & Rt
Bank Height	0.1	36" CMP	0.2	0.35	0.3	0.4	PVC
Bankfull Height	0.1	-	0.2	0.25	0.25	0.28	-
Root Depth	0.11	-	0.22	0.5	0.31	0.5	-
Root Density	0.75	-	0.75	0.2	0.75	0.75	-
Bank Angle	20	-	20	20	20	20	-
Surface Protection	1	-	1	0.2	1	1	-
Bank Material	Silt/Clay	-	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay	-
Stratification	None	-	None	None	None	None	-
Thalweg Position	Center	-	Center	Center	Center	Center	-
DTOE/DMEAN	< 1	-	< 1	< 1	< 1	< 1	-
Local Slope > Avg	No	-	No	No	No	No	-

BEHI Calculation

Bnk Ht / Bkf Ht	1	-	1	1.4	1.2	1.4	-
BEHI Score	1.0	-	1.0	4.7	3.4	4.9	-
Root Depth / Bnk Ht	1.1	-	1.1	1.4	1.0	1.3	-
BEHI Score	0.0	-	0.0	0.0	0.0	0.0	-
Weighted Root Density	0.8	-	0.8	0.3	0.8	0.9	-
BEHI Score	1.5	-	1.5	6.2	1.9	0.5	-
Bank Angle	20.0	-	20.0	20.0	20.0	20.0	-
BEHI Score	2.0	-	2.0	2.0	2.0	2.0	-
Surface Protection	1.0	-	1.0	0.2	1.0	1.0	-
BEHI Score	0.0	-	0.0	7.3	0.0	0.0	-
Bank Material Adjustment	0.0	-	0.0	0.0	0.0	0.0	-
Stratification Adjustment	0	-	0	0	0	0	-
Total BEHI Score	4.5	-	4.5	20.2	7.3	7.4	-
Rating	Very Low	-	Very Low	Moderate	Very Low	Very Low	-

NBS Calculation

Thalweg Position Score	1	-	1	1	1	1	-
Toe Depth Ratio Score	0	-	0	0	0	0	-
Local Slope Score	0	-	0	0	0	0	-
Total NBS Rating	1	-	1	1	1	1	-
WARSS NBS Rating	1	-	1	1	1	1	-
Rating	Very Low	-	Very Low	Very Low	Very Low	Very Low	-

Erosion Rate Prediction

State	NC						
Erosion Rate (ft/yr)	0.0	-	0.0	0.0	0.0	0.0	-
Erosion Total (ft^3/yr)	0	-	0	0	0	0	-

Total Erosion (Sheet Total)	0.1

Erosion Rate Calculations

Project: John Deere
Project No.: 1080-JNDR
Stream: David Branch
Reach: Description

Date: 9/2/15
Observer: RTS
Page: 8

Observed Values

Reach Name	8	9	10	11	12	13	
Station/Location	301+55	301+55	303+55	303+55	303+70	303+70	
Photo No.							
Reach Length	200	200	15	15	35	35	
Bank	Left	Right	Left	Right	Left	Right	
Bank Height	0.4	0.4	0.4	0.55	1.2	0.43	
Bankfull Height	0.25	0.25	0.25	0.25	0.25	0.25	
Root Depth	0.41	0.41	0.41	0.56	0.6	0.44	
Root Density	0.75	0.75	0.75	0.75	0.5	0.75	
Bank Angle	20	20	30	80	90	45	
Surface Protection	1	1	1	1	0.4	0.8	
Bank Material	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay	Sand	Sand	
Stratification	None	None	None	None	None	None	
Thalweg Position	Center	Center	Center	Center	Center	Center	
DTOE/DMEAN	< 1	< 1	< 1	< 1	< 1	< 1	
Local Slope > Avg	No	No	No	No	No	No	

BEHI Calculation

Bnk Ht / Bkf Ht	1.6	1.6	1.6	2.2	4.8	1.72	
BEHI Score	5.8	5.8	5.8	8.3	10.0	6.4	
Root Depth / Bnk Ht	1.0	1.0	1.0	1.0	0.5	1.0	
BEHI Score	0.0	0.0	0.0	0.0	4.0	0.0	
Weighted Root Density	0.8	0.8	0.8	0.8	0.3	0.8	
BEHI Score	2.0	2.0	2.0	2.0	6.7	2.0	
Bank Angle	20.0	20.0	30.0	80.0	90.0	45.0	
BEHI Score	2.0	2.0	2.5	6.0	8.0	3.3	
Surface Protection	1.0	1.0	1.0	1.0	0.4	0.8	
BEHI Score	0.0	0.0	0.0	0.0	5.1	1.7	
Bank Material Adjustment	0.0	0.0	0.0	0.0	10.0	10.0	
Stratification Adjustment	0	0	0	0	0	0	
Total BEHI Score	9.8	9.8	10.3	16.3	43.8	23.4	
Rating	Low	Low	Low	Low	Very High	Moderate	

NBS Calculation

Thalweg Position Score	1	1	1	1	1	1	
Toe Depth Ratio Score	0	0	0	0	0	0	
Local Slope Score	0	0	0	0	0	0	
Total NBS Rating	1	1	1	1	1	1	
WARSS NBS Rating	1	1	1	1	1	1	
Rating	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	

Erosion Rate Prediction

State	NC						
Erosion Rate (ft/yr)	0.0	0.0	0.0	0.0	0.5	0.0	
Erosion Total (ft^3/yr)	0	0	0	0	21	0	

Total Erosion (Sheet Total)	22

Erosion Rate Calculations

Project: John Deere
Project No.: 1080-JNDR
Stream: David Branch
Reach: Description

Date: 9/2/15
Observer: RTS
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Observed Values

Reach Name	14	15					
Station/Location	304+05	304+05					
Photo No.							
Reach Length	40	40					
Bank	Left	Right					
Bank Height	4.6	3.5					
Bankfull Height	0.25	0.25					
Root Depth	1	2.5					
Root Density	0.2	0.5					
Bank Angle	75	75					
Surface Protection	0.25	0.2					
Bank Material	Silt/Clay	Silt/Clay					
Stratification	None	None					
Thalweg Position	Center	Center					
DTOE/DMEAN	< 1	< 1					
Local Slope > Avg	Yes	Yes					

BEHI Calculation

Bnk Ht / Bkf Ht	18.4	14					
BEHI Score	10.0	10.0					
Root Depth / Bnk Ht	0.2	0.7					
BEHI Score	7.4	2.9					
Weighted Root Density	0.0	0.4					
BEHI Score	9.4	5.5					
Bank Angle	75.0	75.0					
BEHI Score	5.5	5.5					
Surface Protection	0.3	0.2					
BEHI Score	6.7	7.3					
Bank Material Adjustment	0.0	0.0					
Stratification Adjustment	0	0					
Total BEHI Score	39.0	31.3					
Rating	High	High					

NBS Calculation

Thalweg Position Score	1	1					
Toe Depth Ratio Score	0	0					
Local Slope Score	1	1					
Total NBS Rating	2	2					
WARSS NBS Rating	3	3					
Rating	Moderate	Moderate					

Erosion Rate Prediction

State	NC						
Erosion Rate (ft/yr)	0.1	0.1					
Erosion Total (ft^3/yr)	20	16					

Total Erosion (Sheet Total)	36

Erosion Rate Calculations

Project: John Deere
Project No.: 1080-JNDR
Stream: Thelma Branch
Reach: Description

Date: 9/2/15
Observer: RTS
Page: 10

Observed Values

Reach Name	1	2	3	4	5	6	
Station/Location	200+00	200+30	200+60	200+60	200+85	201+00	
Photo No.							
Reach Length	30	30	25	40	15	66	
Bank	Lt & Rt	Left	Lt & Rt	Lt & Rt	Lt & Rt	Lt & Rt	
Bank Height	1.2	1	1.7	1.7	1.3	1.6	
Bankfull Height	0.4	0.4	0.15	0.15	0.15	0.15	
Root Depth	0.6	0.8	0.8	0.8	0.7	0.7	
Root Density	0.4	0.6	0.6	0.4	0.6	0.4	
Bank Angle	80	45	80	80	80	90	
Surface Protection	0.6	0.8	0.8	0.2	0.6	0.2	
Bank Material	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay	
Stratification	None	None	None	None	None	None	
Thalweg Position	Center	Center	Center	Center	Center	Center	
DTOE/DMEAN	< 1	< 1	< 1	< 1	< 1	< 1	
Local Slope > Avg	No	No	No	No	No	No	

BEHI Calculation

Bnk Ht / Bkf Ht	3.0	2.5	11.3	11.3	8.7	10.7	
BEHI Score	9.6	8.8	10.0	10.0	10.0	10.0	
Root Depth / Bnk Ht	0.5	0.8	0.5	0.5	0.5	0.4	
BEHI Score	4.0	2.5	4.4	4.4	3.8	4.7	
Weighted Root Density	0.2	0.5	0.3	0.2	0.3	0.2	
BEHI Score	7.3	4.5	6.2	7.5	5.8	7.7	
Bank Angle	80.0	45.0	80.0	80.0	80.0	90.0	
BEHI Score	6.0	3.3	6.0	6.0	6.0	8.0	
Surface Protection	0.6	0.8	0.8	0.2	0.6	0.2	
BEHI Score	3.4	1.7	1.7	7.3	3.4	7.3	
Bank Material Adjustment	0.0	0.0	0.0	0.0	0.0	0.0	
Stratification Adjustment	0	0	0	0	0	0	
Total BEHI Score	30.4	20.7	28.3	35.2	29.0	37.7	
Rating	High	Moderate	Moderate	High	Moderate	High	

NBS Calculation

Thalweg Position Score	1	1	1	1	1	1	
Toe Depth Ratio Score	0	0	0	0	0	0	
Local Slope Score	0	0	0	0	0	0	
Total NBS Rating	1	1	1	1	1	1	
WARSS NBS Rating	1	1	1	1	1	1	
Rating	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	

Erosion Rate Prediction

State	NC						
Erosion Rate (ft/yr)	0.1	0.0	0.0	0.1	0.0	0.1	
Erosion Total (ft^3/yr)	7	1	1	13	1	20	

Total Erosion (Sheet Total): 42

Erosion Rate Calculations

Project:	John Deere	Date:	9/2/15
Project No.:	1080-JNDR	Observer:	RTS
Stream:	Puzzle Creek	Page:	11
Reach:	Description		

Observed Values

Reach Name	1	2	3	4	5	6	
Station/Location	106+00	106+75	106+75	107+50	107+50	108+25	
Photo No.							
Reach Length	75	75	75	75	75	75	
Bank	Lt & Rt	Left	Right	Left	Right	Lt & Rt	
Bank Height	5	5	6	6	5	6	
Bankfull Height	0.9	0.9	0.9	0.9	0.9	0.9	
Root Depth	0.5	1	1	1	1	0.5	
Root Density	0.2	0.3	0.2	0.2	0.15	0.2	
Bank Angle	75	50	80	90	45	80	
Surface Protection	0.2	0.7	0.4	0.3	0.7	0.4	
Bank Material	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay	
Stratification	None	None	None	None	None	None	
Thalweg Position	Center	Off-center	Toe	Toe	Off-center	Center	
DTOE/DMEAN	< 1	< 1	< 1	< 1	< 1	< 1	
Local Slope > Avg	No	No	No	No	No	No	

BEHI Calculation

Bnk Ht / Bkf Ht	5.6	5.6	6.7	6.7	5.6	6.7	
BEHI Score	10.0	10.0	10.0	10.0	10.0	10.0	
Root Depth / Bnk Ht	0.1	0.2	0.2	0.2	0.2	0.1	
BEHI Score	8.8	7.6	8.0	8.0	7.6	9.0	
Weighted Root Density	0.0	0.1	0.0	0.0	0.0	0.0	
BEHI Score	9.7	9.2	9.6	9.6	9.6	9.8	
Bank Angle	75.0	50.0	80.0	90.0	45.0	80.0	
BEHI Score	5.5	3.5	6.0	8.0	3.3	6.0	
Surface Protection	0.2	0.7	0.4	0.3	0.7	0.4	
BEHI Score	7.3	2.6	5.1	6.0	2.6	5.1	
Bank Material Adjustment	0.0	0.0	0.0	0.0	0.0	0.0	
Stratification Adjustment	0	0	0	0	0	0	
Total BEHI Score	41.4	32.9	38.7	41.6	33.0	39.9	
Rating	Very High	High	High	Very High	High	Very High	

NBS Calculation

Thalweg Position Score	1	2	2	2	2	1	
Toe Depth Ratio Score	0	0	0	0	0	0	
Local Slope Score	0	0	0	0	0	0	
Total NBS Rating	1	2	2	2	2	1	
WARSS NBS Rating	1	2	3	3	2	1	
Rating	Very Low	Low	Moderate	Moderate	Low	Very Low	

Erosion Rate Prediction

State	NC						
Erosion Rate (ft/yr)	0.5	0.1	0.1	0.7	0.1	0.5	
Erosion Total (ft^3/yr)	380	38	50	320	38	455	

Total Erosion (Sheet Total)	1282

Erosion Rate Calculations

Project:	John Deere	Date:	9/2/15
Project No.:	1080-JNDR	Observer:	RTS
Stream:	Puzzle Creek	Page:	12
Reach:	Description		

Observed Values

Reach Name	7	8	9	10	11	12	
Station/Location	109+00	109+00	110+00	110+00	111+00	111+00	
Photo No.							
Reach Length	100	100	100	100	75	75	
Bank	Left	Right	Left	Right	Left	Right	
Bank Height	5	5	6	6	6	6	
Bankfull Height	0.9	0.9	0.9	0.9	0.9	0.9	
Root Depth	0.5	0.5	0.5	0.5	0.5	0.5	
Root Density	0.2	0.2	0.2	0.2	0.3	0.25	
Bank Angle	70	80	80	80	80	75	
Surface Protection	0.75	0.1	0.6	0.25	0.2	0.3	
Bank Material	Silt/Clay	Silt/Clay	Silt/Clay	Silt/Clay	Sand	Sand	
Stratification	None	Moderate	None	None	None	None	
Thalweg Position	Center	Center	Center	Center	Center	Center	
DTOE/DMEAN	< 1	< 1	< 1	< 1	< 1	< 1	
Local Slope > Avg	No	No	No	No	No	No	

BEHI Calculation

Bnk Ht / Bkf Ht	5.6	5.6	6.7	6.7	6.7	6.7	
BEHI Score	10.0	10.0	10.0	10.0	10.0	10.0	
Root Depth / Bnk Ht	0.1	0.1	0.1	0.1	0.1	0.1	
BEHI Score	8.8	8.8	9.0	9.0	9.0	9.0	
Weighted Root Density	0.0	0.0	0.0	0.0	0.0	0.0	
BEHI Score	9.7	9.7	9.8	9.8	9.7	9.7	
Bank Angle	70.0	80.0	80.0	80.0	80.0	75.0	
BEHI Score	5.0	6.0	6.0	6.0	6.0	5.5	
Surface Protection	0.8	0.1	0.6	0.3	0.2	0.3	
BEHI Score	2.1	10.0	3.4	6.7	7.3	6.0	
Bank Material Adjustment	0.0	0.0	0.0	0.0	10.0	10.0	
Stratification Adjustment	0	5.0	0	0	0	0	
Total BEHI Score	35.7	49.5	38.2	41.4	52.0	50.2	
Rating	High	Extreme	High	Very High	Extreme	Extreme	

NBS Calculation

Thalweg Position Score	1	1	1	1	1	1	
Toe Depth Ratio Score	0	0	0	0	0	0	
Local Slope Score	0	0	0	0	0	0	
Total NBS Rating	1	1	1	1	1	1	
WARSS NBS Rating	1	1	1	1	1	1	
Rating	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	

Erosion Rate Prediction

State	NC						
Erosion Rate (ft/yr)	0.1	0.4	0.1	0.5	0.4	0.4	
Erosion Total (ft^3/yr)	47	205	57	304	185	185	

Total Erosion (Sheet Total)	982

Site Assessment Calculations

Project: John Deere
Project No.: 1080-JNDR
Stream: Carson Branch
Reach: Description

Date: 9/2/15
Observers: TAS/RTS
Page: 1

Observed Values

Section Number	1	2	3				
Reach Name	Carson	Carson	Carson				
Location	Riffle	Riffle	Riffle				
D_A (mi^2)	0.17	0.18	0.18				
W_{BKF} (ft)	3.9	3.5	3.5				
W_{BED} (ft)	1.9	3.4	3.3				
D_{BKF} (ft)	0.6	0.7	0.6				
$D_{TOE\ LT}$ (ft)	0.0	0.0	0.0				
$D_{TOE\ RT}$ (ft)	0.0	-0.2	-0.1				
Field D_{THAL} (ft)	0.1	0.1	0.1				
W_{THAL} (ft)	0.4	0.9	0.3				
Bank/Terrace Height (ft)	1.6	1.5	1.8				
Flood Prone Width (ft)	6	4	5				

Section Calculations

D_{MAX}	0.70	0.75	0.65				
Average D_{TOE}	0.60	0.63	0.58				
D_{THAL}	0.10	0.13	0.08				
A_{BKF}	1.9	2.4	2.1				
D_{MEAN}	0.48	0.69	0.60				
W/D ratio	8.2	5.1	5.9				
Bank Height Ratio	2.3	2.0	2.8				
Entrenchment Ratio	1.5	1.1	1.4				

Index Calculations

Reference
Bed Width Equation

Coef	Exp
10.2	0.48

Reference
Max Depth Equation

Coef	Exp
1.3	0.24

Reference Bed Width	4.4	4.5	4.5				
Bed Width Index (BWI)	0.4	0.8	0.7				
Reference D_{MAX}	0.8	0.9	0.9				
Max Depth Index (MDI)	0.8	0.9	0.8				

Stream Classification

Stream Type	G	G	G				

Site Assessment Calculations

Project: John Deere
Project No.: 1080-JNDR
Stream: Carson Branch
Reach: Description

Date: 9/24/15
Observers: SGG/TAS
Page: 2

Observed Values

Section Number	4	5	6				
Reach Name	Carson	Carson	Carson				
Location	U/S Riffle	U/S Riffle	Riffle				
D_A (mi^2)	0.18	0.18	0.18				
W_{BKF} (ft)	7.0	6.8	7.0				
W_{BED} (ft)	4.3	4.0	3.3				
D_{BKF} (ft)	0.7	0.6	0.5				
$D_{TOE\ LT}$ (ft)	0.0	0.0	0.0				
$D_{TOE\ RT}$ (ft)	0.0	0.0	0.0				
Field D_{THAL} (ft)	0.1	0.2	0.2				
W_{THAL} (ft)	0.7	0.7	0.7				
Bank/Terrace Height (ft)	1.2	1.5	1.1				
Flood Prone Width (ft)	10	10	13				

Section Calculations

D_{MAX}	0.75	0.80	0.69				
Average D_{TOE}	0.65	0.60	0.54				
D_{THAL}	0.10	0.20	0.15				
A_{BKF}	3.9	3.7	3.1				
D_{MEAN}	0.56	0.55	0.44				
W/D ratio	12.5	12.3	15.9				
Bank Height Ratio	1.6	1.9	1.6				
Entrenchment Ratio	1.4	1.4	1.9				

Index Calculations

Reference Bed Width Equation

Coef	Exp
10.2	0.48

Reference Max Depth Equation

Coef	Exp
1.3	0.24

Reference Bed Width	4.5	4.5	4.5				
Bed Width Index (BWI)	1.0	0.9	0.7				
Reference D_{MAX}	0.9	0.9	0.9				
Max Depth Index (MDI)	0.9	0.9	0.8				

Stream Classification

Stream Type	G	G	E				

Site Assessment Calculations

Project:	John Deere	Date:	9/9/15
Project No.:	1080-JNDR	Observers:	TAS/RTS
Stream:	David Branch	Page:	3
Reach:	Description		

Observed Values

Section Number	7	8	9				
Reach Name	David	David	David				
Location	U/S Bridge	D/S Bridge	D/S PVC				
D_A (mi^2)	0.09	0.09	0.09				
W_{BKF} (ft)	2.5	1.6	2.3				
W_{BED} (ft)	1.4	1.2	1.9				
D_{BKF} (ft)	0.2	0.2	0.3				
$D_{TOE\ LT}$ (ft)	0.0	0.2	0.0				
$D_{TOE\ RT}$ (ft)	0.0	0.1	0.0				
Field D_{THAL} (ft)	0.2	0.2	0.1				
W_{THAL} (ft)	0.4	0.4	0.4				
Bank/Terrace Height (ft)	0.4	0.6	0.8				
Flood Prone Width (ft)	5	2	3				

Section Calculations

D_{MAX}	0.35	0.42	0.35				
Average D_{TOE}	0.20	0.33	0.25				
D_{THAL}	0.15	0.10	0.10				
A_{BKF}	0.5	0.5	0.6				
D_{MEAN}	0.21	0.33	0.28				
W/D ratio	11.9	4.8	8.3				
Bank Height Ratio	1.1	1.4	2.3				
Entrenchment Ratio	1.8	1.4	1.4				

Index Calculations

Reference Bed Width Equation

Coef	Exp
10.2	0.48

Reference Max Depth Equation

Coef	Exp
1.3	0.24

Reference Bed Width	3.2	3.2	3.2				
Bed Width Index (BWI)	0.4	0.4	0.6				
Reference D_{MAX}	0.7	0.7	0.7				
Max Depth Index (MDI)	0.5	0.6	0.5				

Stream Classification

Stream Type	G	G	G				

Site Assessment Calculations

Project: John Deere
Project No.: 1080-JNDR
Stream: Thelma Branch
Reach: Description

Date: 9/9/15
Observers: TAS/CME
Page: 4

Observed Values

Section Number	10	11					
Reach Name	Thelma	Thelma					
Location							
D_A (mi^2)	0.06	0.06					
W_{BKF} (ft)	3.1	2.4					
W_{BED} (ft)	1.5	1.5					
D_{BKF} (ft)	0.2	0.2					
$D_{TOE\ LT}$ (ft)	0.4	0.1					
$D_{TOE\ RT}$ (ft)	0.5	0.1					
Field D_{THAL} (ft)	0.5	0.1					
W_{THAL} (ft)	0.6	0.7					
Bank/Terrace Height (ft)	2.7	3.8					
Flood Prone Width (ft)	4	4					

Section Calculations

D_{MAX}	0.65	0.25					
Average D_{TOE}	0.55	0.20					
D_{THAL}	0.10	0.05					
A_{BKF}	1.4	0.4					
D_{MEAN}	0.44	0.19					
W/D ratio	7.0	12.9					
Bank Height Ratio	4.2	15.2					
Entrenchment Ratio	1.2	1.5					

Index Calculations

Reference
Bed Width Equation

Coef	Exp
10.2	0.48

Reference
Max Depth Equation

Coef	Exp
1.3	0.24

Reference Bed Width	2.6	2.6					
Bed Width Index (BWI)	0.6	0.6					
Reference D_{MAX}	0.7	0.7					
Max Depth Index (MDI)	1.0	0.4					

Stream Classification

Stream Type	G	G					

Site Assessment Calculations

Project: John Deere
Project No.: 1080-JNDR
Stream: Puzzle Creek
Reach: Description

Date: 9/9/15
Observers: TAS/CME
Page: 5

Observed Values

Section Number	1	2					
Reach Name	Puzzle	Puzzle					
Location	108+25	110+25					
D_A (mi^2)	9.50	9.50					
W_{BKF} (ft)	16.5	15.0					
W_{BED} (ft)	15.8	13.6					
D_{BKF} (ft)	0.9	0.9					
$D_{TOE\ LT}$ (ft)	0.8	0.0					
$D_{TOE\ RT}$ (ft)	0.2	0.3					
Field D_{THAL} (ft)	0.9	0.3					
W_{THAL} (ft)	4.4	4.0					
Bank/Terrace Height (ft)	3.6	6.0					
Flood Prone Width (ft)	18	18					

Section Calculations

D_{MAX}	1.80	1.20					
Average D_{TOE}	1.38	1.03					
D_{THAL}	0.43	0.18					
A_{BKF}	26.5	16.2					
D_{MEAN}	1.61	1.08					
W/D ratio	10.3	13.9					
Bank Height Ratio	2.0	5.0					
Entrenchment Ratio	1.1	1.2					

Index Calculations

Reference Bed Width Equation

Coef	Exp
10.2	0.48

Reference Max Depth Equation

Coef	Exp
1.3	0.24

Reference Bed Width	30.1	30.1					
Bed Width Index (BWI)	0.5	0.5					
Reference D_{MAX}	2.2	2.2					
Max Depth Index (MDI)	0.8	0.5					

Stream Classification

Stream Type	G	G					

Bulk Material Samples

Project: John Deere
Project No.: 1080-JNDR
Client: RES
Contract No.: 96917
County/State: Rutherford County, NC

Reach: Carson Branch
Location: Riffle
Sample Type: Pavement

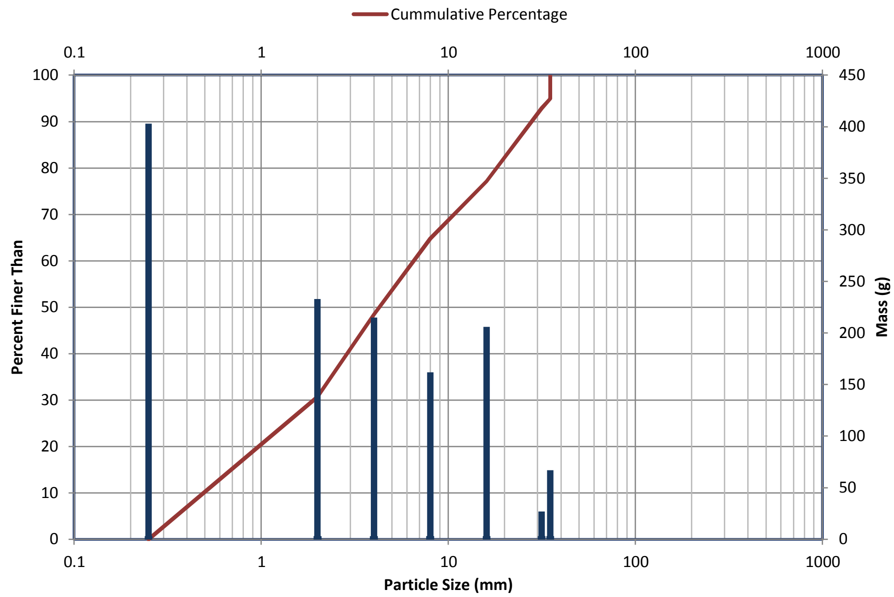
Largest Particle

Dim: 68.58 X 33.53 X 16.76 mm
Mass: 67 g

Second Largest Particle

Dim: 53.34 X 35.05 X 18.29 mm
Mass: 27 g

Size (mm)	Mass (g)
0.25	403
2	233
4	215
8	162
16	206
31.5	27
35	67
35	
35	
35	
35	
35	



Sample Statistics							
Material Included	D_{16}	D_{35}	D_{50}	D_{65}	D_{84}	D_{95}	% Sand
Entire Sample	1	2	**4**	8	23	35	31%
D > 2mm	3	6	8	15	28	35	0%

Reach: Carson Branch
Location: Riffle
Sample Type: Sub-pavement

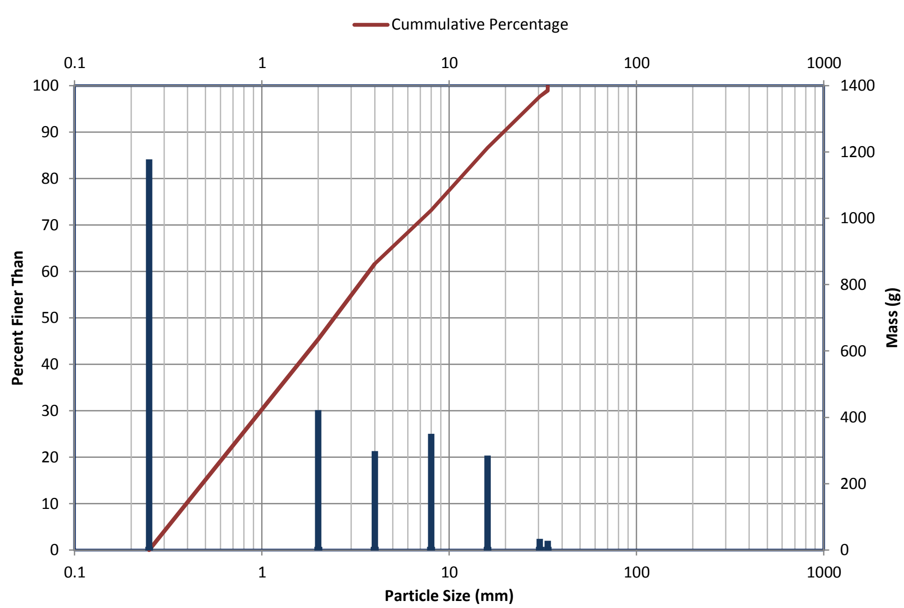
Largest Particle

Dim: 50.29 X 30.48 X 16.76 mm
Mass: 34 g

Second Largest Particle

Dim: 48.77 X 33.53 X 15.24 mm
Mass: 28 g

Size (mm)	Mass (g)
0.25	1178
2	422
4	298
8	350
16	285
30.48	34
34	28
34	
34	
34	
34	
34	



Sample Statistics							
Material Included	D_{16}	D_{35}	D_{50}	D_{65}	D_{84}	D_{95}	% Sand
Entire Sample	1	2	**3**	5	14	27	45%
D > 2mm	3	5	8	13	22	30	0%

Bulk Material Samples

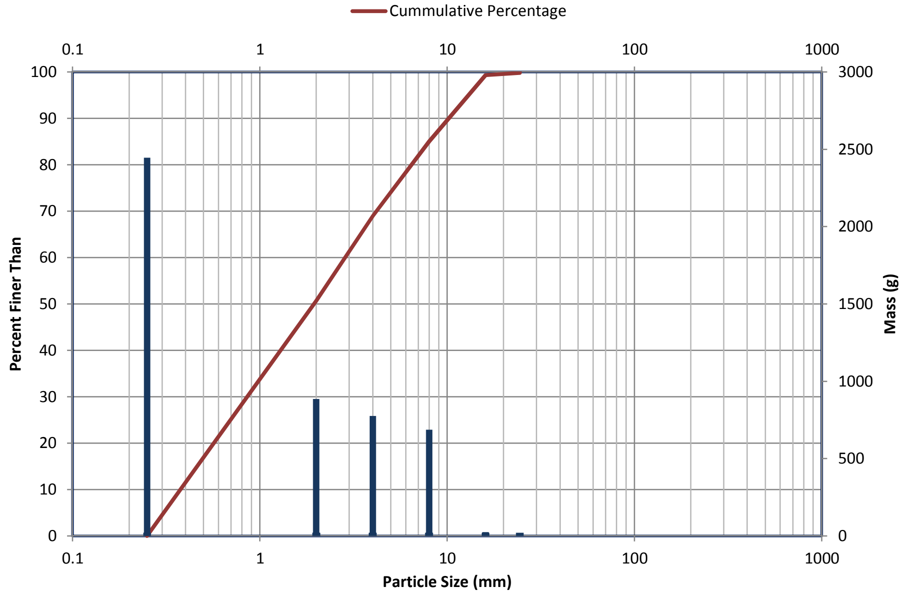
Project: John Deere
Project No.: 1080-JNDR
Client: RES
Contract No.: 96917
County/State: Rutherford County, NC

Reach: Carson Branch
Location: Lower 1/3 Bar
Sample Type: Bar

Largest Particle
Dim: 27.43 X 24.38 X 12.19 mm
Mass: 10 g

Second Largest Particle
Dim: 28.96 X 24.38 X 13.72 mn
Mass: 10 g

Size (mm)	Mass (g)
0.25	2446
2	885
4	776
8	687
16	25
24.38	10
24	
24	
24	
24	
24	
24	



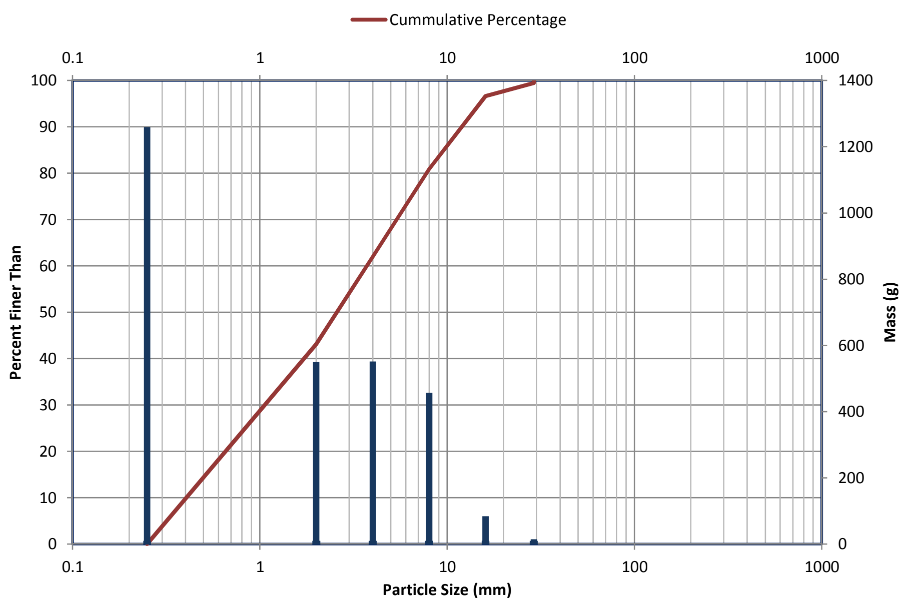
Sample Statistics							
Material Included	D_{16}	D_{35}	**D_{50}**	D_{65}	D_{84}	D_{95}	% Sand
Entire Sample	1	1	**2**	4	8	14	51%
D > 2mm	3	4	6	7	12	15	0%

Reach: Carson Branch
Location: Uppar 1/3 Bar
Sample Type: Bar

Largest Particle
Dim: 44.2 X 28.97 X 18.29 mm
Mass: 15 g

Second Largest Particle
Dim: 28.96 X 25.91 X 12.19 mn
Mass: 16 g

Size (mm)	Mass (g)
0.25	1259
2	550
4	552
8	457
16	84
28.97	15
29	
29	
29	
29	
29	
29	



Sample Statistics							
Material Included	D_{16}	D_{35}	**D_{50}**	D_{65}	D_{84}	D_{95}	% Sand
Entire Sample	1	2	**3**	5	10	15	43%
D > 2mm	3	4	6	8	13	18	0%

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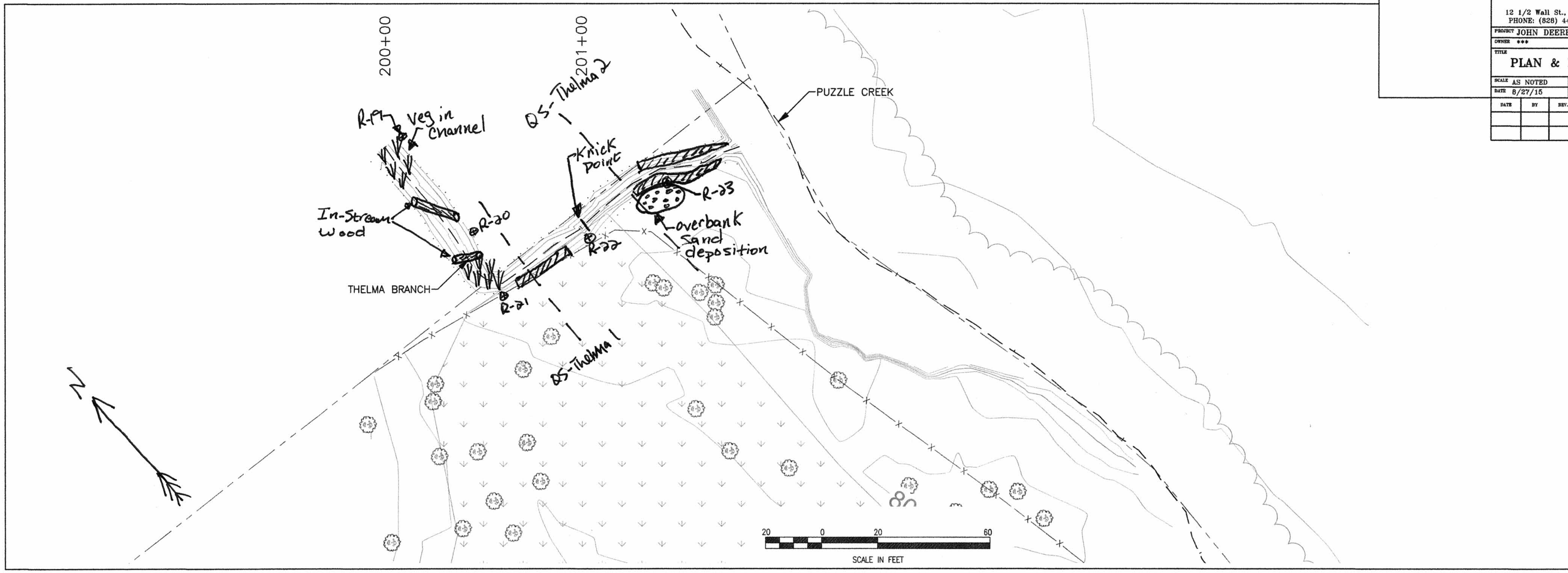
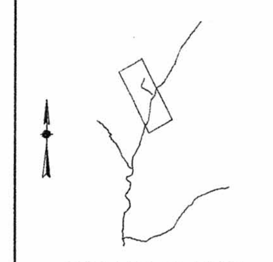
PROJECT	JOHN DEERE STREAM RESTORATION
OWNER	***
TITLE	PLAN & PROFILE

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	RTS	1080	8
DATE 8/27/15	CHKD. BY SSG		

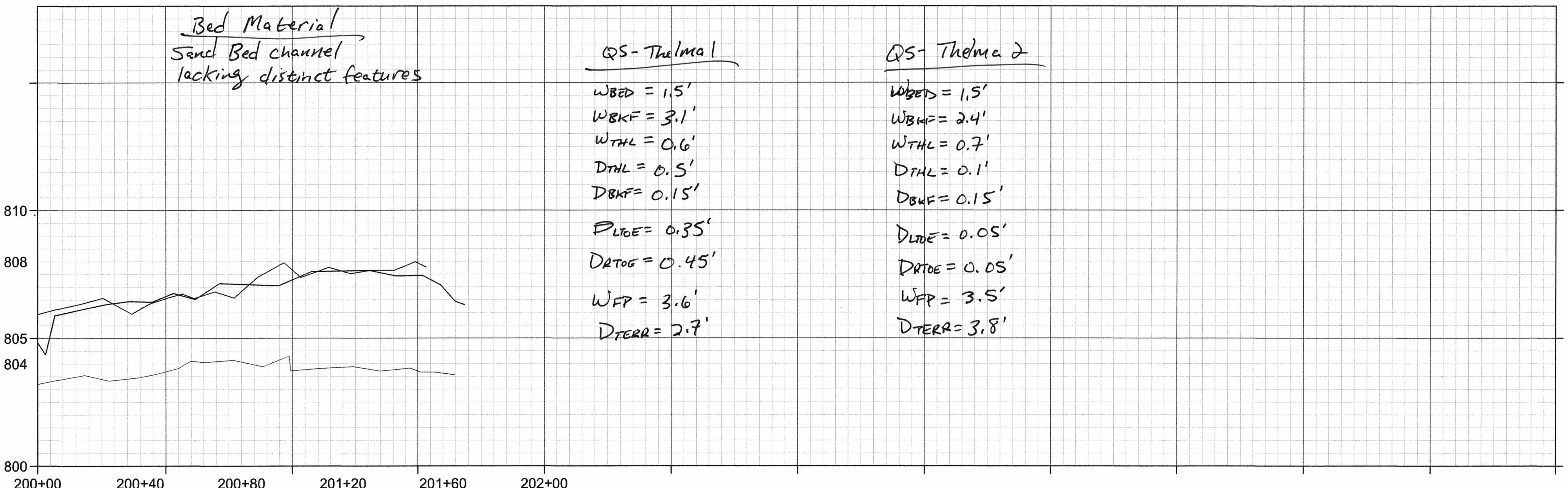
DATE	BY	REV.	DESCRIPTION





LEGEND

- EXISTING THALWEG
- EXISTING TOP BANK
- GIS PROPERTY BOUNDARY
- FENCE LINE
- EXISTING TREE
- EXISTING WETLAND
- Eroding Bank
- Photo Point



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 20' VERTICAL SCALE: 1" = 2'

HALF SIZE PLAN – HORIZONTAL: 1" = 40' VERTICAL: 1" = 4'

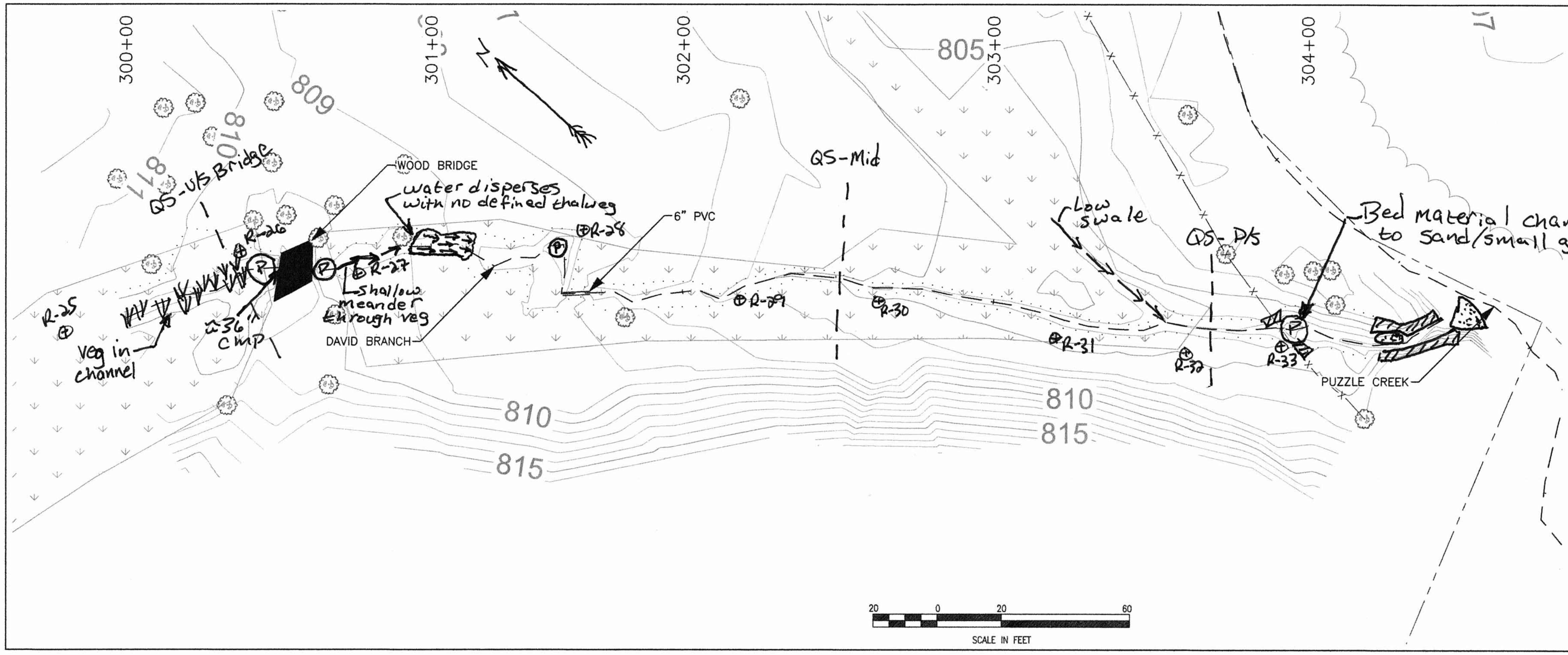
THELMA BRANCH

Wolf Creek Engineering
ENGINEERING & ENVIRONMENTAL CONSULTING
LICENSE NO. P-0417
12 1/2 Wall St., Suite C Asheville, NC 28801
PHONE: (828) 449-1930 WWW.WOLFCREEKENG.COM

PROJECT	JOHN DEERE STREAM RESTORATION
OWNER	***
TITLE	PLAN & PROFILE

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	RTS	1080	9
DATE 8/27/15	CHKD. BY SSG		

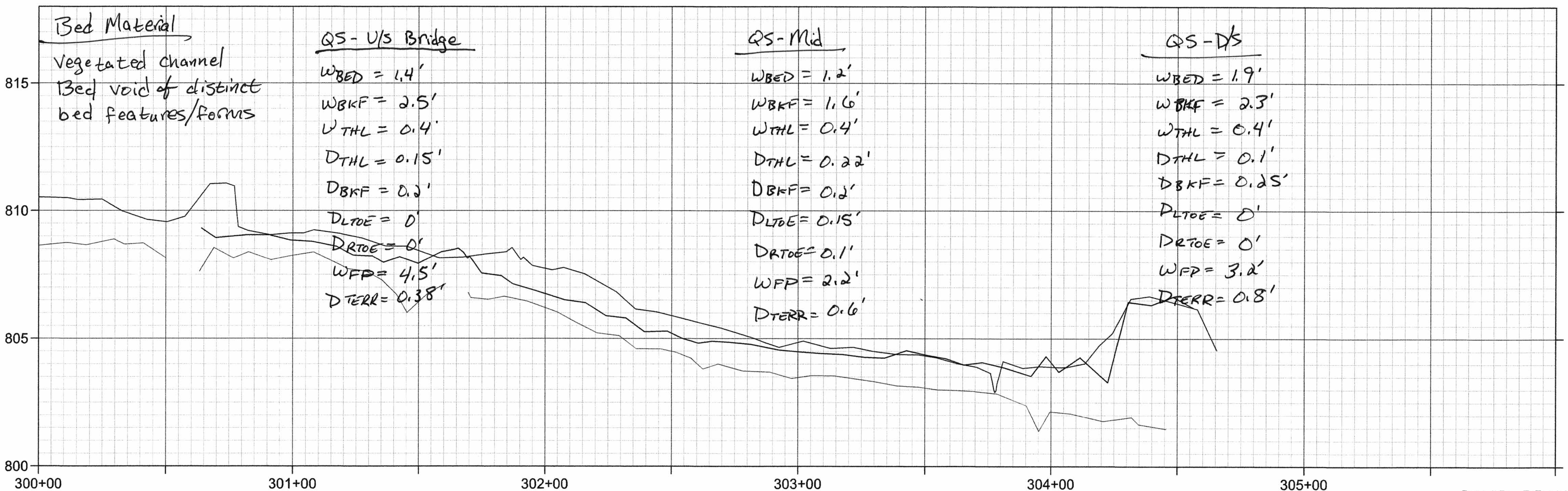
DATE	BY	REV.	DESCRIPTION



LOCATION KEY

LEGEND

- EXISTING THALWEG
- EXISTING TOP BANK
- GIS PROPERTY BOUNDARY
- FENCE LINE
- EXISTING TREE
- EXISTING WETLAND
- Eroding Bank
- Pool
- Bar
- Photo Point



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 20' VERTICAL SCALE: 1" = 2' HALF SIZE PLAN – HORIZONTAL: 1" = 40' VERTICAL: 1" = 4'

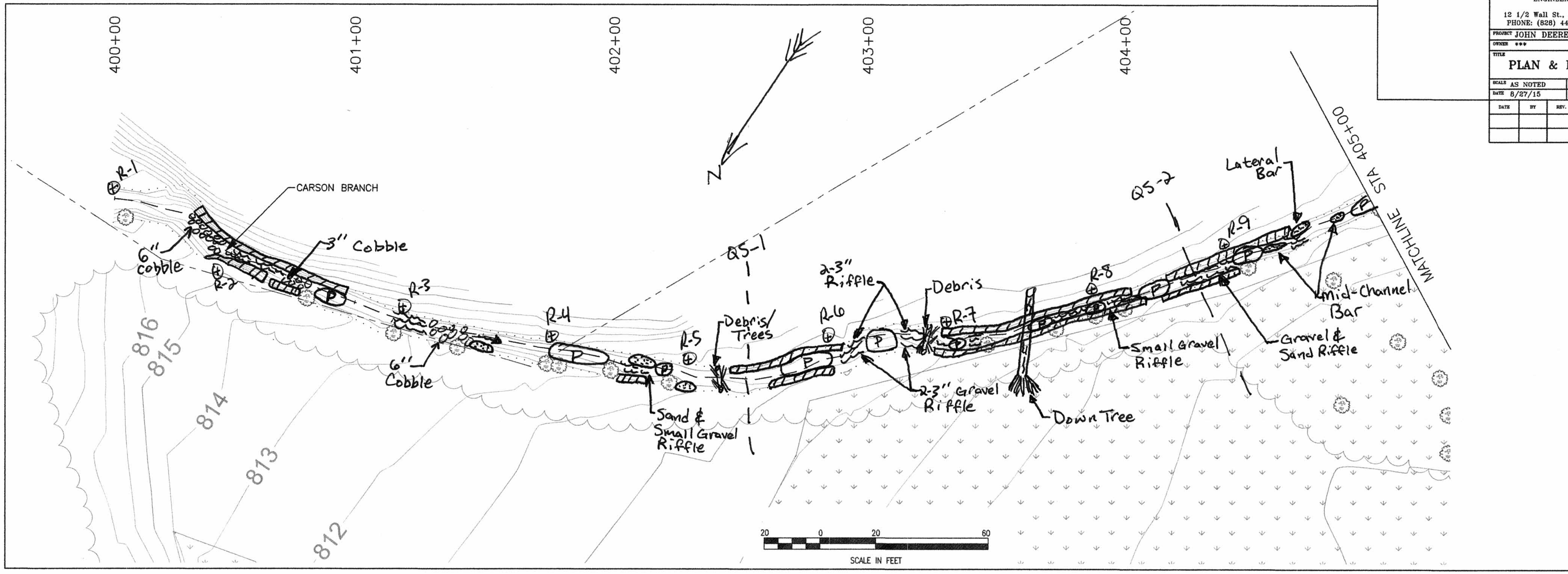
DAVID BRANCH

Wolf Creek Engineering
ENGINEERING & ENVIRONMENTAL CONSULTING
LICENSE NO. P-0417
12 1/2 Wall St., Suite C Asheville, NC 28801
PHONE: (828) 449-1930 WWW.WOLFCREEKENG.COM

PROJECT: JOHN DEERE STREAM RESTORATION
OWNER: ***
TITLE: PLAN & PROFILE

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	RTS	1080	10
DATE 8/27/15	CHKD. BY SSG		

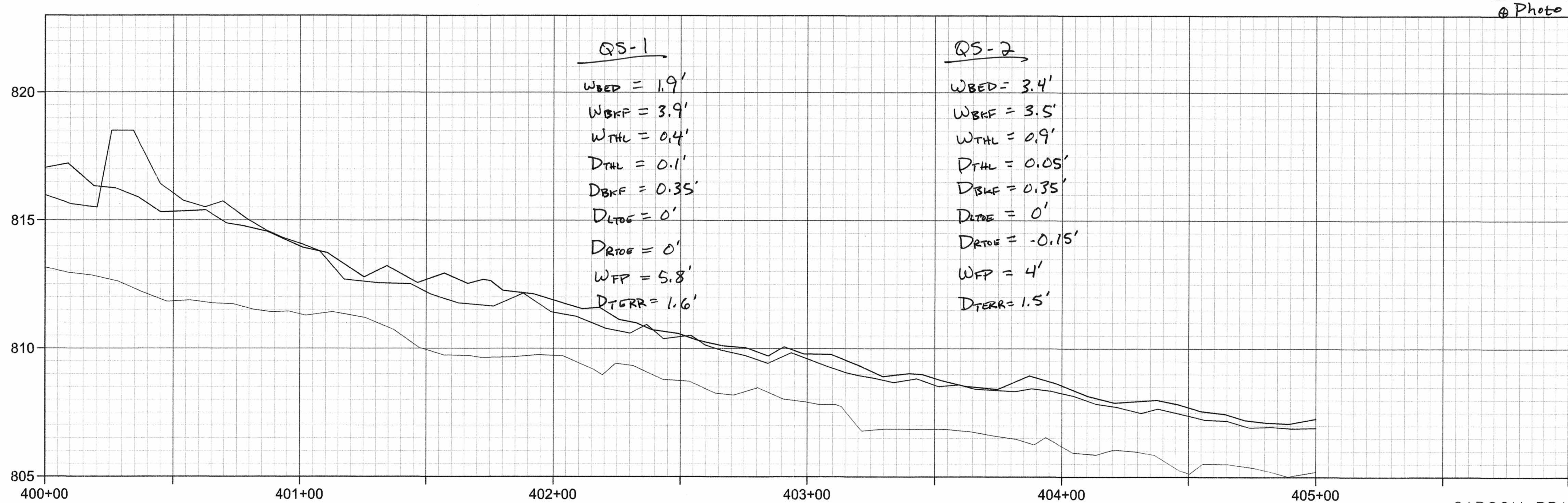
DATE	BY	REV.	DESCRIPTION



LOCATION KEY

LEGEND

- EXISTING THALWEG
- EXISTING TOP BANK
- GIS PROPERTY BOUNDARY
- FENCE LINE
- EXISTING TREE
- EXISTING WETLAND
- Eroding Bank
- Pool
- Riffle
- Bar/Deposition
- Photo Point



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 20' VERTICAL SCALE: 1" = 2'

HALF SIZE PLAN – HORIZONTAL: 1" = 40' VERTICAL: 1" = 4'

CARSON BRANCH

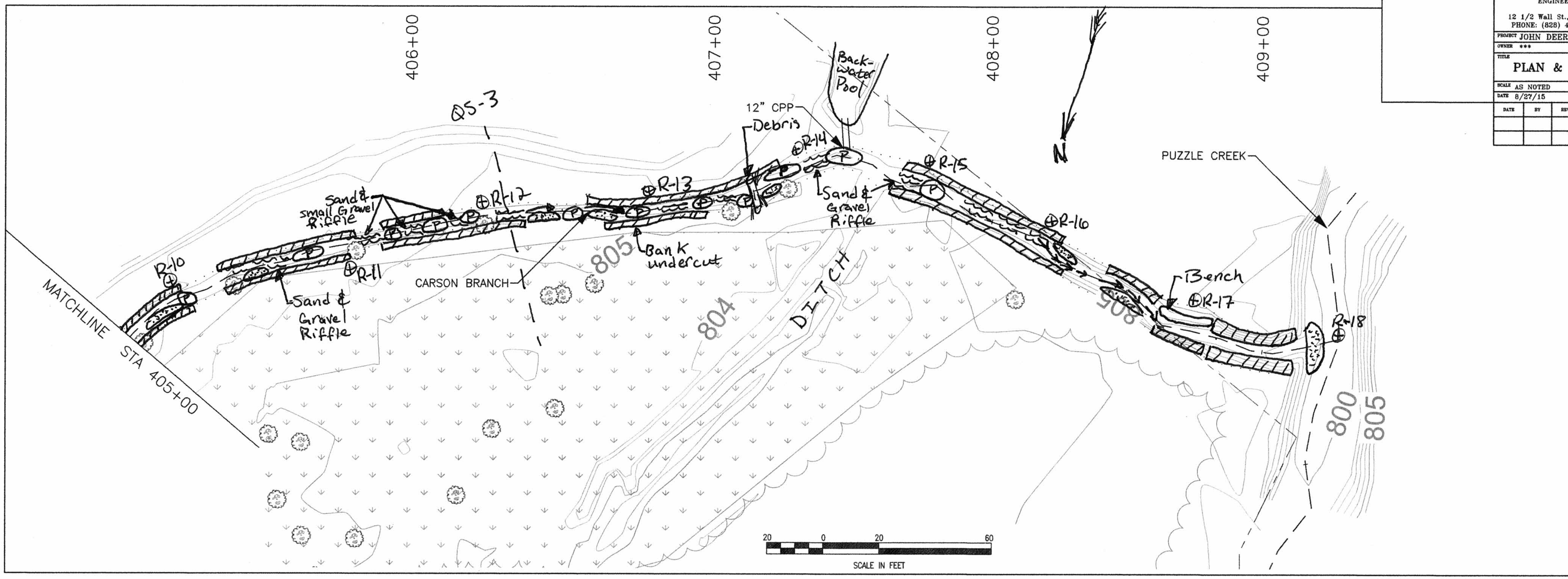
Wolf Creek Engineering
ENGINEERING & ENVIRONMENTAL CONSULTING
LICENSE NO. P-0417
12 1/2 Wall St., Suite C Asheville, NC 28801
PHONE: (828) 449-1930 WWW.WOLFCREEKENG.COM

PROJECT JOHN DEERE STREAM RESTORATION
OWNER ***

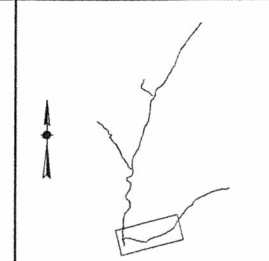
PLAN & PROFILE

SCALE AS NOTED	DRWN. BY RTS	PROJECT NO. 1080	SHEET NUMBER 11
DATE 8/27/15	CHKD. BY SSG		

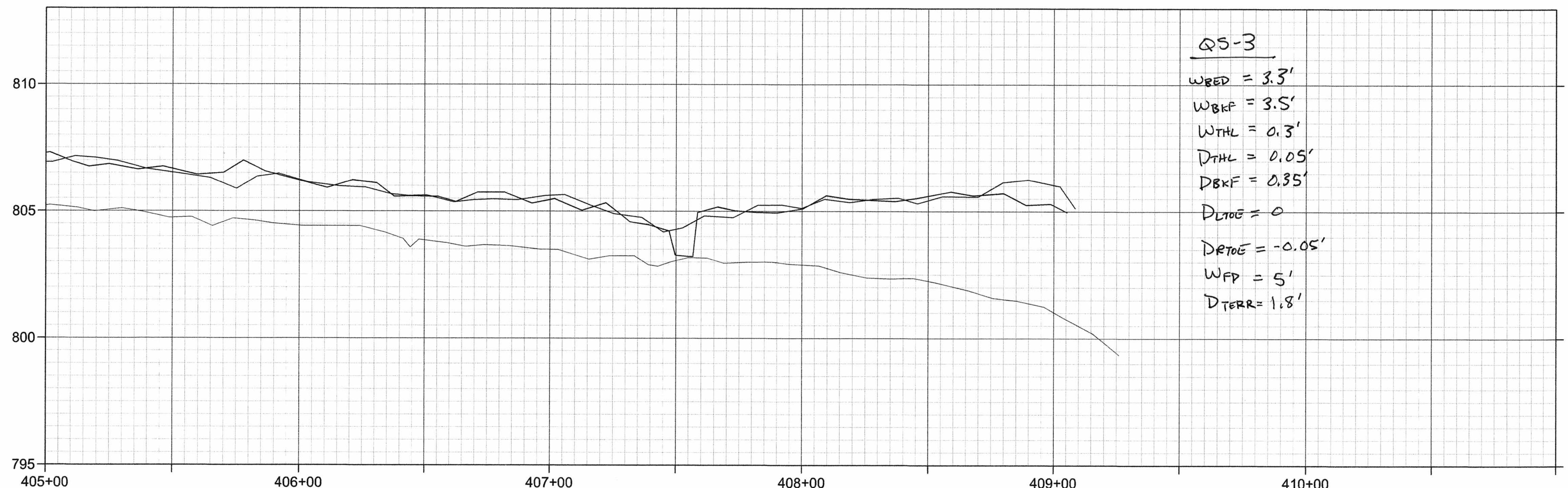
DATE	BY	REV.	DESCRIPTION



LOCATION KEY



LEGEND
- EXISTING THALWEG
- EXISTING TOP BANK
- GIS PROPERTY BOUNDARY
- FENCE LINE
- EXISTING TREE
- EXISTING WETLAND
- Eroding Bank
- Pool
- Riffle
- Bar/Deposition
- Photo Point



FULL SIZE PLAN – HORIZONTAL SCALE: 1" = 20' VERTICAL SCALE: 1" = 2' HALF SIZE PLAN – HORIZONTAL: 1" = 40' VERTICAL:1" = 4'

CARSON BRANCH

Summary

Stream:	Henry Fork
Watershed:	Forested
Location:	South Mountain State Park
Latitude:	35.61315
Longitude:	81.74880
State:	NC
County:	Burke
Date:	August 2, 2016
Observers:	SGG, CME, RTS
Channel type:	C5
Drainage area (sq.mi.):	0.094
notes:	Located upstream of old logging road

Dimension		bankfull channel			
		typical	min	max	
floodplain:	width flood prone area (ft)	14.0	14.0	16.0	
	low bank height (ft)	1.5	1.1	1.8	
riffle-run:	x-area bankfull (sq.ft.)	2.5	2.4	2.5	
	width bankfull (ft)	6.3	5.9	6.3	
	mean depth (ft)	0.40	0.4	0.4	
	max depth (ft)	0.6	0.6	0.6	
	hydraulic radius (ft)	0.4			
pool:	x-area pool (sq.ft.)	2.8	2.4	2.8	
	width pool (ft)	7.0	6.2	7.0	
	max depth pool (ft)	0.7	0.6	0.7	
	hydraulic radius (ft)	0.4			
dimensionless ratios:		typical	min	max	
	width depth ratio	15.9	---	---	
	entrenchment ratio	2.2	2.2	2.5	
	riffle max depth ratio	1.5	1.5	1.5	
	bank height ratio	2.5	1.8	3.0	
	pool area ratio	1.1	1.0	1.1	
	pool width ratio	1.1	1.0	1.1	
	pool max depth ratio	1.6	1.5	1.6	
hydraulics:		typical	min	max	
	discharge rate (cfs)	5.0	---	---	
	channel slope (%)	0.57			
		riffle-run	min	max	pool
	velocity (ft/s)	2.0	---	---	1.8
	Froude number	0.56	---	---	0.25
	shear stress (lbs/sq.ft.)	0.139	---	---	0.139
	shear velocity (ft/s)	0.268	---	---	0.268
	stream power (lb/s)	1.8	---	---	
	unit stream power (lb/ft/s)	0.282	---	---	
	relative roughness	60.5	---	---	
	friction factor u/u*	7.5	---	---	
	threshold grain size (t*=0.06) (mm)	6.9	---	---	
	Shield's parameter	0.205			

Pattern				
	typical	min	max	
meander length (ft)	36.0	30.0	50.0	
belt width (ft)	10.0	8.0	15.0	
amplitude (ft)	---	---	---	
radius (ft)	16.0	12.0	26.0	
arc angle (degrees)	---	---	---	
stream length (ft)	59.0			
valley length (ft)	58.0			
Sinuosity	1.0			
Meander Length Ratio	5.7	4.8	7.9	
Meander Width Ratio	1.6	1.3	2.4	
Radius Ratio	2.5	1.9	4.1	
Profile				
	typical	min	max	
pool-pool spacing (ft)	18.0	11.0	21.0	
riffle length (ft)	21.0	17.0	21.0	
pool length (ft)	4.5	4.0	7.0	
run length (ft)	3.8	2.0	4.0	
glide length (ft)	2.7	1.3	2.7	
channel slope (%)	0.57			
riffle slope (%)	0.85	0.81	2.8	
pool slope (%)	0	0	1.4	
run slope (%)	1.4	0	2.8	
glide slope (%)	0.4	0	0.8	
measured valley slope (%)	1.53			
valley slope from sinuosity (%)	0.6			
Riffle Length Ratio	3.3	2.7	3.3	
Pool Length Ratio	0.7	0.6	1.1	
Run Length Ratio	0.6	0.3	0.6	
Glide Length Ratio	0.4	0.2	0.4	
Riffle Slope Ratio	1.5	1.4	4.9	
Pool Slope Ratio	0	0	2.5	
Run Slope Ratio	2.5	0	4.9	
Glide Slope Ratio	0.7	0	1.4	
Pool Spacing Ratio	2.9	1.7	3.3	
Channel Materials	Riffle Surface			
D16 (mm)	0.18	---	---	---
D35 (mm)	0.41	---	---	---
D50 (mm)	2	---	---	---
D65 (mm)	4.6	---	---	---
D84 (mm)	7.1	---	---	---
D95 (mm)	11	---	---	---
mean (mm)	1.1			---
dispersion	7.3			---
skewness	-0.2			---
Shape Factor	---			
% Silt/Clay	1%	---	---	---
% Sand	49%	---	---	---
% Gravel	50%	---	---	---
% Cobble	0%	---	---	---
% Boulder	0%	---	---	---
% Bedrock		---		---
% Clay Hardpan		---		---
% Detritus/Wood		---		---
% Artificial		---		---
Largest Mobile (mm)	---			

Site Assessment Calculations

Project:	John Deere	Date:	8/2/16
Project No.:	1080-JNDR	Observers:	sgg,cme,rts
Stream:	Henry Fork	Page:	1
Reach:	South Mountain Reference		

Observed Values

Section Number	QS-1	QS-2	QS-3	QS-4	QS-5	QS-6	
Reach Name	Ref	Ref	Ref	Ref	d/s of ref	d/s of ref	
Location	u/s riffle	u/s pool	d/s riffle	d/s pool	riff	riffle	
D_A (mi^2)	0.09	0.09	0.09	0.09	0.23	0.19	
W_{BKF} (ft)	6.3	6.2	5.9	7.0	10.0	10.5	
W_{BED} (ft)	3.1	2.9	2.7	3.1	6.5	5.7	
D_{BKF} (ft)	0.5	0.5	0.5	0.5	1.1	1.0	
$D_{TOE\ LT}$ (ft)	0.0	0.0	0.0	0.0	-0.1	0.0	
$D_{TOE\ RT}$ (ft)	0.0	0.1	0.1	0.0	0.0	0.0	
Field D_{THAL} (ft)	0.1	0.2	0.1	0.2	0.2	0.2	
W_{THAL} (ft)	0.6	0.7	0.5	0.7	0.8	1.0	
Bank/Terrace Height (ft)	1.1	1.8	1.5	1.7	2.5	2.0	
Flood Prone Width (ft)	14	15	15	16	20	24	

Section Calculations

D_{MAX}	0.60	0.60	0.60	0.65	1.25	1.15	
Average D_{TOE}	0.50	0.48	0.53	0.50	1.05	1.00	
D_{THAL}	0.10	0.13	0.08	0.15	0.20	0.15	
A_{BKF}	2.5	2.4	2.4	2.8	9.4	8.6	
D_{MEAN}	0.40	0.38	0.40	0.40	0.94	0.82	
W/D ratio	15.7	16.1	14.6	17.4	10.6	12.8	
Bank Height Ratio	1.8	3.0	2.5	2.6	2.0	1.7	
Entrenchment Ratio	2.2	2.4	2.5	2.3	2.0	2.3	

Index Calculations

Reference Bed Width Equation

Coef	Exp
10.2	0.48

Reference Max Depth Equation

Coef	Exp
1.3	0.24

Reference Bed Width	3.3	3.3	3.3	3.3	5.0	4.6	
Bed Width Index (BWI)	0.9	0.9	0.8	0.9	1.3	1.2	
Reference D_{MAX}	0.7	0.7	0.7	0.7	0.9	0.9	
Max Depth Index (MDI)	0.8	0.8	0.8	0.9	1.4	1.3	

Stream Classification

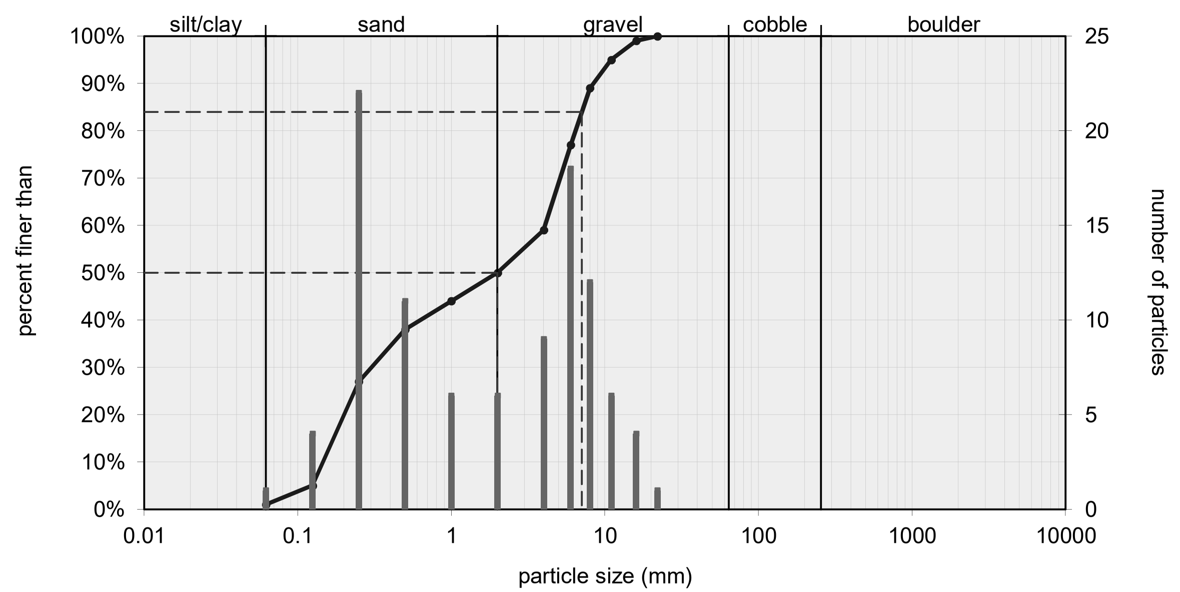
Stream Type	C5	C5	C5	C5	C4	C4	

Riffle Surface

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	**1**
very fine sand	0.062 - 0.125	**4**
fine sand	0.125 - 0.25	**22**
medium sand	0.25 - 0.5	**11**
coarse sand	0.5 - 1	**6**
very coarse sand	1 - 2	**6**
very fine gravel	2 - 4	**9**
fine gravel	4 - 6	**18**
fine gravel	6 - 8	**12**
medium gravel	8 - 11	**6**
medium gravel	11 - 16	**4**
coarse gravel	16 - 22	**1**
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
	total particle count:	100
bedrock -------------		
clay hardpan -------------		
detritus/wood -------------		
artificial -------------		
	total count:	100

Note:

Riffle Surface Pebble Count, ---



Size (mm)	
D16	0.18
D35	0.41
D50	2
D65	4.6
D84	7.1
D95	11

Size Distribution	
mean	1.1
dispersion	7.3
skewness	-0.20

Type	
silt/clay	1%
sand	49%
gravel	50%
cobble	0%
boulder	0%

Henry Fork Pool

Henry Fork Riffle

Appendix 3. Site Protection Instrument(s)

PLAT BOOK:________PAGE:________

COVER SHEET FOR:
JOHN DEERE STREAM & WETLAND MITIGATION SITE
SHEET: 1 OF 3

TOTAL CONSERVATION EASEMENT AREA:
15.37 ACRES
AREA A: 3.21 ACRES
AREA B: 12.16 ACRES

CERTIFICATE OF SURVEY AND ACCURACY:

I, NOLAN R. CARMACK, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION FROM DEED DESCRIPTION(S) RECORDED IN DB: 403 PG: 453 & DB: 500 PG: 78; THAT THE BOUNDARIES NOT SURVEYED ARE INDICATED AS DRAWN FROM INFORMATION AS REFERENCED; THAT THE RATIO OF PRECISION AS CALCULATED DOES NOT EXCEED 1:10,000; THAT THE GPS PORTION OF THIS PROJECT WAS TO PERFORM A GRID TIE TO THE NC STATE PLANE COORDINATE SYSTEM AND INFORMATION USED IS SHOWN & NOTED HEREON; THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED.

I ALSO HEREBY CERTIFY THAT THIS PLAT IS OF ONE OF THE FOLLOWING: GS 47-30 F(11) D; THAT THE SURVEY IS OF ANOTHER CATEGORY, SUCH AS THE RECOMBINATION OF EXISTING PARCELS, A COURT-ORDERED SURVEY, OR OTHER EXCEPTION TO THE DEFINITION OF SUBDIVISION.

GPS METADATA
CLASS OF SURVEY: HORIZONTAL: A VERTICAL: C
FIELD PROCEDURE: STATIC NETWORK
DATES: 07/15/15
DATUM: NAD83(2011) NAVD 88
EPOCH: 2010
GEOID: 12B
AVERAGE COMBINED FACTOR: .99984330
POSITIONAL ACCURACY: HORIZONTAL: 0.07 VERTICAL: 0.07
UNITS: USFT
CORS USED: NCSP, NCMG, NCSH

WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS XXTH DAY OF SEPTEMBER, 2016, A.D.

NORTH CAROLINA PROFESSIONAL SEAL L-5076 LAND SURVEYOR NOLAN R. CARMACK

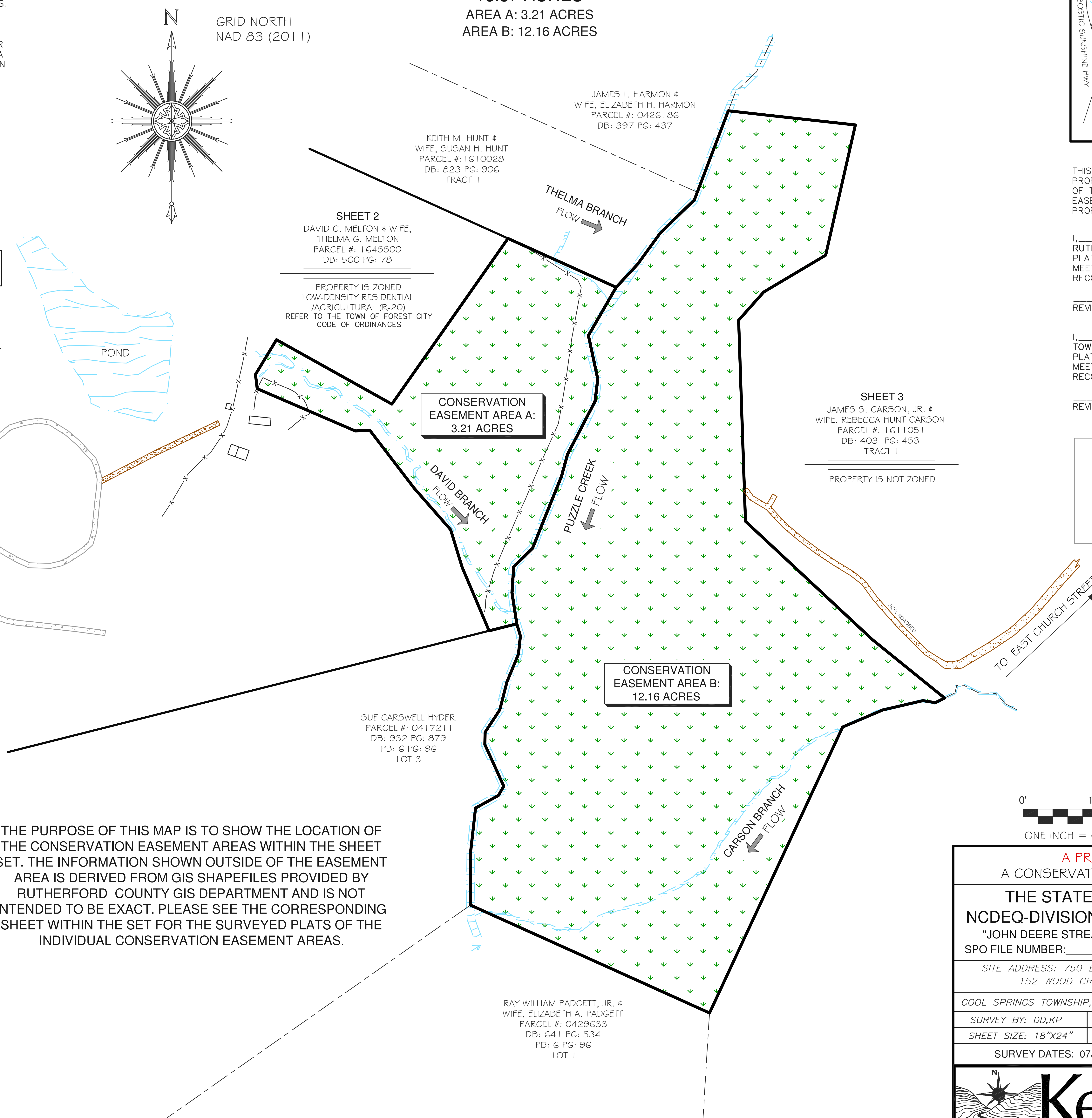
PRELIMINARY

THIS DOCUMENT IS NOT VALID UNLESS SIGNED AND SEALED.

NOLAN R. CARMACK L-5076

PRELIMINARY--FOR REVIEW ONLY (09/16/16)

NOT FOR CONVEYANCE, SALE OR RESALE-ALL AREAS, BEARINGS AND DISTANCES ARE APPROXIMATE

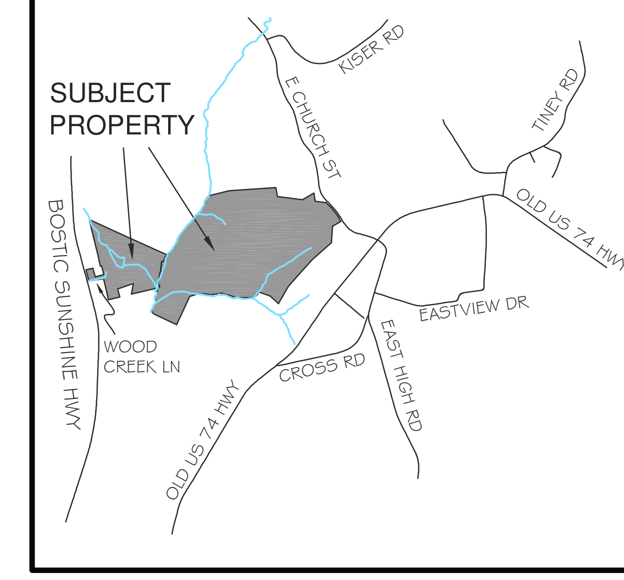


THE PURPOSE OF THIS MAP IS TO SHOW THE LOCATION OF THE CONSERVATION EASEMENT AREAS WITHIN THE SHEET SET. THE INFORMATION SHOWN OUTSIDE OF THE EASEMENT AREA IS DERIVED FROM GIS SHAPEFILES PROVIDED BY RUTHERFORD COUNTY GIS DEPARTMENT AND IS NOT INTENDED TO BE EXACT. PLEASE SEE THE CORRESPONDING SHEET WITHIN THE SET FOR THE SURVEYED PLATS OF THE INDIVIDUAL CONSERVATION EASEMENT AREAS.

SURVEYOR'S NOTES:

1. ALL DISTANCES AND COORDINATES ARE GROUND MEASUREMENTS IN US SURVEY FEET UNLESS OTHERWISE NOTED.
2. AREAS CALCULATED BY THE COORDINATE METHOD.
3. PROPERTY SUBJECT TO ALL EASEMENTS, RIGHT OF WAYS AND RESTRICTIONS THAT ARE RECORDED, UNRECORDED, WRITTEN AND UNWRITTEN.
4. RUTHERFORD COUNTY GIS WEBSITE USED TO IDENTIFY PROPERTY OWNERS.
5. THE PROFESSIONAL SURVEYOR HAS MADE NO INVESTIGATION OR INDEPENDENT SEARCH FOR EASEMENTS, RIGHT OF WAYS, ENCUMBRANCES, RESTRICTIVE COVENANTS, CORRECT OWNERSHIP OR ANY OTHER FACTS THAT AN ACCURATE AND CURRENT TITLE SEARCH MAY DISCLOSE. A NC LICENSED ATTORNEY SHOULD BE CONSULTED.
6. BY GRAPHIC DETERMINATION, A PORTION OF THE SUBJECT PROPERTY APPEARS TO LIE WITHIN A SPECIAL FLOOD HAZARD AREA (SFHA) ZONE AE AS DETERMINED BY THE F.E.M.A. MAP# 3710155900J DATED 07/02/2008.
7. UTILITIES WERE LOCATED BASED ON VISIBLE ABOVE GROUND STRUCTURES, THEREFORE THE LOCATION OF UNDERGROUND UTILITIES ARE APPROXIMATE OR MAY BE PRESENT AND NOT SHOWN HEREON. CALL 1-800-632-4949 BEFORE DIGGING.
8. ALL EXISTING FENCES WITHIN THE CONSERVATION EASEMENT AREAS ARE TO BE REMOVED.
9. THE STATE OF NORTH CAROLINA, ITS EMPLOYEES AND AGENTS, SUCCESSORS AND ASSIGNS, RECEIVE A PERPETUAL RIGHT OF ACCESS TO THE EASEMENT AREA OVER THE PROPERTY AT REASONABLE TIMES TO UNDERTAKE ANY ACTIVITIES TO RESTORE, CONSTRUCT, MANAGE, MAINTAIN, ENHANCE, AND MONITOR THE STREAM, WETLAND AND ANY OTHER RIPARIAN RESOURCES IN THE EASEMENT AREA, IN ACCORDANCE WITH RESTORATION ACTIVITIES OR A LONG-TERM MANAGEMENT PLAN AS DESCRIBED IN SECTION III-A OF THE CONSERVATION EASEMENT AGREEMENT.

VICINITY MAP
(NOT TO SCALE)



THIS PLAT DOES NOT CREATE A SUBDIVISION OF PROPERTY IN RUTHERFORD COUNTY. THE PURPOSE OF THIS SURVEY IS TO IDENTIFY THE CONSERVATION EASEMENT AREAS ONLY. NO TRANSFER OF PROPERTY IS TAKING PLACE.

I,________________, REVIEW OFFICER FOR RUTHERFORD COUNTY, CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED, MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

____
REVIEW OFFICER DATE

I,________________, REVIEW OFFICER FOR THE TOWN OF FOREST CITY, CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED, MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

____
REVIEW OFFICER DATE

REGISTER OF DEEDS STAMP

A PRELIMINARY PLAT OF
A CONSERVATION EASEMENT SURVEY FOR

THE STATE OF NORTH CAROLINA,
NCDEQ-DIVISION OF MITIGATION SERVICES
"JOHN DEERE STREAM AND WETLAND MITIGATION SITE"
SPO FILE NUMBER:____________ DMS PROJECT ID:______

SITE ADDRESS: 750 E. CHURCH ST. BOSTIC, NC 28018 & 152 WOOD CREEK LANE. BOSTIC, NC 28018

COOL SPRINGS TOWNSHIP,	RUTHERFORD COUNTY,	NORTH CAROLINA
SURVEY BY: DD,KP	DRAWN BY: NH	CHECKED BY: NC
SHEET SIZE: 18"X24"	SHEET #: 1 OF 3	SCALE: 1"=120'
SURVEY DATES: 07/15/15 - 08/30/16		JOB # 150692-CE

Kee MAPPING & SURVEYING

P.O. Box 2566
Asheville, NC 28802
(828) 575-9021
www.keemap.com
License # C-3039

PLAT BOOK:________PAGE:________

CERTIFICATE OF SURVEY AND ACCURACY:

I, NOLAN R. CARMACK, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION FROM DEED DESCRIPTION(S) RECORDED IN DB: 500 PG: 78 ; THAT THE BOUNDARIES NOT SURVEYED ARE INDICATED AS DRAWN FROM INFORMATION AS REFERENCED; THAT THE RATIO OF PRECISION AS CALCULATED DOES NOT EXCEED 1:10,000 ; THAT THE GPS PORTION OF THIS PROJECT WAS TO PERFORM A GRID TIE TO THE NC STATE PLANE COORDINATE SYSTEM AND INFORMATION USED IS SHOWN & NOTED HEREON; THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED.

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GPS METADATA
CLASS OF SURVEY: HORIZONTAL: A VERTICAL: C
FIELD PROCEDURE: STATIC NETWORK
DATES: 07/15/15
DATUM: NAD83(2011) NAVD 88
EPOCH: 2010
GEOID: 12B
AVERAGE COMBINED FACTOR: .99984030
POSITIONAL ACCURACY: HORIZONTAL: 0.07' VERTICAL: 0.07'
UNITS: USFT
CORS USED: NCSP, NCMG, NCSH

WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS XXTH DAY OF SEPTEMBER, 2016, A.D.

PRELIMINARY

NORTH CAROLINA PROFESSIONAL SEAL L-5076 SURVEYOR NOLAN R. CARMACK

THIS DOCUMENT IS NOT VALID UNLESS SIGNED AND SEALED.

NOLAN R. CARMACK L-5076

RUTHERFORD COUNTY, NORTH CAROLINA

THIS PLAT DOES NOT CREATE A SUBDIVISION OF PROPERTY IN RUTHERFORD COUNTY. THE PURPOSE OF THIS SURVEY IS TO IDENTIFY THE CONSERVATION EASEMENT AREAS ONLY. NO TRANSFER OF PROPERTY IS TAKING PLACE.

I,________________, REVIEW OFFICER FOR RUTHERFORD COUNTY, CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED, MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

REVIEW OFFICER DATE

I,________________, REVIEW OFFICER FOR THE TOWN OF FOREST CITY, CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED, MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

REVIEW OFFICER DATE

REGISTERED THIS THE ___ DAY OF ___________,
20___ AT _________ AND RECORDED IN
PLAT BOOK _______ PAGE ________ BY:

DEPUTY

REGISTER OF DEEDS

REGISTER OF DEEDS STAMP

CERTIFICATE OF OWNERSHIP AND DEDICATION:

I HEREBY CERTIFY THAT WE ARE THE OWNERS OF THE PROPERTY AS SHOWN AND DESCRIBED HEREON. I ALSO HEREBY ACCEPT AND ADOPT THIS RECORD PLAT AND CONSERVATION EASEMENT WITH MY FREE CONSENT AND DEDICATED ALL EASEMENTS, RIGHT-OF-WAYS, AND RESERVE ROADS TO PUBLIC AND/OR PRIVATE USE AS NOTED ON SAID PLAT.

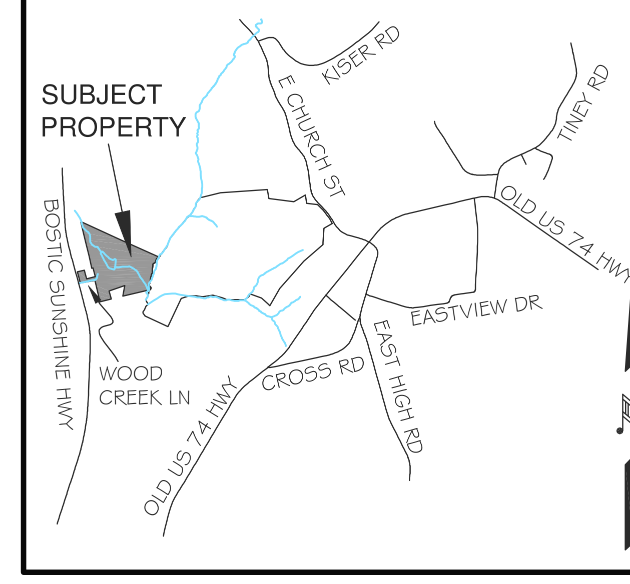
DAVID C. MELTON DATE

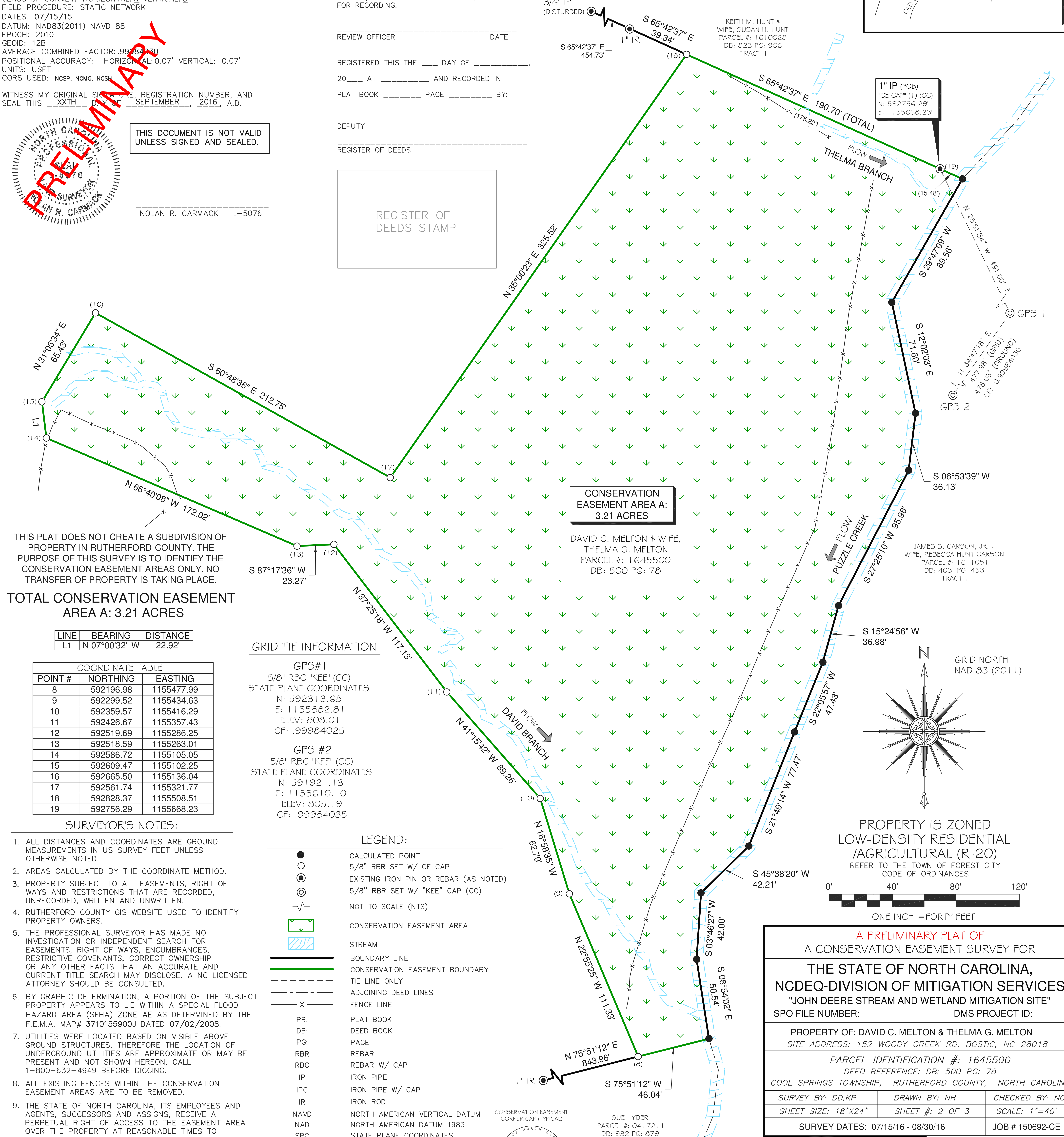
THELMA G. MELTON DATE

ATTESTED BY:

NAME DATE

VICINITY MAP
(NOT TO SCALE)





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TOTAL CONSERVATION EASEMENT AREA A: 3.21 ACRES

LINE	BEARING	DISTANCE
L1	N 07°00'32" W	22.92'

COORDINATE TABLE

POINT #	NORTHING	EASTING
8	592196.98	1155477.99
9	592299.52	1155434.63
10	592359.57	1155416.29
11	592426.67	1155357.43
12	592519.69	1155286.25
13	592518.59	1155263.01
14	592586.72	1155105.05
15	592609.47	1155102.25
16	592665.50	1155136.04
17	592561.74	1155321.77
18	592828.37	1155508.51
19	592756.29	1155668.23

GRID TIE INFORMATION

GPS#1
5/8" RBC "KEE" (CC)
STATE PLANE COORDINATES
N: 592313.68
E: 1155882.81
ELEV: 808.01
CF: .99984025

GPS #2
5/8" RBC "KEE" (CC)
STATE PLANE COORDINATES
N: 591921.13'
E: 1155610.10'
ELEV: 805.19
CF: .99984035

SURVEYOR'S NOTES:

1. ALL DISTANCES AND COORDINATES ARE GROUND MEASUREMENTS IN US SURVEY FEET UNLESS OTHERWISE NOTED.
2. AREAS CALCULATED BY THE COORDINATE METHOD.
3. PROPERTY SUBJECT TO ALL EASEMENTS, RIGHT OF WAYS AND RESTRICTIONS THAT ARE RECORDED, UNRECORDED, WRITTEN AND UNWRITTEN.
4. RUTHERFORD COUNTY GIS WEBSITE USED TO IDENTIFY PROPERTY OWNERS.
5. THE PROFESSIONAL SURVEYOR HAS MADE NO INVESTIGATION OR INDEPENDENT SEARCH FOR EASEMENTS, RIGHT OF WAYS, ENCUMBRANCES, RESTRICTIVE COVENANTS, CORRECT OWNERSHIP OR ANY OTHER FACTS THAT AN ACCURATE AND CURRENT TITLE SEARCH MAY DISCLOSE. A NC LICENSED ATTORNEY SHOULD BE CONSULTED.
6. BY GRAPHIC DETERMINATION, A PORTION OF THE SUBJECT PROPERTY APPEARS TO LIE WITHIN A SPECIAL FLOOD HAZARD AREA (SFHA) ZONE AE AS DETERMINED BY THE F.E.M.A. MAP# 3710155900J DATED 07/02/2008.
7. UTILITIES WERE LOCATED BASED ON VISIBLE ABOVE GROUND STRUCTURES, THEREFORE THE LOCATION OF UNDERGROUND UTILITIES ARE APPROXIMATE OR MAY BE PRESENT AND NOT SHOWN HEREON. CALL 1-800-632-4949 BEFORE DIGGING.
8. ALL EXISTING FENCES WITHIN THE CONSERVATION EASEMENT AREAS ARE TO BE REMOVED.
9. THE STATE OF NORTH CAROLINA, ITS EMPLOYEES AND AGENTS, SUCCESSORS AND ASSIGNS, RECEIVE A PERPETUAL RIGHT OF ACCESS TO THE EASEMENT AREA OVER THE PROPERTY AT REASONABLE TIMES TO UNDERTAKE ANY ACTIVITIES TO RESTORE, CONSTRUCT, MANAGE, MAINTAIN, ENHANCE, AND MONITOR THE STREAM, WETLAND AND ANY OTHER RIPARIAN RESOURCES IN THE EASEMENT AREA, IN ACCORDANCE WITH RESTORATION ACTIVITIES OR A LONG-TERM MANAGEMENT PLAN AS DESCRIBED IN SECTION III-A OF THE CONSERVATION EASEMENT AGREEMENT.

LEGEND:

●	CALCULATED POINT
○	5/8" RBR SET W/ CE CAP
◉	EXISTING IRON PIN OR REBAR (AS NOTED)
◎	5/8" RBR SET W/ "KEE" CAP (CC)
	NOT TO SCALE (NTS)
	CONSERVATION EASEMENT AREA
	STREAM
	BOUNDARY LINE
	CONSERVATION EASEMENT BOUNDARY
	TIE LINE ONLY
	ADJOINING DEED LINES
—X—	FENCE LINE
PB:	PLAT BOOK
DB:	DEED BOOK
PG:	PAGE
RBR	REBAR
RBC	REBAR W/ CAP
IP	IRON PIPE
IPC	IRON PIPE W/ CAP
IR	IRON ROD
NAVD	NORTH AMERICAN VERTICAL DATUM
NAD	NORTH AMERICAN DATUM 1983
SPC	STATE PLANE COORDINATES
CC	CONTROL CORNER
CE	CONSERVATION EASEMENT
CF	COMBINED FACTOR
POB	POINT OF BEGINNING

PROPERTY IS ZONED LOW-DENSITY RESIDENTIAL /AGRICULTURAL (R-20)
REFER TO THE TOWN OF FOREST CITY CODE OF ORDINANCES

0' 40' 80' 120'
ONE INCH = FORTY FEET

A PRELIMINARY PLAT OF
A CONSERVATION EASEMENT SURVEY FOR
THE STATE OF NORTH CAROLINA,
NCDEQ-DIVISION OF MITIGATION SERVICES
"JOHN DEERE STREAM AND WETLAND MITIGATION SITE"
SPO FILE NUMBER:______ DMS PROJECT ID:______

PROPERTY OF: DAVID C. MELTON & THELMA G. MELTON
SITE ADDRESS: 152 WOODY CREEK RD. BOSTIC, NC 28018

PARCEL IDENTIFICATION #: 1645500
DEED REFERENCE: DB: 500 PG: 78
COOL SPRINGS TOWNSHIP, RUTHERFORD COUNTY, NORTH CAROLINA

SURVEY BY: DD,KP	DRAWN BY: NH	CHECKED BY: NC
SHEET SIZE: 18"X24"	SHEET #: 2 OF 3	SCALE: 1"=40'
SURVEY DATES: 07/15/16 - 08/30/16		JOB # 150692-CE

Kee MAPPING & SURVEYING
P.O. Box 2566
Asheville, NC 28802
(828) 575-9021
www.keemap.com
License # C-3039

PRELIMINARY--FOR REVIEW ONLY (09/16/16)

NOT FOR CONVEYANCE, SALE OR RESALE-ALL AREAS, BEARINGS AND DISTANCES ARE APPROXIMATE

PLAT BOOK:_______PAGE:_______

CERTIFICATE OF SURVEY AND ACCURACY:

I, __NOLAN R. CARMACK___, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION FROM DEED DESCRIPTION(S) RECORDED IN DB: 403 PG: 453; THAT THE BOUNDARIES NOT SURVEYED ARE INDICATED AS DRAWN FROM INFORMATION AS REFERENCED; THAT THE RATIO OF PRECISION AS CALCULATED DOES NOT EXCEED __1:10,000__; THAT THE GPS PORTION OF THIS PROJECT WAS TO PERFORM A GRID TIE TO THE NC STATE PLANE COORDINATE SYSTEM AND INFORMATION USED IS SHOWN & NOTED HEREON; THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED.

I ALSO HEREBY CERTIFY THAT THIS PLAT IS OF ONE OF THE FOLLOWING: GS 47-30 F(11) D; THAT THE SURVEY IS OF ANOTHER CATEGORY, SUCH AS THE RECOMBINATION OF EXISTING PARCELS, A COURT-ORDERED SURVEY, OR OTHER EXCEPTION TO THE DEFINITION OF SUBDIVISION.

GPS METADATA
CLASS OF SURVEY: HORIZONTAL: A VERTICAL: C
FIELD PROCEDURE: STATIC NETWORK
DATES: 07/15/15
DATUM: NAD83(2011) NAVD 88
EPOCH: 2010
GEOID: 12B
AVERAGE COMBINED FACTOR: .99984030
POSITIONAL ACCURACY: HORIZONTAL: 0.07' VERTICAL: 0.07'
UNITS: USFT
CORS USED: NCSP, NCMG, NCSH

WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS __XXTH__ DAY OF __SEPTEMBER__, _2016_, A.D.

PRELIMINARY

NORTH CAROLINA PROFESSIONAL SEAL L-5076 SURVEYOR NOLAN R. CARMACK

THIS DOCUMENT IS NOT VALID UNLESS SIGNED AND SEALED.

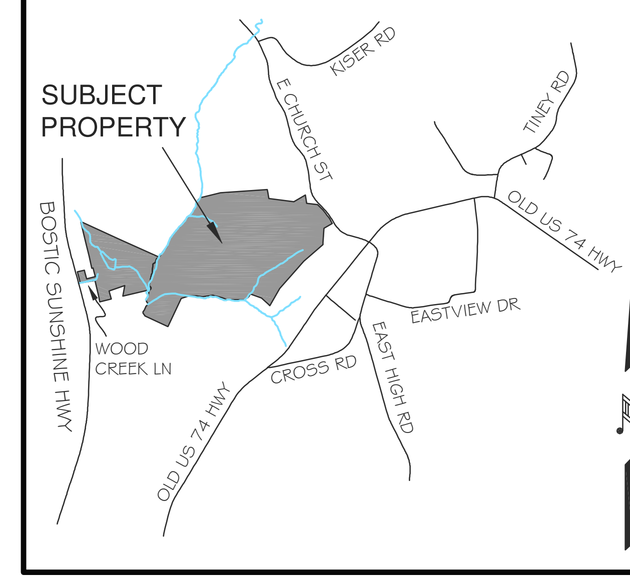
____
NOLAN R. CARMACK L-5076

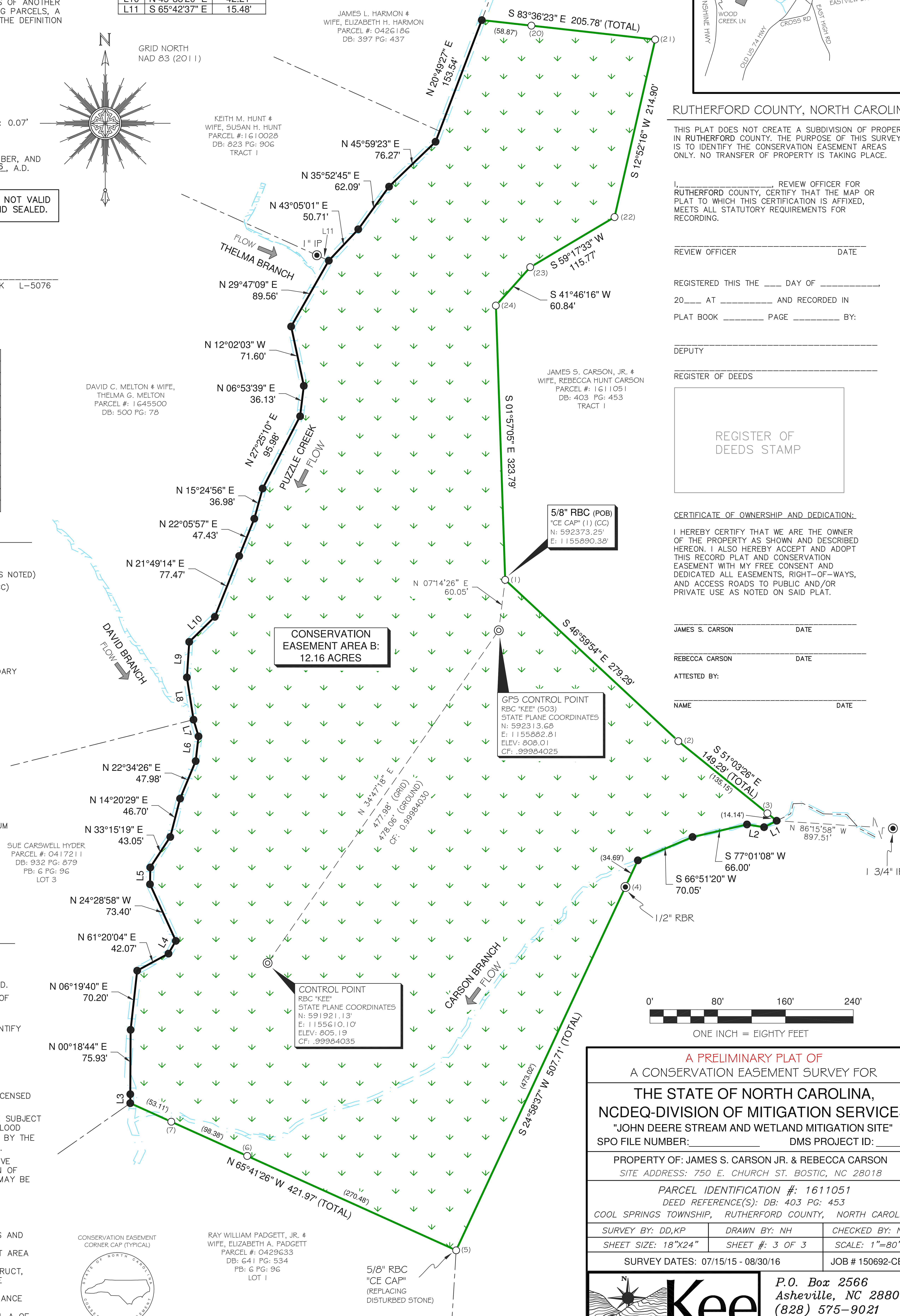
LINE	BEARING	DISTANCE
L1	S 63°20'36" W	16.71'
L2	N 80°56'37" W	20.42'
L3	N 00°18'44" E	10.54'
L4	N 29°50'31" E	17.32'
L5	N 00°54'50" E	19.86'
L6	N 06°28'47" E	29.31'
L7	N 16°40'30" W	20.52'
L8	N 08°54'02" W	50.54'
L9	N 03°46'27" E	42.00'
L10	N 45°38'20" E	42.21'
L11	S 65°42'37" E	15.48'

TOTAL CONSERVATION EASEMENT AREA B: 12.16 ACRES

THIS PLAT DOES NOT CREATE A SUBDIVISION OF PROPERTY IN RUTHERFORD COUNTY. THE PURPOSE OF THIS SURVEY IS TO IDENTIFY THE CONSERVATION EASEMENT AREAS ONLY. NO TRANSFER OF PROPERTY IS TAKING PLACE.

VICINITY MAP
(NOT TO SCALE)





COORDINATE TABLE

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4	592010.85	1156032.28
5	591582.09	1155832.54
6	591693.42	1155586.05
7	591733.92	1155496.39
20	593027.21	1155921.31
21	593010.86	1156067.30
22	592801.35	1156019.43
23	592742.24	1155919.90
24	592696.86	1155879.37

LEGEND:

●	CALCULATED POINT
○	5/8" RBR SET W/ CE CAP
⊙	EXISTING IRON PIN OR REBAR (AS NOTED)
◎	5/8" RBR SET W/ "KEE" CAP (CC)
	NOT TO SCALE (NTS)
	CONSERVATION EASEMENT AREA
	STREAM
	BOUNDARY LINE
	CONSERVATION EASEMENT BOUNDARY
	TIE LINE ONLY
	ADJOINING DEED LINES
X	FENCE LINE
PB:	PLAT BOOK
DB:	DEED BOOK
PG:	PAGE
RBR	REBAR
RBC	REBAR W/ CAP
IP	IRON PIPE
IPC	IRON PIPE W/ CAP
IR	IRON ROD
NAVD	NORTH AMERICAN VERTICAL DATUM
NAD	NORTH AMERICAN DATUM 1983
SPC	STATE PLANE COORDINATES
CC	CONTROL CORNER
CE	CONSERVATION EASEMENT
CF	COMBINED FACTOR
POB	POINT OF BEGINNING

SURVEYOR'S NOTES:

1. ALL DISTANCES AND COORDINATES ARE GROUND MEASUREMENTS IN US SURVEY FEET UNLESS OTHERWISE NOTED.
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7. UTILITIES WERE LOCATED BASED ON VISIBLE ABOVE GROUND STRUCTURES, THEREFORE THE LOCATION OF UNDERGROUND UTILITIES ARE APPROXIMATE OR MAY BE PRESENT AND NOT SHOWN HEREON. CALL 1-800-632-4949 BEFORE DIGGING.
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RUTHERFORD COUNTY, NORTH CAROLINA

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I,_________________, REVIEW OFFICER FOR RUTHERFORD COUNTY, CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED, MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

____
REVIEW OFFICER DATE

REGISTERED THIS THE ___ DAY OF __________,

20___ AT _________ AND RECORDED IN

PLAT BOOK _______ PAGE ________ BY:

____
DEPUTY

____
REGISTER OF DEEDS

REGISTER OF DEEDS STAMP

CERTIFICATE OF OWNERSHIP AND DEDICATION:

I HEREBY CERTIFY THAT WE ARE THE OWNER OF THE PROPERTY AS SHOWN AND DESCRIBED HEREON. I ALSO HEREBY ACCEPT AND ADOPT THIS RECORD PLAT AND CONSERVATION EASEMENT WITH MY FREE CONSENT AND DEDICATED ALL EASEMENTS, RIGHT-OF-WAYS, AND ACCESS ROADS TO PUBLIC AND/OR PRIVATE USE AS NOTED ON SAID PLAT.

____
JAMES S. CARSON DATE

____
REBECCA CARSON DATE

ATTESTED BY:

____
NAME DATE

A PRELIMINARY PLAT OF
A CONSERVATION EASEMENT SURVEY FOR

THE STATE OF NORTH CAROLINA,
NCDEQ-DIVISION OF MITIGATION SERVICES
"JOHN DEERE STREAM AND WETLAND MITIGATION SITE"
SPO FILE NUMBER:________ DMS PROJECT ID:________

PROPERTY OF: JAMES S. CARSON JR. & REBECCA CARSON
SITE ADDRESS: 750 E. CHURCH ST. BOSTIC, NC 28018

PARCEL IDENTIFICATION #: 1611051
DEED REFERENCE(S): DB: 403 PG: 453
COOL SPRINGS TOWNSHIP, RUTHERFORD COUNTY, NORTH CAROLINA

SURVEY BY: DD,KP	DRAWN BY: NH	CHECKED BY: NC
SHEET SIZE: 18"X24"	SHEET #: 3 OF 3	SCALE: 1"=80'

SURVEY DATES: 07/15/15 - 08/30/16 JOB # 150692-CE

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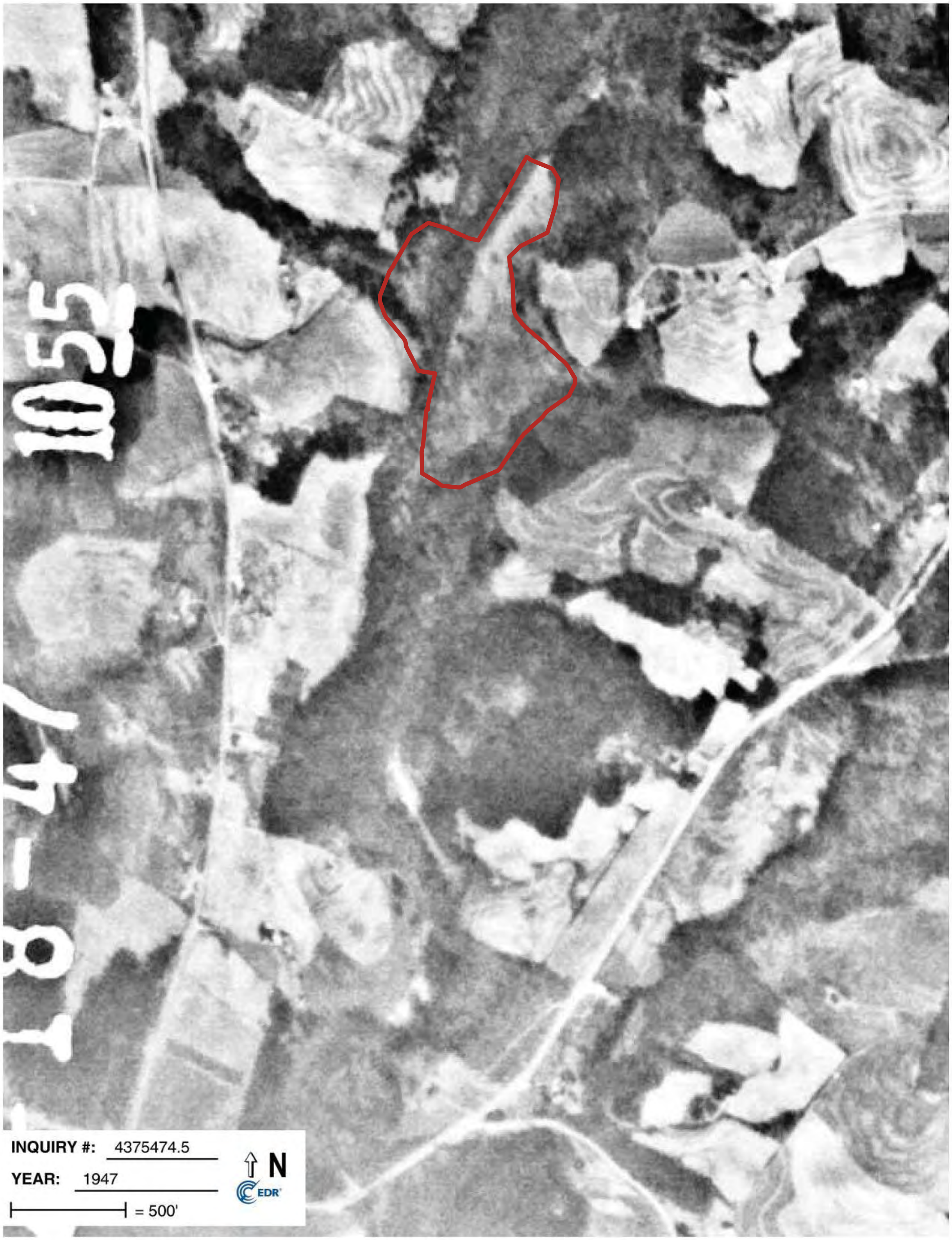
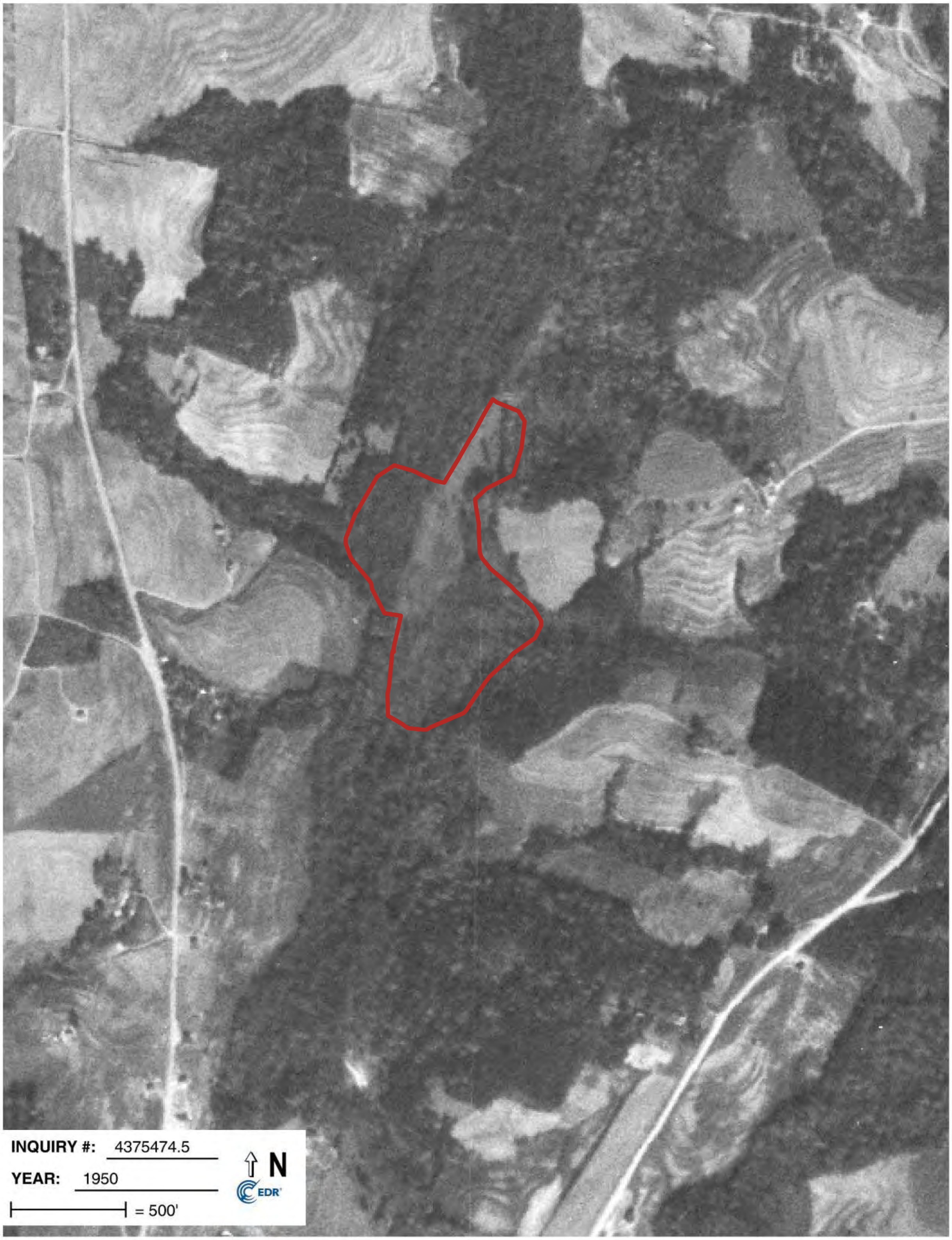
NOT FOR CONVEYANCE, SALE OR RESALE-ALL AREAS, BEARINGS AND DISTANCES ARE APPROXIMATE

Appendix 4. Historical Aerial Photos

Historical Aerial Photographs

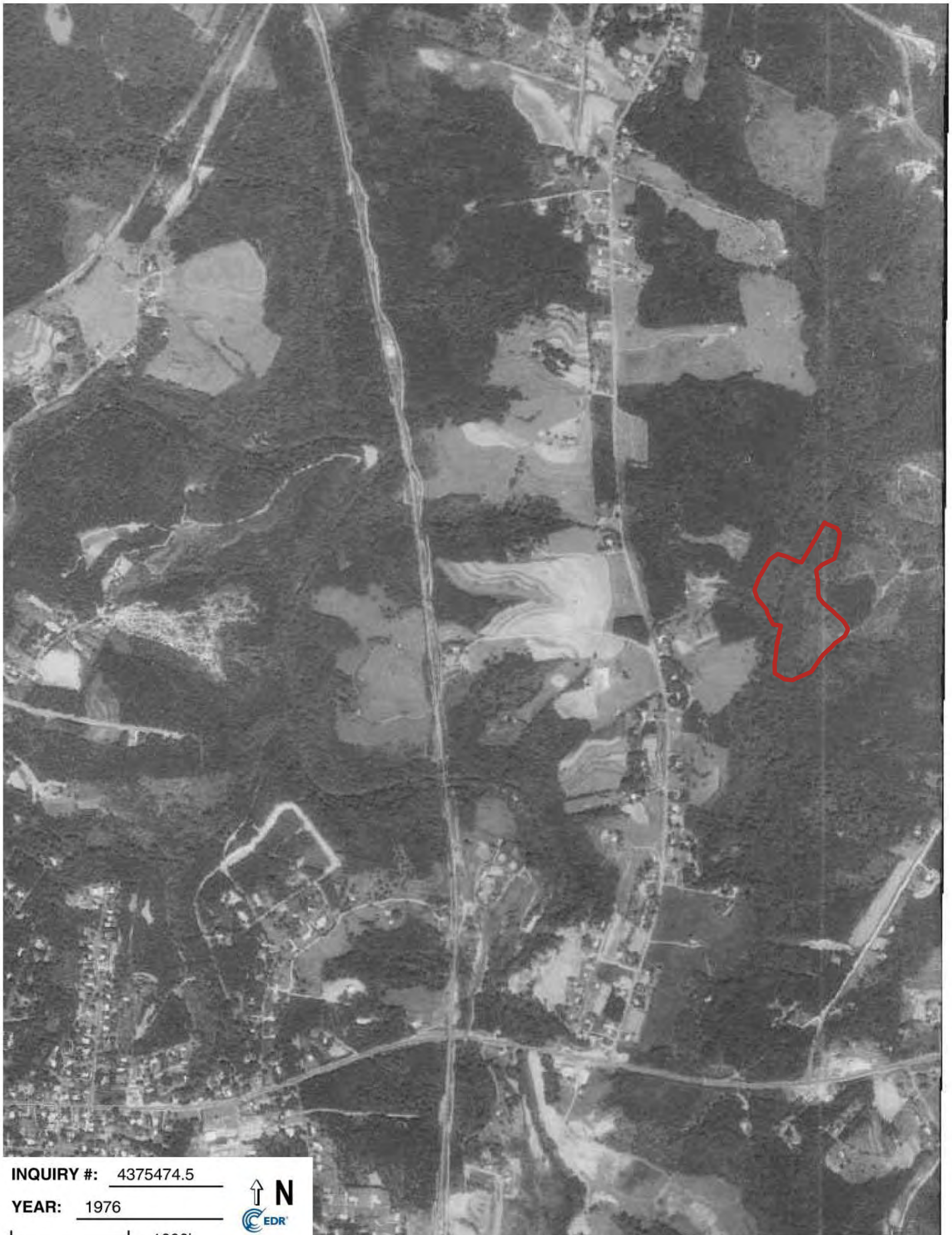




INQUIRY #: 4375474.5
YEAR: 1950
= 500'
N
EDR


INQUIRY #: 4375474.5
YEAR: 1961
= 1000'
N
EDR


3-22-63
INQUIRY #: 4375474.5
YEAR: 1963
= 750'
N
EDR



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= 1000'
N
EDR

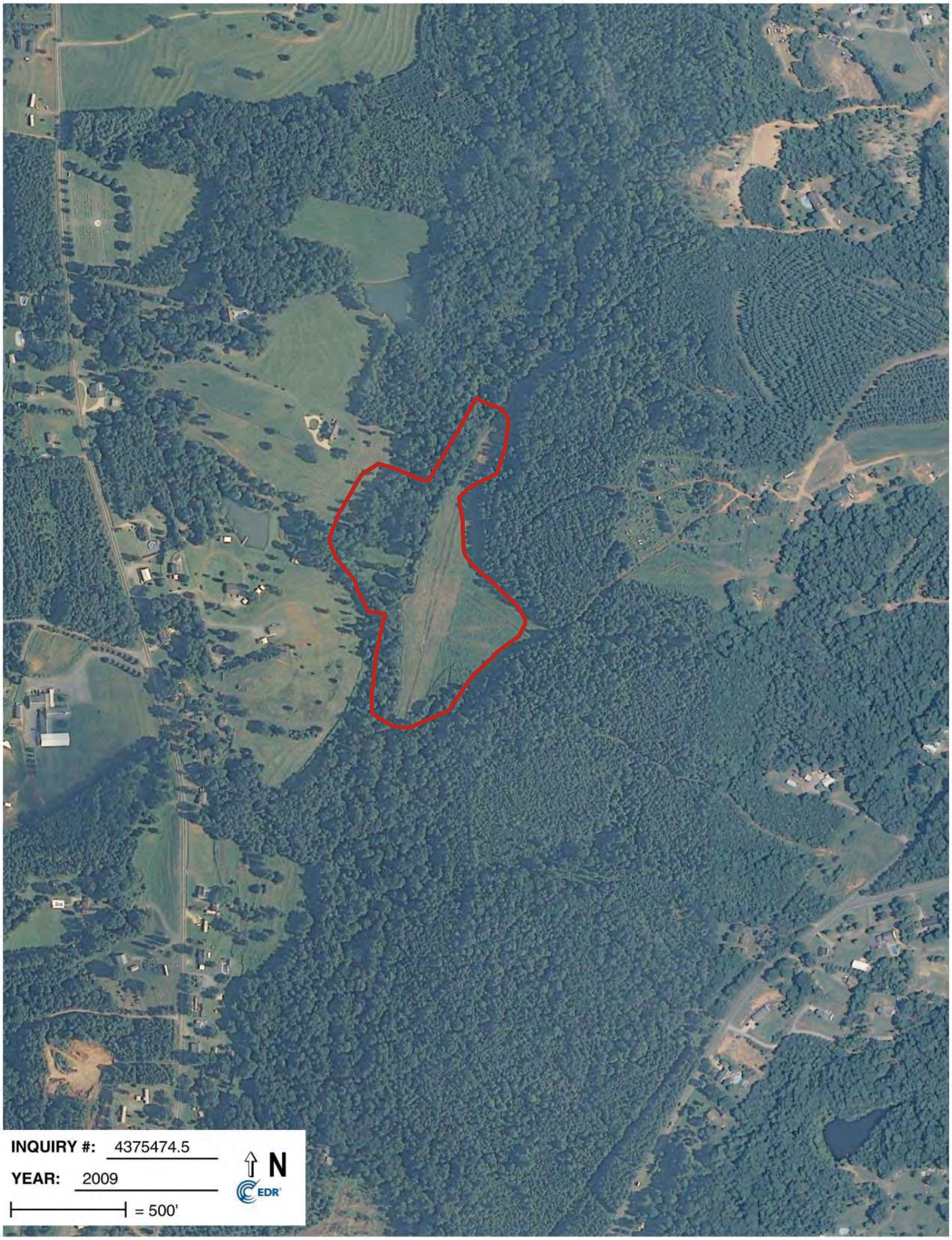
INQUIRY #: 4375474.5
YEAR: 1993
= 500'
N
EDR


INQUIRY #: 4375474.5
YEAR: 1998
= 750'
N
EDR

INQUIRY #: 4375474.5
YEAR: 2005
= 500'
N
EDR

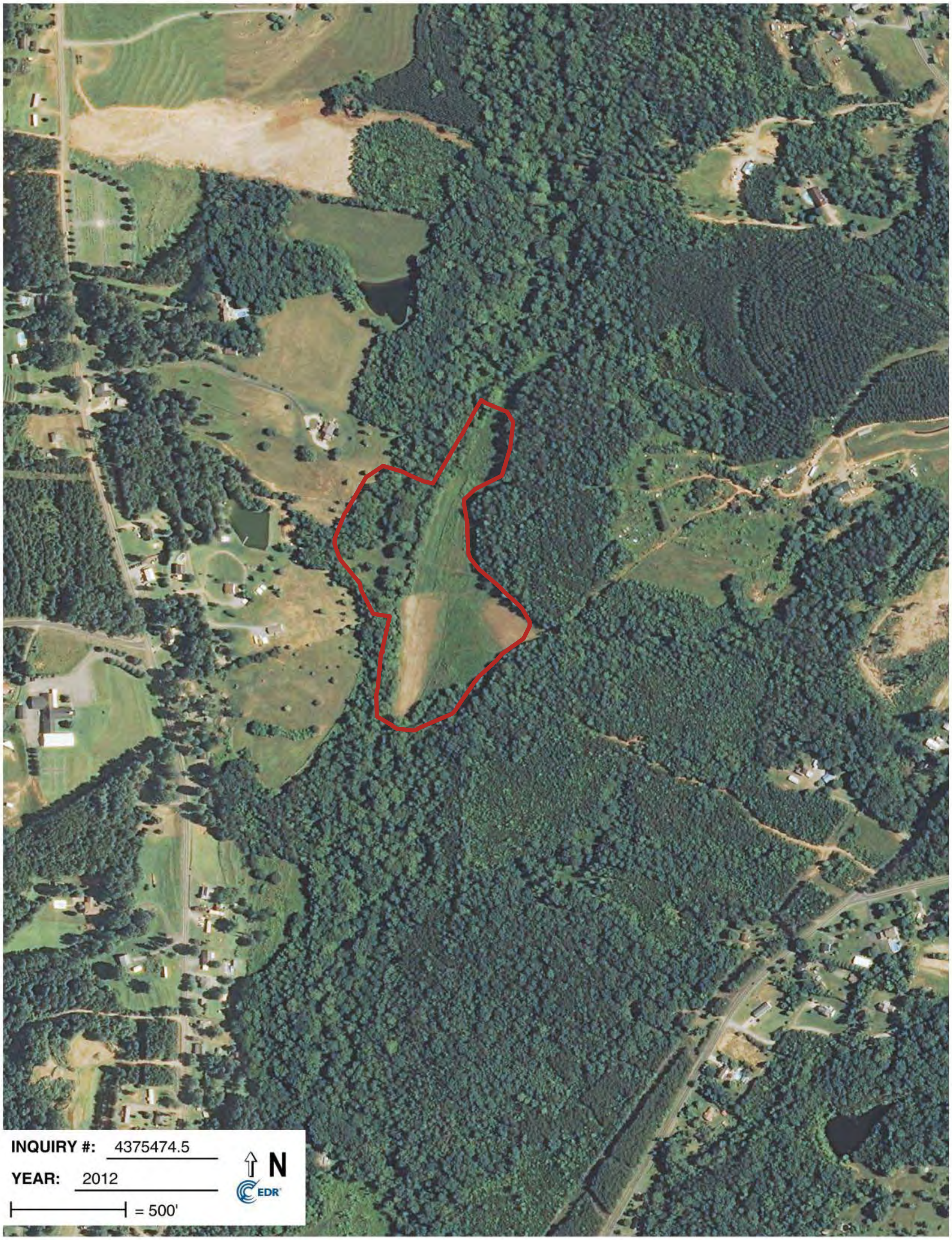
INQUIRY #: 4375474.5
YEAR: 2006
= 500'
N
EDR


INQUIRY #: 4375474.5
YEAR: 2008
N
EDR
= 500'



INQUIRY #: 4375474.5
YEAR: 2009
= 500'
N
EDR


INQUIRY #: 4375474.5
YEAR: 2010
= 500'
N
EDR


INQUIRY #: 4375474.5
YEAR: 2012
= 500'
N
EDR

Appendix 5. Hydric Soil Report

HYDRIC SOIL INVESTIGATION

John Deere Project Site

Rutherford County, North Carolina

Prepared for:

Mr. Daniel Ingram
Resource Environmental Solutions
909 Capability Drive, Suite 3100
Raleigh, NC 27606

Prepared by:

Three Oaks Engineering

The Catena Group

1000 Corporate Drive, Suite 101
Hillsborough, NC 27278
Tel (919) 732-1300

LICENSED SOIL SCIENTIST
MICHAEL G. WOOD
1219
STATE OF NORTH CAROLINA

October 6, 2015

INTRODUCTION

Resource Environmental Solutions is investigating the feasibility of on-site wetland mitigation within the John Deere Project Site in the Upper Broad River Basin (HUC 03050105). The study area is located off East Church Street, Rutherford County, NC. Three Oaks Engineering/The Catena Group (Catena) has been retained to perform a Hydric Soil Investigation that describes and classifies the soil throughout the study area and to make a determination as to its hydric status. A preliminary site investigation was performed by Catena in November 2014, from which this report and investigation were formulated.

METHODOLOGY

The field investigation was performed on July 7, 2015. Hand-turned soil auger borings were advanced throughout the project study area on a fifty foot by fifty foot grid (Figure 1). Each soil boring was classified based on soil characteristics indicating the hydric soil status. Hydric indicators are those noted in the NRCS Field Indicators of Hydric Soils in the Unities States - A Guide for Identifying and Delineating Hydric Soils (Version 7.0, 2010).

RESULTS

As the November 2014 preliminary evaluation concluded, there is clear evidence of human manipulation throughout the study area. The study area includes approximately 10 acres within the floodplain of Puzzle Creek and is comprised of an agricultural field to the east and a pasture to the west. The agricultural field shows evidence of being highly manipulated by past tillage and farming applications. The area west of Puzzle Creek shows evidence of ditching and filling. Based on existing soil conditions, five soil units were created:

- Soil Unit 1 – Hydric, relatively undisturbed.
- Soil Unit 2 – Buried hydric soil with relatively disturbed overburden soil material that has developed enough indicators to classify as hydric.
- Soil Unit 3 – Buried hydric soil with relatively disturbed overburden soil material that has not developed enough indicators to classify as hydric.
- Soil Unit 4 – Non-hydric, relatively disturbed.
- Soil Unit 5 – Non-hydric, relatively undisturbed.

<u>**Soil Unit 1 (0.82 acre).**</u> Soils in this area generally had typical diagnostic soil horizons and met hydric soil indicator F3;

<u>F3 Depleted Matrix</u>. A layer that has a depleted matrix with 60 percent or more chroma of 2 or less and that has a minimum thickness of either:

a. 5 cm (2 inches) if the 5 cm is entirely within the upper 15 cm (6 inches) of the soil, or 5 cm (6 inches), or

b. 15 cm (6 inches), starting within 25 cm (10 inches) of the soil surface.

This soil unit had a silty clay loam or clay loam textured surface horizon with many oxidized rhizoshperes. The subsurface textures generally were clay loam that graded to sandy loam, with a matrix color of chroma 2 or less, and common to many concentrations. A soil profile description of boring B12 lists the typical soil characteristics for this Soil Unit and is attached.

Soil Unit 2 (5.03 acres). The upper 12 to 30+ inches of this Soil Unit exhibited evidence of human manipulation. The surface soil typically had a sandy clay loam or clay loam textured horizon underlain by either loamy sand, sandy loam or loam horizon above the buried hydric layer. The depth to the buried soil horizon is shown on the attached figure next to the soil boring. The buried hydric layer consisted of a loam or clay loam texture and typical met hydric soil indicator F3. A soil profile description of boring B75 lists the typical soil characteristics for this Soil Unit and is attached.

The manipulated surface material appears to have been in place long enough that it has developed redoximorphic concentrations and depletions. There is clear evidence of active oxidation reactions of recent origin within this soil unit, which meet indicator F8 Redox Depressions;

F8: Redox Depressions. In closed depressions subject to ponding, 5 percent or more distinct or prominent redox concentrations occurring as soft masses or pore linings in a layer that is 2 in. (5cm) or more thick and is entirely within the upper 6 in. (15 cm) of the soil.

Combining hydraulic modifications (i.e. stream relocation, removing subsurface drainage) with limited soil removal, qualifies this Soil Unit as a candidate for Wetland Re-establishment.

Soil Unit 3 (3.32 acres). Soils within this unit exhibited evidence of human manipulation. The surface soil typically had a sandy clay loam or clay loam textured horizon underlain by either loamy sand, sandy loam or loam horizon above the buried hydric layer. The depth to the buried soil horizon is shown on the attached figure next to the boring. The buried hydric layer consisted of a loam or clay loam texture and a typical met hydric soil indicator F3. A soil profile description of boring B137 lists the typical soil characteristics for this Soil Unit and is attached.

The manipulated surface material did not exhibit adequate soil characteristics to be classified as hydric using any current hydric soil indicator.

Combining hydraulic modifications (i.e. stream relocation, removing subsurface drainage) with limited soil removal qualifies this Soil Unit as a candidate for Wetland Re-rehabilitation.

Soil Unit 4 (0.83 acre). Soil Unit 4 in conjunction with Soil Unit 5 make up the stream levee. However, the level on the east side of Puzzle Creek has obviously been extended into the field over the years, which has resulted in the levee being unnaturally wide. So while the soils in Unit 4 did not necessarily exhibit characteristics indicative of hydric soils, they appeared to have been worked and disturbed as part of the agricultural practices and are in a landscape position which, based upon the specific site findings, would likely have historically been hydric. As such, combining hydraulic modifications (i.e.

stream relocation, removing subsurface drainage) with limited soil removal qualifies this Soil Unit as a candidate for Wetland Re-rehabilitation.

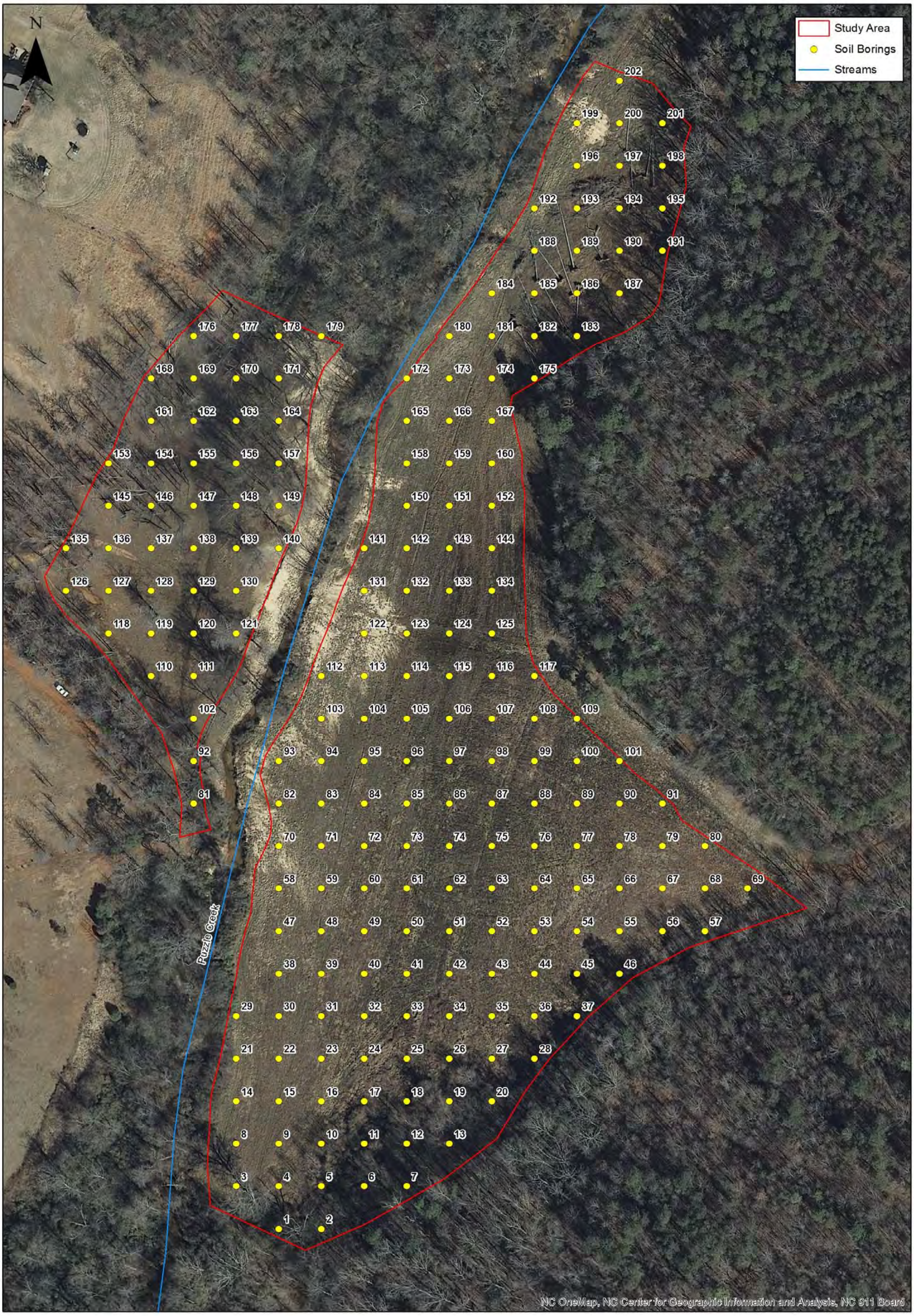
Soil Unit 5 (1.69 acres). Soils within this unit did not exhibit soil characteristics indicative of hydric. A soil profile description of boring B38 lists the typical soil characteristics for this Soil Unit and is attached.

CONCLUSION

There is evidence of soil manipulation, via agriculture alterations, throughout the study area. Soil borings were advanced on a 50 foot by 50 foot grid and five soil units were identified within the study area.

- Soil Unit 1 – Hydric, relatively undisturbed.
- Soil Unit 2 – Buried hydric soil with relatively disturbed overburden soil material that has developed enough indicators to classify as hydric. Combining hydraulic modifications (i.e. stream relocation, removing subsurface drainage) with limited soil removal qualifies this Soil Unit as a candidate for Wetland Re-establishment.
- Soil Unit 3 – Buried hydric soil with relatively disturbed overburden soil material that has not developed enough indicators to classify as hydric. Combining hydraulic modifications (i.e. stream relocation, removing subsurface drainage) with limited soil removal qualifies this Soil Unit as a candidate for Wetland Re-rehabilitation.
- Soil Unit 4 – Non-hydric, relatively disturbed.
- Soil Unit 5 – Non-hydric, relatively undisturbed.

Based on this Hydric Soil Investigation, Soil Units 2, 3 and 4 are suitable for Wetland Re-establishment and Re-habilitation, respectively. The findings presented herein represent Catena's professional opinion based on our Hydric Soil Investigation and knowledge of the current regulations regarding wetland mitigation in North Carolina and national criteria for determining hydric soil.



The Catena Group

THREE OAKS ENGINEERING

John Deere Site

Hydric Soil Investigation

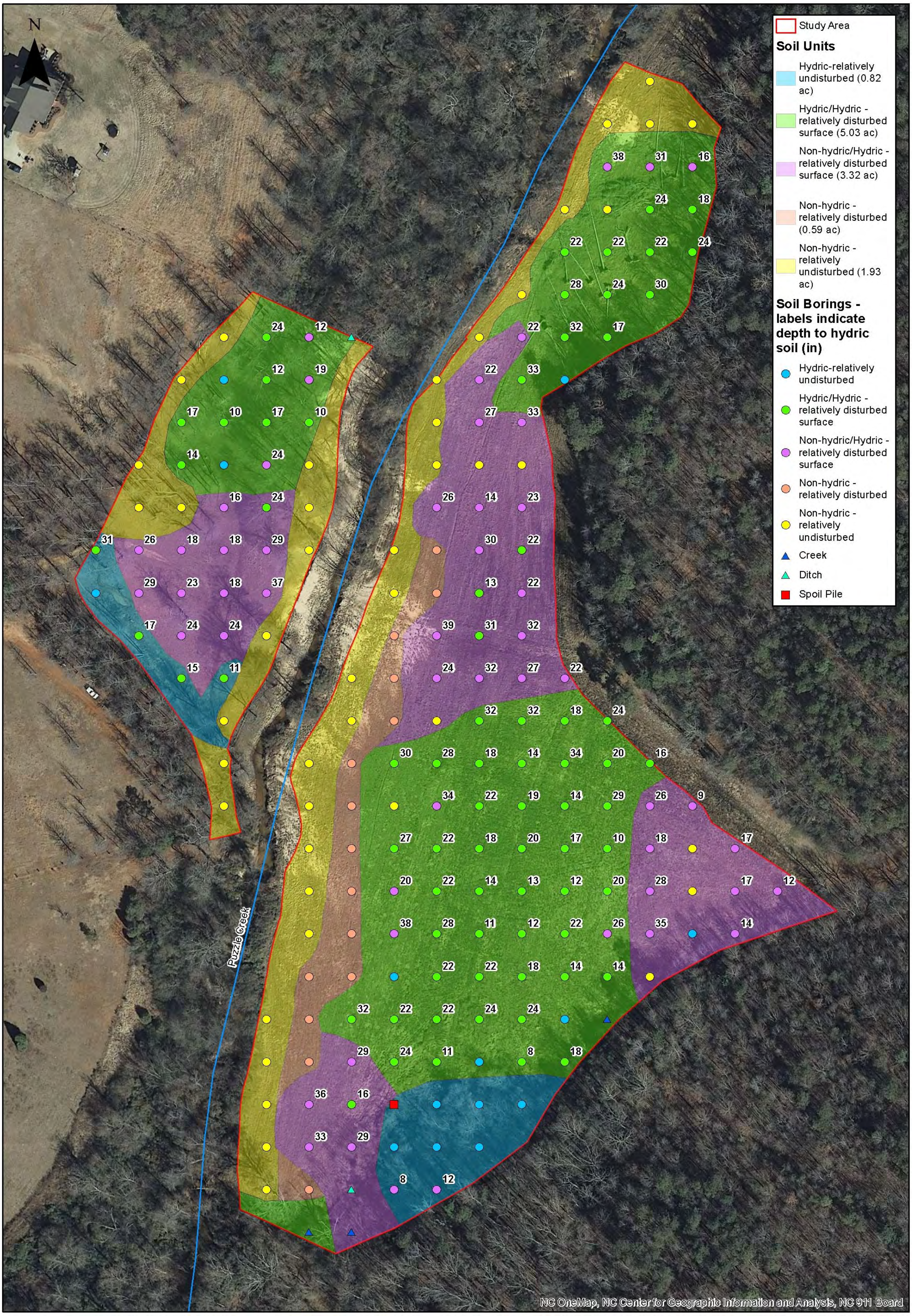
Rutherford County, North Carolina

Date: July 2015

Scale: 0 50 100 Feet

Job No: 4178

Figure 1



THREE OAKS ENGINEERING

The Catena Group

John Deere Site

Hydric Soil Investigation

Rutherford County, North Carolina

Date: September 2015

Scale: 0 50 100 Feet

Job No: 4178

Figure 2

SOIL EVALUATION FORM

The Catena Group, Inc
1000 Corporate Drive, Suite 101
Hillsborough, NC 27278
919.732.1300

Catena Job: John Deere Mitigation Site
County: Rutherford
Date: 7-7-14
Sheet: 1 of 1

Profile #	Horizon	Horizon Depth (in)	Structure / Texture	Consistence / Mineralogy	Matrix Color	Mottle Colors (Quantity, Size, Contrast, Color)
B12	A	10	1mSBK/SiL	VFR/SS,SP	10YR 4/2	m, 2, P 7.5YR 4/6
	Bwg	20	1mSBK/SCL	FR/SS,SP	10YR 6/2	m, 2, P 7.5YR 5/6; c, 2, D 10YR 5/8
B25	Ap	12	1mSBK/CL	FR/SS,SP	10YR 5/4	c, 2, P 7.5YR 4/6; oxidized rhizospheres
	E/B	20	1mSBK/SL	VFR/NS,NP	10YR 6/6	c, 2, P 7.5YR 4/6; c, 2, D 10YR 5/4
	Ab	28	1mSBK→GR/CL	FR/SS,SP	10YR 5/2	f, 2, P 7.5YR 4/6
B137	Fill-A	18	1mSBK/CL	FR/SS,SP	5YR 5/6	f, 2, D 7.5YR 6/4
	Ab	24	1mSBK-GR/CL	FR/SS,SP	10YR 5/2	c, 2, P 7.5YR 5/6
B38	Ap	12	1mSBK/SL	VFR/SS,SP	7.5YR 6/4	
	Bw	26	1mSBK/SCL	FR/SS,SP	7.5YR 5/4	c, 2, P 10YR 6/3; f, 1, D 7.5YR 5/3

Evaluated by: JCR

Appendix 6.

Approved Jurisdictional Determination

Wetland Data Forms

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action I.D.: **SAW-2015-00825** County: **Rutherford** U.S.G.S. Quad: **NC-FOREST CITY**

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owner/Agent: **Jim Carson/David Melton**
Address: **750 E. Church Street Bostic, North Carolina 28018**
Telephone No.:

Property description:
Size (acres): 11.7 acres
Nearest Town: Bostic
Nearest Waterway: Second Broad River
Coordinates: 35.34838, -81.82307
River Basin: Upper Broad
Hydrologic Unit Code: 03050105

Location Description: The site is located between Bostic Sunshine Hwy and State Road 1576 on three UTs of Puzzel Creek near Bostic North Carolina. From Old US Hwy 74 E left onto E Church Street, turn left just before Cemetery.

Indicate Which of the Following Apply:

A. Preliminary Determination

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

B. Approved Determination

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

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

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

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

_ There are no waters of the U.S., to include wetlands, present on the above described 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.

Action Id.: **SAW-2015-00825**

Placement of dredged or fill material within waters of the US and/or wetlands without a Department of the Army permit may constitute a violation of Section 301 of the Clean Water Act (33 USC § 1311). If you have any questions regarding this determination and/or the Corps regulatory program, please contact **William Elliott** at **828-271-7980**.

C. Basis For Determination

The site contains wetlands as determined by the *1987 Corps of Engineers Wetland Delineation Manual* and the *Interim Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Eastern Mountain and Piedmont Region.* These wetlands are adjacent to stream channels located on the property that exhibit indicators of ordinary high water marks. The stream channel on the property "is an unnamed tributary to Puzzle Creek which flows into the Second Broad River to the Broad River which becomes a Section 10 water in South Carolina then flows to the Congaree River and the Santee River, before flowing into the Atlantic Ocean.

D. Remarks: Jurisdictional "Waters of the US" have been identified on this property as depicted by submitted Jurisdictional Request Package on file.

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)

Attached to this verification is an approved jurisdictional determination. If you are not in agreement with that approved jurisdictional determination, you can make an administrative appeal under 33 CFR 331. Enclosed you will find a 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 within 60 days of the issue date below.

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: William Elliott

Issue Date: **May 18, 2016** Expiration Date: **May 17, 2021**

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 our website at http://per2.nwp.usace.army.mil/survey.html to complete the survey online.

CF:

David Melton, 152 Wood Creek Lane, Bostic, NC 28018

Hunter Terrell , 37 Haywood Street, Suite 100, Asheville, NC 28801

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL		
Applicant: Jim Carson/David Melton	File Number: SAW-2015-00825	Date: May 18, 2016

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

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

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

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.

- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

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

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.

- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

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

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

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.

- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

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

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

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

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

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:	If you only have questions regarding the appeal process you may also contact:
William Elliott, Project Manager USACE, Asheville Regulatory Field Office 151 Patton Ave RM 208 Asheville, NC 28801 828-271-7980	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: William Elliott, 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

USACE Wetland Delineation Forms

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: ~~[illegible]~~ John Deere City/County: Rutherford Sampling Date: 7/16/15

Applicant/Owner: RES/ Carson State: NC Sampling Point: D1

Investigator(s): HT, OC Section, Township, Range: ______

Landform (hillslope, terrace, etc.): creek bottom Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): LRR N Lat: 35 343445 Long: -81.831462 Datum: WGS 84

Soil Map Unit Name: Chewacla NWI classification: None

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

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

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes ✓ No ______	Is the Sampled Area within a Wetland? Yes ✓ No ______
Hydric Soil Present?	Yes ✓ No ______	
Wetland Hydrology Present?	Yes ✓ No ______	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✓ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

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

Wetland Hydrology Present? Yes ✓ No ______

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

Remarks:
Actively managed ag. field,

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

Sampling Point: 01

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	___ = Total Cover		
50% of total cover: ___	20% of total cover: ___		

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. Cephalanthus occidentalis	5	Y	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	5 = Total Cover		
50% of total cover: 2	20% of total cover: 1		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Rhexia mariana	1	N	
2. Erigeron annuus	15	N	
3. Juncus effusus	25	Y	FACW
4. Apios americana	10	N	
5. Symphyotrichum noveboracensis	15	N	
6. Dichanthelium sp.	5		
7. Carex lurida	20	Y	OBL
8. Scirpus sp.	20	Y	OBL
9.			
10.			
11.			
	97 = Total Cover		
50% of total cover: 48	20% of total cover: 19		

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	___ = Total Cover		
50% of total cover: ___	20% of total cover: ___		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	___	x 1 = ___
FACW species	___	x 2 = ___
FAC species	___	x 3 = ___
FACU species	___	x 4 = ___
UPL species	___	x 5 = ___
Column Totals:	___ (A)	___ (B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

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

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No ___

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

SOIL

Sampling Point: ~~02~~ 01

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 5/4	90	7.5YR 4/6	10	C	PL		
20	10YR 6/6	95	7.5YR 4/6	5	C	M		
28	10YR 5/2	95	7.5YR 4/6	5	C	M		

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

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- X Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

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

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

Restrictive Layer (if observed):

Type: ________

Depth (inches): ________

Hydric Soil Present? Yes X No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: John Deere City/County: Rutherford Sampling Date: ~~09~~ 7/16/15

Applicant/Owner: RES / Carson State: ______ Sampling Point: 02

Investigator(s): THT/WC Section, Township, Range: ______

Landform (hillslope, terrace, etc.): bottom Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): LRR N Lat: 35.343170 Long: -81.83451 Datum: WGS84

Soil Map Unit Name: Chewacla NWI classification: none

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

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

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present? Yes ✓ No ___ Hydric Soil Present? Yes ✓ No ___ Wetland Hydrology Present? Yes ✓ No ___	Is the Sampled Area within a Wetland? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ✓ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 1

Water Table Present? Yes X No ___ Depth (inches): 0

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0

Wetland Hydrology Present? Yes ✓ No ___

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

Remarks:

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

Sampling Point: 02

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Liquidamber styraciflua	40	Y	FAC
2. Acer rubrum	35	Y	FAC
3. Liriodendron tulipifera	20	Y	FACU
4. Betula nigra	5	N	
5.			
6.			
7.			
	95 = Total Cover		
50% of total cover: 47	20% of total cover: 19		

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. Ligustrum sinensis	10	N	
2. Alnus serrulata	60	Y	OBL
3. Liquidamber styraciflua	10	N	
4. Cornus amomum	10	N	
5.			
6.			
7.			
8.			
9.			
	90 = Total Cover		
50% of total cover: 45	20% of total cover: 18		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Woodwardia areolata	65	Y	FACW
2. Persicaria sp.	5	N	
3. Arum sp.	10	N	
4. Boehmeria cylindrica	1	N	
5. Apios americana	1	N	
6. Carex lurida	5	N	
7. Impatiens capensis	2	N	
8.			
9.			
10.			
11.			
	89 = Total Cover		
50% of total cover: 44	20% of total cover: 17		

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Toxicodendron radicans	2	N	
2. Smilax herbacea	10	Y	FAC
3. Lonicera japonica	2	N	
4. Parthenocissus quinquefolia	5	Y	FACU
5. Bignonia capreolata	10	Y	FAC
	29 = Total Cover		
50% of total cover: 14	20% of total cover: 5		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

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

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No ____

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

SOIL

Sampling Point: ~~01~~ 02

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 3/1	95	~~10YR~~ 7.5YR 4/6	5	C	PL		
2-18	10YR 4/1	95	7.5YR 4/6	5+	C	M/PL		

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

Hydric Soil Indicators:

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] 2 cm Muck (A10) **(LRR N)**
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] Stripped Matrix (S6)
- [ ] Dark Surface (S7)
- [ ] Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- [ ] Thin Dark Surface (S9) **(MLRA 147, 148)**
- [ ] Loamy Gleyed Matrix (F2)
- [x] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)
- [ ] Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- [ ] Umbric Surface (F13) **(MLRA 136, 122)**
- [ ] Piedmont Floodplain Soils (F19) **(MLRA 148)**
- [ ] Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

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

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

Restrictive Layer (if observed):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ✓ No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: John Deere City/County: Rutherford Sampling Date: 7/16/15
Applicant/Owner: RES/Carson State: NC Sampling Point: 03
Investigator(s): JHT/WDL Section, Township, Range: ____
Landform (hillslope, terrace, etc.): bottom Local relief (concave, convex, none): concave Slope (%): 0
Subregion (LRR or MLRA): LRR N Lat: 35.345029 Long: -81.831374 Datum: WGS 84
Soil Map Unit Name: Chewacla NWI classification: None

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

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

Hydrophytic Vegetation Present? Yes ✓ No ____	Is the Sampled Area within a Wetland?	Yes ✓ No ____
Hydric Soil Present? Yes ✓ No ____		
Wetland Hydrology Present? Yes ✓ No ____		

Remarks:
Very highly disturbed.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

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

Wetland Hydrology Present? Yes ✓ No ____

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: 03

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	____ = Total Cover		
50% of total cover: ____	20% of total cover: ____		

Sapling/Shrub Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	____ = Total Cover		
50% of total cover: ____	20% of total cover: ____		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Ambrosia artemisifolia	65	Y	FACU
2. Ambrosia trifida	5	N	
3. Amphicarpaea bracteata	5	N	
4. Erigeron annuus	2	N	
5. Polygonum sagittatum	8	N	
6. Eupatorium capillifolium	2	N	
7. Hypericum gentianoides	1	N	
8. Oxalis stricta	1	N	
9. Vitis rotundifolia	1	N	
10. Conyza sp.	8	N	
11.			
	98 = Total Cover		
50% of total cover: 49	20% of total cover: 19		

Woody Vine Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1. ~~Vitis~~			
2.			
3.			
4.			
5.			
	____ = Total Cover		
50% of total cover: ____	20% of total cover: ____		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	0	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species	65	x 4 = 260
UPL species		x 5 =
Column Totals:	65 (A)	260 (B)

Prevalence Index = B/A = 4

Hydrophytic Vegetation Indicators:

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

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No ____

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

marginal hydrophytic veg. @ toe of slope, away from central disturbed/managed area.

SOIL

Sampling Point: 03

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 5/4	90	7.5YR 4/6	10	C	PL		
20	10YR 6/6	95	2.5YR 4/6	5	C	M		
28	10YR 5/2	95	7.5YR 4/6	5	c	M		

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

Hydric Soil Indicators:

- __ Histosol (A1)
- __ Histic Epipedon (A2)
- __ Black Histic (A3)
- __ Hydrogen Sulfide (A4)
- __ Stratified Layers (A5)
- __ 2 cm Muck (A10) **(LRR N)**
- __ Depleted Below Dark Surface (A11)
- __ Thick Dark Surface (A12)
- __ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- __ Sandy Gleyed Matrix (S4)
- __ Sandy Redox (S5)
- __ Stripped Matrix (S6)
- __ Dark Surface (S7)
- __ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- __ Thin Dark Surface (S9) **(MLRA 147, 148)**
- __ Loamy Gleyed Matrix (F2)
- __ Depleted Matrix (F3)
- __ Redox Dark Surface (F6)
- __ Depleted Dark Surface (F7)
- X Redox Depressions (F8)
- __ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- __ Umbric Surface (F13) **(MLRA 136, 122)**
- __ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- __ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

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

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

Restrictive Layer (if observed):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ✓ No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: John Rune City/County: Rutherford Sampling Date: 7/16/15

Applicant/Owner: RES/Melton State: NC Sampling Point: 04

Investigator(s): THT/WOC Section, Township, Range: ______

Landform (hillslope, terrace, etc.): bottom Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): LRR N Lat: 35.344980 Long: -81.832299 Datum: WGS 84

Soil Map Unit Name: Chewacla NWI classification: None

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

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

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present? Yes ✓ No ___		Is the Sampled Area within a Wetland? Yes ✓ No ___
Hydric Soil Present? Yes ✓ No ___		
Wetland Hydrology Present? Yes ✓ No ___		

Remarks:

Active drainage + grazing

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ______

Water Table Present? Yes ___ No ___ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ______

Wetland Hydrology Present? Yes ✓ No ___

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

Remarks:

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

Sampling Point: ~~03~~ 04

Tree Stratum (Plot size: 30')

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Betula nigra	70	Y	
2.			
3.			
4.			
5.			
6.			
7.			

70 = Total Cover

50% of total cover: 35 20% of total cover: 14

Sapling/Shrub Stratum (Plot size: 15')

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			

____ = Total Cover

50% of total cover: ____ 20% of total cover: ____

Herb Stratum (Plot size: 5')

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Murdannia keisak	90	Y	OBL
2. Polygonum sp. (pink smartweed)	5	N	
3. Cyperus sp.	5	N	
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			

100 = Total Cover

50% of total cover: 50 20% of total cover: 20

Woody Vine Stratum (Plot size: 30')

Woody Vine Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			

____ = Total Cover

50% of total cover: ____ 20% of total cover: ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

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

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No ____

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

SOIL

Sampling Point: ~~03~~ 04

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 4/1	95	7.5YR 4/6	5	C	PL		

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

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

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

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

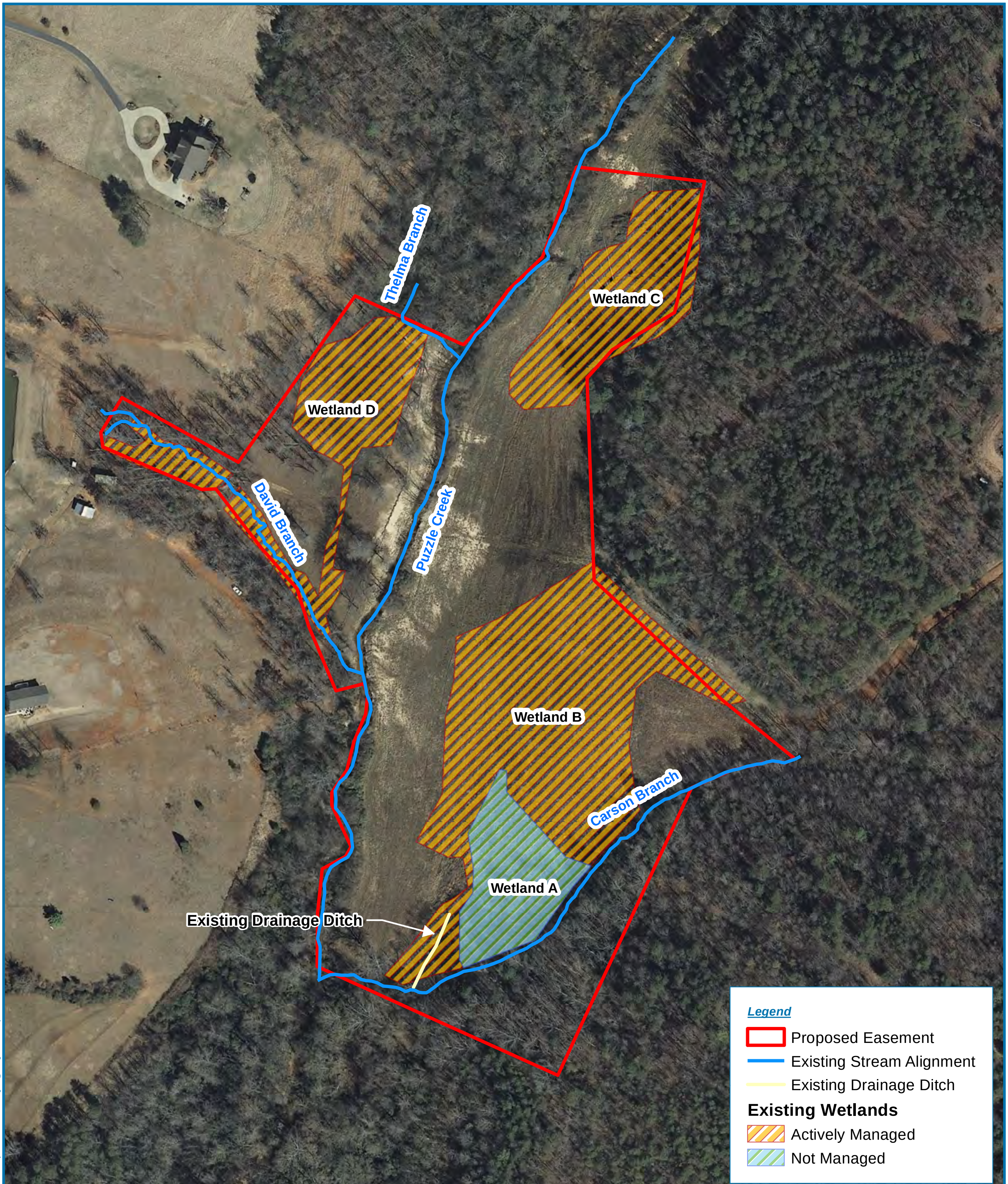
Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks:



N
W E
S
0 100 200
Feet

FIGURE 7

Existing Hydrologic Features Map
John Deere Mitigation Site

Rutherford County, NC

Date: 5/11/2017	res
Drawn by: BPB	
Checked by: DPI	

Appendix 7. NC DWR Stream Forms

NCDWR Stream Classification Forms

NC DWQ Stream Identification Form Version 4.11

Date: 11/11/14	**Project/Site:** TD- Carson 1	**Latitude:** 35.343301
Evaluator: JHT	**County:** Rutherford	**Longitude:** -81.831946
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 38	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** *e.g. Quad Name*:

A. Geomorphology (Subtotal = 19)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

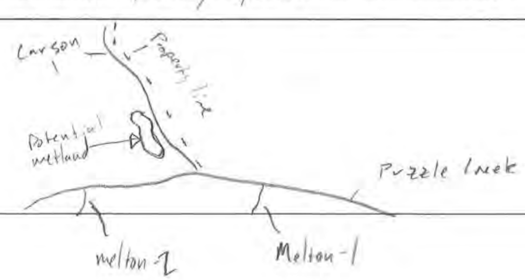
B. Hydrology (Subtotal = 10)	Absent	Weak	Moderate	Strong
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 9)	Absent	Weak	Moderate	Strong
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0 None			

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

Notes: Appears that channel probably pushed to toe of slope

Sketch:



NC DWQ Stream Identification Form Version 4.11

Date: 11/11/14	**Project/Site:** JD - Melton 1	**Latitude:** 35.344913
Evaluator: JHT	**County:** Rutherford	**Longitude:** -81.8633066
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 30.5	**Stream Determination (circle one)** **Ephemeral Intermittent Perennial**	**Other** *e.g. Quad Name*:

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

[a] artificial ditches are not rated; see discussions in manual

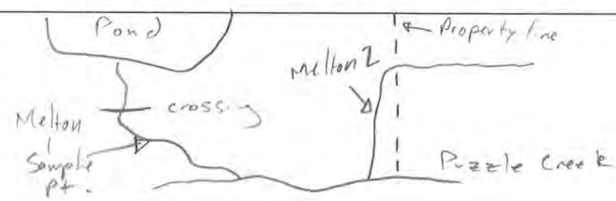
B. Hydrology (Subtotal = 11.5)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 9)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

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

Notes: Highly disturbed, anecdotal evidence of perennial flow and dredging

Sketch:



NC DWQ Stream Identification Form Version 4.11

Date: 11/11/14	**Project/Site:** TD-Melton 2	**Latitude:** 35.345694
Evaluator: JHT	**County:** Rutherford	**Longitude:** -81.832081
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 30	**Stream Determination (circle one)** **Ephemeral Intermittent Perennial**	**Other** *e.g. Quad Name:*

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

[a] artificial ditches are not rated; see discussions in manual

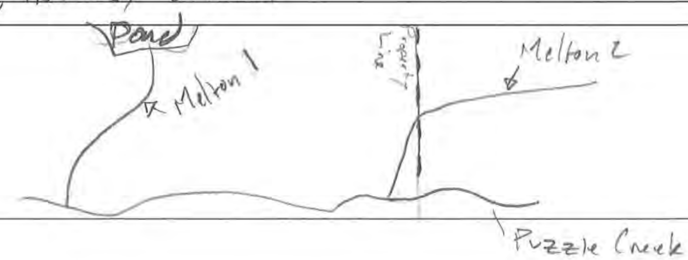
B. Hydrology (Subtotal = 10.5)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 8.5)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	0 1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			None

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

Notes: Highly disturbed; Previously ditched.

Sketch:



Appendix 8. Categorical Exclusion Form and Task 1 ERTR

Appendix D - Categorical Exclusion Supporting Documentation

Categorical Exclusion Form for Division of Mitigation Services
Version 1.4

Project Name:	John Deere Stream and Wetland Mitigation Site
County Name:	Rutherford
DMS Number:	96917
Project Sponsor:	Resource Environmental Solutions, LLC
Project Contact Name:	Daniel Ingram
Project Contact Address:	302 Jefferson Street, Suite 110, Raleigh, NC 27605
Project Contact E-mail:	dingram@res.us
DMS Project Manager:	Paul Wiesner

Project Description

A stream and wetland restoration site in the Puzzle Creek watershed whose objectives are to restore 831 linear feet of existing tributaries (for this project known as David Branch and Thelma Branch) and 11.03 acres of wetland restoration and enhancement. Both streams have been previously relocated or ditched resulting in channels and wetlands with degraded function. A total of 11.7 acres of riparian buffer will be revegetated and placed in a permanent conservation easement to protect the restored stream channels and riparian wetlands.

For Official Use Only

Reviewed By:

10-14-15

Date

Paul Wiesner

DMS Project Manager

Conditional Approved By:

Date

For Division Administrator FHWA

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

Final Approval By:

10-14-15

Date

For Division Administrator FHWA

Part 2: All Projects

Part 2: All Projects Regulation/Question	*Response*
Coastal Zone Management Act (CZMA)	
1. Is the project located in a CAMA county?	☐ Yes ☒ No
2. Does the project involve ground-disturbing activities within a CAMA Area of Environmental Concern (AEC)?	☐ Yes ☐ No ☒ N/A
3. Has a CAMA permit been secured?	☐ Yes ☐ No ☒ N/A
4. Has NCDCM agreed that the project is consistent with the NC Coastal Management Program?	☐ Yes ☐ No ☒ N/A
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)	
1. Is this a “full-delivery” project?	☒ Yes ☐ No
2. Has the zoning/land use of the subject property and adjacent properties ever been designated as commercial or industrial?	☐ Yes ☒ No ☐ N/A
3. As a result of a limited Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☒ No ☐ N/A
4. As a result of a Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☒ No ☐ N/A
5. As a result of a Phase II Site Assessment, are there known or potential hazardous waste sites within the project area?	☐ Yes ☐ No ☒ N/A
6. Is there an approved hazardous mitigation plan?	☐ Yes ☐ No ☒ N/A
National Historic Preservation Act (Section 106)	
1. Are there properties listed on, or eligible for listing on, the National Register of Historic Places in the project area?	☐ Yes ☒ No
2. Does the project affect such properties and does the SHPO/THPO concur?	☐ Yes ☐ No ☒ N/A
3. If the effects are adverse, have they been resolved?	☐ Yes ☐ No ☒ N/A
Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)	
1. Is this a “full-delivery” project?	☒ Yes ☐ No
2. Does the project require the acquisition of real estate?	☒ Yes ☐ No ☐ N/A
3. Was the property acquisition completed prior to the intent to use federal funds?	☐ Yes ☒ No ☐ N/A
4. Has the owner of the property been informed: * prior to making an offer that the agency does not have condemnation authority; and * what the fair market value is believed to be?	☒ Yes ☐ No ☐ N/A

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

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

John Deere Stream and Wetland Mitigation Site

Rutherford County, North Carolina

Project No. 96917

ENVIRONMENTAL RESOURCES TECHNICAL REPORT

Prepared for:

North Carolina Department of Environment and Natural Resources
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

September 2015

Prepared by:

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1 Introduction

1.1 Restoration Project Description

The John Deere Stream and Wetland Restoration Site (JDS) is located approximately 1.2 miles southeast of the City of Bostic, N.C. in Rutherford County (Figure 7.1). The Site lies within the Broad River Watershed (N.C. Division of Water Quality [NCDWQ]; now Division of Water Resources [NCDWR]) sub-basin 03-08-02 and local HUC 03050105070050. The JDS is bisected by Puzzle Creek, which drains to the Second Broad River approximately 1.1 miles downstream of the project. Puzzle Creek has been assigned a WS-V water quality classification (NCDWQ 2013). The JDS is split into an “east” and “west” side, with Puzzle Creek being the boundary between the two areas.

East Side - The eastern side of the JDS project consists of one unnamed reach referred to as Carson Branch for the purposes of this proposal and adjacent historical wetlands. The east side shows signs of manipulation through stream re-location, draining of wetlands with tiles, along with plowing and cultivation of historic wetlands. Streams and wetlands within this area are highly degraded. Based on field observation, 100% of Carson Branch included in this proposal is perennial, having received a score of 38 on the NCDWR Stream Classification form (Table 2; Appendix C; Stream Form “Carson-1”). The channel is considered to be a G-Type. The Carson Branch drainage area is approximately 110 acres (0.17 mi.^{2}.

Carson Branch is a stream that was previously relocated and straightened to facilitate and maximize agricultural production and drain the adjoining field (Appendix A, Photos 2 and 3). The majority of Carson Branch is located along the toe of the slope and has limited vegetation along the right-descending bank. Historical land use practices within the reach and in the watershed upstream of the site have resulted in a highly degraded system. Carson Branch is proposed for restoration. A description of the proposed development of this reach and adjacent wetlands are outlined in Section 5.3 of this proposal. Adjacent to Carson Branch is a historic wetland that has been manipulated extensively through drainage, vegetation removal, and cultivation. A majority of the area is being proposed for wetland re-establishment, with one small area of potential jurisdiction being proposed for wetland re-habilitation.

West Side - The portion of the JDS on the west side of Puzzle Creek consists of two unnamed reaches referred to as David Branch and Thelma Branch and adjacent historical wetlands (Appendix A, Photos 3-6). Both streams have been previously manipulated through re-location and ditching resulting in streams and wetlands with degraded function. David Branch has been straightened and vegetation has been removed to facilitate draining of the adjacent bottomland. The original alignment of Thelma Branch flowed through the floodplain of the proposed site, joining David Branch near its confluence with Puzzle Creek; however, Thelma Branch has been turned into Puzzle Creek near the northern end of the property boundary and proposed easement. Currently, the area is being seasonally grazed with livestock. Restoration of both reaches is required in order to restore hydrology to adjacent wetlands. However, due to the limited number of warmwater SMUs requested in this RFP, David Branch will be restored, but no SMUs will be requested.

Based on field observation 100% of David Branch included in this proposal is perennial, having received a score of 30.5 on the NCDWR Stream Classification form (Table 2; Appendix C; Stream Form “Melton-1”). The channel is considered to be a G-type. The drainage area for David Branch is 57 acres (0.09 mi.^{2}). Adjacent to David Branch are portions of historic wetland features that were ditched to maximize agricultural potential including seasonal grazing of livestock. These historic wetlands are being proposed for wetland re-establishment.

Riparian Wetlands - As described above, channel relocation, wetland draining, and agricultural use has resulted in highly degraded wetland function. The JDS offers a total ecosystem restoration opportunity in which the degraded wetlands adjacent to the three tributaries to Puzzle Creek will be restored to improve water quality (Appendix A, Photo 7 and 8).

Prior to performing the wetland evaluation, Natural Resource Conservation Service (NRCS) soils maps and U.S. Geological Survey (USGS) topographic maps were reviewed. The field investigation was performed on November 11, 2014. Hand-turned soil auger borings were advanced throughout the project study area (Appendix D). Hydric soil status is based upon the NRCS Field Indicators of Hydric Soils in the Unities States - A Guide for Identifying and Delineating Hydric Soils (Version 7.0, 2010).

The wetland study area included approximately 10 acres within the floodplain of Puzzle Creek and is comprised of an agricultural field to the east and a pasture to the west. The agricultural field shows evidence of being highly manipulated by past tillage and farming applications. The area west of Puzzle Creek shows evidence of ditching and filling. Based on existing soil conditions, two soil units were created:

- Soil Unit 1 – Hydric, relatively undisturbed.
- Soil Unit 2 – Buried hydric soil with overburden soil material that has developed enough indicators to classify as hydric.

Soil Unit 1 - Hydric Soil. Soils in this area generally had typical diagnostic soil horizons and met hydric soil indicator F3;

F3 Depleted Matrix. A layer that has a depleted matrix with 60 percent or more chroma of 2 or less and that has a minimum thickness of either:

a. 5 cm (2 inches) if the 5 cm is entirely within the upper 15 cm (6 inches) of the soil, or
b. 15 cm (6 inches), starting within 25 cm (10 inches) of the soil surface.

This soil unit had a clay loam textured surface horizon with many oxidized rhizospheres. The subsurface textures generally were clay loam that graded to sandy loam, gleyed, with a matrix color of chroma 2 or less and common to many concentrations.

Soil Unit 2. Soils within this unit exhibited evidence of human manipulation. The surface soil typically had a clay or clay loam textured horizon underlain by either loamy sand, sandy loam or loam horizon above the buried hydric layer. Buried soil horizons ranged from 18 to 24 inches below the soil surface.

1.2 Restoration Project Goals and Objectives

The goal of the JDS is to restore ecological function to the existing stream and riparian corridor by returning the existing streams to a stable condition. This will be accomplished by regrading the floodplain topography in order to remove surface drainage features and restore wetland micro topography, excavation of overburden on a portion of the site, off-line channel construction to restore streams back to their historical alignments through the wetlands, and planting with native riparian vegetation. Benefits to be accrued from these activities include improved water quality and terrestrial and aquatic habitat. Wetland hydrology will be restored by the removal of buried agricultural drain tiles and reconnection of the stream to the floodplain.

The following goals are established to guide stream restoration efforts:

a. Improve water quality within the restored channel reaches and downstream watercourses through:
    - reducing sediment loads by stabilizing existing stream banks and altering stream channel dimension, pattern and profile
    - reducing nutrient loads from adjacent agricultural fields by reestablishing a vegetated riparian buffer and restoring riparian wetlands
    - increasing dissolved oxygen levels by including in-stream structures to enhance aquatic habitat complexity and water turbulence

b. Improve flood flow attenuation on-site and downstream through:
    - raising the bed or creating bankfull benches to allow for overbank flows every 1-2 years
    - improving the connection to the active floodplain by raising the bed elevation or constructing a new floodplain bench

c. Improve ecological processes
    - Reduce maximum water temperatures by reestablishing riparian vegetation that will provide shade
    - Improve aquatic habitat complexity by restoring stable riffle/pool features; restore riparian wetlands to provide habitat for amphibians and reptiles
    - Improve terrestrial wildlife habitat by creating a riparian buffer composed of native plant species
    - Improve aquatic habitat and function by establishing a tree canopy that will provide large woody debris and leaf-packs for aquatic life
    - Restore a native riparian plant community by removing non-native invasive plants and planting riparian species native to the area

The following objectives are proposed for accomplishing project goals:

a. Provide an estimated 900 stream mitigation units (SMUs) through Priority I restoration of approximately 831 linear feet of existing stream.
b. Provide an estimated 10.98 wetland mitigation units (WMUs) by re-establishing 10.9 acres of riparian wetland and rehabilitating 0.08 acres of riparian wetland
c. Restore stable channel morphology and proper sediment transport capacity.
d. Create and improve stream bed form and improve aquatic and benthic macroinvertebrate habitat.
e. Construct a floodplain bench that is accessible at the proposed bankfull channel elevation.
f. Improve channel and stream bank stabilization by integrating in-stream structures and native bank vegetation.
g. Provide approximately 11.7 acres of riparian buffer restoration by establishing a native forested and herbaceous riparian buffer plant community with a minimum width of 30 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.

1.3 Qualifications of Investigators

Wolf Creek Engineering and Equinox Environmental Consultation and Design, Inc. (Equinox) have the specific qualifications based on education, training, and experience to assess the nature, history, and setting of the subject property. This analysis has been performed in accordance with accepted practices and applicable requirements set forth by the Federal Highway Administration and the North Carolina Division of Mitigation Services. The following investigators are responsible for the completion of this Environmental Resources Technical Report (ERTR):

Grant Ginn, Professional Engineer, President of Wolf Creek Engineering
Mr. Ginn has over twenty years of experience in the hydrologic and hydraulic design of streams, wetlands, bridges, and other transportation and industrial facilities. Mr. Ginn's environmental design responsibilities include stream restoration and wetland mitigation design. As a part of the analysis and design of environmental sites he performs natural channel design, sediment transport analysis, water budget analysis, stream classification, detention basin design, construction plan preparation, and construction management. Mr. Ginn has a Bachelor of Science in Civil Engineering and is trained in Rosgen stream classification and field analysis methods and has extensive experience implementing these practices in a variety of geomorphic settings. Mr. Ginn has experience in permitting projects through the Corps of Engineers, NCDOT, SCDOT, and various state water quality agencies in Tennessee, Georgia, South Carolina, Virginia, Louisiana, Florida, and North Carolina.

Throughout his career, Mr. Ginn has had to deal with a variety of project complexities and constraints. Included among these are, FEMA No-rise certification, FEMA floodmap revisions, BMP's, developing watersheds, historical resource issues, adjacent property constraints, unique soil conditions, various regulatory constraints, aesthetic concerns, public education and consent, fully urbanized watersheds, livestock management issues, unique backwater flow conditions, limited access, and high-use/high-visibility project settings.

Steve Melton, Field Biologist, Vice President of Equinox
Mr. Melton holds an Associate's degree in Wildlife Management and a Bachelor of Science degree in Environmental Health. Mr. Melton has 14 years of experience in stream and wetland resource investigations and is trained in Rosgen's Fluvial Geomorphology Levels I, II, and III and in stream delineation by NCSU. Mr. Melton's background, training, and extensive experience in all types of field conditions gives him a strong practical understanding of aquatic ecosystems, wildlife habitats, environmental monitoring, and natural resource protection. Mr. Melton is experienced in stream morphology, intermittent and perennial stream identification, watershed analysis, aerial photographic analysis, natural resource inventories and habitat management.

Hunter Terrell, Aquatic Resource and GIS Specialist
Mr. Terrell has degrees in Environmental Studies and Geography. He has 8 years of experience in delineation, assessment, and management of aquatic resources as well as fisheries, stream and wetland resource investigations and management. He has extensive experience in the collection and analysis of data associated with terrestrial and aquatic habitats, stream and wetland mitigation monitoring projects, intermittent and perennial stream classifications, and wetland delineations. He will be responsible for coordinating the sampling design, collection, management, and analysis of data associated with this project. Hunter will be primarily responsible for the preparation of the annual site assessment, annual monitoring reports, plant warranty inspection reports, and closeout reports. He will apply his knowledge of EEP's report templates to ensure that all required reports are prepared using the most recent report template versions.

Owen Carson, Plant Ecologist
Mr. Carson Owen Bachelor's Degree in Environmental Science with a Concentration in Plant Ecology and a Minor in Geology from Brevard College. He is trained in the identification of plant communities, Forest Health Monitoring and Forest Inventory and Analysis, as well as in Carolina Vegetation Survey Phase I and II Vegetation Plot Monitoring. Owen is also trained in wetlands delineation and NC Surface Water Identification. Furthermore, he is qualified to conduct Phase I Environmental Site Assessments and Baseline Documentation Reports. Since 2012 he has been certified as an Associate Ecologist with the Ecological Society of America, of which he is an active member. Owen is a NC Certified Pesticide Applicator, and assists in the coordination of volunteer education for invasive exotic plant research, monitoring, and control.

Jim Borawa, Environmental Scientist
Jim has 34 years of experience in fisheries and stream resources investigations, aquatic habitat assessment, watershed management and planning. As supervisor of NCWRC's Watershed Enhancement Group from 2002 - 2009, Jim collaborated extensively with DMS on stream mitigation activities, overseeing the Wildlife Commission's design, installation and reporting on stream restoration projects. Jim has strong technical analysis and reporting skills and will be utilized in ensuring the deliverable reports are of the highest quality. He also has experience with the Interagency Review Team mitigation project closeout process. He holds a degrees in Zoology (M.S.; North Carolina State University) and Fisheries Biology (B.S.; University of Alaska – Fairbanks) and has training in stream geomorphology.

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2 Project Site Location

2.1 Directions to the Project Site

The JDS is located in central Rutherford County approximately 1.2 miles south of Bostic, N.C. (Figure 7.1). From Raleigh, proceed west on I-40 towards Greensboro. Follow I-85 south toward Charlotte. Exit I-85 onto US 74 (Exit 10B) west towards Shelby. Near Forest City take Exit 184 for Old Caroleen Road (SR 1901). Turn right onto Old Caroleen Road (SR 1901), then take the first right onto Riverside Drive (SR 1814). Follow Riverside Drive until it intersects with East Main Street (Business US 74). Turn right onto East Main Street, then take the first left onto Bostic Sunshine Highway (SR 1006). Travel approximately 1.4 miles; then turn right Wood Creek Lane (Private); the project area is at the end of the road. Coordinates for the site are as follows: 35.344240 N, -81.831507 W (WGS84).

2.2 USGS Hydrologic Unit Code and NCDWQ River Basin Designations

The JDS lies within the Broad River Basin, NCDWR sub-basin 03-08-02 and USGS 14-digit HUC 03050105070050. The site is bisected by Puzzle Creek, which drains to the Second Broad River approximately 1.1 miles downstream of the project. Puzzle Creek has been assigned a Water Supply-V classification (WS-V; NCDWQ 2013). The JDS site is split into "east" and "west" portions, with Puzzle Creek being the boundary between the two areas. The section of Puzzle Creek between the east and west sides, although not included as part of this proposal, will be protected by a conservation easement.

Waters classified as WS-V are protected as water supplies. They are generally upstream and draining to Class WS-IV waters or waters used by industry to supply their employees with drinking water or as waters formerly used as a water supply. 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).

2.3 Study Area

The JDS site lies in the Southern Outer Piedmont sub-region of the Piedmont ecoregion (Griffith et al. 2002). This ecoregion is comprised of gneiss, schist, and granite rock types, and the rocks are more intensely deformed and metamorphosed than the geologic materials in most Piedmont regions. Loam and sandy loam soils are typical in this region. They are usually covered with deep saprolite and mostly red, clayey subsoils.

Elevations at the JDS headwaters range from 982 feet on the west side and 970 feet on the east side to 806 feet at the confluence with Puzzle Creek.

The JDS lies within Rutherford County, which receives moderate rainfall, having an annual precipitation averaging approximately 51 inches. The dominant soil found on site is Chewacla Loam (NRCS 2014). Poor agricultural practices have resulted in valley slope erosion of existing soils. This region has lower elevations, less relief, and less precipitation than other Piedmont regions and tends to have more cropland than those Inner Piedmont regions. All stream beds on site are dominated by sand, gravel, and silt materials eroded from the riparian and upland areas.

Drainage area for the three project streams (0.32 $mi.^2$, 202 acres); Carson Branch (0.17 $mi.^2$, 110 acres), Thelma Branch (0.09 $mi.^2$, 57 acres), and David Branch (0.06 $mi.^2$, 35 acres). Land use within the watershed consists of 48% forest, 8% low-density residential, and 40% agricultural land. Impervious area covers less than 1% of the total watershed.

The JDS encompasses approximately 11.7 acres of actively managed floodplain. The east side consists of cropland while the west side is actively grazed during summer months. Grazing livestock have historically had access to most stream reaches on the west side of the project. On the east side of the project, active cropland management have led to unstable banks as well as drained wetlands. The lack of deep-rooted vegetation and unstable channel characteristics appears to have contributed to the degradation of stream banks on both sides of the project (Figure 7.2).

3 Waters of the United States

3.1 Site Evaluations Methodology

A desktop analysis and field investigation were conducted to evaluate the JDS. Prior to field investigation, 2010 National Wetland Inventory (NWI) data, USGS topographic maps, aerial photographs, and soil surveys were reviewed in GIS to gather information about the JDS study area.

The NWI data were reviewed to determine whether or not wetlands may occur on-site. A section of the USGS 7.5 Minute Topographic Map of the Forest City, North Carolina Quadrangle containing the JDS was examined to identify natural features such as elevation contours and water features as well as anthropogenic features such as roads and structures. Thirteen aerial photos dated 1947, 1950, 1961, 1963, 1976, 1993, 1998, 2005, 2006, 2008, 2009, 2010, and 2012 were provided by Environmental Data Resources (EDR) (Section 7.3) and were reviewed by Equinox to identify past uses on the site and surrounding properties. Rutherford County soil surveys downloaded from the NRCS website were studied to ascertain the type and distribution of soils that occur within the John Deere site.

Prior to the desktop analysis, field investigations were conducted by Hunter Terrell, Aquatic Resource Specialist, on November 11th, 2014 to assess the physical characteristics and jurisdictional status of streams using the *NCDWQ Methodology for Identification of Intermittent and Perennial Streams and their Origins* (NCDWQ 2010). Stream scoring was conducted more than 48 hours after rainfall to ensure baseflow conditions. Cross sections were surveyed by Equinox using total station survey equipment to determine the profile of Restoration Site streams.

Potential wetlands on the JDS were evaluated using the USACE wetland delineation methodology (USACE 1987). In addition, an on-site Reconnaissance Hydric Soil Investigation was conducted by a licensed soil scientist. Hydric soil status was based upon the Version 7.0 of the NRCS guide for identifying and delineating hydric soils (NRCS 2010).

3.2 Jurisdictional Wetlands and Streams

A survey of the existing streams and wetlands was conducted to determine the presence of jurisdictional waters on the JDS. For wetlands, a routine Level II wetland determination was performed (USACE 1987). Streams were determined based on the NCDWR stream determination methodology (NCDWQ 2010). Carson Branch, David Branch, and Thelma Branch are considered jurisdictional streams within the project site boundaries (Figure 7.2) by having a score of 30.0 or higher using the NCDWR rating methodology. Potential jurisdictional wetlands occur on the east and west sides of the project. The approximate acreage of existing wetlands is 6.28 acres. Of that, only 0.75 acres are not under active management. The area not under active management is considered a forested wetland dominated by sweet gum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), and tulip tree (*Liriodendron tulipifera*), and river birch (*Betula nigra*). Vegetation in areas under active management vary depending on the length of time since it was last disturbed (tilled), ranging from bare earth to a dense herbaceous layer. Refer to Appendix B for NCDWQ Stream Classification Forms and Appendix C for USACE Wetland Determination Forms.

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4 Environmental Screening and Documentation

4.1 Federally Protected Species

The purpose of the Endangered Species Act of 1973 is to "provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved" and "to provide a program for the conservation of such endangered and threatened species." Endangered species are defined as "any species which is in danger of extinction throughout all or a significant portion of its range…" whereas the term threatened is defined as "any species which is likely to become endangered within a foreseeable future throughout all or a significant portion of its range."

4.1.1 Site Evaluation Methodology

A desktop analysis and field investigation were conducted to evaluate federally protected species potentially occurring on the John Deere Restoration Site. The U.S. Fish & Wildlife Service (USFWS) Information for Planning and Conservation (IPAC) online tool was consulted to determine any resources managed or regulated by the USFWS that may be affected by project-related activities at the JDS; the tool queries available databases of endangered species, migratory birds, wildlife refuges, and wetlands. In addition to the USFWS IPAC tool, the October 2014 North Carolina Natural Heritage Program (NCNHP 2011) database of natural heritage element occurrences was also reviewed in GIS to identify rare species or unique habitats on-site, especially those listed in the USFWS database.

Natural communities, wildlife, species habitat, cultural resources, land use, and other features of interest were documented in the field by Owen Carson, Plant Ecologist, during a field investigation conducted on July 16th, 2015.

4.1.2 Threatened and Endangered Species

According to the USFWS IPAC database review tool (USFWS 2015), six Federally listed species may occur in proximity to the JDS (Table 1).

Table 1 Threatened and Endangered Species List for the John Deere Site

Common Name	Scientific name	Federal Status	Record Status
Flowering Plants:			
Dwarf-Flowered heartleaf	*Hexastylis naniflora*	T	Current
Small whorled pogonia	*Isotria medeoloides*	T	Current
White irisette	*Sisyrinchium dichotomum*	E	Current
Lichens:			
Rock gnome lichen	*Gymnoderma lineare*	E	Current
Mammals:			
Northern long-eared bat	*Myotis septentrionalis*	T	Current
Indiana bat	*Myotis sodalis*	E	Current

Definitions of Federal Status Codes: T = threatened, E = endangered.

4.1.2.1 Species Description

Dwarf-flowered heartleaf
Dwarf-flowered heartleaf is a low-growing evergreen perennial plant. It has heart-shape leaves that are four to six centimeters long, dark green and leathery, supported by long, thin-leaf stems connecting it to an underground stem. The jug-shaped flowers are usually beige to dark brown or purple and appear from mid-March to early June. The flowers are small and inconspicuous and are found near the base of the leaf stems, often buried beneath the leaf litter.

Dwarf-flowered heartleaf grows in acidic soils along bluffs and adjacent slopes, in boggy areas next to streams and creek heads, and along the slopes of nearby hillsides and ravines in the upper piedmont region of Western North Carolina and upstate South Carolina.

The greatest threat to dwarf-flowered heartleaf is conversion of habitat to agricultural, residential, commercial, and industrial uses. Habitat may also be eliminated through the construction of reservoirs, which flood its habitat.

Small whorled pogonia
The small whorled pogonia is a perennial orchid with long, pubescent roots and a smooth, hollow stem 9.5 to 25 centimeters tall terminating in a whorl of 5 or 6 light green, elliptical leaves that are somewhat pointed and measure up to 8 by 4 cm. A flower, or occasionally two flowers, is produced at the top of the stem. Small whorled pogonia's nearest relative is *I. verticillata*, which is similar looking but can be distinguished by its purplish stem and by differences in the flower structure. *I. verticillata* is much more common and widespread than the small-whorled pogonia. When not in flower, young plants of Indian cucumber-root (*Medeola virginiana*) also resemble small whorled pogonia, however, the hollow stout stem of *Isotria* will separate it from the genus *Medeola*, which has a solid, more slender stem. Flowering occurs from about mid-May to mid-June.

In North Carolina, this species is typically found in montane oak-hickory or acidic cove forests. The understory structure and composition of occupied sites can be quite variable, ranging from dense rhododendron thickets to open/sparse shrub and sub-shrub strata. Herbaceous cover tends to be sparse, however at least two sites are characterized by fairly dense stands of New York fern (*Thelypteris noveboracensis*). Sites currently or historically known to support this species range from 2,000 to 4,000 feet in elevation. The species does not appear to exhibit strong affinities for a particular aspect, soil type, or underlying geologic substrate. Habitat manipulation experiments in New England indicate that the species responds favorably to canopy openings, and may therefore be light-limited, however this remains to be observed in the southern Blue Ridge portion of the species' range.

White irisette
White irisette is a perennial herb that lives in areas with partial sun. It generally grows from 10 - 16 inches (25.4 – 40.6 centimeters) tall and has winged stems. An individual White irisette plant is typically defined as a cluster of stems arising from fibrous roots. There may be 10 or more stems on one plant. White irisette flowers from late May through July. The seeds are very small and black and three to six seeds are contained in each capsule.

The species is found on mid-elevation slopes, characterized by open, dry to moderate-moisture oak hickory forests. White irisette usually grows in shallow soils on regularly disturbed sites (such as woodland edges and roadsides) and over rocky, steep terrain. The species is known from Henderson, Polk and Rutherford Counties, North Carolina; and Greenville County, South Carolina.

White irisette is threatened by many human caused disturbances, such as residential development, road construction, and possibly herbicide use. It is also indirectly affected by the extirpation of elk and bison and possibly the suppression of fire. The elimination or suppression of these natural disturbances allows vegetative succession to occur, often accompanied by exotic invasive plants that out compete this native species.

Rock gnome lichen

The rock gnome lichen of the reindeer moss family grows in dense colonies of narrow, strap-like lobes, called squamules. The squamules are blue-gray on the upper surface and usually shiny white on the lower surface. Near the base of the lobe, the color darkens to black. The slightly branched squamules are less than 0.04 inch (1 mm) across near the tip, and are usually 0.4-0.8 inch (1-2 cm) long. The squamules grow parallel to the substrate, but the tips curl up almost perpendicularly. The small fruiting bodies (apothecia) occur at the tips of the squamules from July-September. They are colored black or brown, and are no larger than 1 mm across. The fruiting bodies may be sessile, or they may be carried on short stalks (podetia) less than 0.1 in. height. The fruiting bodies are shaped like cylinders. Similar-looking lichens in the genus *Cladonia* do not blacken near the base and have brown or red fruiting bodies.

The rock gnome lichen only grows in areas with a great deal of humidity, such as high elevations above 5,000 feet where there is often fog, or in deep river gorges at lower elevations. Habitat is restricted to vertical rock faces occasionally exposed to seepage water. It does well on moist, generally open sites with northern exposures but needs partial canopy coverage on southern or western aspect because it is intolerant of high-intensity solar radiation. High-elevation coniferous forests, red spruce (*Picea ruben*) and Fraser fir (*Abies fraseri*), usually on rocky outcrop or cliff habitat.

Rock gnome lichen is endemic to the southern mountains of Tennessee, North Carolina, South Carolina, and Georgia. Only 35 populations are known to exist and most are 1 square meter or less in size. It is the only member of its genus in North America. Populations have been reported in Ashe, Avery, Buncombe, Graham, Haywood, Jackson, Macon, Mitchell, Rutherford, Swain, Transylvania, and Yancey counties.

Indiana bat

Indiana bats are quite small, weighing only one-quarter of an ounce although in flight they have a wingspan of 9 to 11 inches. Their fur is dark-brown to black. *Myotis* means “mouse eared” and refers to the relatively small, mouse-like ears of the bats in this group. *Sodalis* is the Latin word for “companion.” The Indiana bat is a very social species; large numbers cluster together during hibernation.

Indiana bats hibernate during winter in caves or, occasionally, in abandoned mines. For hibernation, they require cool, humid caves with stable temperatures, under 50° F but above freezing. After hibernation, Indiana bats migrate to their summer habitat in wooded areas where they usually roost under loose tree bark on dead or dying trees. During summer, males roost alone or in small groups, while females roost in larger groups of up to 100 bats or more. Indiana bats eat a variety of flying insects found along rivers or lakes and in uplands. Indiana bats also forage in or along the edges of forested areas.

Indiana bats are found over most of the eastern half of the United States. Almost half of all Indiana bats hibernate in caves in southern Indiana. In 2005, other states known to support populations of over 40,000 individuals included Missouri, Kentucky, Illinois, and New York. Other states within the current range of the Indiana bat include Alabama, Arkansas, Connecticut, Iowa, Maryland, Michigan, New Jersey, North Carolina, Ohio, Oklahoma, Pennsylvania, Tennessee, Vermont, Virginia, and West Virginia.

Northern long-eared bat

The northern long-eared bat is a medium-sized bat about 3 to 3.7 inches in length but with a wingspan of 9 to 10 inches. As its name suggests, this bat is distinguished by its long ears, particularly as compared to other bats in its genus *Myotis*, which are actually bats noted for their small ears (*Myotis* means "mouse-eared"). The northern long-eared bat is found across much of the eastern and north central United States and all Canadian provinces from the Atlantic coast west to the southern Northwest Territories and eastern British Columbia.

Northern long-eared bats spend winter hibernating in caves and mines, called hibernacula. They use areas in various sized caves or mines with constant temperatures, high humidity, and no air currents. Within hibernacula, surveyors find them hibernating most often in small crevices or cracks, often with only the nose and ears visible. During the summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities or in crevices of both live trees and snags (dead trees). Males and non-reproductive females may also roost in cooler places, like caves and mines. Northern long-eared bats seem to be flexible in selecting roosts, choosing roost trees based on suitability to retain bark or provide cavities or crevices. This bat has also been found rarely roosting in structures, like barns and sheds.

The northern long-eared bat's range includes much of the eastern and north central United States, and all Canadian provinces from the Atlantic Ocean west to the southern Yukon Territory and eastern British Columbia. The species' range includes the following 37 States and the District of Columbia: Alabama, Arkansas, Connecticut, Delaware, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, West Virginia, Wisconsin, and Wyoming.

White-nose syndrome, a fungal disease (*Pseudogymnoascus destructans*) known to affect bats, is currently the predominant threat to this bat, especially throughout the Northeast where the species has declined by up to 99 percent from pre-white-nose syndrome levels at many hibernation sites. Although the disease has not yet spread throughout the northern long-eared bat's entire range (white-nose syndrome is currently found in at least 25 of 37 states where the northern long-eared bat occurs), it continues to spread. Experts expect that where it spreads, it will have the same impact as seen in the Northeast.

4.1.2.2 Biological Conclusion

Species and species habitat listed in the USFWS database were inspected during the field investigation to determine whether or not they occur at the John Deere Site. Potential impacts to species and species habitat off site, downstream, and within the vicinity of the project were also considered. Individual biological conclusions per species are detailed below:

Dwarf-flowered heartleaf: Dwarf-flowered heartleaf grows in acidic soils along bluffs and adjacent slopes, in boggy areas next to streams and creek heads, and along the slopes of nearby hillsides and ravines. Although these habitats do exist at the margins of the project area, the area of disturbance for the project is confined to an agricultural field that provides unsuitable habitat for the dwarf-flowered heartleaf. Furthermore, the wooded areas peripheral to the project area, which are in a state of succession from pine plantation to oak-pine and oak-hickory forest types, were surveyed and no populations were found. The biological conclusion for dwarf-flowered heartleaf is "No Effect".

Small whorled pogonia: This species is typically found in montane oak-hickory or acidic cove forests, neither of which are present within the project area. Nevertheless, the successional oak-hickory and oak-pine woods along the perimeter of the project area were surveyed and no populations were found. Therefore the biological conclusion for the small whorled pogonia is "No Effect".

White irisette: This species is found on mid-elevation slopes, characterized by open, dry to moderate-moisture oak hickory forests; it usually grows in shallow soils on regularly disturbed sites (such as woodland edges and roadsides) and over rocky, steep terrain. Roadside and woodland edge habitat exists along the periphery of the project area, but investigation of these habitats yielded no evidence of occurrence. The interior project area is a managed agricultural field and is unsuitable habitat for the species. For the above reasons the biological conclusion for white irisette is "No Effect".

Rock gnome lichen: Rock gnome lichen only grows in areas with a great deal of humidity, such as high elevations above 5,000 feet where there is often fog, or in deep river gorges at lower elevations; its habitat is restricted to vertical rock faces occasionally exposed to seepage water. These habitats and conditions do not occur within the project area or within moderate proximity to the site. Therefore, the biological conclusion for rock gnome lichen is "No Effect".

Indiana bat: The project area does not contain any caves or suitable winter roosting areas. However, a wooded edge forms the perimeter of the project area and would be suitable for foraging Indiana bats; also, certain tree species within the wooded edge could provide suitable habitat for summer roosting. That said, any project activities involving tree cutting of suitable summer roosting tree species would be conducted between October 15 and March 31 as per USFWS guidance. For the above reasons the biological conclusion for the Indiana bat is "No Effect".

Northern long-eared bat: As is the case with the Indiana bat, the project area does not contain any caves or suitable winter roosting areas for the Northern long-eared bat. However, this species is less selective about summer roosting tree species than the Indiana bat, and therefore suitable summer habitat exists on the periphery of the project area as well as in certain interior areas. That said, any project activities involving tree cutting of suitable summer roosting tree species would be conducted between October 1 and March 31 as per USFWS guidance. For the above reasons the biological conclusion for the Northern long-eared bat is "No Effect".

In summation, the biological conclusion for all threatened and endangered species listed in the USFWS database that could be potentially affected by John Deere project activities is "No Effect".

4.1.3 Federal Designated Critical Habitat

Critical habitat is defined by the Endangered Species Act of 1973 as "the specific areas within the geographical area occupied by the species at the time it is listed…which are essential to the conservation of the species and which may require special management considerations or protection…". No critical habitat occurs on or in close proximity to the John Deere Stream Restoration Site, according to the USFWS IPAC tool (USFWS 2015).

Because the database search and field investigation determined that that the biological conclusion for each species is "No Effect," no written concurrence from the USFWS is required.

4.2 Cultural Resources

Several federal laws exist to protect historic and cultural resources. The National Historic Preservation Act of 1966 was established for the preservation of historic properties throughout the United States. The American Indian Religious Freedom Act was passed in 1978 and was developed "to protect and preserve American Indian's inherent right of freedom to believe, express, and exercise the traditional religions…including, but not limited to, site access, the use and possession of sacred objects, and worship through ceremonial and traditional rites." The Antiquities Act of 1906 prohibits excavation or destruction of "objects of historic and scientific interest." The Act requires that an Antiquity Permit be obtained for excavation occurring at any sites containing these objects. The Archaeological Resources Protection Act of 1979 was enacted "…to secure the protection of archaeological resources and sites which are on public lands and Indian lands and to foster increased cooperation and exchange of information between governmental authorities, the professional archaeological community, and private individuals." Executive Order 13007, *Indian Sacred Sites*, orders agencies to "…accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of such sacred sites."

4.2.1 Site Evaluation Methodology

A review of properties listed on the North Carolina National Register of Historic Places maintained by the North Carolina State Historic Preservation Office (NCSHPO 2015) was conducted for the JDS and surrounding areas. No historic properties exist within a 1 mile radius of the project area.

4.2.2 Field Evaluation

In addition to searched databases, a visual assessment of structures or archaeological sites was conducted to evaluate potential cultural resources occurring on-site. A field evaluation was conducted by Owen Carson on July 16th, 2015 to determine the potential for historic architectural resources or archaeological resources on the JDS.

4.2.2.1 Potential for Historic Architectural Resources

No historic structures were observed on the JDS, therefore the proposed restoration project will have no effect on any architectural resources.

4.2.2.2 Potential for Archeological Resources

No archaeological resources were observed on the JDS.

4.2.3 SHPO/THPO Concurrence

Letters were sent to the North Carolina Department of Cultural Resources, State Historic Preservation Office (SHPO), the Eastern Band of Cherokee Indians, Tribal Historic Preservation Office (EBCI-THPO), and the Catawba Indian Nation Tribal Historic Preservation (CIN-THPO) office on July 8th, 2015. The letters described the JDS and requested a review and comment of potential cultural resources occurring within the vicinity of the Site.

The Catawba Indian Nation response dated July 22, 2015 states they "have no immediate concerns with regard to traditional cultural properties, sacred sites or Native American archaeological sites within the boundaries" of the JDS (Appendix E).

As of September 17, 2015, response information from the SHPO and EBCI-THPO have not yet been received.

4.3 Other Compliance Issues

In addition to screening for federally protected species and cultural resources, other compliance issues were screened. The Farmland Protection Policy Act was passed in 1981 to minimize impacts on farmland and increase coordination with state and local programs. Any activities that result in the conversion of farmland must coordinate with the local Natural Resource Conservation Service (NRCS) to identify potential impacts to farmland. The JDS project proposes to convert approximately 11.7 acres of farmland into a forested riparian buffer under a protective conservation easement. Following requirements set forth by the Farmland Protection Policy Act, Form AD-1006 was submitted to the Rutherford County NRCS office on July 8th, 2015. A completed form was returned on September 9, 2015 and indicated the presence of 11.7 acres of prime and unique farmland with no statewide or locally important farmland occurring on the JDS. The completed Form AD-1006 can be viewed in Appendix F.

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 July 8th, 2015 requesting review and comment of possible issues with respect to fish and wildlife resources on the JDS. A response was received on August 10, 2015 stating that the project will not impact wild trout resources or other known significant aquatic or terrestrial resources. Refer to Appendix E to view the response letter from the NCWRC.

5 Constraints Analysis

5.1 Environmental Screening

A search of State, Federal, and Local environmental databases were searched by Environmental Data Resources, Inc. (EDR) on August 6th, 2015 under contract with Equinox. The complete report (EDR 2015), including a list of databases searched and the results of the search, is presented in Appendix G, EDR Regulatory Record Search Report. This environmental assessment is required to aid in determining the environmental risks associated with documented contaminants within a 1 mile radius of the proposed project.

In summary, the project property was not listed in any of the databases included in the environmental search (Appendix G).

In addition to the EDR search, an inspection of the JDS and improvements was conducted during the field evaluation to assess the potential for the occurrence of recognized environmental conditions on the property with particular attention to any obvious use, storage, or generation of hazardous materials. No hazardous substances or petroleum products were observed.

5.2 Utilities and Easements

No utilities are located within the JDS. Additionally, no exclusions are included in the easement.

5.3 Property Ownership and Site Access

The JDS transects two parcels in Rutherford County with the following ownership:

Table 2 Parcel Ownership Information

Owner	Parcel Identification Number (PIN)	Stream Reach
James S. and Rebecca Carson	1559006370100000	Carson Branch on east side of Puzzle Creek
David C. and Thelma Melton	1559145206040000	David Branch and Thelma Branch on west side of Puzzle Creek

Both tracts are accessible from the Bostic Sunshine Highway (SR 1006) via Wood Creek Lane (Private).

5.4 Hydrologic Issues

According to the North Carolina Floodplain Mapping Information System, streams on the JDS lie within the 100 year flood zone (1% annual chance of flooding); however, it does not contain a regulatory floodway (NCFMP 2008). Hydraulic modeling will be required to determine that restoration activities will have no effect on 100-year flood elevations downstream. No hydrologic trespass will be permitted to adjacent properties upstream or downstream of the project.

6 References

American Indian Religious Freedom Act of 1978. Public Law 95-341 (original) and PL 103-344 (added section 1996a). 42 USC 1996-1996a.

Antiquities Act of 1906. Public Law 16 USC 431-433. 16 USC 431-433.

Archaeological Resources Protection Act of 1979. Public Law 96-95, 16 USC 470aa-mm.

Coastal Zone Management Act. 16 USC 1451-1465.

Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended. 42 USC 9601-9675.

Endangered Species Act of 1973. Public Law 93-205, 87 Stat. 884. 16 USC 1531-1543,

EDR (Environmental Data Resources, Inc.) 2015. John Deere EDR Radius Map™ Report with GeoCheck®, Inquiry Number 4375474.2s. Report received via e-mail August 6, 2015. Shelton, Connecticut.

Farmland Protection Policy Act of 1981. Public Law 97-98, Subtitle I of Title XV, Section 1539-1549. 73 USC 4301-4209.

Fish and Wildlife Coordination Act of 1934. Public Law 85-72, 79 Stat. 216. 16 USC 661-667(d).

Griffith, G.E., J.M. Omernik, J.A. Comstock, M.P. Schafale, W.H. McNab, D.R. Lenat, T.F. McPherson, J.B. Glover, and V.B. Shelburne. 2002. Ecoregions of North Carolina and South Carolina. Color poster with map, descriptive text, summary tables, and photographs. U.S. Geological Survey, Reston, Virginia.

Indian Sacred Sites, Executive Order 13007.

Land and Water Conservation Fund Act of 1964, as amended (Section 6(f)). 16 USC 46l14-11

Magnuson-Stevens Fishery Conservation and Management Act (EFH). PL 94-265. 16 USC 1801-1803.

Migratory Bird Treaty Act. 16 USC 703-712.

National Historic Preservation Act of 1966 (as amended Section 106). 16 USC 470. 36 CFR 800, 23 CFR 771, 36 CFR 60, 36 CFR 63.

NCDWQ (North Carolina Division of Water Quality). *Surface Water Classifications*. http://portal.ncdenr.org/web/wq/ps/csu/classifications. Raleigh.

NCDWQ. (North Carolina Division of Water Quality). 2010. Methodology for *Identification of Intermittent and Perennial Streams and Their Origins*. Version 4.11. Raleigh.

NCDWQ (North Carolina Division of Water Quality). 2011. A Guide to Surface Freshwater Classifications in North Carolina. Raleigh. http://portal.ncdenr.org/c/document_library/get_file?p_l_id=1169848&folderId=2209568&name=DLFE-35732.pdf; accessed July 2015.

NCDWQ (North Carolina Division of Water Quality). 2013. North Carolina Water Bodies Listed by River Basin. http://portal.ncdenr.org/web/wq/ps/csu/classifications; accessed June 2015.

NCFMP (North Carolina Floodplain Mapping Program). 2008. National Flood Insurance Program Flood Insurance Rate Map. North Carolina Panel 1559; map number 3710155900J, revised 7/2/2008. Raleigh. http://fris.nc.gov/fris_hardfiles/nc/hardfiles/DFIRM/161/DFIRM_NC_3710155900J.pdf; accessed July 2015.

NCNHP (North Carolina Natural Heritage Program). 2011. Natural Heritage Element Occurrences. January 2011Raleigh.

NCSHPO (North Carolina State Historic Preservation Office). 2015. North Carolina Listings in the National Register of Historic Places as of July 14, 2015. http://www.hpo.ncdcr.gov/NR-PDFs.pdf; accessed August 2015.

NRCS (Natural Resources Conservation Service). 2010. Field Indicators of Hydric Soils in the United States, Version 7.0. L.M. Vasilas, G.W. Hurt, and C.V. Noble editors. U.S. Department of Agriculture NRCS in cooperation with the National Technical Committee for Hydric Soils.

NRCS (Natural Resource Conservation Service). 2014. Web Soil Survey GIS Data. http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm; accessed July 2015.

Uniform Relocation Assistance and Real Property Acquisition Policies Act. 42 USC 4601-4655.

USFWS (United States Fish and Wildlife Service). 2015. Information, Planning, and Conservation (IPAC) Online Screening Tool. https://ecos.fws.gov/ipac/; accessed July 2015.

USACE (U.S. Army Corps of Engineers). 1987. Corps of Engineers Wetlands Delineation Manual. Wetlands Research Program Technical Report Y-87-1. Environmental Laboratory, Vicksburg Experiment Station, Vicksburg, Mississippi.

Wilderness Act. PL 93-622 (Eastern Wilderness Areas Act of 1975), PL 94-557 (North Carolina Wilderness Act of 1984), PL 98-514. 16 USC 1131-1136.

7 Figures

7.1 Vicinity Map

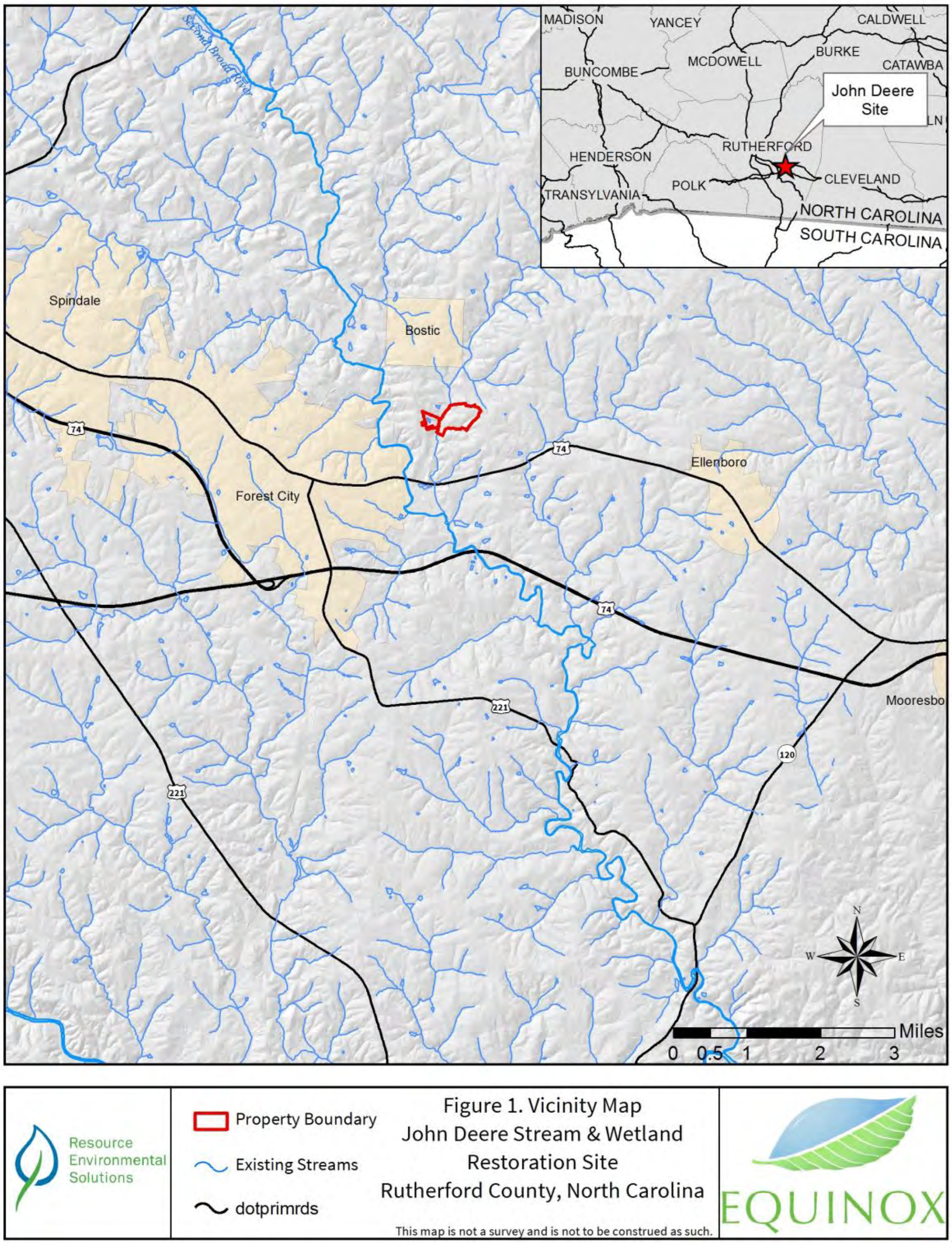
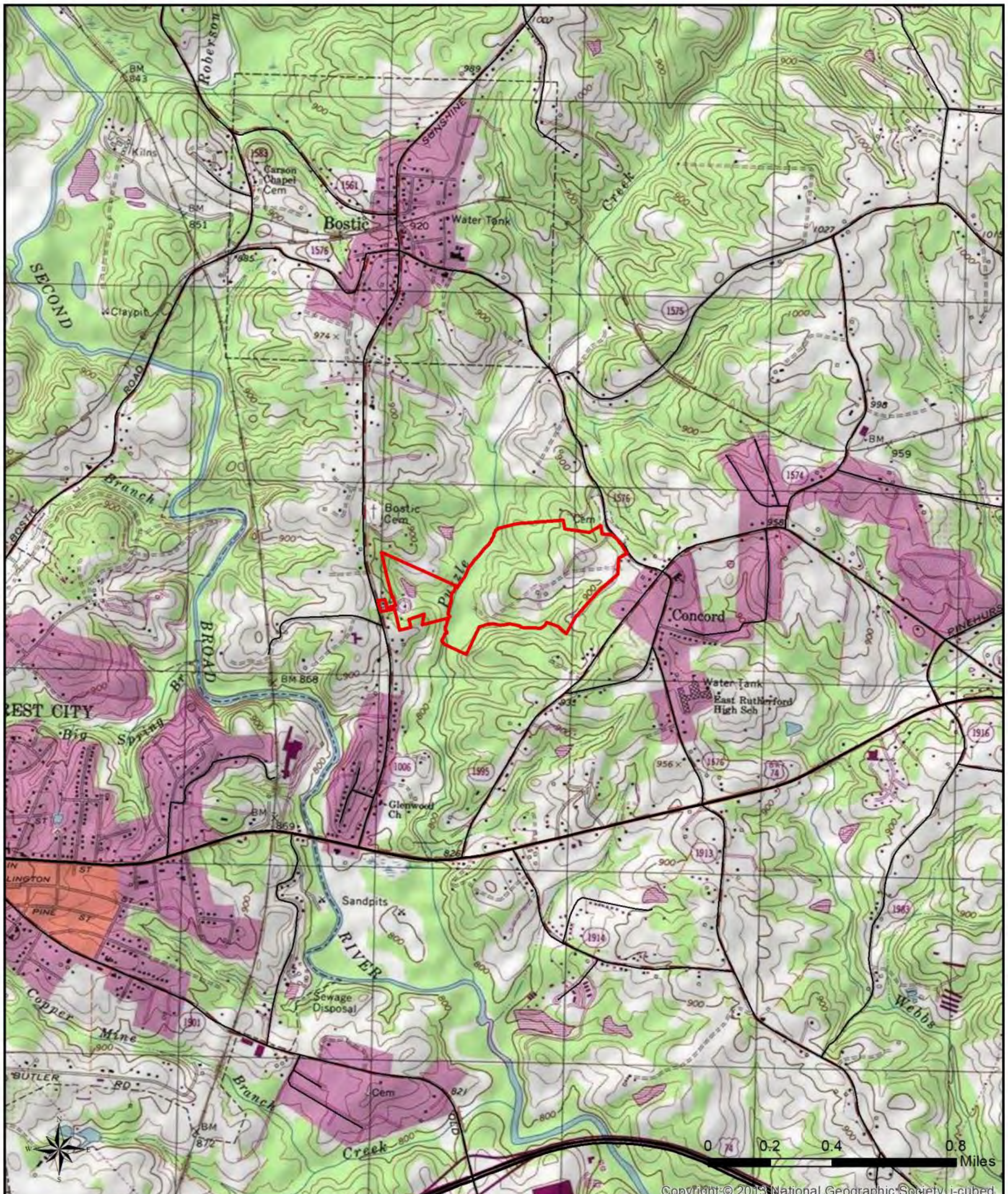


Figure 1. Vicinity Map
John Deere Stream & Wetland Restoration Site
Rutherford County, North Carolina
This map is not a survey and is not to be construed as such.

7.2 Study Area Maps



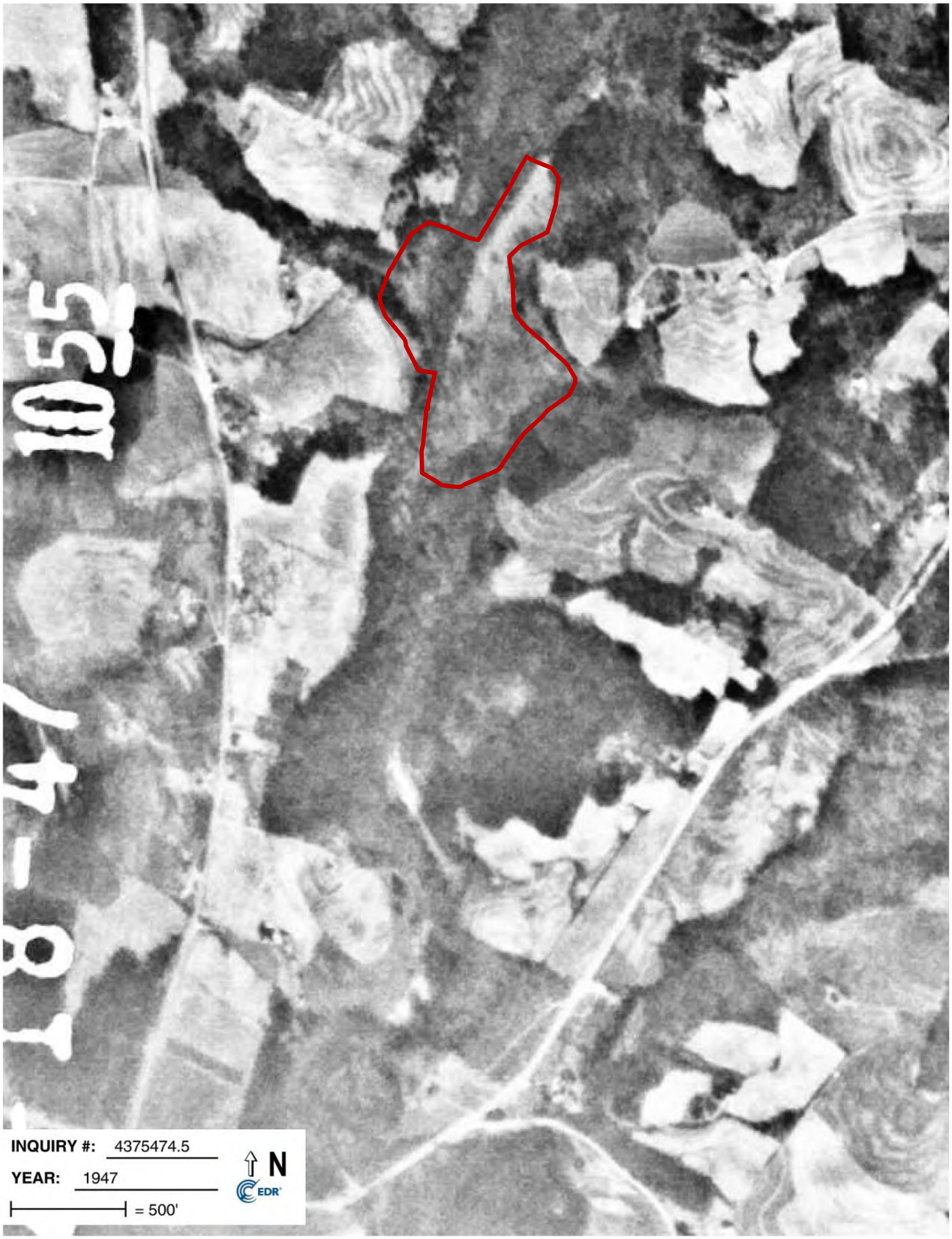
Resource Environmental Solutions

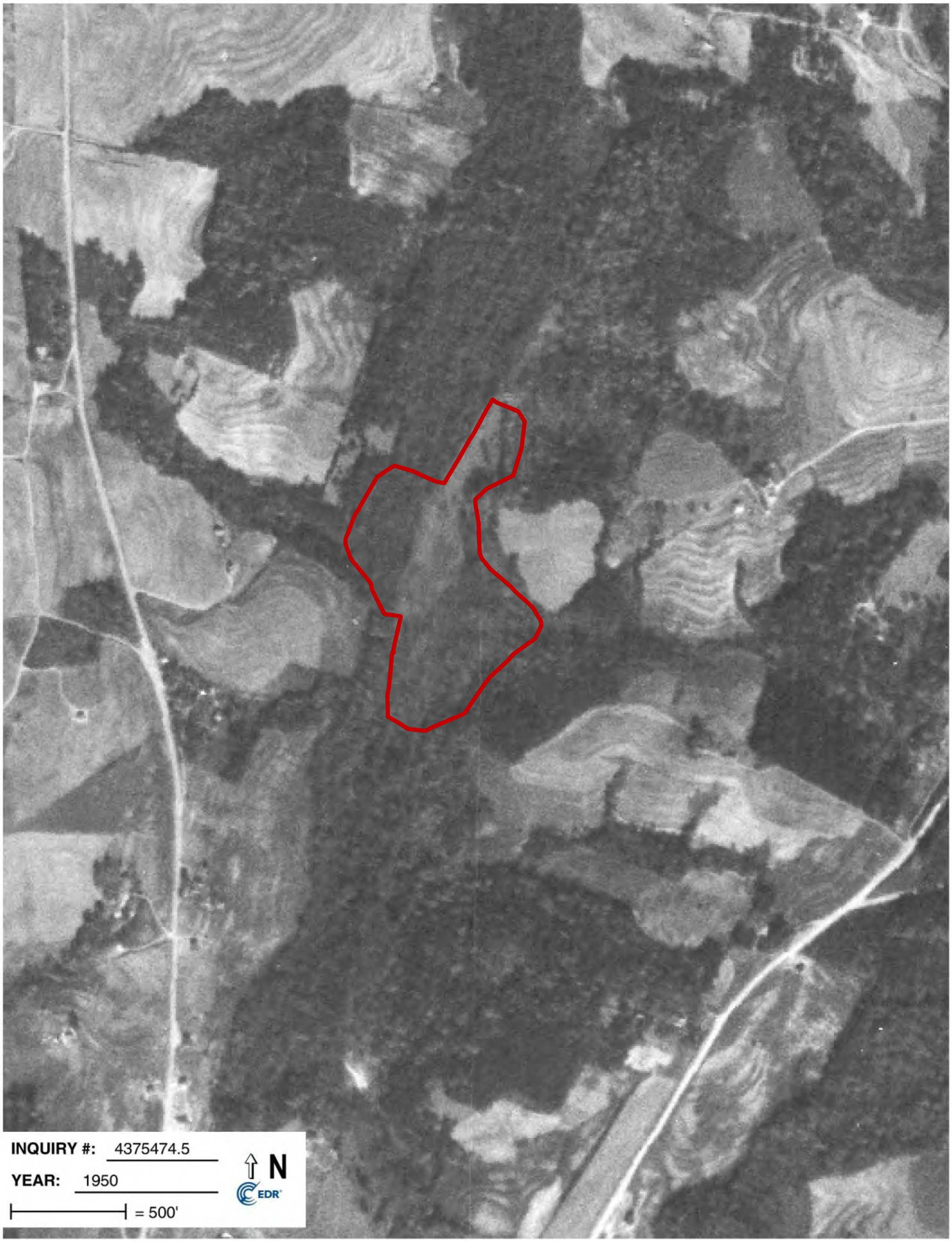
John Deere Stream and Wetland Restoration Site
Topographic Features

Property Boundary

EQUINOX

7.3 Historical Aerial Photographs

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N
EDR


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= 1000'
N
EDR


3-22-63
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YEAR: 1963
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N
EDR


INQUIRY #: 4375474.5
YEAR: 1976
= 1000'
N
EDR

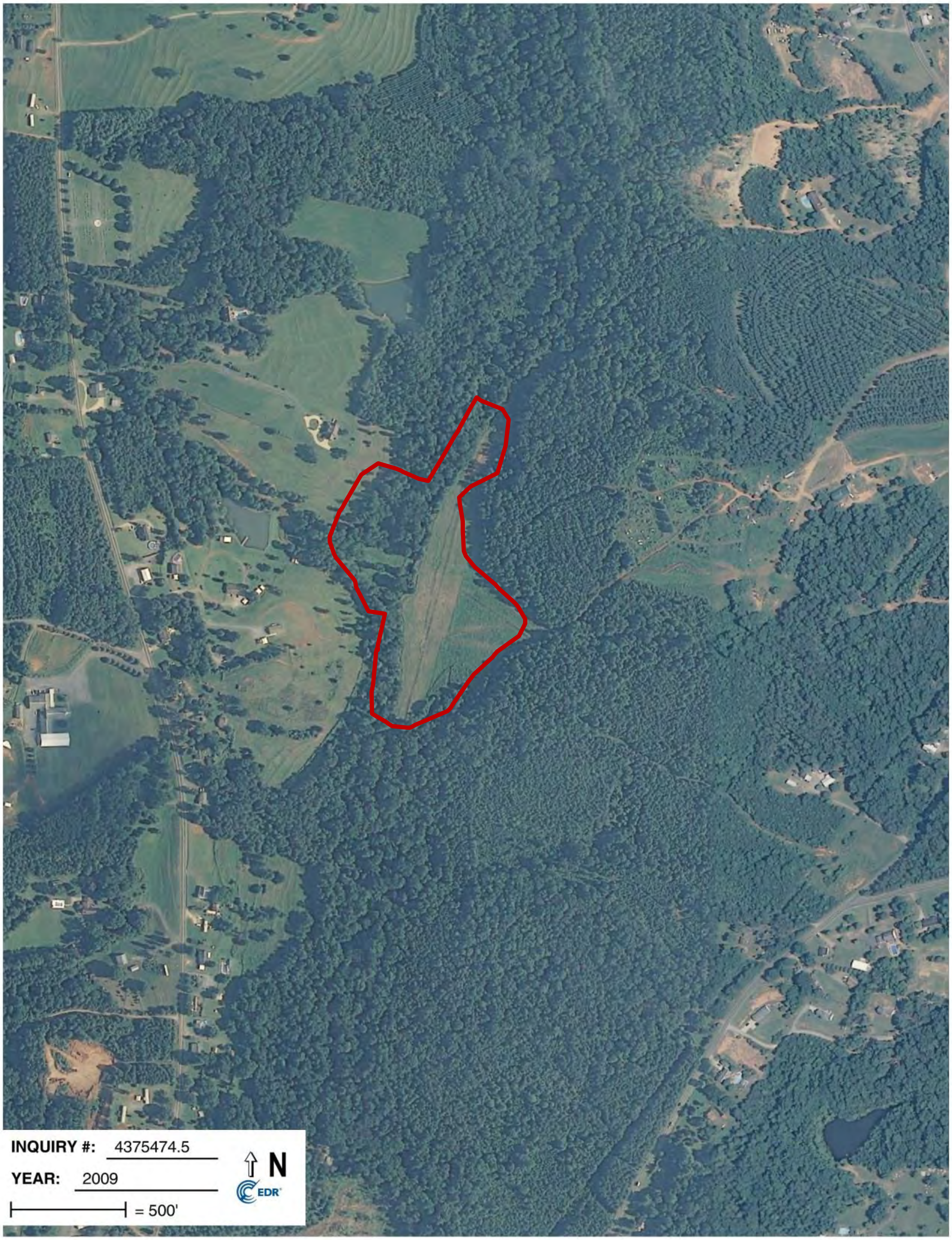

INQUIRY #: 4375474.5
YEAR: 1993
= 500'
N
EDR


INQUIRY #: 4375474.5
YEAR: 1998
= 750'
N
EDR


INQUIRY #: 4375474.5
YEAR: 2005
= 500'
N
EDR


INQUIRY #: 4375474.5
YEAR: 2006
= 500'
N
EDR


INQUIRY #: 4375474.5
YEAR: 2008
= 500'
N
EDR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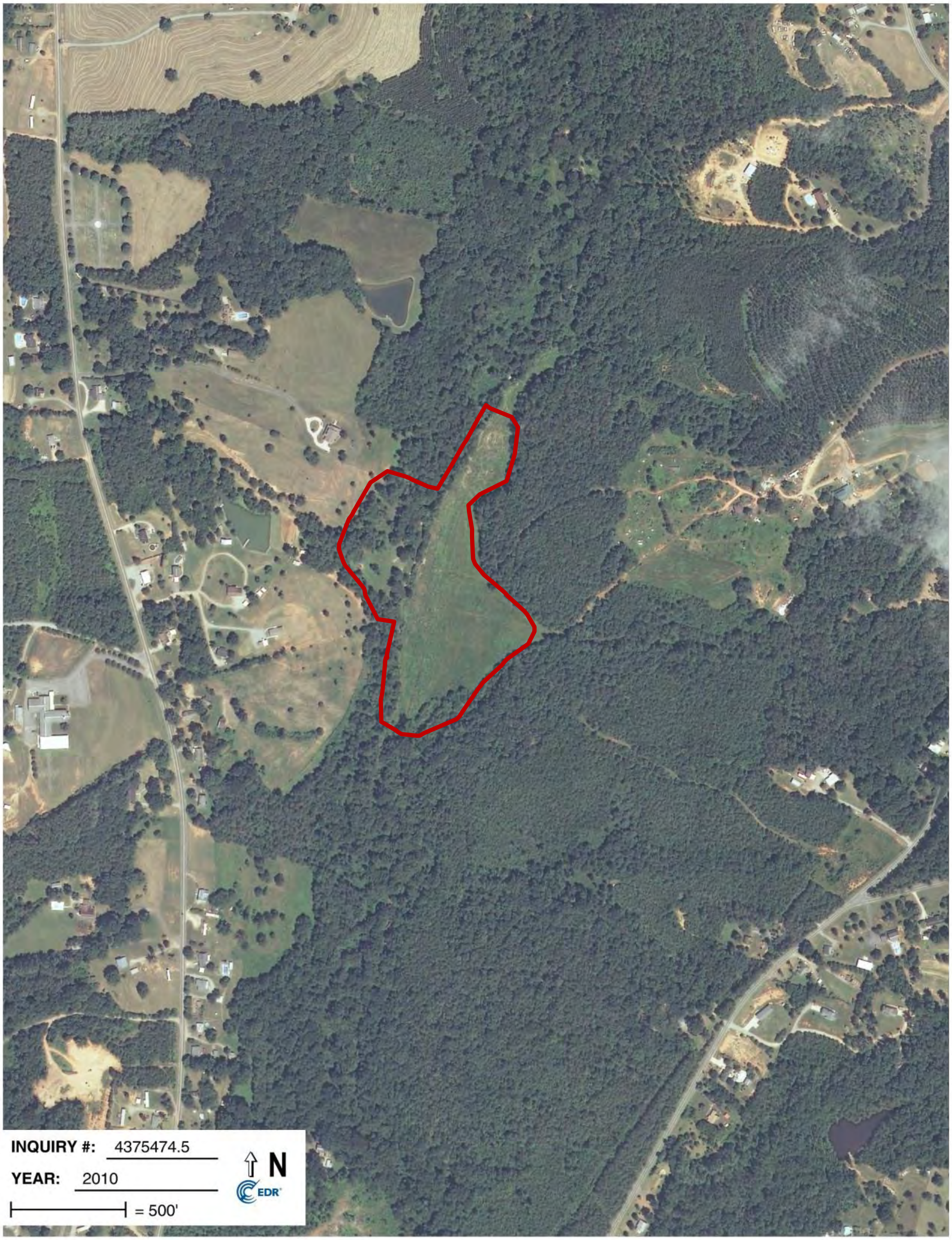
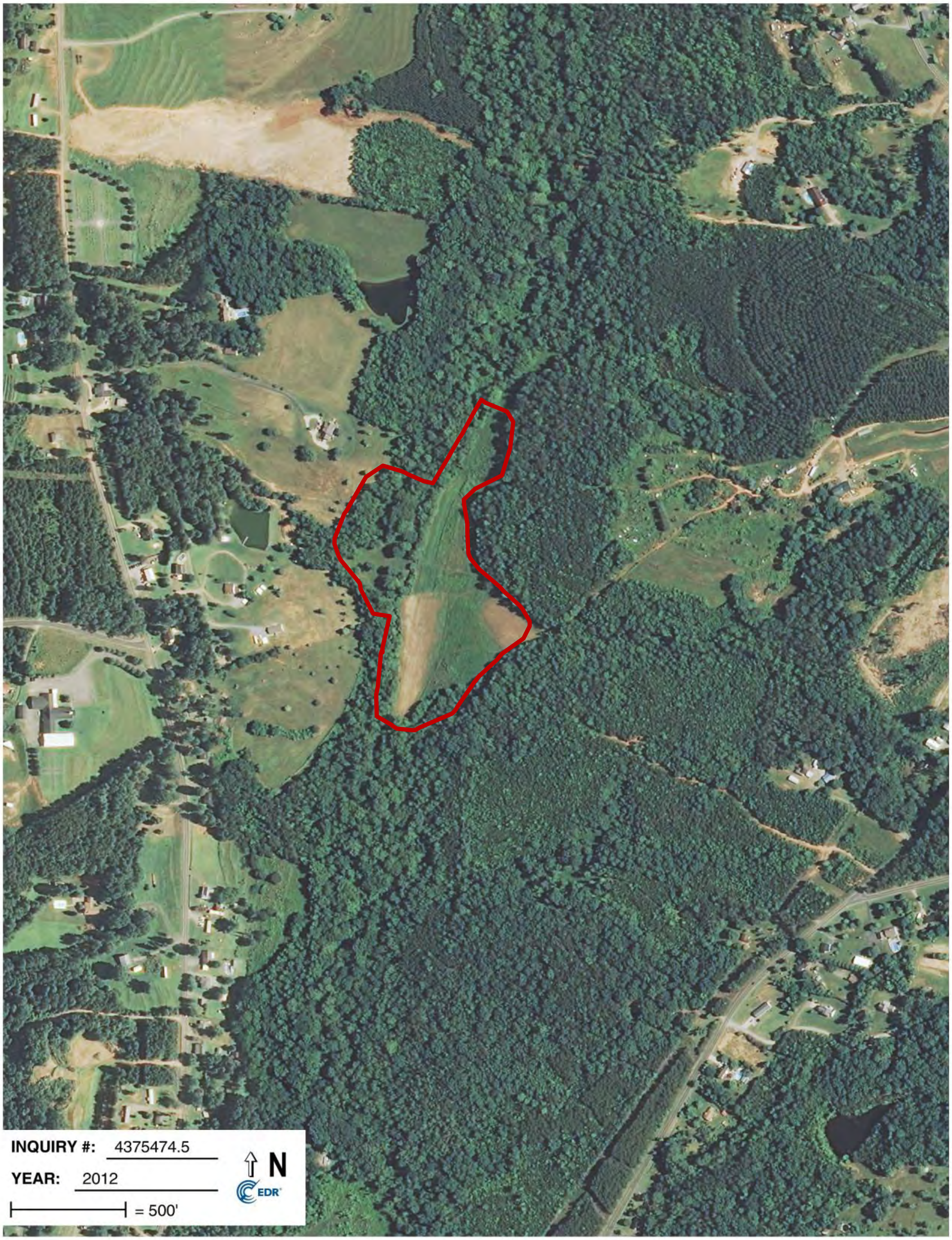
YEAR: 2009
= 500'
N
EDR


INQUIRY #: 4375474.5
YEAR: 2010
N
EDR
= 500'


INQUIRY #: 4375474.5
YEAR: 2012
N
EDR
= 500'

7.4 Site Conditions and Features Map

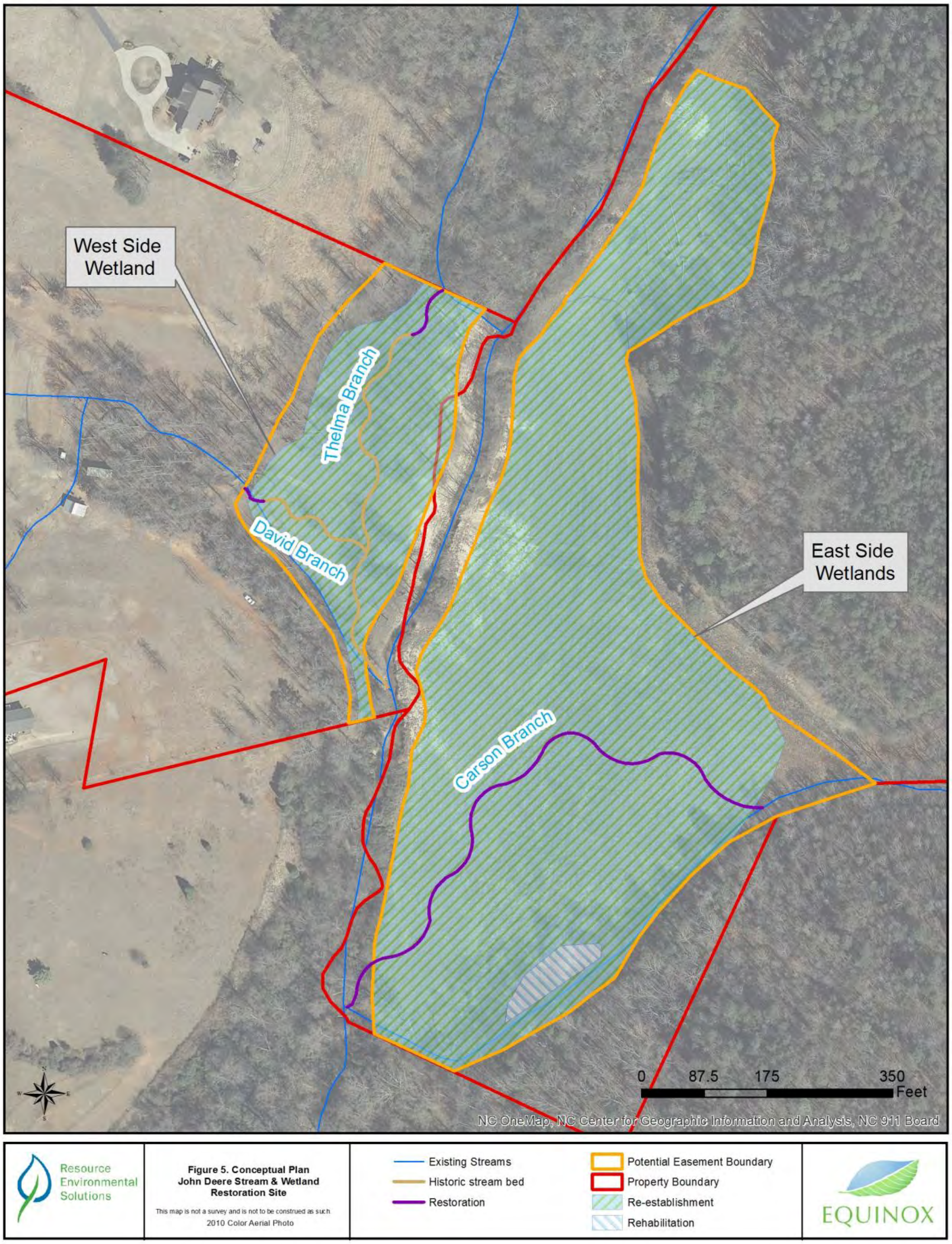


Figure 5. Conceptual Plan John Deere Stream & Wetland Restoration Site

This map is not a survey and is not to be construed as such.
2010 Color Aerial Photo

8 Appendices

Appendix A - Site Photographs

Photo 1. Carson Branch looking upstream.

Photo 2. Carson Branch looking downstream.

Photo 3. Looking downstream at David Branch.

Photo 4. Looking upstream at David Branch

Photo 5. Thelma Branch looking upstream.

Photo 6. Thelma Branch looking downstream.

Photo 7. Drained and degraded wetland on east side.

Photo 8. Drained wetland on west side.

Appendix B - NCDWR Stream Classification Forms

NC DWQ Stream Identification Form Version 4.11

Date: 11/11/14	**Project/Site:** TD- Carson 1	**Latitude:** 35.343301
Evaluator: JHT	**County:** Rutherford	**Longitude:** -81.831946
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 38	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 19)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

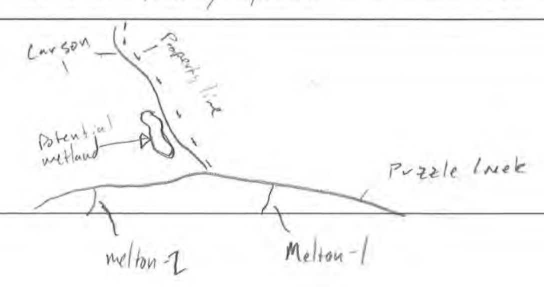
B. Hydrology (Subtotal = 10)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 9)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			None

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

Notes: Appears that channel probably pushed to toe of slope

Sketch:



NC DWQ Stream Identification Form Version 4.11

Date: 11/11/14	Project/Site: JD - Melton 1	Latitude: 35.344913
Evaluator: JHT	County: Rutherford	Longitude: -81.633066
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 30.5	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** *e.g. Quad Name:*

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

[a] artificial ditches are not rated; see discussions in manual

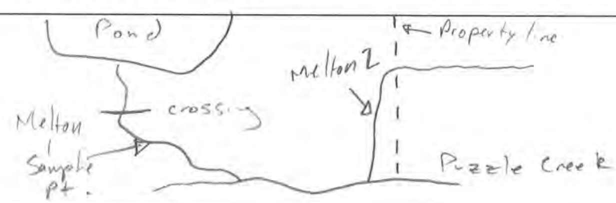
B. Hydrology (Subtotal = 11.5)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 9)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

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

Notes: Highly disturbed, anecdotal evidence of perennial flow and dredging

Sketch:



NC DWQ Stream Identification Form Version 4.11

Date: 11/11/14	**Project/Site:** JD-Melton 2	**Latitude:** 35.345694
Evaluator: JHT	**County:** Rutherford	**Longitude:** -81.832081
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 30	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** *e.g. Quad Name*:

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

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 10.5)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?		No = 0	Yes = 3	

C. Biology (Subtotal = 8.5)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0 0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed		FACW = 0.75; OBL = 1.5 Other = 0		None

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

Notes: Highly disturbed; Previously ditched.

Sketch:

Appendix C - USACE Wetland Delineation Forms

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: ~~John Deere~~ John Deere City/County: Rutherford Sampling Date: 7/16/15

Applicant/Owner: RES/ Carson State: NC Sampling Point: D1

Investigator(s): HT, OC Section, Township, Range: ______

Landform (hillslope, terrace, etc.): creek bottom Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): LRR N Lat: 35 343445 Long: -81.831462 Datum: WGS 84

Soil Map Unit Name: Chewacla NWI classification: None

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

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

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present? Yes ✓ No ______	Is the Sampled Area within a Wetland?	Yes ✓ No ______
Hydric Soil Present? Yes ✓ No ______		
Wetland Hydrology Present? Yes ✓ No ______		

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- __ Surface Soil Cracks (B6)
- __ Sparsely Vegetated Concave Surface (B8)
- __ Drainage Patterns (B10)
- __ Moss Trim Lines (B16)
- __ Dry-Season Water Table (C2)
- __ Crayfish Burrows (C8)
- __ Saturation Visible on Aerial Imagery (C9)
- __ Stunted or Stressed Plants (D1)
- ✓ Geomorphic Position (D2)
- __ Shallow Aquitard (D3)
- __ Microtopographic Relief (D4)
- __ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ______	No ______	Depth (inches): ______	
Water Table Present?	Yes ______	No ______	Depth (inches): ______	
Saturation Present? (includes capillary fringe)	Yes ______	No ______	Depth (inches): ______	Wetland Hydrology Present? Yes ✓ No ______

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

Remarks:
Actively managed ag. field,

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

Sampling Point: 01

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			

_______ = Total Cover

50% of total cover: _______ 20% of total cover: _______

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cephalanthus occidentalis	5	Y	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			

5 = Total Cover

50% of total cover: 2 20% of total cover: 1

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Rhexia mariana	1	N	
2. Erigeron annuus	.5	N	
3. Juncus effusus	25	Y	FACW
4. Apios americana	10	N	
5. Symphyotrichum noveboracensis	15	N	
6. Dichanthelium sp.	5		
7. Carex lurida	20	Y	OBL
8. Scirpus sp.	20	Y	OBL
9.			
10.			
11.			

97 = Total Cover

50% of total cover: 48 20% of total cover: 19

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			

_______ = Total Cover

50% of total cover: _______ 20% of total cover: _______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _______	x 1 = _______
FACW species _______	x 2 = _______
FAC species _______	x 3 = _______
FACU species _______	x 4 = _______
UPL species _______	x 5 = _______
Column Totals: _______ (A)	_______ (B)

Prevalence Index = B/A = _______

Hydrophytic Vegetation Indicators:

__ 1 - Rapid Test for Hydrophytic Vegetation

__ 2 - Dominance Test is >50%

__ 3 - Prevalence Index is ≤3.0[1]

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

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No ______

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

SOIL

Sampling Point: ~~02~~ 01

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 5/4	90	7.5YR 4/6	10	C	PL		
20	10YR 6/6	95	7.5YR 4/6	5	C	M		
28	10YR 5/3	95	7.5YR 4/6	5	C	M		

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

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- X Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

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

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

Restrictive Layer (if observed):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes X No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: John Deere City/County: Rutherford Sampling Date: ~~09~~ 7/16/15

Applicant/Owner: RES / Carson State: ________ Sampling Point: B2

Investigator(s): THT / WC Section, Township, Range: ________

Landform (hillslope, terrace, etc.): bottom Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): LRR N Lat: 35.343170 Long: -81.83451 Datum: WGS 84

Soil Map Unit Name: Chewacla NWI classification: none

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

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

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes ✓ No ____	Is the Sampled Area within a Wetland? Yes ✓ No ____
Hydric Soil Present?	Yes ✓ No ____	
Wetland Hydrology Present?	Yes ✓ No ____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ✓ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 1	
Water Table Present?	Yes X	No ____	Depth (inches): 0	
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0	Wetland Hydrology Present? Yes ✓ No ____

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: 02

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Liquidambar styraciflua	40	Y	FAC
2. Acer rubrum	35	Y	FAC
3. Liriodendron tulipifera	20	Y	FACU
4. Betula nigra	5	N	
5.			
6.			
7.			
	95 = Total Cover		
50% of total cover: 47	20% of total cover: 19		

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. Ligustrum sinensis	10	N	
2. Alnus serrulata	60	Y	OBL
3. Liquidamber styraciflua	10	N	
4. Cornus amomum	10	N	
5.			
6.			
7.			
8.			
9.			
	90 = Total Cover		
50% of total cover: 45	20% of total cover: 18		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Woodwardia areolata	65	Y	FACW
2. Persicaria sp.	5	N	
3. Arum sp.	10	N	
4. Bohemeria cylindrica	1	N	
5. Apios americana	1	N	
6. Carex lurida	5	N	
7. Impatiens capensis	2	N	
8.			
9.			
10.			
11.			
	89 = Total Cover		
50% of total cover: 44	20% of total cover: 17		

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Toxicodendron radicans	2	N	
2. Smilax herbacea	10	Y	FAC
3. Lonicera japonica	2	N	
4. Parthenocissus quinquefolia	5	Y	FACU
5. Bignonia capreolata	10	Y	FAC
	29 = Total Cover		
50% of total cover: 14	20% of total cover: 5		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

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

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No ____

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

SOIL

Sampling Point: ~~01~~ 02

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 3/1	95	7.5YR 4/6	5	C	PL		
2-18	10YR 4/1	95	7.5YR 4/6	5+	C	M/PL		

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

Hydric Soil Indicators:

- __ Histosol (A1)
- __ Histic Epipedon (A2)
- __ Black Histic (A3)
- __ Hydrogen Sulfide (A4)
- __ Stratified Layers (A5)
- __ 2 cm Muck (A10) **(LRR N)**
- __ Depleted Below Dark Surface (A11)
- __ Thick Dark Surface (A12)
- __ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- __ Sandy Gleyed Matrix (S4)
- __ Sandy Redox (S5)
- __ Stripped Matrix (S6)
- __ Dark Surface (S7)
- __ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- __ Thin Dark Surface (S9) **(MLRA 147, 148)**
- __ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- __ Redox Dark Surface (F6)
- __ Depleted Dark Surface (F7)
- __ Redox Depressions (F8)
- __ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- __ Umbric Surface (F13) **(MLRA 136, 122)**
- __ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- __ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

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

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

Restrictive Layer (if observed):

Type: ________

Depth (inches): ________

Hydric Soil Present? Yes ✓ No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: John Deere City/County: Rutherford Sampling Date: 7/16/15
Applicant/Owner: RES/Carson State: NC Sampling Point: 03
Investigator(s): JHT/WDL Section, Township, Range: ____
Landform (hillslope, terrace, etc.): bottom Local relief (concave, convex, none): Concave Slope (%): 0
Subregion (LRR or MLRA): LRR N Lat: 35.345029 Long: -81.831374 Datum: WGS 84
Soil Map Unit Name: Chewacla NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)
Are Vegetation Y, Soil Y, or Hydrology Y significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X
Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present? Yes ✓ No ____	Is the Sampled Area within a Wetland?	Yes ✓ No ____
Hydric Soil Present? Yes ✓ No ____		
Wetland Hydrology Present? Yes ✓ No ____		

Remarks:
Veg highly disturbed.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

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

Wetland Hydrology Present? Yes ✓ No ____

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

Remarks:

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

Sampling Point: 03

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	______ = Total Cover		
50% of total cover: ______	20% of total cover: ______		

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

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Ambrosia artemisifolia	65	Y	FACU
2. Ambrosia trifida	5	N	
3. Amphicarpaea bracteata	5	N	
4. Erigeron annuus	2	N	
5. Polygonum sagittatum	8	N	
6. Eupatorium capillifolium	2	N	
7. Hypericum gentianoides	1	N	
8. Oxalis stricta	1	N	
9. Vitis rotundifolia	1	N	
10. Conyza sp.	8	N	
11.			
	98 = Total Cover		
50% of total cover: 49	20% of total cover: 19		

Woody Vine Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1. ~~Vitis~~			
2.			
3.			
4.			
5.			
	______ = Total Cover		
50% of total cover: ______	20% of total cover: ______		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species	65	x 4 = 260
UPL species		x 5 =
Column Totals:	65 (A)	260 (B)

Prevalence Index = B/A = 4

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

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

X Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No ______

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

marginal hydrophytic veg. @ toe of slope, away from central disturbed/managed area.

SOIL

Sampling Point: 03

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 5/4	90	7.5YR 4/6	10	C	PL		
20	10YR 6/6	95	7.5YR 4/6	5	C	M		
28	10YR 5/2	95	7.5YR 4/6	5	C	M		

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

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- X Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

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

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

Restrictive Layer (if observed):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ✓ No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: John Deere City/County: Rutherford Sampling Date: 7/16/15

Applicant/Owner: RES/Melton State: NC Sampling Point: 04

Investigator(s): JHT/WOC Section, Township, Range: ______

Landform (hillslope, terrace, etc.): bottom Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): LRR N Lat: 35.344980 Long: -81.832299 Datum: WGS 84

Soil Map Unit Name: Chewacla NWI classification: None

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

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

Are Vegetation N , Soil N , or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present? Yes ✓ No ____	Is the Sampled Area within a Wetland? Yes ✓ No ____	
Hydric Soil Present? Yes ✓ No ____		
Wetland Hydrology Present? Yes ✓ No ____		

Remarks:

Active drainage + grazing

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No ____ Depth (inches): ______

Water Table Present? Yes ____ No ____ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): ______

Wetland Hydrology Present? Yes ✓ No ____

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: 04 ~~03~~

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Betula nigra	70	Y	
2.			
3.			
4.			
5.			
6.			
7.			
	70 = Total Cover		
50% of total cover: 35 20% of total cover: 14			
Sapling/Shrub Stratum (Plot size: 15')			
1. ~~[illegible]~~			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	= Total Cover		
50% of total cover: 20% of total cover:			
Herb Stratum (Plot size: 5')			
1. Murdannia keisak	90	Y	OBL
2. Polygonum sp. (pink smartweed)	5	N	
3. Cyperus sp.	5	N	
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		
50% of total cover: 50 20% of total cover: 20			
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
50% of total cover: 20% of total cover:			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

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

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No ______

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

SOIL

Sampling Point: ~~03~~ 04

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 4/2	95	7.5YR 4/6	5	C	PL		

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

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

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

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

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

Wetland A/B and Carson Branch

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD):

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:

C. PROJECT LOCATION AND BACKGROUND INFORMATION:

State: NC County/parish/borough: Rutherford City: Bostic
Center coordinates of site (lat/long in degree decimal format): Lat. 35.344240 ° N, Long. -81.831507 ° W.
Universal Transverse Mercator:
Name of nearest waterbody: Puzzle Creek

Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Broad River
Name of watershed or Hydrologic Unit Code (HUC): Broad River
☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

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

☐ Office (Desk) Determination. Date:
☒ Field Determination. Date(s): 7/16/2015

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** *"navigable waters of the U.S."* within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain:

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** *"waters of the U.S."* within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☒ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: 850 linear feet: 3 width (ft) and/or acres.
      Wetlands: 3.98 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known):

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain:

---

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW:

Summarize rationale supporting determination:

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent":

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **Pick List**
Drainage area: **Pick List**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain:

Identify flow route to TNW[5]:
Tributary stream order, if known:

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain:

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):
☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: .
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank ☐ the presence of litter and debris
☐ changes in the character of soil ☐ destruction of terrestrial vegetation
☐ shelving ☐ the presence of wrack line
☐ vegetation matted down, bent, or absent ☐ sediment sorting
☐ leaf litter disturbed or washed away ☐ scour
☐ sediment deposition ☐ multiple observed or predicted flow events
☐ water staining ☐ abrupt change in plant community
☐ other (list):
☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by: ☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects ☐ survey to available datum;
☐ fine shell or debris deposits (foreshore) ☐ physical markings;
☐ physical markings/characteristics ☐ vegetation lines/changes in vegetation types.
☐ tidal gauges
☐ other (list):

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

---

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

☐ Riparian corridor. Characteristics (type, average width):
☐ Wetland fringe. Characteristics:
☐ Habitat for:
  ☐ Federally Listed species. Explain findings:
  ☐ Fish/spawn areas. Explain findings:
  ☐ Other environmentally-sensitive species. Explain findings:
  ☐ Aquatic/wildlife diversity. Explain findings:

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:
Properties:
Wetland size: acres
Wetland type. Explain:
Wetland quality. Explain:
Project wetlands cross or serve as state boundaries. Explain:

(b) General Flow Relationship with Non-TNW:
Flow is: **Pick List**. Explain:

Surface flow is: **Pick List**
Characteristics:

Subsurface flow: **Pick List**. Explain findings:
☐ Dye (or other) test performed:

(c) Wetland Adjacency Determination with Non-TNW:
☐ Directly abutting
☐ Not directly abutting
  ☐ Discrete wetland hydrologic connection. Explain:
  ☐ Ecological connection. Explain:
  ☐ Separated by berm/barrier. Explain:

(d) Proximity (Relationship) to TNW
Project wetlands are **Pick List** river miles from TNW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Flow is from: **Pick List.**
Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain:
Identify specific pollutants, if known:

(iii) Biological Characteristics. Wetland supports (check all that apply):

☐ Riparian buffer. Characteristics (type, average width):
☐ Vegetation type/percent cover. Explain:
☐ Habitat for:
  ☐ Federally Listed species. Explain findings:
  ☐ Fish/spawn areas. Explain findings:
  ☐ Other environmentally-sensitive species. Explain findings:
  ☐ Aquatic/wildlife diversity. Explain findings:

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**
Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed:

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   - ☐ TNWs: linear feet width (ft), Or, acres.
   - ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   - ☒ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: The channel shows characteristics of perennial channel including continuous bed and bank, substrate sorting, and presence of obligate aquatic macroinvertebrates. Additionally, the stream scores 38 on the NCDWR Stream Determination form.
   - ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☒ Tributary waters: **850** linear feet **3** width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☒ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **The wetland directly abuts the top of bank of the relatively permanent water.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW:

Provide acreage estimates for jurisdictional wetlands in the review area: **3.76** acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

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[8] See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] **Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.***

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .
☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ 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: .
☐ USDA Natural Resources Conservation Service Soil Survey. Citation: .
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date):2010.
or ☐ Other (Name & Date): .
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

Wetland C

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD):

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:

C. PROJECT LOCATION AND BACKGROUND INFORMATION:
State: NC County/parish/borough: Rutherford City: Bostic
Center coordinates of site (lat/long in degree decimal format): Lat. 35.344240 ° N, Long. -81.831507 ° W.
Universal Transverse Mercator:
Name of nearest waterbody: Puzzle Creek

Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Broad River
Name of watershed or Hydrologic Unit Code (HUC): Broad River
☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☐ Office (Desk) Determination. Date:
☒ Field Determination. Date(s): 7/16/2015

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** *"navigable waters of the U.S."* within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]
☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain:

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** *"waters of the U.S."* within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
   ☐ TNWs, including territorial seas
   ☐ Wetlands adjacent to TNWs
   ☐ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
   ☐ Non-RPWs that flow directly or indirectly into TNWs
   ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
   ☒ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
   ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
   ☐ Impoundments of jurisdictional waters
   ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
   Non-wetland waters: linear feet: width (ft) and/or acres.
   Wetlands: 1.04 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **Pick List**
   Elevation of established OHWM (if known):

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain:

---
[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW:

Summarize rationale supporting determination:

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent":

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **Pick List**
Drainage area: **Pick List**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain:

Identify flow route to TNW[5]:
Tributary stream order, if known:

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[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):
☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover: .
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: .
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank ☐ the presence of litter and debris
☐ changes in the character of soil ☐ destruction of terrestrial vegetation
☐ shelving ☐ the presence of wrack line
☐ vegetation matted down, bent, or absent ☐ sediment sorting
☐ leaf litter disturbed or washed away ☐ scour
☐ sediment deposition ☐ multiple observed or predicted flow events
☐ water staining ☐ abrupt change in plant community
☐ other (list): .
☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by: ☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects ☐ survey to available datum;
☐ fine shell or debris deposits (foreshore) ☐ physical markings;
☐ physical markings/characteristics ☐ vegetation lines/changes in vegetation types.
☐ tidal gauges
☐ other (list): .

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

☐ Riparian corridor. Characteristics (type, average width): .
☐ Wetland fringe. Characteristics: .
☐ Habitat for:
  ☐ Federally Listed species. Explain findings: .
  ☐ Fish/spawn areas. Explain findings: .
  ☐ Other environmentally-sensitive species. Explain findings: .
  ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:
Properties:
Wetland size:1.04 acres
Wetland type. Explain: Non-Tidal Freshwater Marsh.
Wetland quality. Explain:Poor; area has been actively managed for agriculture for 30+ years.
Project wetlands cross or serve as state boundaries. Explain: No.

(b) General Flow Relationship with Non-TNW:
Flow is: **Ephemeral flow**. Explain: .

Surface flow is: **Not present**
Characteristics: .

Subsurface flow: **Yes**. Explain findings: Subsurface flow is assumed due to the proximity to Puzzle Creek (3rd order stream).

☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:
☐ Directly abutting
☒ Not directly abutting
  ☐ Discrete wetland hydrologic connection. Explain: .
  ☒ Ecological connection. Explain: .
  ☒ Separated by berm/barrier. Explain: Seperated by depositional berm formed from overbank flooding of Puzzle Creek..

(d) Proximity (Relationship) to TNW
Project wetlands are **10-15** river miles from TNW.
Project waters are **5-10** aerial (straight) miles from TNW.
Flow is from: **Wetland to navigable waters.**
Estimate approximate location of wetland as within the **20 - 50-year** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: No water present at time of determination. Immediate watershed is ag, upstream immediate watershed is forested. Greater Puzzle Creek watershed is mixture of ag in the bottomlands with forested slopes..

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

☐ Riparian buffer. Characteristics (type, average width): .
☒ Vegetation type/percent cover. Explain:Herbaceous- 100%.
☐ Habitat for:
  ☐ Federally Listed species. Explain findings: .
  ☐ Fish/spawn areas. Explain findings: .
  ☐ Other environmentally-sensitive species. Explain findings: .
  ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **1**
Approximately (1.04) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)
No	1.04		

Summarize overall biological, chemical and physical functions being performed: Wetland is highly impacted, however still shows indication of hydric soil formation and hydrology. Currently, main function being performed is floodwater retention and filtration.

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D:

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: Significant nexus occurs due to the proximity of Puzzle Creek, the frequency with which the wetland is flooded (<50 year floodplain). No surface water connection exists due to a depositional berm formed by overbank flooding; however, a groundwater connection exists between Puzzle Creek and Wetland C.

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .

☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally:

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters:

3. Non-RPWs[8] that flow directly or indirectly into TNWs.
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.
☒ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: **1.04** acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.

---

[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] **Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.***

☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .
☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ 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: .
☐ USDA Natural Resources Conservation Service Soil Survey. Citation: .
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date):2010.
or ☐ Other (Name & Date): .
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

Wetland D and David/
Thelma Branch

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD):

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:

C. PROJECT LOCATION AND BACKGROUND INFORMATION:

State: NC County/parish/borough: Rutherford City: Bostic
Center coordinates of site (lat/long in degree decimal format): Lat. 35.344240 ° N, Long. -81.831507 ° W.
Universal Transverse Mercator:
Name of nearest waterbody: Puzzle Creek

Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Broad River
Name of watershed or Hydrologic Unit Code (HUC): Broad River
☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc...) are associated with this action and are recorded on a different JD form.

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

☐ Office (Desk) Determination. Date:
☒ Field Determination. Date(s): 7/16/2015

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** *"navigable waters of the U.S."* within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain:

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** *"waters of the U.S."* within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. Waters of the U.S.

a. Indicate presence of waters of U.S. in review area (check all that apply): [1]

☐ TNWs, including territorial seas
☐ Wetlands adjacent to TNWs
☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
☐ Non-RPWs that flow directly or indirectly into TNWs
☒ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
☐ Impoundments of jurisdictional waters
☐ Isolated (interstate or intrastate) waters, including isolated wetlands

b. Identify (estimate) size of waters of the U.S. in the review area:

Non-wetland waters: 362 linear feet: 3 width (ft) and/or acres.
Wetlands: 0.125 acres.

c. Limits (boundaries) of jurisdiction based on: **1987 Delineation Manual**
Elevation of established OHWM (if known):

2. Non-regulated waters/wetlands (check if applicable):[3]

☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain:

---

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW

Identify TNW:

Summarize rationale supporting determination:

2. Wetland adjacent to TNW

Summarize rationale supporting conclusion that wetland is "adjacent":

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:

Watershed size: **Pick List**
Drainage area: **Pick List**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:

(a) Relationship with TNW:

☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain:

Identify flow route to TNW[5]:
Tributary stream order, if known:

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.

[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain:

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):
☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: .
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank ☐ the presence of litter and debris
☐ changes in the character of soil ☐ destruction of terrestrial vegetation
☐ shelving ☐ the presence of wrack line
☐ vegetation matted down, bent, or absent ☐ sediment sorting
☐ leaf litter disturbed or washed away ☐ scour
☐ sediment deposition ☐ multiple observed or predicted flow events
☐ water staining ☐ abrupt change in plant community
☐ other (list):
☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by: ☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects ☐ survey to available datum;
☐ fine shell or debris deposits (foreshore) ☐ physical markings;
☐ physical markings/characteristics ☐ vegetation lines/changes in vegetation types.
☐ tidal gauges
☐ other (list):

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

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[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

- ☐ Riparian corridor. Characteristics (type, average width): .
- ☐ Wetland fringe. Characteristics: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties:

Wetland size: acres

Wetland type. Explain: .

Wetland quality. Explain: .

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **Pick List**. Explain: .

Surface flow is: **Pick List**

Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .

☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

- ☐ Directly abutting
- ☐ Not directly abutting
  - ☐ Discrete wetland hydrologic connection. Explain: .
  - ☐ Ecological connection. Explain: .
  - ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **Pick List** river miles from TNW.

Project waters are **Pick List** aerial (straight) miles from TNW.

Flow is from: **Pick List.**

Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

- ☐ Riparian buffer. Characteristics (type, average width): .
- ☐ Vegetation type/percent cover. Explain: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**

Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed:

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☒ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: The channel shows characteristics of perennial channel including continuous bed and bank, substrate sorting, and presence of obligate aquatic macroinvertebrates. Additionally, David and Thelma Branch score 30.5 and 30, respectively, on the NCDWR stream determination form.
   ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.
☒ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☒ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **Wetland directly abuts the RPW top of bank.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW:

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

---

[8] See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] **Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.***

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .
☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ 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: .
☐ USDA Natural Resources Conservation Service Soil Survey. Citation: .
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date):2010.
or ☐ Other (Name & Date): .
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

Appendix D - Categorical Exclusion Supporting Documentation

Categorical Exclusion Form for Ecosystem Enhancement Program Projects
Version 1.4

8.1.1.1.1.1 Part 1: General Project Information	
Project Name:	John Deere Stream and Wetland Mitigation Site
County Name:	Rutherford
EEP Number:	96917
Project Sponsor:	Resource Environmental Solutions, LLC
Project Contact Name:	Daniel Ingram
Project Contact Address:	302 Jefferson Street, Suite 110, Raleigh, NC 27605
Project Contact E-mail:	dingram@res.us
EEP Project Manager:	Paul Wiesner

Project Description

A stream and wetland restoration site in the Puzzle Creek watershed whose objectives are to 831 linear feet of existing tributaries (for this project known as David Branch and Thelma Branch) and re-establishing 10.9 acres and rehabilitating 0.08 acres of riparian wetlands. Both streams have been previously relocated or ditched resulting in channels and wetlands with degraded function. A total of 11.7 acres of riparian buffer will be revegetated and placed in a permanent conservation easement to protect the restored stream channels and riparian wetlands.

For Official Use Only

Reviewed By:

Date **EEP Project Manager**

Conditional Approved By:

Date **For Division Administrator FHWA**

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

Final Approval By:

Date **For Division Administrator FHWA**

Part 2: All Projects Regulation/Question	*Response*
Coastal Zone Management Act (CZMA)	
1. Is the project located in a CAMA county?	☐ Yes ☒ No
2. Does the project involve ground-disturbing activities within a CAMA Area of Environmental Concern (AEC)?	☐ Yes ☐ No ☒ N/A
3. Has a CAMA permit been secured?	☐ Yes ☐ No ☒ N/A
4. Has NCDCM agreed that the project is consistent with the NC Coastal Management Program?	☐ Yes ☐ No ☒ N/A
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)	
1. Is this a "full-delivery" project?	☒ Yes ☐ No
2. Has the zoning/land use of the subject property and adjacent properties ever been designated as commercial or industrial?	☐ Yes ☒ No ☐ N/A
3. As a result of a limited Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☒ No ☐ N/A
4. As a result of a Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☒ No ☐ N/A
5. As a result of a Phase II Site Assessment, are there known or potential hazardous waste sites within the project area?	☐ Yes ☐ No ☒ N/A
6. Is there an approved hazardous mitigation plan?	☐ Yes ☐ No ☒ N/A
National Historic Preservation Act (Section 106)	
1. Are there properties listed on, or eligible for listing on, the National Register of Historic Places in the project area?	☐ Yes ☒ No
2. Does the project affect such properties and does the SHPO/THPO concur?	☐ Yes ☐ No ☒ N/A
3. If the effects are adverse, have they been resolved?	☐ Yes ☐ No ☒ N/A
Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)	
1. Is this a "full-delivery" project?	☒ Yes ☐ No
2. Does the project require the acquisition of real estate?	☒ Yes ☐ No ☐ N/A
3. Was the property acquisition completed prior to the intent to use federal funds?	☐ Yes ☒ No ☐ N/A
4. Has the owner of the property been informed: * prior to making an offer that the agency does not have condemnation authority; and * what the fair market value is believed to be?	☒ Yes ☐ No ☐ N/A

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

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

Appendix E - Letters to and Responses from Agencies

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July 8, 2015

Ms. Caitlin Totherow
Tribal Historic Preservation Office
Catawba Indian Nation
1536 Tom Steven Road
Rock Hill, SC 29730

Subject: John Deere Stream and Wetland Mitigation Site, Rutherford County, North Carolina

Dear Ms. Gledhill-Earley,

Equinox Environmental, acting as an agent of Resource Environmental Solutions, LLC (RES), requests review and comment on any possible issues that might emerge with respect to Catawba Indian Nation tribal resources associated with this proposed stream restoration project being developed for the North Carolina Division of Mitigation Services. A USGS topographic map of the project area, a conceptual plan of the project, and site photos are attached. The project is located at the following coordinates: 35.344240 N, -81.831507 W; WGS84.

The John Deere Site has been identified for the purpose of providing mitigation for unavoidable stream channel impacts in the Broad River Basin. RES has been contracted to design and build the John Deere project. A requirement of the project is to prepare an Environmental Resource Technical Document that describes the existing resources at the project site.

The John Deere site is currently utilized for agricultural production and livestock grazing. The project encompasses three unnamed tributaries to Puzzle Creek in Rutherford County. On the east side of Puzzle Creek the unnamed reach, called Carson Branch, shows signs of having been relocated, draining of wetlands with tiles, and plowing and cultivation of historic wetlands. The stream reach is now located along the toe of the slope and has limited vegetation along the bank bordering the agricultural production. This reach is proposed for restoration; the majority of wetlands are being proposed for reestablishment, with one small area being proposed for rehabilitation.

On the west side, two unnamed reaches referred to as David Branch and Thelma Branch, also have been manipulated through relocation and ditching. Adjacent wetland function was also impacted. Restoration of both reaches is proposed to restore stream function and wetland hydrology. The area surrounding these two reaches is grazed with livestock.

The project stream reaches and adjacent riparian areas will be placed in conservation easements to protect the restored resources. While not a part of the restoration project, a conservation easement along the portion of Puzzle Creek that connects the two restoration reaches is a part of the proposed project.

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Restoration of streams and wetlands re-establishment/rehabilitation at the John Deere site is expected to entail 1) re-grading of floodplain topography in order to remove surface drainage features and restore wetland micro-topography, 2) excavation and removal of buried agricultural drainage tiles, 3) excavation of overburden located on a portion of the site, 4) off-line channel construction to restore streams back to historical alignments through the wetland re-establishment/rehabilitation areas, 5) channel backfill, and 6) vegetative planting.

Re-establishment of wetlands on the east side of Puzzle Creek will be accomplished by restoring wetland hydrology and re-vegetation with wetland species. Wetland hydrology will be restored by locating and removing buried agricultural drain tiles throughout the floodplain. Carson Branch, which was previously relocated to the edge of the field, will be reconstructed as a Type E stream in the natural low of the floodplain. Additionally, a ditch constructed to drain the remaining wetlands will be plugged and partially backfilled. The new alignment of Carson Branch will provide additional hydrology to the floodplain. General excavation of the floodplain on the east side of Puzzle Creek is not proposed, instead re-grading of microtopography will further facilitate wetland functions.

Re-establishment of wetlands on the west side of Puzzle Creek will be accomplished by restoration of wetland hydrology, removal of overburden, and re-vegetation with wetland species. Wetland hydrology will be restored by removing buried agricultural drain tiles and by reconnecting two streams back to the floodplain. Thelma Branch historically flowed through the wetlands bordering Puzzle Creek on the west floodplain prior to being diverted directly into Puzzle Creek. David Branch was relocated to the edge of the floodplain. Both streams will be restored, as Type E streams, to their proper position in the low point of the floodplain. At the time that Thelma Branch was diverted, the spoil material from the channel excavation along with additional fill was placed on the wetlands adjacent to the ditch. This overburden material will be removed to expose the buried hydric soils. Additionally, deposition carried out of the valley of David Branch has formed a relatively recent alluvial fan that has also buried a portion of the former wetlands. This deposition, which is approximately 12 to 18 inches deep, will be removed to expose the buried hydric soils.

In-stream structures will be used to provide bank and profile stability and to improve habitat. Structures will likely include log structures. Existing bed material will be excavated and reused in the proposed channel bed. Sod mats will be used where available to provide immediate bank vegetation and stabilization. Where sod mats are not available, erosion control matting will be used. Upon completion of channel construction, erosion-control measures, such as seeding with erosion-control vegetation and/or mulching, will be implemented.

All of the restored stream reaches and the wetland areas will be planted with native vegetation (trees, shrubs, and an herbaceous seed mix) to match vegetation reference conditions and provide biological diversity. Stream banks will be stabilized using a combination of erosion matting, bare-root plantings,

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and bio-engineering techniques. Fencing will be installed in areas where livestock grazing is expected to continue.

We ask that you review and comment on any possible issues that might emerge with respect to any Catawba Indian Nation tribal resources associated with the site. Please email, fax, or mail your reply to jborawa@equinoxenvironmental, 828-253-8256 X206 or the address below within 90 days. We thank you in advance for your timely response and cooperation. Please feel free to contact me or Hunter Terrell at 828-253-6856 with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Jim Borawa
Environmental Scientist

Attachments: USGS topographic map, Conceptual Plan map, Site Photos
CC: Paul Wiesner, Division of Mitigation Services Project Manager

Catawba Indian Nation
Tribal Historic Preservation Office
1536 Tom Steven Road
Rock Hill, South Carolina 29730

Office 803-328-2427
Fax 803-328-5791

July 22, 2015

Attention: Jim Borawa
Equinox
37 Haywood Street, Suite 100
Asheville, NC 28801

Re. THPO #	TCNS #	Project Description
2015-660-1		John Deere Stream and Wetland Mitigation Site, Rutherford Co., NC

Mr. Borawa,

The Catawba have no immediate concerns with regard to traditional cultural properties, sacred sites or Native American archaeological sites within the boundaries of the proposed project areas. **However, the Catawba are to be notified if Native American artifacts and / or human remains are located during the ground disturbance phase of this project.**

If you have questions please contact Caitlin Totherow at 803-328-2427 ext. 226, or e-mail caitlinh@ccppcrafts.com.

Sincerely,

Caitlin Totherow for

Wenonah G. Haire
Tribal Historic Preservation Officer

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July 8, 2015

Mr. Russell Townsend
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians
2975 Governors Island Road
Bryson City, NC 28713

Subject: John Deere Stream and Wetland Mitigation Site, Rutherford County, North Carolina

Dear Mr. Townsend,

Equinox Environmental, acting as an agent of Resource Environmental Solutions, LLC (RES), requests review and comment on any possible issues that might emerge with respect to Eastern Band of Cherokee Indians tribal resources associated with this proposed stream restoration project being developed for the North Carolina Division of Mitigation Services. A USGS topographic map of the project area, a conceptual plan map of the project, and site photos are attached. The project is located at the following coordinates: 35.344240 N, -81.831507 W; WGS84.

The John Deere Site has been identified for the purpose of providing mitigation for unavoidable stream channel impacts in the Broad River Basin. RES has been contracted to design and build the John Deere project. A requirement of the project is to prepare an Environmental Resource Technical Document that describes the existing resources at the project site.

The John Deere site is currently utilized for agricultural production and livestock grazing. The project encompasses three unnamed tributaries to Puzzle Creek in Rutherford County. On the east side of Puzzle Creek the unnamed reach, called Carson Branch, shows signs of having been relocated, draining of wetlands with tiles, and plowing and cultivation of historic wetlands. The stream reach is now located along the toe of the slope and has limited vegetation along the bank bordering the agricultural production. This reach is proposed for restoration; the majority of wetlands are being proposed for reestablishment, with one small area being proposed for rehabilitation.

On the west side, two unnamed reaches referred to as David Branch and Thelma Branch, also have been manipulated through relocation and ditching. Adjacent wetland function was also impacted. Restoration of both reaches is proposed to restore stream function and wetland hydrology. The area surrounding these two reaches is grazed with livestock.

The project stream reaches and adjacent riparian areas will be placed in conservation easements to protect the restored resources. While not a part of the restoration project, a conservation easement along the portion of Puzzle Creek that connects the two restoration reaches is a part of the proposed project.

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Restoration of streams and wetlands re-establishment/rehabilitation at the John Deere site is expected to entail 1) re-grading of floodplain topography in order to remove surface drainage features and restore wetland micro-topography, 2) excavation and removal of buried agricultural drainage tiles, 3) excavation of overburden located on a portion of the site, 4) off-line channel construction to restore streams back to historical alignments through the wetland re-establishment/rehabilitation areas, 5) channel backfill, and 6) vegetative planting.

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In-stream structures will be used to provide bank and profile stability and to improve habitat. Structures will likely include log structures. Existing bed material will be excavated and reused in the proposed channel bed. Sod mats will be used where available to provide immediate bank vegetation and stabilization. Where sod mats are not available, erosion control matting will be used. Upon completion of channel construction, erosion-control measures, such as seeding with erosion-control vegetation and/or mulching, will be implemented.

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and bio-engineering techniques. Fencing will be installed in areas where livestock grazing is expected to continue.

We ask that you review and comment on any possible issues that might emerge with respect to any Eastern Band of Cherokee Indians tribal resources associated with the site. Please email, fax, or mail your reply to jborawa@equinoxenvironmental, 828-253-8256 X206 or the address below within 90 days. We thank you in advance for your timely response and cooperation. Please feel free to contact me or Hunter Terrell at 828-253-6856 with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Jim Borawa
Environmental Scientist

Attachments: Site Map, USGS topographic map, Site Photos
CC: Paul Wiesner, Division of Mitigation Services Project Manager

As of September 17, 2015 a response from the Eastern Band of Cherokee Indians has not been received.

July 8, 2015

Ms. Andrea Leslie
North Carolina Wildlife Resources Commission
29830 Great Smoky Mtn. Expressway
Waynesville NC 28786

Subject: John Deere Stream and Wetland Mitigation Site, Rutherford County, North Carolina

Dear Andrea,

Equinox Environmental, acting as an agent of Resource Environmental Solutions, LLC (RES), requests review and comment on any possible issues that might emerge with respect to fish and wildlife resources associated with this proposed stream restoration project being developed for the North Carolina Division of Mitigation Services. A USGS topographic map of the project, a conceptual plan map, and site photographs of the project are attached. The project is located at the following coordinates: 35.344240 N, -81.831507 W; WGS84.

The John Deere Site has been identified for the purpose of providing mitigation for unavoidable stream channel impacts in the Broad River Basin. RES has been contracted to design and build the John Deere project. A requirement of the project is to prepare an Environmental Resource Technical Document that describes the existing resources at the project site.

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The project stream reaches and adjacent riparian areas will be placed in conservation easements to protect the restored resources. While not a part of the restoration project, a conservation easement along the portion of Puzzle Creek that connects the two restoration reaches is a part of the proposed project.

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Restoration of streams and wetlands re-establishment/rehabilitation at the John Deere site is expected to entail 1) re-grading of floodplain topography in order to remove surface drainage features and restore wetland micro-topography, 2) excavation and removal of buried agricultural drainage tiles, 3) excavation of overburden located on a portion of the site, 4) off-line channel construction to restore streams back to historical alignments through the wetland re-establishment/rehabilitation areas, 5) channel backfill, and 6) vegetative planting.

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and bio-engineering techniques. Fencing will be installed in areas where livestock grazing is expected to continue.

We ask that you review and comment on any possible issues that might emerge with respect to the fish and wildlife resources on the site. Please email, fax, or mail your reply to jborawa@equinoxenvironmental, 828-253-8256 X206 or the address below within 90 days. We thank you in advance for your timely response and cooperation. Please feel free to contact me or Hunter Terrell at 828-253-6856 with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Jim Borawa
Environmental Scientist

Attachments: Site Map, USGS topographic map, Site Photos
CC: Paul Wiesner, Division of Mitigation Services Project Manager

North Carolina Wildlife Resources Commission

Gordon Myers, Executive Director

August 10, 2015

Jim Borawa
Equinox Environmental
37 Haywood Street, Suite 100
Asheville, NC 28801

SUBJECT: John Deere Stream and Wetland Mitigation Site
Puzzle Creek tributaries, Rutherford County

Dear Mr. Borawa:

Biologists with the North Carolina Wildlife Resources Commission (NCWRC) received your July 8, 2015 letter regarding plans for a stream and wetland restoration project involving the relocation of three tributaries to Puzzle Creek—David Branch, Thelma Branch, and Carson Branch—as well as the restoration of wetland vegetation hydrology and vegetation in wetlands in the Puzzle Creek floodplain in Rutherford County. You requested information concerning any issues that might arise with respect to fish and wildlife. Our comments on this project are offered for your consideration under provisions of the Clean Water Act of 1977 (33 U.S.C. 466 et. seq.) and Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667d).

This project will not impact wild trout resources or other known significant aquatic or terrestrial resources.

Thank you for the opportunity to review and comment on this project. Please contact me at (828) 400-4223 if you have any questions about these comments.

Sincerely,

Andrea Leslie

Andrea Leslie
Mountain Region Coordinator
Division of Habitat Conservation

Mailing Address: Division of Inland Fisheries • 1721 Mail Service Center • Raleigh, NC 27699-1721
Telephone: (919) 707-0220 • **Fax:** (919) 707-0028

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July 6, 2015

Mr. Mike Sigmon
District Conservationist
Natural Resource Conservation Service
121 Laurel Drive
Rutherfordton, NC 28139

Subject: John Deere Stream and Wetland Mitigation Site, Rutherford County, North Carolina

Dear Mr. Sigmond,

Equinox Environmental, acting as an agent of Resource Environmental Solutions, LLC (RES), requests review and comment on any possible issues that might emerge with respect to farmland resources including prime, unique, statewide or local important farmland associated with this proposed stream restoration project and being developed for the North Carolina Division of Mitigation Services. The project will convert approximately 11.7 acres of land being used for agricultural purposes (crops and/or seasonal livestock grazing). A USGS topographic map of the project area, a conceptual plan map, site photographs, and a Form AD-1006 are attached. The project is located at the following coordinates: 35.344240 N, -81.831507 W; WGS84.

The John Deere Site has been identified for the purpose of providing mitigation for unavoidable stream channel impacts in the Broad River Basin. RES has been contracted to design and build the John Deere project. A requirement of the project is to prepare an Environmental Resource Technical Document that describes the existing resources at the project site.

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The project stream reaches and adjacent riparian areas will be placed in conservation easements to protect the restored resources. While not a part of the restoration project, a conservation easement

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along the portion of Puzzle Creek that connects the two restoration reaches is a part of the proposed project.

Restoration of streams and wetlands re-establishment/rehabilitation at the John Deere site is expected to entail 1) re-grading of floodplain topography in order to remove surface drainage features and restore wetland micro-topography, 2) excavation and removal of buried agricultural drainage tiles, 3) excavation of overburden located on a portion of the site, 4) off-line channel construction to restore streams back to historical alignments through the wetland re-establishment/rehabilitation areas, 5) channel backfill, and 6) vegetative planting.

Re-establishment of wetlands on the east side of Puzzle Creek will be accomplished by restoring wetland hydrology and re-vegetation with wetland species. Wetland hydrology will be restored by locating and removing buried agricultural drain tiles throughout the floodplain. Carson Branch, which was previously relocated to the edge of the field, will be reconstructed as a Type E stream in the natural low of the floodplain. Additionally, a ditch constructed to drain the remaining wetlands will be plugged and partially backfilled. The new alignment of Carson Branch will provide additional hydrology to the floodplain. General excavation of the floodplain on the east side of Puzzle Creek is not proposed, instead re-grading of microtopography will further facilitate wetland functions.

Re-establishment of wetlands on the west side of Puzzle Creek will be accomplished by restoration of wetland hydrology, removal of overburden, and re-vegetation with wetland species. Wetland hydrology will be restored by removing buried agricultural drain tiles and by reconnecting two streams back to the floodplain. Thelma Branch historically flowed through the wetlands bordering Puzzle Creek on the west floodplain prior to being diverted directly into Puzzle Creek. David Branch was relocated to the edge of the floodplain. Both streams will be restored, as Type E streams, to their proper position in the low point of the floodplain. At the time that Thelma Branch was diverted, the spoil material from the channel excavation along with additional fill was placed on the wetlands adjacent to the ditch. This overburden material will be removed to expose the buried hydric soils. Additionally, deposition carried out of the valley of David Branch has formed a relatively recent alluvial fan that has also buried a portion of the former wetlands. This deposition, which is approximately 12 to 18 inches deep, will be removed to expose the buried hydric soils.

In-stream structures will be used to provide bank and profile stability and to improve habitat. Structures will likely include log structures. Existing bed material will be excavated and reused in the proposed channel bed. Sod mats will be used where available to provide immediate bank vegetation and stabilization. Where sod mats are not available, erosion control matting will be used. Upon completion of channel construction, erosion-control measures, such as seeding with erosion-control vegetation and/or mulching, will be implemented.

All of the restored stream reaches and the wetland areas will be planted with native vegetation (trees, shrubs, and an herbaceous seed mix) to match vegetation reference conditions and provide biological diversity. Stream banks will be stabilized using a combination of erosion matting, bare-root plantings, and bio-engineering techniques. Fencing will be installed in areas where livestock grazing is expected to continue.

Also enclosed is Form AD-1006 with Parts I and III completed. We ask that you review the site information and complete Parts II, IV, and V as required by the NRCS. Please email (jborawa@equinoxenvironmental.com), fax (828-253-8256), or mail your reply to or the address below within 90 days. We thank you in advance for your timely response and cooperation. Please feel free to contact me or Hunter Terrell at 828-253-6856 with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Jim Borawa
Environmental Scientist

Attachments: USGS topographic map, Conceptual Plan map, Site Photos, Form AD-1006
CC: Paul Wiesner, Division of Mitigation Services Project Manager

USDA
United States Department of Agriculture
Natural Resources Conservation Service
4407 Bland Road, Suite 117
Raleigh, North Carolina 27609

Milton Cortés, Assistant State Soil Scientist
Telephone No.: (919) 873-2171
Fax No.: (919) 873-2157
E-mail: milton.cortes@nc.usda.gov

September 09, 2015

Mr. Terrell Hunter
Aquatic Resource and GIS Specialist
EQUINOX
37 Haywood Street, Suite 100
Asheville, NC 28801

Mr. Hunter;

The following information is in response to your review request in the John Deere Stream/Wetland restoration Site Project, Rutherford Co., NC

Projects are subject to Farmland Protection Policy Act (FPPA) requirements if they may irreversibly convert farmland (directly or indirectly) to nonagricultural use and are completed by a Federal agency or with assistance from a Federal agency.

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 forest land, pastureland, cropland, or other land, but not water or urban built-up land.

Farmland means prime or unique farmlands as defined in section 1540(c)(1) of the Act or farmland that is determined by the appropriate state or unit of local government agency or agencies with concurrence of the Secretary to be farmland of statewide of local importance.

"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 USGS topographical maps, or as ``urban-built-up" on the USDA Important Farmland Maps. See over for more information.

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.

If you have any questions, please contact me at number above.

Sincerely,

Milton Cortes

Milton Cortés
Assistant State Soil Scientist

cc. Kent Clary, State Soil Scientist, USDA NRCS, NC

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July 8, 2015

Ms. Marella Buncick
Asheville Field Office
U.S. Fish and Wildlife Service
160 Zillicoa Street
Asheville, NC 28801

Subject: John Deere Stream and Wetland Mitigation Site, Rutherford County, North Carolina

Dear Marella,

Equinox Environmental, acting as an agent of Resource Environmental Solutions, LLC (RES), requests review and comment on any possible issues that might emerge with respect to endangered species, migratory birds, or other trust resources associated with this proposed stream restoration project being developed for the North Carolina Division of Mitigation Services. A USGS topographic map of the project area, a conceptual plan map, and site photos of the project are attached. The project is located at the following coordinates: 35.344240 N, -81.831507 W; WGS84.

The John Deere Site has been identified for the purpose of providing mitigation for unavoidable stream channel impacts in the Broad River Basin. RES has been contracted to design and build the John Deere project. A requirement of the project is to prepare an Environmental Resource Technical Document that describes the existing resources at the project site.

The John Deere site is currently utilized for agricultural production and livestock grazing. The project encompasses three unnamed tributaries to Puzzle Creek in Rutherford County. On the east side of Puzzle Creek the unnamed reach, called Carson Branch, shows signs of having been relocated, draining of wetlands with tiles, and plowing and cultivation of historic wetlands. The stream reach is now located along the toe of the slope and has limited vegetation along the bank bordering the agricultural production. This reach is proposed for restoration; the majority of wetlands are being proposed for reestablishment, with one small area being proposed for rehabilitation.

On the west side, two unnamed reaches referred to as David Branch and Thelma Branch, also have been manipulated through relocation and ditching. Adjacent wetland function was also impacted. Restoration of both reaches is proposed to restore stream function and wetland hydrology. The area surrounding these two reaches is grazed with livestock.

37 Haywood Street, Suite 100 Asheville NC 28801 828.253.6856 www.equinoxenvironmental.com

The project stream reaches and adjacent riparian areas will be placed in conservation easements to protect the restored resources. While not a part of the restoration project, a conservation easement along the portion of Puzzle Creek that connects the two restoration reaches is a part of the proposed project.

Restoration of streams and wetlands re-establishment/rehabilitation at the John Deere site is expected to entail 1) re-grading of floodplain topography in order to remove surface drainage features and restore wetland micro-topography, 2) excavation and removal of buried agricultural drainage tiles, 3) excavation of overburden located on a portion of the site, 4) off-line channel construction to restore streams back to historical alignments through the wetland re-establishment/rehabilitation areas, 5) channel backfill, and 6) vegetative planting.

Re-establishment of wetlands on the east side of Puzzle Creek will be accomplished by restoring wetland hydrology and re-vegetation with wetland species. Wetland hydrology will be restored by locating and removing buried agricultural drain tiles throughout the floodplain. Carson Branch, which was previously relocated to the edge of the field, will be reconstructed as a Type E stream in the natural low of the floodplain. Additionally, a ditch constructed to drain the remaining wetlands will be plugged and partially backfilled. The new alignment of Carson Branch will provide additional hydrology to the floodplain. General excavation of the floodplain on the east side of Puzzle Creek is not proposed, instead re-grading of microtopography will further facilitate wetland functions.

Re-establishment of wetlands on the west side of Puzzle Creek will be accomplished by restoration of wetland hydrology, removal of overburden, and re-vegetation with wetland species. Wetland hydrology will be restored by removing buried agricultural drain tiles and by reconnecting two streams back to the floodplain. Thelma Branch historically flowed through the wetlands bordering Puzzle Creek on the west floodplain prior to being diverted directly into Puzzle Creek. David Branch was relocated to the edge of the floodplain. Both streams will be restored, as Type E streams, to their proper position in the low point of the floodplain. At the time that Thelma Branch was diverted, the spoil material from the channel excavation along with additional fill was placed on the wetlands adjacent to the ditch. This overburden material will be removed to expose the buried hydric soils. Additionally, deposition carried out of the valley of David Branch has formed a relatively recent alluvial fan that has also buried a portion of the former wetlands. This deposition, which is approximately 12 to 18 inches deep, will be removed to expose the buried hydric soils.

In-stream structures will be used to provide bank and profile stability and to improve habitat. Structures will likely include log structures. Existing bed material will be excavated and reused in the proposed channel bed. Sod mats will be used where available to provide immediate bank vegetation and stabilization. Where sod mats are not available, erosion control matting will be used. Upon completion of channel construction, erosion-control measures, such as seeding with erosion-control vegetation and/or mulching, will be implemented.

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All of the restored stream reaches and the wetland areas will be planted with native vegetation (trees, shrubs, and an herbaceous seed mix) to match vegetation reference conditions and provide biological diversity. Stream banks will be stabilized using a combination of erosion matting, bare-root plantings, and bio-engineering techniques. Fencing will be installed in areas where livestock grazing is expected to continue.

We have already obtained an updated species list for Rutherford County from your web site. The federally threatened or endangered species for this county include the following:

- Indiana Bat (*Myotis sodalist*) - Endangered
- Rock Gnome Lichen (*Gymnoderma lineare*) - Endangered
- White Irisette (*Sisyrinchium dichotomum*) - Endangered
- Dwarf-Flowered Heartleaf (*Hexastylis naniflora*) – Threatened
- Small Whorled Pagonia (*Isotria medeoloides*) - Threatened
- Northern Long-Eared Bat (*Myotis septentrionalis*) – Threatened

We are requesting that you please provide any known information for each species in the county. The USFWS will be contacted if suitable habitat for any listed species is found or if we determine that the project may affect one or more federally listed species. According to the USFWS Critical Habitat Web Portal there are no federally designated critical habitats within Rutherford County.

We ask that you review and comment on any possible issues that might emerge with respect to endangered species, migratory birds, or other trust resources on the site. Please email, fax, or mail your reply to jborawa@equinoxenvironmental, 828-253-8256 X206 or the address below within 90 days. We thank you in advance for your timely response and cooperation. Please feel free to contact me or Hunter Terrell at 828-253-6856 with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Jim Borawa
Environmental Scientist

Attachments: USGS topographic map, Conceptual Plan map, Site Photos
CC: Paul Wiesner, Division of Mitigation Services Project Manager

37 Haywood Street, Suite 100 Asheville NC 28801 828.253.6856 www.equinoxenvironmental.com

Note: Marella Buncick with the USFWS was contacted on September 8th, 2015 regarding this project. She stated that the ERTR does not provide sufficient data to comment regarding potential impacts to threatened and endangered species. The agency will provide comments when they review the mitigation plan for this project.

Appendix F - Form AD-1006

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*			Date Of Land Evaluation Request July 6, 2015		
Name of Project John Deere Stream/Wetland Site			Federal Agency Involved Federal Highway Admin. (FHWA)		
Proposed Land Use Conservation Easement			County and State Rutherford County, North Carolina		
PART II *(To be completed by NRCS)*			Date Request Received By NRCS resent on 09/09/15	Person Completing Form: Milton Cortes NRCS	
Does the site contain Prime, Unique, Statewide or Local Important Farmland? *(If no, the FPPA does not apply - do not complete additional parts of this form)*		YES ☑ NO ☐	Acres Irrigated none	Average Farm Size 93 acres	
Major Crop(s) CORN	Farmable Land In Govt. Jurisdiction Acres: 47.9% % 54,557 acres		Amount of Farmland As Defined in FPPA Acres: 90.5% % 329,807		
Name of Land Evaluation System Used Rutherford, NC LESA	Name of State or Local Site Assessment System N/A		Date Land Evaluation Returned by NRCS 09/09/15 by email		

		Alternative Site Rating			
PART III *(To be completed by Federal Agency)*		Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly		2.41	9.34		
B. Total Acres To Be Converted Indirectly					
C. Total Acres In Site		2.41	9.34		
PART IV *(To be completed by NRCS)* Land Evaluation Information					
A. Total Acres Prime And Unique Farmland		2.4	9.10		
B. Total Acres Statewide Important or Local Important Farmland		0	0		
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted		0.0044	0.0167		
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value		15	15		
PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value of Farmland To Be Converted (Scale of 0 to 100 Points)		81	81		
PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(Criteria are explained in 7 CFR 658.5 b. For Corridor project use form NRCS-CPA-106)*	**Maximum Points**	Site A	Site B	Site C	Site D
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	0	0	0	0
PART VII ***(To be completed by Federal Agency)***					
Relative Value Of Farmland *(From Part V)*	100	81	81	0	0
Total Site Assessment *(From Part VI above or local site assessment)*	160	0	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	81	81	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? YES ☐ NO ☐
Reason For Selection:		
Name of Federal agency representative completing this form:		Date:

(See Instructions on reverse side) **Form AD-1006 (03-02)**

Appendix G - EDR Regulatory Record Search Report

John Deere
East Church Street
Bostic, NC 28018

Inquiry Number: 4375474.2s
August 06, 2015

The EDR Radius Map™ Report with GeoCheck®

EDR® Environmental Data Resources Inc

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

TABLE OF CONTENTS

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-13) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

EAST CHURCH STREET
BOSTIC, NC 28018

COORDINATES

Latitude (North):	35.3441000 - 35˚ 20' 38.76''
Longitude (West):	81.8311000 - 81˚ 49' 51.96''
Universal Tranverse Mercator:	Zone 17
UTM X (Meters):	424477.0
UTM Y (Meters):	3911321.8
Elevation:	825 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map:	5947865 FOREST CITY, NC
Version Date:	2013

AERIAL PHOTOGRAPHY IN THIS REPORT

Portions of Photo from:	20120816, 20120602
Source:	USDA

MAPPED SITES SUMMARY

Target Property Address:
EAST CHURCH STREET
BOSTIC, NC 28018

Click on Map ID to see full detail.

MAP ID	SITE NAME	ADDRESS	DATABASE ACRONYMS	RELATIVE ELEVATION	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

EXECUTIVE SUMMARY

TARGET PROPERTY SEARCH RESULTS

The target property was not listed in any of the databases searched by EDR.

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL: National Priority List
Proposed NPL: Proposed National Priority List Sites
NPL LIENS: Federal Superfund Liens

Federal Delisted NPL site list

Delisted NPL: National Priority List Deletions

Federal CERCLIS list

CERCLIS: Comprehensive Environmental Response, Compensation, and Liability Information System
FEDERAL FACILITY: Federal Facility Site Information listing

Federal CERCLIS NFRAP site List

CERC-NFRAP: CERCLIS No Further Remedial Action Planned

Federal RCRA CORRACTS facilities list

CORRACTS: Corrective Action Report

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF: RCRA - Treatment, Storage and Disposal

Federal RCRA generators list

RCRA-LQG: RCRA - Large Quantity Generators
RCRA-SQG: RCRA - Small Quantity Generators
RCRA-CESQG: RCRA - Conditionally Exempt Small Quantity Generator

Federal institutional controls / engineering controls registries

US ENG CONTROLS: Engineering Controls Sites List
US INST CONTROL: Sites with Institutional Controls

EXECUTIVE SUMMARY

LUCIS - - - - Land Use Control Information System

Federal ERNS list

ERNS - - - - Emergency Response Notification System

State- and tribal - equivalent NPL

NC HSDS - - - - Hazardous Substance Disposal Site

State- and tribal - equivalent CERCLIS

SHWS - - - - Inactive Hazardous Sites Inventory

State and tribal landfill and/or solid waste disposal site lists

SWF/LF - - - - List of Solid Waste Facilities
OLI - - - - Old Landfill Inventory

State and tribal leaking storage tank lists

LUST - - - - Regional UST Database
LUST TRUST - - - - State Trust Fund Database
LAST - - - - Leaking Aboveground Storage Tanks
INDIAN LUST - - - - Leaking Underground Storage Tanks on Indian Land

State and tribal registered storage tank lists

UST - - - - Petroleum Underground Storage Tank Database
AST - - - - AST Database
INDIAN UST - - - - Underground Storage Tanks on Indian Land
FEMA UST - - - - Underground Storage Tank Listing

State and tribal institutional control / engineering control registries

INST CONTROL - - - - No Further Action Sites With Land Use Restrictions Monitoring

State and tribal voluntary cleanup sites

INDIAN VCP - - - - Voluntary Cleanup Priority Listing
VCP - - - - Responsible Party Voluntary Action Sites

State and tribal Brownfields sites

BROWNFIELDS - - - - Brownfields Projects Inventory

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS - - - - A Listing of Brownfields Sites

Local Lists of Landfill / Solid Waste Disposal Sites

ODI - - - - Open Dump Inventory

EXECUTIVE SUMMARY

DEBRIS REGION 9 Torres Martinez Reservation Illegal Dump Site Locations
SWRCY Recycling Center Listing
HIST LF Solid Waste Facility Listing
INDIAN ODI Report on the Status of Open Dumps on Indian Lands

Local Lists of Hazardous waste / Contaminated Sites

US CDL Clandestine Drug Labs
US HIST CDL National Clandestine Laboratory Register

Local Land Records

LIENS 2 CERCLA Lien Information

Records of Emergency Release Reports

HMIRS Hazardous Materials Information Reporting System
IMD Incident Management Database
SPILLS Spills Incident Listing
SPILLS 80 SPILLS 80 data from FirstSearch
SPILLS 90 SPILLS 90 data from FirstSearch

Other Ascertainable Records

RCRA NonGen / NLR RCRA - Non Generators / No Longer Regulated
DOT OPS Incident and Accident Data
DOD Department of Defense Sites
FUDS Formerly Used Defense Sites
CONSENT Superfund (CERCLA) Consent Decrees
ROD Records Of Decision
UMTRA Uranium Mill Tailings Sites
US MINES Mines Master Index File
TRIS Toxic Chemical Release Inventory System
TSCA Toxic Substances Control Act
FTTS FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
HIST FTTS FIFRA/TSCA Tracking System Administrative Case Listing
SSTS Section 7 Tracking Systems
ICIS Integrated Compliance Information System
PADS PCB Activity Database System
MLTS Material Licensing Tracking System
RADINFO Radiation Information Database
FINDS Facility Index System/Facility Registry System
RAATS RCRA Administrative Action Tracking System
RMP Risk Management Plans
UIC Underground Injection Wells Listing
DRYCLEANERS Drycleaning Sites
NPDES NPDES Facility Location Listing
INDIAN RESERV Indian Reservations
SCRD DRYCLEANERS State Coalition for Remediation of Drycleaners Listing
COAL ASH Coal Ash Disposal Sites
Financial Assurance Financial Assurance Information Listing
LEAD SMELTERS Lead Smelter Sites
US AIRS Aerometric Information Retrieval System Facility Subsystem
EPA WATCH LIST EPA WATCH LIST

EXECUTIVE SUMMARY

US FIN ASSUR - - - - - - - - - - - - - - Financial Assurance Information
COAL ASH EPA - - - - - - - - - - - - - Coal Combustion Residues Surface Impoundments List
PCB TRANSFORMER - - - - - - - PCB Transformer Registration Database
COAL ASH DOE - - - - - - - - - - - - - Steam-Electric Plant Operation Data
2020 COR ACTION - - - - - - - - - - 2020 Corrective Action Program List
PRP - Potentially Responsible Parties

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP - - - - - - - - - - - - - - - - - - - EDR Proprietary Manufactured Gas Plants
EDR US Hist Auto Stat - - - - - - - EDR Exclusive Historic Gas Stations
EDR US Hist Cleaners - - - - - - - EDR Exclusive Historic Dry Cleaners

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

RGA HWS - - - - - - - - - - - - - - - - - - - Recovered Government Archive State Hazardous Waste Facilities List
RGA LF - Recovered Government Archive Solid Waste Facilities List
RGA LUST - - - - - - - - - - - - - - - - - - Recovered Government Archive Leaking Underground Storage Tank

SURROUNDING SITES: SEARCH RESULTS

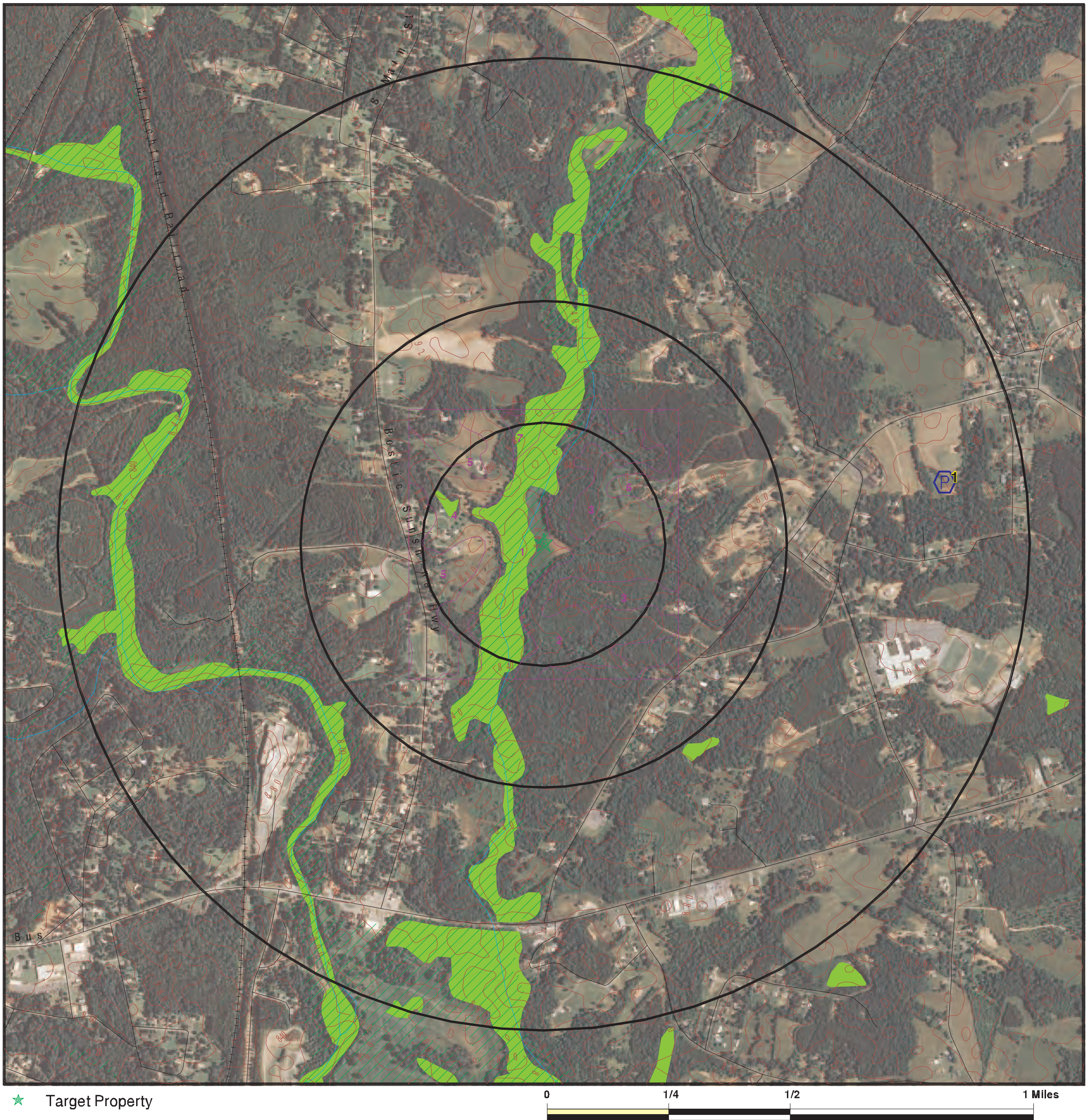
Surrounding sites were not identified.

Unmappable (orphan) sites are not considered in the foregoing analysis.

EXECUTIVE SUMMARY

There were no unmapped sites in this report.

OVERVIEW MAP - 4375474.2S



Target Property

Sites at elevations higher than or equal to the target property

Sites at elevations lower than the target property

Manufactured Gas Plants

National Priority List Sites

Dept. Defense Sites

Indian Reservations BIA

100-year flood zone

500-year flood zone

National Wetland Inventory

State Wetlands

Hazardous Substance Disposal Sites

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: John Deere ADDRESS: East Church Street Bostic NC 28018 LAT/LONG: 35.3441 / 81.8311	CLIENT: Equinox Env. Consult. & Design CONTACT: Owen Carson INQUIRY #: 4375474.2s DATE: August 06, 2015 10:50 am

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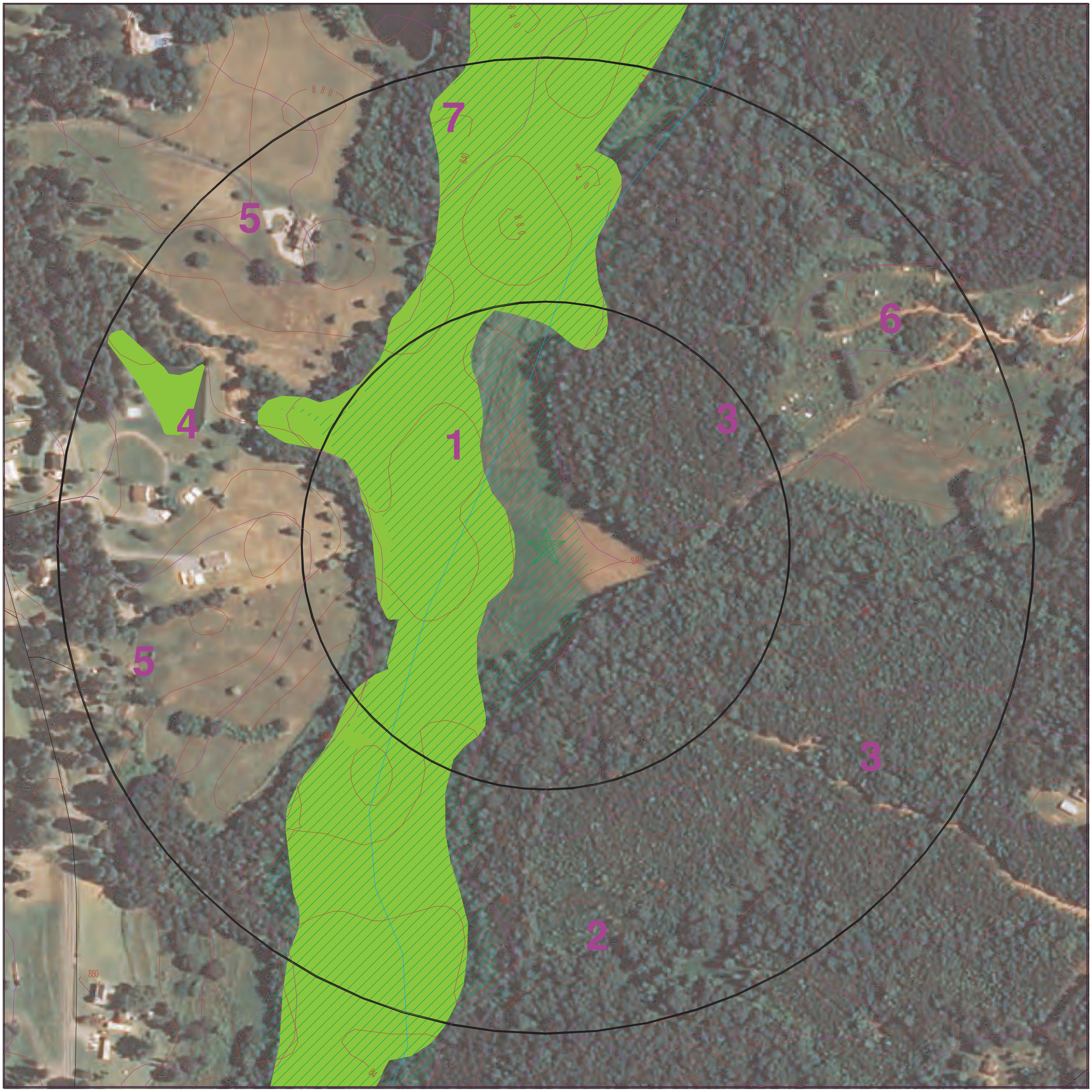
DETAIL MAP - 4375474.2S



Target Property
Sites at elevations higher than or equal to the target property
Sites at elevations lower than the target property
Manufactured Gas Plants
Sensitive Receptors
National Priority List Sites
Dept. Defense Sites

Indian Reservations BIA
100-year flood zone
500-year flood zone
National Wetland Inventory
State Wetlands

Hazardous Substance Disposal Sites

0 1/16 1/8 1/4 Miles

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME:	John Deere	CLIENT:	Equinox Env. Consult. & Design
ADDRESS:	East Church Street Bostic NC 28018	CONTACT:	Owen Carson
		INQUIRY #:	4375474.2s
LAT/LONG:	35.3441 / 81.8311	DATE:	August 06, 2015 10:51 am

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MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
STANDARD ENVIRONMENTAL RECORDS								
Federal NPL site list								
NPL	1.000		0	0	0	0	NR	0
Proposed NPL	1.000		0	0	0	0	NR	0
NPL LIENS	TP		NR	NR	NR	NR	NR	0
Federal Delisted NPL site list								
Delisted NPL	1.000		0	0	0	0	NR	0
Federal CERCLIS list								
CERCLIS	0.500		0	0	0	NR	NR	0
FEDERAL FACILITY	0.500		0	0	0	NR	NR	0
Federal CERCLIS NFRAP site List								
CERC-NFRAP	0.500		0	0	0	NR	NR	0
Federal RCRA CORRACTS facilities list								
CORRACTS	1.000		0	0	0	0	NR	0
Federal RCRA non-CORRACTS TSD facilities list								
RCRA-TSDF	0.500		0	0	0	NR	NR	0
Federal RCRA generators list								
RCRA-LQG	0.250		0	0	NR	NR	NR	0
RCRA-SQG	0.250		0	0	NR	NR	NR	0
RCRA-CESQG	0.250		0	0	NR	NR	NR	0
Federal institutional controls / engineering controls registries								
US ENG CONTROLS	0.500		0	0	0	NR	NR	0
US INST CONTROL	0.500		0	0	0	NR	NR	0
LUCIS	0.500		0	0	0	NR	NR	0
Federal ERNS list								
ERNS	TP		NR	NR	NR	NR	NR	0
State- and tribal - equivalent NPL								
NC HSDS	1.000		0	0	0	0	NR	0
State- and tribal - equivalent CERCLIS								
SHWS	1.000		0	0	0	0	NR	0
State and tribal landfill and/or solid waste disposal site lists								
SWF/LF	0.500		0	0	0	NR	NR	0
OLI	0.500		0	0	0	NR	NR	0
State and tribal leaking storage tank lists								
LUST	0.500		0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
LUST TRUST	0.500		0	0	0	NR	NR	0
LAST	0.500		0	0	0	NR	NR	0
INDIAN LUST	0.500		0	0	0	NR	NR	0
State and tribal registered storage tank lists								
UST	0.250		0	0	NR	NR	NR	0
AST	0.250		0	0	NR	NR	NR	0
INDIAN UST	0.250		0	0	NR	NR	NR	0
FEMA UST	0.250		0	0	NR	NR	NR	0
State and tribal institutional control / engineering control registries								
INST CONTROL	0.500		0	0	0	NR	NR	0
State and tribal voluntary cleanup sites								
INDIAN VCP	0.500		0	0	0	NR	NR	0
VCP	0.500		0	0	0	NR	NR	0
State and tribal Brownfields sites								
BROWNFIELDS	0.500		0	0	0	NR	NR	0
ADDITIONAL ENVIRONMENTAL RECORDS								
Local Brownfield lists								
US BROWNFIELDS	0.500		0	0	0	NR	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
ODI	0.500		0	0	0	NR	NR	0
DEBRIS REGION 9	0.500		0	0	0	NR	NR	0
SWRCY	0.500		0	0	0	NR	NR	0
HIST LF	0.500		0	0	0	NR	NR	0
INDIAN ODI	0.500		0	0	0	NR	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US CDL	TP		NR	NR	NR	NR	NR	0
US HIST CDL	TP		NR	NR	NR	NR	NR	0
Local Land Records								
LIENS 2	TP		NR	NR	NR	NR	NR	0
Records of Emergency Release Reports								
HMIRS	TP		NR	NR	NR	NR	NR	0
IMD	0.500		0	0	0	NR	NR	0
SPILLS	TP		NR	NR	NR	NR	NR	0
SPILLS 80	TP		NR	NR	NR	NR	NR	0
SPILLS 90	TP		NR	NR	NR	NR	NR	0
Other Ascertainable Records								
RCRA NonGen / NLR	0.250		0	0	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
DOT OPS	TP		NR	NR	NR	NR	NR	0
DOD	1.000		0	0	0	0	NR	0
FUDS	1.000		0	0	0	0	NR	0
CONSENT	1.000		0	0	0	0	NR	0
ROD	1.000		0	0	0	0	NR	0
UMTRA	0.500		0	0	0	NR	NR	0
US MINES	0.250		0	0	NR	NR	NR	0
TRIS	TP		NR	NR	NR	NR	NR	0
TSCA	TP		NR	NR	NR	NR	NR	0
FTTS	TP		NR	NR	NR	NR	NR	0
HIST FTTS	TP		NR	NR	NR	NR	NR	0
SSTS	TP		NR	NR	NR	NR	NR	0
ICIS	TP		NR	NR	NR	NR	NR	0
PADS	TP		NR	NR	NR	NR	NR	0
MLTS	TP		NR	NR	NR	NR	NR	0
RADINFO	TP		NR	NR	NR	NR	NR	0
FINDS	TP		NR	NR	NR	NR	NR	0
RAATS	TP		NR	NR	NR	NR	NR	0
RMP	TP		NR	NR	NR	NR	NR	0
UIC	TP		NR	NR	NR	NR	NR	0
DRYCLEANERS	0.250		0	0	NR	NR	NR	0
NPDES	TP		NR	NR	NR	NR	NR	0
INDIAN RESERV	1.000		0	0	0	0	NR	0
SCRD DRYCLEANERS	0.500		0	0	0	NR	NR	0
COAL ASH	0.500		0	0	0	NR	NR	0
Financial Assurance	TP		NR	NR	NR	NR	NR	0
LEAD SMELTERS	TP		NR	NR	NR	NR	NR	0
US AIRS	TP		NR	NR	NR	NR	NR	0
EPA WATCH LIST	TP		NR	NR	NR	NR	NR	0
US FIN ASSUR	TP		NR	NR	NR	NR	NR	0
COAL ASH EPA	0.500		0	0	0	NR	NR	0
PCB TRANSFORMER	TP		NR	NR	NR	NR	NR	0
COAL ASH DOE	TP		NR	NR	NR	NR	NR	0
2020 COR ACTION	0.250		0	0	NR	NR	NR	0
PRP	TP		NR	NR	NR	NR	NR	0
EDR HIGH RISK HISTORICAL RECORDS								
EDR Exclusive Records								
EDR MGP	1.000		0	0	0	0	NR	0
EDR US Hist Auto Stat	0.250		0	0	NR	NR	NR	0
EDR US Hist Cleaners	0.250		0	0	NR	NR	NR	0
EDR RECOVERED GOVERNMENT ARCHIVES								
Exclusive Recovered Govt. Archives								
RGA HWS	TP		NR	NR	NR	NR	NR	0
RGA LF	TP		NR	NR	NR	NR	NR	0
RGA LUST	TP		NR	NR	NR	NR	NR	0
- Totals --		0	0	0	0	0	0	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted

NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

MAP FINDINGS

Map ID Direction Distance Elevation	Site	Database(s)	EDR ID Number EPA ID Number

NO SITES FOUND

Count: 0 records.

ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
		NO SITES FOUND			

Appendix 9. Agency Correspondence

Letters to and Responses from Agencies

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July 8, 2015

Ms. Caitlin Totherow
Tribal Historic Preservation Office
Catawba Indian Nation
1536 Tom Steven Road
Rock Hill, SC 29730

Subject: John Deere Stream and Wetland Mitigation Site, Rutherford County, North Carolina

Dear Ms. Gledhill-Earley,

Equinox Environmental, acting as an agent of Resource Environmental Solutions, LLC (RES), requests review and comment on any possible issues that might emerge with respect to Catawba Indian Nation tribal resources associated with this proposed stream restoration project being developed for the North Carolina Division of Mitigation Services. A USGS topographic map of the project area, a conceptual plan of the project, and site photos are attached. The project is located at the following coordinates: 35.344240 N, -81.831507 W; WGS84.

The John Deere Site has been identified for the purpose of providing mitigation for unavoidable stream channel impacts in the Broad River Basin. RES has been contracted to design and build the John Deere project. A requirement of the project is to prepare an Environmental Resource Technical Document that describes the existing resources at the project site.

The John Deere site is currently utilized for agricultural production and livestock grazing. The project encompasses three unnamed tributaries to Puzzle Creek in Rutherford County. On the east side of Puzzle Creek the unnamed reach, called Carson Branch, shows signs of having been relocated, draining of wetlands with tiles, and plowing and cultivation of historic wetlands. The stream reach is now located along the toe of the slope and has limited vegetation along the bank bordering the agricultural production. This reach is proposed for restoration; the majority of wetlands are being proposed for reestablishment, with one small area being proposed for rehabilitation.

On the west side, two unnamed reaches referred to as David Branch and Thelma Branch, also have been manipulated through relocation and ditching. Adjacent wetland function was also impacted. Restoration of both reaches is proposed to restore stream function and wetland hydrology. The area surrounding these two reaches is grazed with livestock.

The project stream reaches and adjacent riparian areas will be placed in conservation easements to protect the restored resources. While not a part of the restoration project, a conservation easement along the portion of Puzzle Creek that connects the two restoration reaches is a part of the proposed project.

Restoration of streams and wetlands re-establishment/rehabilitation at the John Deere site is expected to entail 1) re-grading of floodplain topography in order to remove surface drainage features and restore wetland micro-topography, 2) excavation and removal of buried agricultural drainage tiles, 3) excavation of overburden located on a portion of the site, 4) off-line channel construction to restore streams back to historical alignments through the wetland re-establishment/rehabilitation areas, 5) channel backfill, and 6) vegetative planting.

Re-establishment of wetlands on the east side of Puzzle Creek will be accomplished by restoring wetland hydrology and re-vegetation with wetland species. Wetland hydrology will be restored by locating and removing buried agricultural drain tiles throughout the floodplain. Carson Branch, which was previously relocated to the edge of the field, will be reconstructed as a Type E stream in the natural low of the floodplain. Additionally, a ditch constructed to drain the remaining wetlands will be plugged and partially backfilled. The new alignment of Carson Branch will provide additional hydrology to the floodplain. General excavation of the floodplain on the east side of Puzzle Creek is not proposed, instead re-grading of microtopography will further facilitate wetland functions.

Re-establishment of wetlands on the west side of Puzzle Creek will be accomplished by restoration of wetland hydrology, removal of overburden, and re-vegetation with wetland species. Wetland hydrology will be restored by removing buried agricultural drain tiles and by reconnecting two streams back to the floodplain. Thelma Branch historically flowed through the wetlands bordering Puzzle Creek on the west floodplain prior to being diverted directly into Puzzle Creek. David Branch was relocated to the edge of the floodplain. Both streams will be restored, as Type E streams, to their proper position in the low point of the floodplain. At the time that Thelma Branch was diverted, the spoil material from the channel excavation along with additional fill was placed on the wetlands adjacent to the ditch. This overburden material will be removed to expose the buried hydric soils. Additionally, deposition carried out of the valley of David Branch has formed a relatively recent alluvial fan that has also buried a portion of the former wetlands. This deposition, which is approximately 12 to 18 inches deep, will be removed to expose the buried hydric soils.

In-stream structures will be used to provide bank and profile stability and to improve habitat. Structures will likely include log structures. Existing bed material will be excavated and reused in the proposed channel bed. Sod mats will be used where available to provide immediate bank vegetation and stabilization. Where sod mats are not available, erosion control matting will be used. Upon completion of channel construction, erosion-control measures, such as seeding with erosion-control vegetation and/or mulching, will be implemented.

All of the restored stream reaches and the wetland areas will be planted with native vegetation (trees, shrubs, and an herbaceous seed mix) to match vegetation reference conditions and provide biological diversity. Stream banks will be stabilized using a combination of erosion matting, bare-root plantings,

and bio-engineering techniques. Fencing will be installed in areas where livestock grazing is expected to continue.

We ask that you review and comment on any possible issues that might emerge with respect to any Catawba Indian Nation tribal resources associated with the site. Please email, fax, or mail your reply to jborawa@equinoxenvironmental, 828-253-8256 X206 or the address below within 90 days. We thank you in advance for your timely response and cooperation. Please feel free to contact me or Hunter Terrell at 828-253-6856 with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Jim Borawa
Environmental Scientist

Attachments: USGS topographic map, Conceptual Plan map, Site Photos
CC: Paul Wiesner, Division of Mitigation Services Project Manager

Catawba Indian Nation
Tribal Historic Preservation Office
1536 Tom Steven Road
Rock Hill, South Carolina 29730

Office 803-328-2427
Fax 803-328-5791

July 22, 2015

Attention: Jim Borawa
Equinox
37 Haywood Street, Suite 100
Asheville, NC 28801

Re. THPO #	TCNS #	Project Description
2015-660-1		John Deere Stream and Wetland Mitigation Site, Rutherford Co., NC

Mr. Borawa,

The Catawba have no immediate concerns with regard to traditional cultural properties, sacred sites or Native American archaeological sites within the boundaries of the proposed project areas. **However, the Catawba are to be notified if Native American artifacts and / or human remains are located during the ground disturbance phase of this project.**

If you have questions please contact Caitlin Totherow at 803-328-2427 ext. 226, or e-mail caitlinh@ccppcrafts.com.

Sincerely,

Caitlin Totherow for

Wenonah G. Haire
Tribal Historic Preservation Officer

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July 8, 2015

Mr. Russell Townsend
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians
2975 Governors Island Road
Bryson City, NC 28713

Subject: John Deere Stream and Wetland Mitigation Site, Rutherford County, North Carolina

Dear Mr. Townsend,

Equinox Environmental, acting as an agent of Resource Environmental Solutions, LLC (RES), requests review and comment on any possible issues that might emerge with respect to Eastern Band of Cherokee Indians tribal resources associated with this proposed stream restoration project being developed for the North Carolina Division of Mitigation Services. A USGS topographic map of the project area, a conceptual plan map of the project, and site photos are attached. The project is located at the following coordinates: 35.344240 N, -81.831507 W; WGS84.

The John Deere Site has been identified for the purpose of providing mitigation for unavoidable stream channel impacts in the Broad River Basin. RES has been contracted to design and build the John Deere project. A requirement of the project is to prepare an Environmental Resource Technical Document that describes the existing resources at the project site.

The John Deere site is currently utilized for agricultural production and livestock grazing. The project encompasses three unnamed tributaries to Puzzle Creek in Rutherford County. On the east side of Puzzle Creek the unnamed reach, called Carson Branch, shows signs of having been relocated, draining of wetlands with tiles, and plowing and cultivation of historic wetlands. The stream reach is now located along the toe of the slope and has limited vegetation along the bank bordering the agricultural production. This reach is proposed for restoration; the majority of wetlands are being proposed for reestablishment, with one small area being proposed for rehabilitation.

On the west side, two unnamed reaches referred to as David Branch and Thelma Branch, also have been manipulated through relocation and ditching. Adjacent wetland function was also impacted. Restoration of both reaches is proposed to restore stream function and wetland hydrology. The area surrounding these two reaches is grazed with livestock.

The project stream reaches and adjacent riparian areas will be placed in conservation easements to protect the restored resources. While not a part of the restoration project, a conservation easement along the portion of Puzzle Creek that connects the two restoration reaches is a part of the proposed project.

Restoration of streams and wetlands re-establishment/rehabilitation at the John Deere site is expected to entail 1) re-grading of floodplain topography in order to remove surface drainage features and restore wetland micro-topography, 2) excavation and removal of buried agricultural drainage tiles, 3) excavation of overburden located on a portion of the site, 4) off-line channel construction to restore streams back to historical alignments through the wetland re-establishment/rehabilitation areas, 5) channel backfill, and 6) vegetative planting.

Re-establishment of wetlands on the east side of Puzzle Creek will be accomplished by restoring wetland hydrology and re-vegetation with wetland species. Wetland hydrology will be restored by locating and removing buried agricultural drain tiles throughout the floodplain. Carson Branch, which was previously relocated to the edge of the field, will be reconstructed as a Type E stream in the natural low of the floodplain. Additionally, a ditch constructed to drain the remaining wetlands will be plugged and partially backfilled. The new alignment of Carson Branch will provide additional hydrology to the floodplain. General excavation of the floodplain on the east side of Puzzle Creek is not proposed, instead re-grading of microtopography will further facilitate wetland functions.

Re-establishment of wetlands on the west side of Puzzle Creek will be accomplished by restoration of wetland hydrology, removal of overburden, and re-vegetation with wetland species. Wetland hydrology will be restored by removing buried agricultural drain tiles and by reconnecting two streams back to the floodplain. Thelma Branch historically flowed through the wetlands bordering Puzzle Creek on the west floodplain prior to being diverted directly into Puzzle Creek. David Branch was relocated to the edge of the floodplain. Both streams will be restored, as Type E streams, to their proper position in the low point of the floodplain. At the time that Thelma Branch was diverted, the spoil material from the channel excavation along with additional fill was placed on the wetlands adjacent to the ditch. This overburden material will be removed to expose the buried hydric soils. Additionally, deposition carried out of the valley of David Branch has formed a relatively recent alluvial fan that has also buried a portion of the former wetlands. This deposition, which is approximately 12 to 18 inches deep, will be removed to expose the buried hydric soils.

In-stream structures will be used to provide bank and profile stability and to improve habitat. Structures will likely include log structures. Existing bed material will be excavated and reused in the proposed channel bed. Sod mats will be used where available to provide immediate bank vegetation and stabilization. Where sod mats are not available, erosion control matting will be used. Upon completion of channel construction, erosion-control measures, such as seeding with erosion-control vegetation and/or mulching, will be implemented.

All of the restored stream reaches and the wetland areas will be planted with native vegetation (trees, shrubs, and an herbaceous seed mix) to match vegetation reference conditions and provide biological diversity. Stream banks will be stabilized using a combination of erosion matting, bare-root plantings,

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and bio-engineering techniques. Fencing will be installed in areas where livestock grazing is expected to continue.

We ask that you review and comment on any possible issues that might emerge with respect to any Eastern Band of Cherokee Indians tribal resources associated with the site. Please email, fax, or mail your reply to jborawa@equinoxenvironmental, 828-253-8256 X206 or the address below within 90 days. We thank you in advance for your timely response and cooperation. Please feel free to contact me or Hunter Terrell at 828-253-6856 with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Jim Borawa
Environmental Scientist

Attachments: Site Map, USGS topographic map, Site Photos
CC: Paul Wiesner, Division of Mitigation Services Project Manager

As of September 17, 2015 a response from the Eastern Band of Cherokee Indians has not been received.

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July 8, 2015

Ms. Andrea Leslie
North Carolina Wildlife Resources Commission
29830 Great Smoky Mtn. Expressway
Waynesville NC 28786

Subject: John Deere Stream and Wetland Mitigation Site, Rutherford County, North Carolina

Dear Andrea,

Equinox Environmental, acting as an agent of Resource Environmental Solutions, LLC (RES), requests review and comment on any possible issues that might emerge with respect to fish and wildlife resources associated with this proposed stream restoration project being developed for the North Carolina Division of Mitigation Services. A USGS topographic map of the project, a conceptual plan map, and site photographs of the project are attached. The project is located at the following coordinates: 35.344240 N, -81.831507 W; WGS84.

The John Deere Site has been identified for the purpose of providing mitigation for unavoidable stream channel impacts in the Broad River Basin. RES has been contracted to design and build the John Deere project. A requirement of the project is to prepare an Environmental Resource Technical Document that describes the existing resources at the project site.

The John Deere site is currently utilized for agricultural production and livestock grazing. The project encompasses three unnamed tributaries to Puzzle Creek in Rutherford County. On the east side of Puzzle Creek the unnamed reach, called Carson Branch, shows signs of having been relocated, draining of wetlands with tiles, and plowing and cultivation of historic wetlands. The stream reach is now located along the toe of the slope and has limited vegetation along the bank bordering the agricultural production. This reach is proposed for restoration; the majority of wetlands are being proposed for reestablishment, with one small area being proposed for rehabilitation.

On the west side, two unnamed reaches referred to as David Branch and Thelma Branch, also have been manipulated through relocation and ditching. Adjacent wetland function was also impacted. Restoration of both reaches is proposed to restore stream function and wetland hydrology. The area surrounding these two reaches is grazed with livestock.

The project stream reaches and adjacent riparian areas will be placed in conservation easements to protect the restored resources. While not a part of the restoration project, a conservation easement along the portion of Puzzle Creek that connects the two restoration reaches is a part of the proposed project.

Restoration of streams and wetlands re-establishment/rehabilitation at the John Deere site is expected to entail 1) re-grading of floodplain topography in order to remove surface drainage features and restore wetland micro-topography, 2) excavation and removal of buried agricultural drainage tiles, 3) excavation of overburden located on a portion of the site, 4) off-line channel construction to restore streams back to historical alignments through the wetland re-establishment/rehabilitation areas, 5) channel backfill, and 6) vegetative planting.

Re-establishment of wetlands on the east side of Puzzle Creek will be accomplished by restoring wetland hydrology and re-vegetation with wetland species. Wetland hydrology will be restored by locating and removing buried agricultural drain tiles throughout the floodplain. Carson Branch, which was previously relocated to the edge of the field, will be reconstructed as a Type E stream in the natural low of the floodplain. Additionally, a ditch constructed to drain the remaining wetlands will be plugged and partially backfilled. The new alignment of Carson Branch will provide additional hydrology to the floodplain. General excavation of the floodplain on the east side of Puzzle Creek is not proposed, instead re-grading of microtopography will further facilitate wetland functions.

Re-establishment of wetlands on the west side of Puzzle Creek will be accomplished by restoration of wetland hydrology, removal of overburden, and re-vegetation with wetland species. Wetland hydrology will be restored by removing buried agricultural drain tiles and by reconnecting two streams back to the floodplain. Thelma Branch historically flowed through the wetlands bordering Puzzle Creek on the west floodplain prior to being diverted directly into Puzzle Creek. David Branch was relocated to the edge of the floodplain. Both streams will be restored, as Type E streams, to their proper position in the low point of the floodplain. At the time that Thelma Branch was diverted, the spoil material from the channel excavation along with additional fill was placed on the wetlands adjacent to the ditch. This overburden material will be removed to expose the buried hydric soils. Additionally, deposition carried out of the valley of David Branch has formed a relatively recent alluvial fan that has also buried a portion of the former wetlands. This deposition, which is approximately 12 to 18 inches deep, will be removed to expose the buried hydric soils.

In-stream structures will be used to provide bank and profile stability and to improve habitat. Structures will likely include log structures. Existing bed material will be excavated and reused in the proposed channel bed. Sod mats will be used where available to provide immediate bank vegetation and stabilization. Where sod mats are not available, erosion control matting will be used. Upon completion of channel construction, erosion-control measures, such as seeding with erosion-control vegetation and/or mulching, will be implemented.

All of the restored stream reaches and the wetland areas will be planted with native vegetation (trees, shrubs, and an herbaceous seed mix) to match vegetation reference conditions and provide biological diversity. Stream banks will be stabilized using a combination of erosion matting, bare-root plantings,

and bio-engineering techniques. Fencing will be installed in areas where livestock grazing is expected to continue.

We ask that you review and comment on any possible issues that might emerge with respect to the fish and wildlife resources on the site. Please email, fax, or mail your reply to jborawa@equinoxenvironmental, 828-253-8256 X206 or the address below within 90 days. We thank you in advance for your timely response and cooperation. Please feel free to contact me or Hunter Terrell at 828-253-6856 with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Jim Borawa
Environmental Scientist

Attachments: Site Map, USGS topographic map, Site Photos
CC: Paul Wiesner, Division of Mitigation Services Project Manager

North Carolina Wildlife Resources Commission

Gordon Myers, Executive Director

August 10, 2015

Jim Borawa
Equinox Environmental
37 Haywood Street, Suite 100
Asheville, NC 28801

SUBJECT: John Deere Stream and Wetland Mitigation Site
Puzzle Creek tributaries, Rutherford County

Dear Mr. Borawa:

Biologists with the North Carolina Wildlife Resources Commission (NCWRC) received your July 8, 2015 letter regarding plans for a stream and wetland restoration project involving the relocation of three tributaries to Puzzle Creek—David Branch, Thelma Branch, and Carson Branch—as well as the restoration of wetland vegetation hydrology and vegetation in wetlands in the Puzzle Creek floodplain in Rutherford County. You requested information concerning any issues that might arise with respect to fish and wildlife. Our comments on this project are offered for your consideration under provisions of the Clean Water Act of 1977 (33 U.S.C. 466 et. seq.) and Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667d).

This project will not impact wild trout resources or other known significant aquatic or terrestrial resources.

Thank you for the opportunity to review and comment on this project. Please contact me at (828) 400-4223 if you have any questions about these comments.

Sincerely,

Andrea Leslie
Mountain Region Coordinator
Division of Habitat Conservation

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July 6, 2015

Mr. Mike Sigmon
District Conservationist
Natural Resource Conservation Service
121 Laurel Drive
Rutherfordton, NC 28139

Subject: John Deere Stream and Wetland Mitigation Site, Rutherford County, North Carolina

Dear Mr. Sigmond,

Equinox Environmental, acting as an agent of Resource Environmental Solutions, LLC (RES), requests review and comment on any possible issues that might emerge with respect to farmland resources including prime, unique, statewide or local important farmland associated with this proposed stream restoration project and being developed for the North Carolina Division of Mitigation Services. The project will convert approximately 11.7 acres of land being used for agricultural purposes (crops and/or seasonal livestock grazing). A USGS topographic map of the project area, a conceptual plan map, site photographs, and a Form AD-1006 are attached. The project is located at the following coordinates: 35.344240 N, -81.831507 W; WGS84.

The John Deere Site has been identified for the purpose of providing mitigation for unavoidable stream channel impacts in the Broad River Basin. RES has been contracted to design and build the John Deere project. A requirement of the project is to prepare an Environmental Resource Technical Document that describes the existing resources at the project site.

The John Deere site is currently utilized for agricultural production and livestock grazing. The project encompasses three unnamed tributaries to Puzzle Creek in Rutherford County. On the east side of Puzzle Creek the unnamed reach, called Carson Branch, shows signs of having been relocated, draining of wetlands with tiles, and plowing and cultivation of historic wetlands. The stream reach is now located along the toe of the slope and has limited vegetation along the bank bordering the agricultural production. This reach is proposed for restoration; the majority of wetlands are being proposed for reestablishment, with one small area being proposed for rehabilitation.

On the west side, two unnamed reaches referred to as David Branch and Thelma Branch, also have been manipulated through relocation and ditching. Adjacent wetland function was also impacted. Restoration of both reaches is proposed to restore stream function and wetland hydrology. The area surrounding these two reaches is grazed with livestock.

The project stream reaches and adjacent riparian areas will be placed in conservation easements to protect the restored resources. While not a part of the restoration project, a conservation easement along the portion of Puzzle Creek that connects the two restoration reaches is a part of the proposed project.

Restoration of streams and wetlands re-establishment/rehabilitation at the John Deere site is expected to entail 1) re-grading of floodplain topography in order to remove surface drainage features and restore wetland micro-topography, 2) excavation and removal of buried agricultural drainage tiles, 3) excavation of overburden located on a portion of the site, 4) off-line channel construction to restore streams back to historical alignments through the wetland re-establishment/rehabilitation areas, 5) channel backfill, and 6) vegetative planting.

Re-establishment of wetlands on the east side of Puzzle Creek will be accomplished by restoring wetland hydrology and re-vegetation with wetland species. Wetland hydrology will be restored by locating and removing buried agricultural drain tiles throughout the floodplain. Carson Branch, which was previously relocated to the edge of the field, will be reconstructed as a Type E stream in the natural low of the floodplain. Additionally, a ditch constructed to drain the remaining wetlands will be plugged and partially backfilled. The new alignment of Carson Branch will provide additional hydrology to the floodplain. General excavation of the floodplain on the east side of Puzzle Creek is not proposed, instead re-grading of microtopography will further facilitate wetland functions.

Re-establishment of wetlands on the west side of Puzzle Creek will be accomplished by restoration of wetland hydrology, removal of overburden, and re-vegetation with wetland species. Wetland hydrology will be restored by removing buried agricultural drain tiles and by reconnecting two streams back to the floodplain. Thelma Branch historically flowed through the wetlands bordering Puzzle Creek on the west floodplain prior to being diverted directly into Puzzle Creek. David Branch was relocated to the edge of the floodplain. Both streams will be restored, as Type E streams, to their proper position in the low point of the floodplain. At the time that Thelma Branch was diverted, the spoil material from the channel excavation along with additional fill was placed on the wetlands adjacent to the ditch. This overburden material will be removed to expose the buried hydric soils. Additionally, deposition carried out of the valley of David Branch has formed a relatively recent alluvial fan that has also buried a portion of the former wetlands. This deposition, which is approximately 12 to 18 inches deep, will be removed to expose the buried hydric soils.

In-stream structures will be used to provide bank and profile stability and to improve habitat. Structures will likely include log structures. Existing bed material will be excavated and reused in the proposed channel bed. Sod mats will be used where available to provide immediate bank vegetation and stabilization. Where sod mats are not available, erosion control matting will be used. Upon completion of channel construction, erosion-control measures, such as seeding with erosion-control vegetation and/or mulching, will be implemented.

All of the restored stream reaches and the wetland areas will be planted with native vegetation (trees, shrubs, and an herbaceous seed mix) to match vegetation reference conditions and provide biological diversity. Stream banks will be stabilized using a combination of erosion matting, bare-root plantings, and bio-engineering techniques. Fencing will be installed in areas where livestock grazing is expected to continue.

Also enclosed is Form AD-1006 with Parts I and III completed. We ask that you review the site information and complete Parts II, IV, and V as required by the NRCS. Please email (jborawa@equinoxenvironmental.com), fax (828-253-8256), or mail your reply to or the address below within 90 days. We thank you in advance for your timely response and cooperation. Please feel free to contact me or Hunter Terrell at 828-253-6856 with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Jim Borawa
Environmental Scientist

Attachments: USGS topographic map, Conceptual Plan map, Site Photos, Form AD-1006
CC: Paul Wiesner, Division of Mitigation Services Project Manager

USDA
United States Department of Agriculture
Natural Resources Conservation Service
4407 Bland Road, Suite 117
Raleigh, North Carolina 27609

Milton Cortés, Assistant State Soil Scientist
Telephone No.: (919) 873-2171
Fax No.: (919) 873-2157
E-mail: milton.cortes@nc.usda.gov

September 09, 2015

Mr. Terrell Hunter
Aquatic Resource and GIS Specialist
EQUINOX
37 Haywood Street, Suite 100
Asheville, NC 28801

Mr. Hunter;

The following information is in response to your review request in the John Deere Stream/Wetland restoration Site Project, Rutherford Co., NC

Projects are subject to Farmland Protection Policy Act (FPPA) requirements if they may irreversibly convert farmland (directly or indirectly) to nonagricultural use and are completed by a Federal agency or with assistance from a Federal agency.

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 forest land, pastureland, cropland, or other land, but not water or urban built-up land.

Farmland means prime or unique farmlands as defined in section 1540(c)(1) of the Act or farmland that is determined by the appropriate state or unit of local government agency or agencies with concurrence of the Secretary to be farmland of statewide of local importance.

"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 USGS topographical maps, or as ``urban-built-up'' on the USDA Important Farmland Maps. See over for more information.

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.

If you have any questions, please contact me at number above.

Sincerely,

Milton Cortes

Milton Cortés
Assistant State Soil Scientist

cc. Kent Clary, State Soil Scientist, USDA NRCS, NC

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July 8, 2015

Ms. Marella Buncick
Asheville Field Office
U.S. Fish and Wildlife Service
160 Zillicoa Street
Asheville, NC 28801

Subject: John Deere Stream and Wetland Mitigation Site, Rutherford County, North Carolina

Dear Marella,

Equinox Environmental, acting as an agent of Resource Environmental Solutions, LLC (RES), requests review and comment on any possible issues that might emerge with respect to endangered species, migratory birds, or other trust resources associated with this proposed stream restoration project being developed for the North Carolina Division of Mitigation Services. A USGS topographic map of the project area, a conceptual plan map, and site photos of the project are attached. The project is located at the following coordinates: 35.344240 N, -81.831507 W; WGS84.

The John Deere Site has been identified for the purpose of providing mitigation for unavoidable stream channel impacts in the Broad River Basin. RES has been contracted to design and build the John Deere project. A requirement of the project is to prepare an Environmental Resource Technical Document that describes the existing resources at the project site.

The John Deere site is currently utilized for agricultural production and livestock grazing. The project encompasses three unnamed tributaries to Puzzle Creek in Rutherford County. On the east side of Puzzle Creek the unnamed reach, called Carson Branch, shows signs of having been relocated, draining of wetlands with tiles, and plowing and cultivation of historic wetlands. The stream reach is now located along the toe of the slope and has limited vegetation along the bank bordering the agricultural production. This reach is proposed for restoration; the majority of wetlands are being proposed for reestablishment, with one small area being proposed for rehabilitation.

On the west side, two unnamed reaches referred to as David Branch and Thelma Branch, also have been manipulated through relocation and ditching. Adjacent wetland function was also impacted. Restoration of both reaches is proposed to restore stream function and wetland hydrology. The area surrounding these two reaches is grazed with livestock.

37 Haywood Street, Suite 100 Asheville NC 28801 828.253.6856 www.equinoxenvironmental.com

The project stream reaches and adjacent riparian areas will be placed in conservation easements to protect the restored resources. While not a part of the restoration project, a conservation easement along the portion of Puzzle Creek that connects the two restoration reaches is a part of the proposed project.

Restoration of streams and wetlands re-establishment/rehabilitation at the John Deere site is expected to entail 1) re-grading of floodplain topography in order to remove surface drainage features and restore wetland micro-topography, 2) excavation and removal of buried agricultural drainage tiles, 3) excavation of overburden located on a portion of the site, 4) off-line channel construction to restore streams back to historical alignments through the wetland re-establishment/rehabilitation areas, 5) channel backfill, and 6) vegetative planting.

Re-establishment of wetlands on the east side of Puzzle Creek will be accomplished by restoring wetland hydrology and re-vegetation with wetland species. Wetland hydrology will be restored by locating and removing buried agricultural drain tiles throughout the floodplain. Carson Branch, which was previously relocated to the edge of the field, will be reconstructed as a Type E stream in the natural low of the floodplain. Additionally, a ditch constructed to drain the remaining wetlands will be plugged and partially backfilled. The new alignment of Carson Branch will provide additional hydrology to the floodplain. General excavation of the floodplain on the east side of Puzzle Creek is not proposed, instead re-grading of microtopography will further facilitate wetland functions.

Re-establishment of wetlands on the west side of Puzzle Creek will be accomplished by restoration of wetland hydrology, removal of overburden, and re-vegetation with wetland species. Wetland hydrology will be restored by removing buried agricultural drain tiles and by reconnecting two streams back to the floodplain. Thelma Branch historically flowed through the wetlands bordering Puzzle Creek on the west floodplain prior to being diverted directly into Puzzle Creek. David Branch was relocated to the edge of the floodplain. Both streams will be restored, as Type E streams, to their proper position in the low point of the floodplain. At the time that Thelma Branch was diverted, the spoil material from the channel excavation along with additional fill was placed on the wetlands adjacent to the ditch. This overburden material will be removed to expose the buried hydric soils. Additionally, deposition carried out of the valley of David Branch has formed a relatively recent alluvial fan that has also buried a portion of the former wetlands. This deposition, which is approximately 12 to 18 inches deep, will be removed to expose the buried hydric soils.

In-stream structures will be used to provide bank and profile stability and to improve habitat. Structures will likely include log structures. Existing bed material will be excavated and reused in the proposed channel bed. Sod mats will be used where available to provide immediate bank vegetation and stabilization. Where sod mats are not available, erosion control matting will be used. Upon completion of channel construction, erosion-control measures, such as seeding with erosion-control vegetation and/or mulching, will be implemented.

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All of the restored stream reaches and the wetland areas will be planted with native vegetation (trees, shrubs, and an herbaceous seed mix) to match vegetation reference conditions and provide biological diversity. Stream banks will be stabilized using a combination of erosion matting, bare-root plantings, and bio-engineering techniques. Fencing will be installed in areas where livestock grazing is expected to continue.

We have already obtained an updated species list for Rutherford County from your web site. The federally threatened or endangered species for this county include the following:

- Indiana Bat (*Myotis sodalist*) - Endangered
- Rock Gnome Lichen (*Gymnoderma lineare*) - Endangered
- White Irisette (*Sisyrinchium dichotomum*) - Endangered
- Dwarf-Flowered Heartleaf (*Hexastylis naniflora*) – Threatened
- Small Whorled Pagonia (*Isotria medeoloides)* - Threatened
- Northern Long-Eared Bat (*Myotis septentrionalis*) – Threatened

We are requesting that you please provide any known information for each species in the county. The USFWS will be contacted if suitable habitat for any listed species is found or if we determine that the project may affect one or more federally listed species. According to the USFWS Critical Habitat Web Portal there are no federally designated critical habitats within Rutherford County.

We ask that you review and comment on any possible issues that might emerge with respect to endangered species, migratory birds, or other trust resources on the site. Please email, fax, or mail your reply to jborawa@equinoxenvironmental, 828-253-8256 X206 or the address below within 90 days. We thank you in advance for your timely response and cooperation. Please feel free to contact me or Hunter Terrell at 828-253-6856 with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Jim Borawa
Environmental Scientist

Attachments: USGS topographic map, Conceptual Plan map, Site Photos
CC: Paul Wiesner, Division of Mitigation Services Project Manager

Note: Marella Buncick with the USFWS was contacted on September 8th, 2015 regarding this project. She stated that the ERTR does not provide sufficient data to comment regarding potential impacts to threatened and endangered species. The agency will provide comments when they review the mitigation plan for this project.

From:	Daniel Ingram
To:	Tugwell, Todd SAW; Marella Buncick (Marella_Buncick@fws.gov); Leslie, Andrea J; Fox, Tim; Johnson, Alan; Ginny; Bowers, Todd; Wilson, Travis W.; Price, Zan (George); Barnett, Kevin; Kichefski, Steven L SAW; Jones, Scott SAW; Alexander, Tasha L SAW; Wiesner, Paul; Tsomides, Harry
Cc:	Steve Melton; "Grant Ginn"; David Godley; Aaron Speaks
Subject:	John Deere IRT Site Visit Summary - DRAFT
Date:	Wednesday, May 27, 2015 11:20:00 AM

All,

Thanks again for the productive site review yesterday. Please review the attached meeting summary and let me know if you have any comments by Friday May 29. Thanks.

John Deere Full Delivery Mitigation Site

IRT Site Evaluation

May 26, 2015 10:00

Attendees:

Daniel Ingram, RES
Aaron Speaks, RES
Steve Melton, Equinox
Hunter Terrell, Equinox
Grant Ginn, Wolf Creek
Paul Wiesner, DMS
Harry Tsomides, DMS
Todd Tugwell, USACE
Marella Buncick, FWS
Andrea Leslie, WRC
Virginai Baker, DWR
Zan Price, DWR
Kevin Barnett, DWR
Todd Bowers, EPA

General Comments:

1. The easement gap for the Puzzle Creek corridor was of general concern to IRT. Primary concerns were lack of contiguous protected corridor and potential for future impacts (natural or man-made) that could threaten the integrity of the mitigation project. RES Team explained gap was due to the limited stream credit requested and consideration of future development of mitigation credits. RES Team agreed to extend the easement to Puzzle Creek along the tributaries included in the project. Extending the easement to Puzzle Creek throughout the project will require additional land acquisition and construction costs not included in the contracted unit cost with DMS. RES will evaluate that option in the mitigation plan development phase.
2. Todd Tugwell suggested increased wetland credit may be awarded for addressing bank stability on Puzzle Creek. This work would be performed to ensure the integrity of the re-established wetlands.

3. Marella Buncick requested the design include considerations for climate change in future conditions. Particularly the potential for storm events of increased intensity and variable return intervals.
4. Todd Tugwell stressed the overall goal of performing the best and most appropriate total uplift available.
5. DMS and IRT requested a detailed monitoring plan (with layout) be provided in the mitigation plan.

Wetland Comments:

1. Todd Tugwell suggested a JD submittal be made early in the design process. William Elliot will be the local USACE PM.
2. RES Team explained that the preliminary soil scientist report prepared for the proposal will be supplemented with a detailed study across the wetland mitigation areas. Areas currently labelled "re-establishment" that are determined to meet jurisdictional wetland criteria will be changed to "rehabilitation" but still credited at a 1:1 ratio due to the significant uplift and change in land use.
3. Todd Tugwell suggested a drainage study to determine the effect of Puzzle Creek subsurface drainage.
4. IRT members requested the wetland "rehabilitation area" be changed to "wetland enhancement" and the ratio be changed from 1.5:1 to 2:1. This is due to the apparent functionality of the existing wetland and lack of significant uplift from the hydrology and vegetation improvements.
5. Todd Tugwell commented that excavation of natural deposition should not be a component of wetland re-establishment. RES Team confirmed that excavation will be of placed fill or deposition from prior upslope erosive land uses.
6. IRT members discouraged the grading of "micro topography" and recommended slight hummocks be left intact for habitat variability.
7. IRT members expressed past problems associated with wetland restoration on Chewacla soils. RES Team understands the technical concerns but is confident in the site due to our long history (3+ years) of evaluating this system. Ultimately, all agreed that risk is assumed by RES.

Stream Comments:

1. As discussed above, the IRT requested the easement on the tributaries be extended to Puzzle Creek.
2. Grant Ginn explained design principle of wide flat channels with minimal matting and log sills, some sections may be anabranching. The oval goal of the stream design is to provide a stream-wetland system as found in local reference site. IRT members generally approved of this approach.
3. IRT members expressed concern that the Carson Branch existing condition was relatively high, particularly mid-reach. All agree the channel is excavated, is not in the appropriate landscape position, and does not function in concert with the adjacent wetland area. However, it is shaded and benthic macro-invertebrates were observed. It was suggested that a lower ratio or anti-degradation standard be applied to this restoration. The RES Team is confident a functional analysis will justify the full-scale restoration and 1:1 credit ratio.

Further, bed material will be harvested from the existing channel to jump start the benthic community. The stream-wetland complex restoration approach also addresses the "best and most appropriate uplift" standard stressed by Todd Tugwell in General Comment #4.

4. DMS and RES explained that the site will provide excess stream restoration beyond the 900 SMUs contracted. This is due to the limited need in the RFP. Excess stream restoration length may be used to offset any areas of losing stream channel due to wetland hydration.

Daniel Ingram
919-622-3845

Resource Environmental Solutions