Michael Baker
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November 30, 2015

Paul Wiesner
Western Supervisor, Project Management
North Carolina Department of Environmental Quality
Division of Mitigation Services
5 Ravenscroft Dr., #102
Asheville, NC 28801

Subject: Mitigation Plan Addendum for the Upper Silver Creek Restoration Project in Burke County
Catawba River Basin – CU#03050101-050050
Service Contract No. 003270
DMS No. 94645
Baker Project No. 120598

Dear Mr. Wiesner,

Please find enclosed the revised Mitigation Plan Addendum for the Upper Silver Creek Restoration Project in Burke County. It is based on field discussions and written comments from DMS, Corps of Engineers, and NC-DEQ. Included are revised asset tables and maps detailing the reclassification of 0.42 WMUs from riparian to non-riparian wetlands.

If you have any questions concerning the Addendum or require any additional information, please feel free to contact me at 919-481-5731 or via email at scott.king@mbakerintl.com.

Sincerely,

Scott King

Scott King, LSS (#1301), PWS (#1908)
Michael Baker Engineering, Inc.

RBF CONSULTING jma THE LPA GROUP KASEMAN SALLYPORT MBAKERINTL.COM

Michael Baker Engineering, Inc.
8000 Regency Parkway, Suite 600, Cary NC 27518
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Upper Silver Creek Stream and Wetland Restoration Project – Mitigation Plan Addendum

Michael Baker Engineering respectfully submits this wetland WMU reclassification as an addendum to the mitigation plan for the Upper Silver Creek Restoration project (DMS Project #94645). The revised table reclassifies 0.42 WMUs from riparian to non-riparian wetlands.

On October 26, 2015, Baker personnel met on site with representatives from the Corps of Engineers, NC Division of Water Resources, and NC Division of Mitigation Services to inspect existing wetland mitigation areas proposed for reclassification from riparian to non-riparian. After discussion, it was determined that the wetland area located within a seep along a slope in the southwestern portion of the project was located outside of the geomorphic floodplain and acceptable for reclassification (see Figure 2). Currently the wetland area is classified as predominantly Riparian Wetland Enhancement (JDW1A) at a 2:1 credit ratio for 0.21 WMUs, with two pockets of Riparian Wetland Restoration (areas R1A and R1B) at a 1:1 credit ratio for 0.21 WMUs. This addendum simply reclassifies those WMUs as Non-Riparian (see Table ES.2.Rev).

During the field investigation Baker also agreed to install an additional monitoring well in the newly reclassified non-riparian wetland area (see Figure 2). It will be installed in the upper portion of the wetland enhancement area over the winter 2015 before the growing season begins in 2016 to capture groundwater data for Monitoring Year 2 onward. The existing monitoring well located in this non-riparian area was installed in one of the wetland restoration areas. Thus this non-riparian wetland area will have two groundwater monitoring wells located within it.

Additionally, during the GIS analysis conducted to reclassify and revise the WMUs for the project, two errors were discovered in the original mitigation plan calculations of the acreage for the R4 and R5 riparian wetland areas proposed for restoration. The acreage for R4 was reported as 0.62 ac but is actually 0.44 ac, while the acreage for R5 was reported as 1.53 ac but is actually 1.29 ac. These errors subsequently resulted in the miscalculation of the total WMUs for the project, with a mistaken reported overage of 0.41 WMUs. The corrected WMU values are reflected in the revised asset Table ES.2.Rev.

Table ES.2: The original wetland mitigation plan asset table (from approved the mitigation plan, dated October 2013):

Table ES.2 Upper Silver Creek Mitigation Plan Overview (Wetlands)
Upper Silver Creek Mitigation Plan-EEP Project #94645

Design Approach	Existing Area (Ac.)	Design Area (Ac.)	WMU Credit Ratio	WMUs	Comments
ENHANCEMENT WETLANDS					
Jurisdictional Wetland 1 (JDW1a) - Riparian					
Enhancement (2:1)	0.53	0.53	2:1	0.26	Existing jurisdictional wetland; 2:1 enhancement proposed to include minor grading in areas of fill and altered drainage patterns, replanting of mowed vegetation to include woody bottomland wetland species. Some peripheral benefit from hydrology enhancements to tributary (UT3) and mainstem.
Jurisdictional Wetland 1 (JDW1b) – Riparian					
Enhancement (2:1)	0.9	0.9	2:1	0.45	Existing jurisdictional wetland; enhancement proposed at 2:1 to include significant enhancements to hydrology and vegetation. UT3 will be raised to bring hydrology within 1' of the surface and will be routed along the periphery of this wetland. In addition, hydrology from the mainstem will be augmented (base flow elevation raised by 0.5') and will be routed closer to the wetland area. Mowed vegetation will be planted with woody bottomland wetland species.
Jurisdictional Wetland 2 (JDW2) –Riparian					
Enhancement (2:1)	0.51	0.51	2:1	0.25	Existing jurisdictional wetland; enhancement proposed at 2:1 (typical enhancement ratio) to include plug of existing drainage ditch which has altered wetland hydrology, planting of woody bottomland wetland species to replace mowed grasses, minor grading of lower part of wetland and increase of baseflow elevation of mainstem by approximately 1.5 feet.
Jurisdictional Wetland 3 (JDW3) – Riparian					
Enhancement (2:1)	0.03	0.03	2:1	0.02	Existing jurisdictional wetland; enhancement proposed at 2:1 to include minor grading to remove less than 12" of overburden, reduction of hydraulic gradient by plugging existing drainage ditch and raising baseflow elevation of mainstem (these will serve to decrease the gradient of groundwater flow within the project area, resulting in an increased hydroperiod for adjacent wetlands). The area will be planted with woody wetland species to replace mowed grasses.
Jurisdictional Wetland 4 (JDW4) – Riparian					
Enhancement (2:1)	0.24	0.24	2:1	0.12	Existing jurisdictional wetland; enhancement proposed at 2:1 to include reduction of hydraulic gradient to adjacent areas by plugging existing drainage ditch and raising baseflow elevation of mainstem. The mainstem will also be relocated which should increase the influence of its hydrology on adjacent areas and decrease the gradient of groundwater flow. The area will be planted with woody wetland species to replace mowed grasses.
Jurisdictional Wetland 5 (JDW5) – Riparian					
Enhancement (2:1)	0.81	0.81	2:1	0.40	Existing jurisdictional wetland; enhancement proposed at 2:1 to include removal of overburden (fill) from areas where vegetation reflects the altered

					soil conditions, plugging/removal of ditching in the immediate vicinity and also upstream along the long linear ditch that parallels the stream, enhancement of wetland hydrology as a result of Priority I stream restoration and an increased base flow elevation, and increased storage/runoff retention by disconnecting direct ditch connections to the main channel and increasing ponding and recharge.
Jurisdictional Wetland 6 (JDW6) – Riparian					
Enhancement (2:1)	0.30	0.25	2:1	0.13	Existing jurisdictional wetland; enhancement proposed at 2:1 to include diversion of additional overland flow into the area, raising of mainstem of Silver Creek to create high level of groundwater and floodplain connectivity with wetland, replanting to establish woody wetland species to replace mowed grasses.
SUBTOTAL	*3.32*	*3.27*		*1.63*	
RESTORATION WETLANDS					
Restoration Wetland 1 (R1) – Riparian					
Restoration	0	0.21	1:1	0.21	Restoration wetland; credit proposed at 1:1. Proposed activities to include minor grading to create connectivity to hydric soils, route overland flow into areas to increase ponding and infiltration, and planting with target of hardwood bottomland forest ecosystem to replace mowed grasses.
Restoration Wetland 2 (R2) – Riparian					
Restoration	0	1.22	1:1	1.22	Restoration wetland; credit proposed at 1:1. Proposed activities to include removal of less than 12” of overburden from past fill activities thought to be associated with road construction, remeandering of UT3 through the middle of the proposed restoration wetland to restore hydrology, and replanting with wetland herbaceous and hardwood bottomland forest ecosystem to replace mowed grasses, predominantly fescue.
Restoration Wetland 3 (R3) – Riparian					
Restoration	0	0.18	1:1	0.18	Restoration wetland; credit proposed at 1:1. Proposed activities to include removal of less than 12” of overburden from past fill activities thought to be associated pasture enhancement, plugging of drainage ditch that extends into the area to restore hydrology (reduce hydraulic gradient), and potential to divert some larger stream flows from UT3 into this vicinity through overland channels that would mimic a complex floodplain with abandoned channels and abundant roughness elements affecting floodplain flow paths.
Restoration Wetland 4 (R4) – Riparian					
Restoration	0	0.62	1:1	0.62	Restoration wetland; credit proposed at 1:1. Proposed activities to include removal of less than 12” of overburden from past fill activities thought to be associated with channel dredging, channel restoration to include removal of levy along mainstem creek bank to enhance floodplain access and also to raise base flow elevation relative to floodplain elevation, and replanting with wetland herbaceous and hardwood bottomland forest ecosystem to replace mowed grasses (predominantly fescue).
Restoration Wetland 5 (R5) – Riparian					
Restoration	0	1.53	1:1	1.53	Restoration wetland; credit proposed at 1:1. Proposed activities to include removal of less than 12” of overburden from past fill activities thought to be associated with pasture enhancement, removal of adjacent ditch should reduce groundwater drawdown rate by raising the potentiometric surface in this area, and replanting with wetland herbaceous and hardwood bottomland forest ecosystem to replace mowed grasses.
Restoration Wetland 6 (R6) – Riparian					
Restoration	0	1.54	1:1	1.54	Restoration wetland; credit proposed at 1:1. Proposed activities will include removal of less than 12” of existing overburden thought to be placed for

					pasture enhancement, removal of ditch features at the top of the wetland and adjacent to the mainstem that are reducing ponding volumes and recharge, raising the baseflow level and modifying the typical design cross-section of the mainstem in this area to increase floodplain activation frequency, and constructing minor diversions of overland flow and flow from high flow events on UT1 into the area to further enhance hydrology. The area will be replanted with a target hardwood bottomland forest plant community to replace existing mowed grasses and herbaceous wetland species.
SUBTOTAL	*0*	*5.3*		*5.30*	
CREATION WETLANDS					
Creation Wetland 1 (C1) – Riparian					
Creation (3:1)	0	0.99	3:1	0.33	Creation wetland; credit proposed at 3:1. Proposed activities to include grading of existing drainage ditch to a more natural and broad swale with a low gradient and intermittent ponding areas. This is already a high recharge area, but reconnection of the main stem with the floodplain will create a significant increase in flooding to this area as well. Higher global water tables will reduce groundwater flow out of the area. The increase in hydrology and the grading efforts should create conditions necessary for wetland creation. The area will be replanted with a target hardwood bottomland forest plant community to replace existing mowed grasses and herbaceous wetland species.
SUBTOTAL	*0*	*0.99*		*0.33*	

Wetland Summary

	Design Area (Ac)	**WMU Credit Ratio**	**WMUs**	**Comments**
Restoration	5.30	1:1	5.30	
Enhancement	3.27	2:1	1.63	
Creation	0.99	3:1	0.33	
TOTAL WMUs			7.26	

Figure ES.1: The original mitigation plan asset map

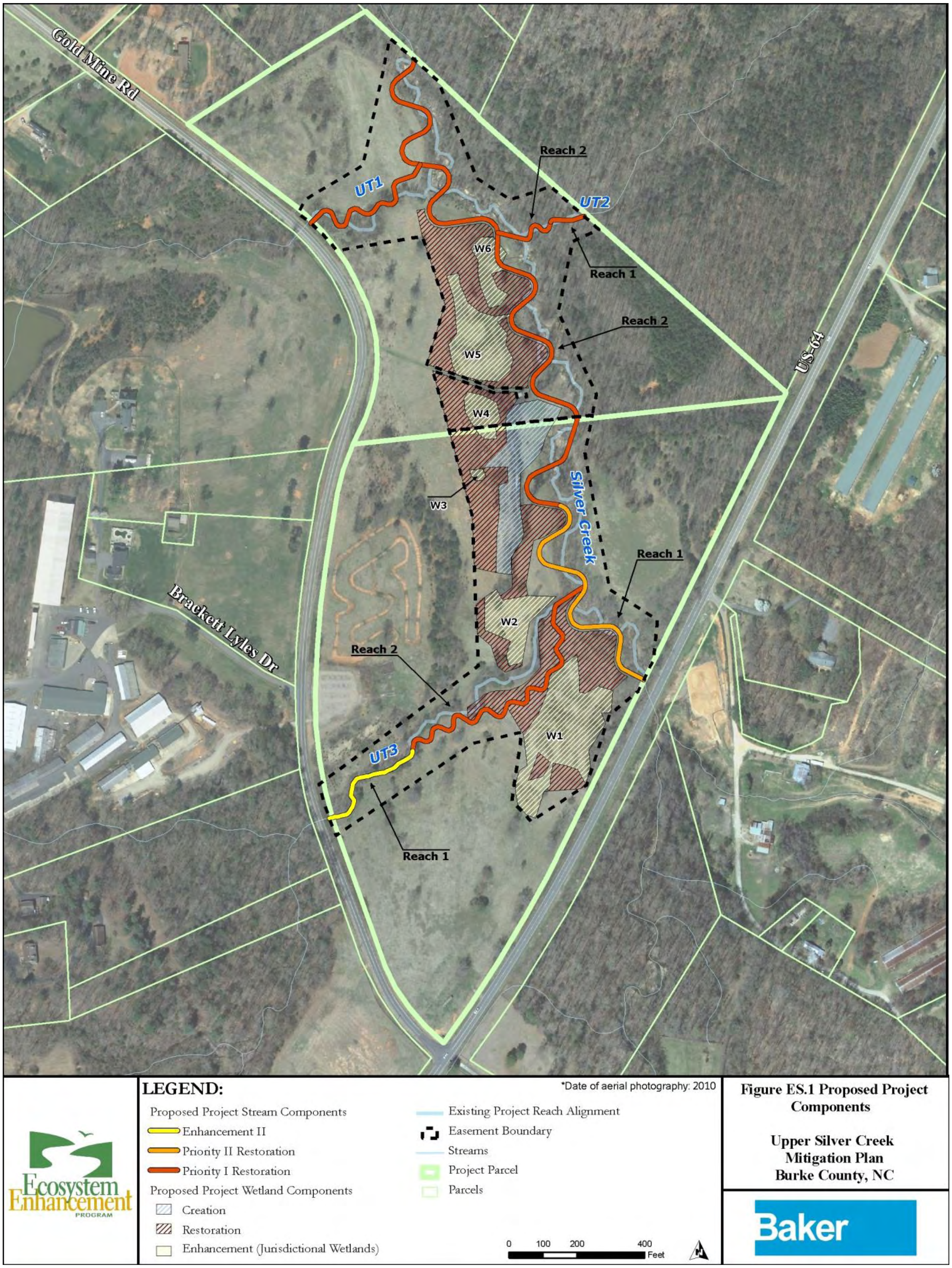


Table ES.2.Rev: The revised mitigation plan addendum wetland asset table:

Table ES.2.Rev Upper Silver Creek Mitigation Plan Addendum: Wetland Assets
Upper Silver Creek Mitigation Plan-DMS Project #94645

Design Approach	Existing Area (Ac.)	Design Area (Ac.)	WMU Credit Ratio	WMUs	Comments
ENHANCEMENT WETLANDS					
Non-Riparian					
Jurisdictional Wetland 1A (JDW1A) – Non-Riparian					
Enhancement (2:1)	0.42	0.42	2:1	0.21	Existing jurisdictional wetland; 2:1 enhancement proposed to include minor grading in areas of fill and altered drainage patterns, replanting of mowed vegetation to include woody bottomland wetland species.
SUBTOTAL	0.42	0.42	2:1	0.21	
Riparian					
Jurisdictional Wetland 1B (JDW1B) – Riparian					
Enhancement (2:1)	1.01	1.01	2:1	0.51	Existing jurisdictional wetland; enhancement proposed at 2:1 to include significant enhancements to hydrology and vegetation. UT3 will be raised to bring hydrology within 1’ of the surface and will be routed along the periphery of this wetland. In addition, hydrology from the mainstem will be augmented (base flow elevation raised by 0.5’) and will be routed closer to the wetland area. Mowed vegetation will be planted with woody bottomland wetland species.
Jurisdictional Wetland 2 (JDW2) –Riparian					
Enhancement (2:1)	0.51	0.51	2:1	0.25	Existing jurisdictional wetland; enhancement proposed at 2:1 (typical enhancement ratio) to include plug of existing drainage ditch which has altered wetland hydrology, planting of woody bottomland wetland species to replace mowed grasses, minor grading of lower part of wetland and increase of baseflow elevation of mainstem by approximately 1.5 feet.
Jurisdictional Wetland 3 (JDW3) – Riparian					
Enhancement (2:1)	0.03	0.03	2:1	0.02	Existing jurisdictional wetland; enhancement proposed at 2:1 to include minor grading to remove less than 12” of overburden, reduction of hydraulic gradient by plugging existing drainage ditch and raising baseflow elevation of mainstem (these will serve to decrease the gradient of groundwater flow within the project area, resulting in an increased hydroperiod for adjacent wetlands). The area will be planted with woody wetland species to replace mowed grasses.
Jurisdictional Wetland 4 (JDW4) – Riparian					
Enhancement (2:1)	0.24	0.24	2:1	0.12	Existing jurisdictional wetland; enhancement proposed at 2:1 to include reduction of hydraulic gradient to adjacent areas by plugging existing drainage ditch and raising baseflow elevation of mainstem. The mainstem will also be relocated which should increase the influence of its hydrology on adjacent areas and decrease the gradient of groundwater flow. The area will be planted with woody wetland species to replace mowed grasses.
Jurisdictional Wetland 5 (JDW5) – Riparian					

Enhancement (2:1)	0.81	0.81	2:1	0.40	Existing jurisdictional wetland; enhancement proposed at 2:1 to include removal of overburden (fill) from areas where vegetation reflects the altered soil conditions, plugging/removal of ditching in the immediate vicinity and also upstream along the long linear ditch that parallels the stream, enhancement of wetland hydrology as a result of Priority I stream restoration and an increased base flow elevation, and increased storage/runoff retention by disconnecting direct ditch connections to the main channel and increasing ponding and recharge.
Jurisdictional Wetland 6 (JDW6) – Riparian					
Enhancement (2:1)	0.25	0.25	2:1	0.13	Existing jurisdictional wetland; enhancement proposed at 2:1 to include diversion of additional overland flow into the area, raising of mainstem of Silver Creek to create high level of groundwater and floodplain connectivity with wetland, replanting to establish woody wetland species to replace mowed grasses.
SUBTOTAL	*2.85*	*2.85*		*1.43*	
RESTORATION WETLANDS					
Non-Riparian					
Restoration Wetland 1A (R1A) – Non-Riparian					
Restoration	0	0.06	1:1	0.06	Restoration wetland; credit proposed at 1:1. Proposed activities to include minor grading to create connectivity to hydric soils, route overland flow into areas to increase ponding and infiltration, and planting with target of hardwood bottomland forest ecosystem to replace mowed grasses.
Restoration Wetland 1B (R1B) – Non-Riparian					
Restoration	0	0.15	1:1	0.15	Restoration wetland; credit proposed at 1:1. Proposed activities to include minor grading to create connectivity to hydric soils, route overland flow into areas to increase ponding and infiltration, and planting with target of hardwood bottomland forest ecosystem to replace mowed grasses.
SUBTOTAL	0	0.21	1:1	0.21	
Riparian					
Restoration Wetland 2 (R2) – Riparian					
Restoration	0	1.22	1:1	1.22	Restoration wetland; credit proposed at 1:1. Proposed activities to include removal of less than 12” of overburden from past fill activities thought to be associated with road construction, remeandering of UT3 through the middle of the proposed restoration wetland to restore hydrology, and replanting with wetland herbaceous and hardwood bottomland forest ecosystem to replace mowed grasses, predominantly fescue.
Restoration Wetland 3 (R3) – Riparian					
Restoration	0	0.18	1:1	0.18	Restoration wetland; credit proposed at 1:1. Proposed activities to include removal of less than 12” of overburden from past fill activities thought to be associated pasture enhancement, plugging of drainage ditch that extends into the area to restore hydrology (reduce hydraulic gradient), and potential to divert some larger stream flows from UT3 into this vicinity through overland channels that would mimic a complex floodplain with abandoned channels and abundant roughness elements affecting floodplain flow paths.
Restoration Wetland 4 (R4) – Riparian					
Restoration	0	0.44	1:1	0.44	Restoration wetland; credit proposed at 1:1. Proposed activities to include removal of less than 12” of overburden from past fill activities thought to be associated with channel dredging, channel restoration to include removal of levy along mainstem creek bank to enhance floodplain access and also to raise base flow elevation relative to floodplain elevation, and replanting with

					wetland herbaceous and hardwood bottomland forest ecosystem to replace mowed grasses (predominantly fescue).
Restoration Wetland 5 (R5) – Riparian					
Restoration	0	1.29	1:1	1.29	Restoration wetland; credit proposed at 1:1. Proposed activities to include removal of less than 12" of overburden from past fill activities thought to be associated with pasture enhancement, removal of adjacent ditch should reduce groundwater drawdown rate by raising the potentiometric surface in this area, and replanting with wetland herbaceous and hardwood bottomland forest ecosystem to replace mowed grasses.
Restoration Wetland 6 (R6) – Riparian					
Restoration	0	1.54	1:1	1.54	Restoration wetland; credit proposed at 1:1. Proposed activities will include removal of less than 12" of existing overburden thought to be placed for pasture enhancement, removal of ditch features at the top of the wetland and adjacent to the mainstem that are reducing ponding volumes and recharge, raising the baseflow level and modifying the typical design cross-section of the mainstem in this area to increase floodplain activation frequency, and constructing minor diversions of overland flow and flow from high flow events on UT1 into the area to further enhance hydrology. The area will be replanted with a target hardwood bottomland forest plant community to replace existing mowed grasses and herbaceous wetland species.
SUBTOTAL	*0*	*4.67*		*4.67*	
CREATION WETLANDS					
Creation Wetland 1 (C1) – Riparian					
Creation (3:1)	0	0.99	3:1	0.33	Creation wetland; credit proposed at 3:1. Proposed activities to include grading of existing drainage ditch to a more natural and broad swale with a low gradient and intermittent ponding areas. This is already a high recharge area, but reconnection of the main stem with the floodplain will create a significant increase in flooding to this area as well. Higher global water tables will reduce groundwater flow out of the area. The increase in hydrology and the grading efforts should create conditions necessary for wetland creation. The area will be replanted with a target hardwood bottomland forest plant community to replace existing mowed grasses and herbaceous wetland species.
SUBTOTAL	*0*	*0.99*		*0.33*	

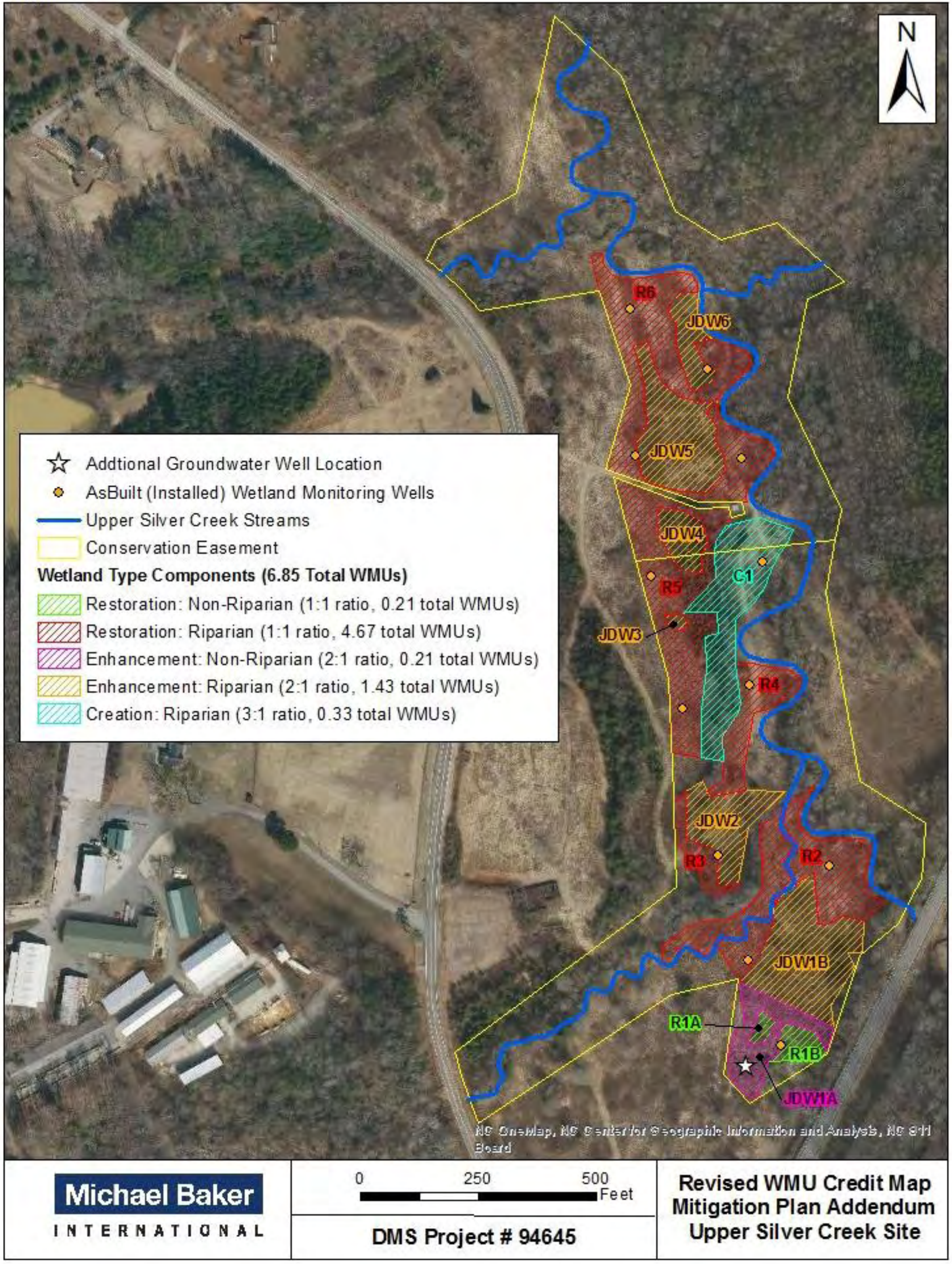
Wetland Summary

	Design Area (Ac)	WMU Credit Ratio	WMUs	Comments
Restoration: Non-Riparian	0.21	1:1	0.21	
Restoration: Riparian	4.67	1:1	4.67	
Enhancement: Non-Riparian	0.42	2:1	0.21	
Enhancement: Riparian	2.85	2:1	1.43	

Creation: Riparian	0.99	3:1	0.33	
TOTAL WMUs			**6.85**	

Figure 2: The revised mitigation plan addendum wetland asset map

Figure 2



DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

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

REPLY TO
ATTENTION OF:

12 August, 2013

Regulatory Division

Re: NCIRT Review and USACE Approval of the Upper Silver Creek- Draft Mitigation Plan; SAW 2010-02157; EEP # 94645

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

Dear Mr. Ellison:

The purpose of this letter is to provide the North Carolina Ecosystem Enhancement Program (NCEEP) with all comments generated by the North Carolina Interagency Review Team (NCIRT) during the 30-day comment period for the Upper Silver Creek Draft Mitigation Plan, which closed on 12 July, 2013. These comments are attached for your review.

Based on our review of these comments, we have determined that no major concerns have been identified with the Draft Mitigation Plan. However, the minor issues with the Draft as discussed in the attached comment memo must be addressed in the Final Mitigation Plan.

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

Thank you for your prompt attention to this matter, and if you have any questions regarding this letter, the mitigation plan review process, or the requirements of the Mitigation Rule, please call me at 919-846-2564.

Sincerely,

Tyler Crumbley
Regulatory Specialist

Enclosures

Electronic Copies Furnished:

NCIRT Distribution List
CESAW-RG/Wicker
CESAW-RG-A/Kichefski
Jeff Jurek, NCEEP
Mike McDonald, NCEEP

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

REPLY TO
ATTENTION OF:

CESAW-RG/Crumbley 25 July, 2013

MEMORANDUM FOR RECORD

SUBJECT: Upper Silver Creek- NCIRT Comments During 30-day Mitigation Plan Review

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

NCEEP Project Name: Upper Silver Creek Mitigation Site, Burke County, NC

USACE AID#: SAW-2010-02157
NCEEP #: 94645

30-Day Comment Deadline: 12 July, 2013

1. *T. Crumbley, USACE; 2 July, 2013*:

    - I made a typographical error on the Jurisdictional Determination forms for the project. The correct Action ID is SAW-2010-02157. Please note and revise on future references to the project.
    - Table 5.2 and subsequent discussions (Section 8.3) on monitoring provide a 5 yr schedule for “non-forested” wetland and riparian vegetation monitoring. Please explain if these areas are supposed to non-forested, and if so, why. If these areas are supposed to be forested, monitoring schedules should be conducted for 7 years rather than 5. The associated credit release schedules and monitoring activities should also reflect the 7 year requirement as well.
    - On pg. 8-1, Section 8.1.2 the proposed number of cross sections per reach will rely on EEP guidance for baseline monitoring. Please ensure that the number of cross sections is at the minimum required in the 2003 Stream Mitigation Guidelines, and that the proposed locations of those cross sections are noted on the final version of the Mitigation Plan and the As-built surveys.
    - Section 8.2: Please ensure that the proposed location of the groundwater monitoring wells and vegetation plots are shown on the final Mitigation Plan and the As-built surveys.

- On pg. 8-3 a 12.5% hydro-period is proposed as a performance standard, but then it is later stated that if below-average precipitation occurs then a 7% standard will be implemented. Additionally, the actual measured data suggests that a hydro-period closer to 20% exists on-site for particular wetlands, but no final standard is proposed. Please better define the hydro-period standard for each wetland type.
- The wetland components on the left (west) side of the stream propose wetland credit generation all the way up to the stream bank. Please note that if those areas fail to meet jurisdictional status, they may be subject to removal from the approved restoration areas.
- 16.5.2: On PCN, please provide further discussion on protection measures for existing wetlands (high visibility fencing, avoidance). Impacts to existing wetlands need to be accounted for in the final mit plan and ensuing NWP application, including explanations on how the impacts/losses will be replaced.
- Wetland areas slated for Restoration credit that will have overburden removed (even if less than 12") may be subject to credit adjustment if hydric soil profiles are not quickly (within monitoring period) reformed/returned as expected on restoration sites.
- The areas of "non-riparian" credit generation should be revised and considered to be "riparian", as the entire project is within a geomorphic floodplain (according to USGS Topographic Quad 1:24,000) and not within the NCWAM definition of a "seep".

2. *Eric Kulz, NCDWQ; 2 July, 2013*:
   - DWQ is concerned regarding the removal of surficial soils to expose "relict" hydric soils, especially in light of the fact that there are currently jurisdictional wetlands at the existing ground surface elevation. Areas considered restoration should be limited to minimal soil removal. Performance standards should include a hydric soil component; if these areas are truly relict surficial wetland soils then hydrologic restoration should result in fairly rapid development of current hydric soil characteristics (e.g. redox concentrations in living root channels).
   - The entire conservation easement appears to be located within a valley feature, as opposed to on a slope or an interstream divide. DWQ believes all proposed restored/enhanced/created wetlands on the site should be classified as riparian.
   - On page 5-2, Table 5.2, the required monitoring period for forested wetland mitigation sites is seven years, not five. The proposed wetlands are forested wetlands, not non-forested as the table indicates. Please revise.

Michael Baker Engineering, Inc.
797 Haywood Road, Suite 201
Asheville, NC 28806

October 2, 2013

Tyler Crumbley
Regulatory Division, Wilmington District
U.S. Army Corps of Engineers
11405 Falls of Neuse Road
Wake Forest, NC 27587
(919) 846-2564

Subject: Response letter to NCIRT Review comments and USACE Approval of the Upper Silver Creek Draft Mitigation Plan; SAW 2010-02157.
NCEEP Contract No. 003270 and Project No. 94645

Dear Mr. Crumbley and NCIRT,

Please find enclosed the following in reference to the Upper Silver Creek Stream and Wetland Restoration Project located in Burke County, NC.

- Upper Silver Creek Final Mitigation Plan,
- Preconstruction Notification (PCN) Application for Nationwide Permit 27,
- NCIRT and USACE Approval Letter for the Upper Silver Creek Draft Mitigation Plan, and
- Responses to review comments dated August 12, 2013.

This letter summarizes our response to comments referenced above and denotes any revisions made in response to those comments.

T. Crumbley, USACE; 2 July 2013

1. **I made a typographical error on the Jurisdictional Determination forms for the project. The correct Action ID is SAW-2010-02157. Please note and revise on future references to the project.**

   Response – This typographical error on the Jurisdictional Determination forms has been acknowledged. All future references to the Action ID for the Upper Silver Creek Restoration Project will refer to SAW-2010-02157.

2. **Table 5.2 and subsequent discussions (Section 8.3) on monitoring provide a 5 yr schedule for "non-forested" wetland and riparian vegetation monitoring. Please explain if these areas are supposed to be non-forested, and if so, why. If these areas are supposed to be forested, monitoring schedules should be conducted for 7 years rather than 5. The associated credit release schedules and monitoring activities should also reflect the 7 year requirement as well.**

Response – The reference to “non-forested” wetland and vegetation monitoring on Table 5.2 and subsequent monitoring discussions was a typographical error. The monitoring should refer to forested wetland and vegetation monitoring. All references to “non-forested” have been revised to reflect the correct term “forested”. The credit release schedules for mitigation credits associated with monitoring activities are based on a 5 Year monitoring period for stream work and a 7 Year monitoring period for riparian wetland work. As stated in the May 13, 2013 letter from NCEEP to the IRT, “In the fourth year of monitoring, EEP will decide if the specific site may qualify to close out after five successful monitoring years. For those, EEP will submit to the IRT for early closure. For any … site that EEP does not think meet early closeout criteria, EEP will contact out to complete the final two years” of monitoring (NCEEP, 2013). A copy of the letter has been included in Appendix G for reference and clarification for the monitoring period rationale has been included in Sections 5.1, 8.1, and 9.0 of the Mitigation Plan.

3. **On pg. 8-1, Section 8.1.2 the proposed number of cross sections per reach will rely on EEP guidance for baseline monitoring. Please ensure that the number of cross sections is at the minimum required in the 2003 Stream Mitigation Guidelines, and that the proposed locations of those cross sections are noted on the final version of the Mitigation Plan and the As-built surveys.**

   Response – The proposed number of cross-sections meet the minimum number required by both the EEP guidance for baseline monitoring and the 2003 Stream Mitigation Guidelines. Figure 8.1 depicts the locations of the cross-sections. Table 9.1 in Section 9.0 has been updated to reflect the proposed number of cross-sections (5 riffle and 5 pool) throughout the project.

4. **Section 8.2: Please ensure that the proposed location of the groundwater monitoring wells and vegetation plots are shown on the final Mitigation Plan and the As-built surveys.**

   Response – Figure 8.1 Proposed Monitoring Component Locations has been included in the Mitigation Plan. Monitoring wells and vegetation plot locations will be collected as part of the As-built survey and will be depicted on the As-built Plan Set. Reference to this statement has been included in Sections 8.2 and 8.3 of the Mitigation Plan. Table 9.1 in Section 9.0 has been updated to reflect the proposed number of groundwater monitoring wells (8) and vegetation monitoring quadrants (7) throughout the project.

5. **On pg. 8-3 a 12.5% hydro-period is proposed as a performance standard, but then it is later stated that if below-average precipitation occurs then a 7% standard will be implemented. Additionally, the actual measured data suggests that a hydro-period closer to 20% exists on-site for particular wetlands, but no final standard is proposed. Please better define the hydro-period standard for each wetland type.**

   Response – The performance standard for the hydro period’s success criteria has been revised to reflect standards outlined in the USACE technical note ERDC TN-WRAP-05-2 (2005) for atypical wetland areas when precipitation has been drier than normal and the NCEEP Guidance Topics for Mitigation Plans (2010) when rainfall conditions have been normal. See the third paragraph in Section 8.2 for the revision. All other statements referring to success criteria for wetland hydrology have been removed.

6. **The wetland components on the left (west) side of the stream propose wetland credit generation all the way up to the stream bank. Please note that if those areas fail to meet jurisdictional status, they may be subject to removal from the approved restoration areas.**

   Response – All wetland areas will be evaluated annually for jurisdictional status and the results will be reported in the annual monitoring report.

7. **16.5.2: On PCN, please provide further discussion on protection measures for existing wetlands (high visibility fencing, avoidance). Impacts to existing wetlands need to be accounted for in the final mit plan and ensuing NWP application, including explanations on how the impacts/losses will be replaced.**

   Response – References to additional protection measures, impacts, and improvements for existing wetlands have been included on the PCN in Section D.1.1, as requested. The PCN will be submitted by NCEEP as part of the permit package. In addition, impacts and proposed improvements to existing wetlands are outlined in Section 16.5.2 of the Mitigation Plan under the sub-heading of Proposed Impacts, as well as in numerous sections throughout the Mitigation Plan. Table 16.13 has been added to section 16.5.2 to summarize the proposed impacts.

8. **Wetland areas slated for Restoration credit that will have overburden removed (even if less than 12") may be subject to credit adjustment if hydric soil profiles are not quickly (within monitoring period) reformed/returned as expected on restoration sites.**

   Response – All wetland areas will be evaluated annually for jurisdictional status and the results will be reported in the annual monitoring report. This statement has been added to Section 8.2 in the Mitigation Plan.

9. **The areas of "non-riparian" credit generation should be revised and considered to be "riparian", as the entire project is within a geomorphic floodplain (according to USGS Topographic Quad 1:24,000) and not within the NCWAM definition of a "seep".**

   Response – All areas referring to "non-ripirian" wetlands and their subsequent reference to credit generation has been revised to reflect only "riparian" wetlands. All wetland descriptions have been revised to more clearly define the wetland type associated with Bottomland Harwood Forested Wetlands. Please refer to Section 16 and corresponding tables within the Mitigation Plan for revisions.

Eric Kulz, NCDWQ; 2 July, 2013:

1. **DWQ is concerned regarding the removal of surficial soils to expose "relict" hydric soils, especially in light of the fact that there are currently jurisdictional wetlands at the existing ground surface elevation. Areas considered restoration should be limited to minimal soil removal. Performance standards should include a hydric soil component; if these areas are truly relict surficial wetland soils then hydrologic restoration should result in fairly rapid development of current hydric soil characteristics (e.g. redox concentrations in living root channels).**

   Response – All wetland areas will be evaluated annually for jurisdictional status and the results will be reported in the annual monitoring report. This statement has been added to Section 8.2 in the Mitigation Plan.

2. **The entire conservation easement appears to be located within a valley feature, as opposed to on a slope or an interstream divide. DWQ believes all proposed restored/enhanced/created wetland on the site should be classified as riparian.**

   Response – All references to wetland classification has been revised to reflect only riparian wetlands. See response to the USACE comment #9 for additional information.

3. **On page 5-2, Table 5.2, the required monitoring period for forested wetland mitigation sites is seven years, not five. The proposed wetlands are forested wetlands, not non-forested as the table indicates. Please revise.**

   Response – Please refer to the response given for the USACE's comment #2.

If you have any questions concerning the Final Draft Mitigation Plan or response to your comments, please feel free to contact me at 828-350-1408 x 2007 or via email at jmclean@mbakercorp.com.

Sincerely,

Jacob P. McLean

Jake McLean, PE, CFM - Project Manager
Michael Baker Engineering, Inc.

Cc: To file

Upper Silver Creek Stream and Wetland Restoration Project, Option C Mitigation Plan - Final

PRE-INSTRUMENT PROJECT

Burke County, North Carolina

EEP Project Number #94645, Contract #003270
Catawba River Basin: 03050101-050050

Prepared For

NC Department of Environment and Natural Resources
Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, North Carolina 27699-1652
Phone: 919-715-0476
Fax: 919-715-2219

October 2013

Upper Silver Creek Stream and Wetland Restoration Project, Option C Mitigation Plan - Final

Burke County, North Carolina

EEP Project Number #94645, Contract #003270
Catawba River Basin: 03050101-050050

Prepared for:

NC Department of Environment and Natural Resources
Ecosystem Enhancement Program (EEP)
1652 Mail Service Center
Raleigh, NC 27699-1652

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October 2013

EXECUTIVE SUMMARY

Michael Baker Engineering, Inc. (Baker) proposes the restoration or enhancement of 5,129 linear feet (LF) of perennial stream channel along Silver Creek and three unnamed tributaries (UT1,UT2, and UT3) in Burke County, NC resulting in the delivery of 4,924 Stream Mitigation Units (SMUs) (Figure ES.1 and Tables ES.1 - ES.2). In addition, Baker proposes to restore, enhance or create approximately 9.56 acres of wetlands that have been previously disturbed resulting in the delivery of 7.26 Wetland Mitigation Units (WMUs). The nearest town, Morganton, is approximately twelve miles northeast of the Upper Silver Creek Mitigation Project site. The site lies in the Catawba River Basin within North Carolina Division of Water Quality (NCDWQ) sub-basin 03-08-31 and local watershed unit 03050101-050050.

According to the 2009 Catawba River Basin Restoration Priority (RBRP) Plan, the Upper Silver Creek mitigation project area is located in the second largest targeted local watershed (TLW) within the Catawba River Basin (http://www.nceep.net/services/restplans/Upper_Catawba_RBRP_2009.pdf). Although it is not located in a Local Watershed Planning (LWP) area, the Upper Silver Creek TLW hosts a wealth of rare, threatened or endangered species and contains some of Burke County's highest quality waters and natural areas. With 28 permitted animal operations in the watershed and approximately one-third of the riparian buffers in the watershed classified as degraded (EEP 2009), the potential exists to greatly improve water quality, biodiversity and habitat within the Upper Silver Creek watershed. Water quality stressors affecting the project watershed include inadequate riparian buffer cover, channel modification, and excess nutrient and sediment loading.

The goals for the Upper Silver Creek mitigation project are as follows:

- Create geomorphically stable stream channels within the Upper Silver Creek project area including headwater tributaries in the Catawba River basin;
- Restore, enhance, and expand wetland functions across the site;
- Improve and restore hydrologic connections between streams and degraded riparian wetland areas and overall ecosystem functionality;
- Improve water quality within the Upper Silver Creek project area through reduction of bank erosion, improved nutrient and sediment removal, and stabilization of streambanks;
- Improve aquatic and terrestrial habitat.

To accomplish these goals, we recommend the following actions:

- Restore the existing incised, eroding, and channelized stream by creating a stable channel that has access to its floodplain;
- Improve water quality by establishing buffers for nutrient removal from runoff and by stabilizing stream banks to reduce bank erosion;
- Improve in-stream habitat by providing a more diverse bedform with riffles and pools, creating deeper pools, developing areas that increase oxygenation, providing woody debris for habitat, and reducing bank erosion;
- Improve terrestrial habitat by planting riparian areas with native vegetation and protecting these areas with a permanent conservation easement. The riparian area will increase storm water runoff filtering capacity, improve bank stability, provide shading to decrease water temperature and improve habitat.

The project goals will directly address stressors identified in the Upper Catawba River Basin Restoration Plan, namely degraded riparian conditions, channel modification, and excess sediment and nutrient inputs. Baker's natural channel design approach will result in a stable riparian system that will reduce sediment and nutrient loading to Silver Creek while contributing to water quality conditions that support terrestrial and aquatic species including priority species identified in the basin.

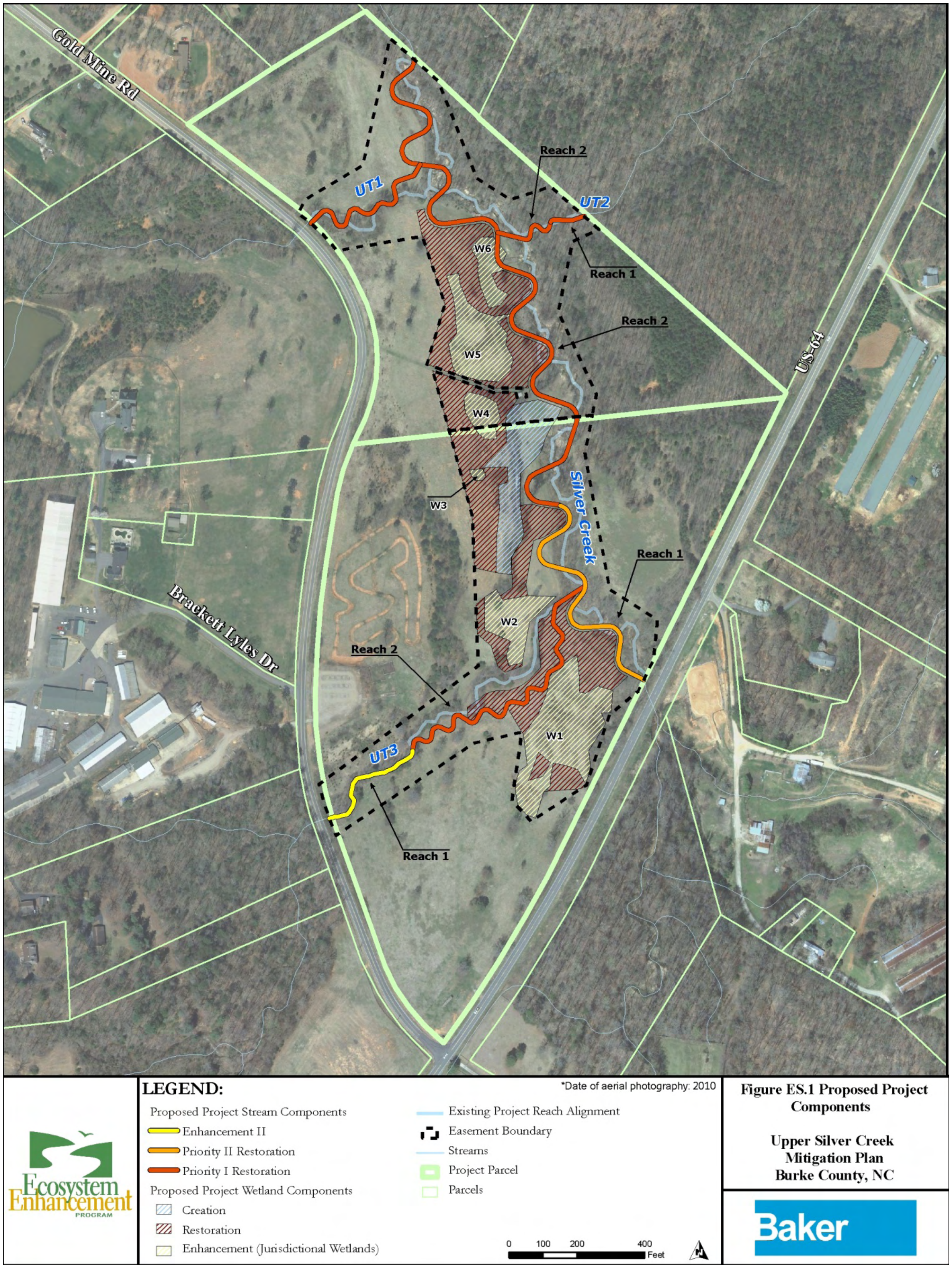

Figure ES.1 Proposed Project Components

Upper Silver Creek Mitigation Plan
Burke County, NC

Table ES.1 Upper Silver Creek Mitigation Plan Overview (Streams)
Upper Silver Creek Mitigation Plan-EEP Project#94645

Reach	Design Approach	Existing Reach (LF)	Design Reach (LF)	Design Stations	SMU Credit Ratio	Stream Mit. Units (SMUs)	Drainage Area (Sq. Mi.)	Comments
Silver Creek								
Reach 1	R	2,643	838	0+14 to 8+52	1:1	838	2.7-3.0	A Rosgen Priority Level II approach will be used to provide an adequate floodplain. Reach constraints include an upstream culvert and regulated floodplain.
Reach 2	R		2,150	8+52 to 30+02	1:1	2,150	3.0-3.3	A Rosgen Priority Level I approach will be used, raising the channel to connect at bankfull to the existing floodplain. The Level I approach will continue throughout the reach, until the final portion of Reach 2 where the profile will transition back to the existing streambed elevation without creating hydraulic barriers.
UT1								
Reach 1	R	478	497	0+07 to 5+04	1:1	497	0.28	A Rosgen Priority Level I approach will be used to eliminate a head cut at the culvert, improve floodplain access and restore geomorphically stable conditions. The end of the reach will transition to meet the elevation of the mainstem.
UT2								
Reach 1	R	187	104	0+00 to 1+04	1:1	104	0.05	A Rosgen Priority Level I approach will eliminate a knick point at the head of the reach and provide floodplain access. The design will also restore a geomorphically stable channel, with the approach in this reach following a step-pool design (i.e. meander pattern will be minimal).
Reach 2	R		209	1+04 to 3+13	1:1	209	0.05	Reach 2 is a transition from a step-pool design approach to a meandering design approach as the tributary comes onto the floodplain of the main channel. It includes a short transition at the end of the reach to meet the elevation of the mainstem. Floodplain connectivity will be improved while stable channel conditions are restored through a Priority Level I approach.
UT3								
Reach 1	EII	1,162	342	0+01 to 3+43	2.5:1	137	0.17	A Level II Enhancement approach will entail establishing grade control (previously achieved by a downstream culvert to be removed) structures that also restore habitat diversity and reduce velocities. In addition, the current narrow buffer will be expanded to 30' or more from top of bank.
Reach 2	R		989	3+43 to 13+32	1:1	989	0.17	Restoration will follow a Rosgen Priority Level I approach by raising the upstream reach and coming offline to provide wetland hydrologic enhancement and connectivity to a wide and diverse floodplain.
TOTALS		4,470	5,129					

Stream Summary

Design Approach	Design Length (LF)	Ratio	SMUs	Notes
Restoration	4,787	1:1	4,787	Existing conditions main stem profile shows additional 270 feet beyond end of project that is not included in tally of existing length.
Enhancement II	342	2.5:1	137	
TOTAL SMUs			4,924	

Table ES.2 Upper Silver Creek Mitigation Plan Overview (Wetlands)
Upper Silver Creek Mitigation Plan-EEP Project#94645

Design Approach	Existing Area (Ac.)	Design Area (Ac.)	WMU Credit Ratio	WMUs	Comments
ENHANCEMENT WETLANDS					
Jurisdictional Wetland 1 (JDW1a) - Riparian					
Enhancement (2:1)	0.53	0.53	2:1	0.26	Existing jurisdictional wetland; 2:1 enhancement proposed to include minor grading in areas of fill and altered drainage patterns, replanting of mowed vegetation to include woody bottomland wetland species. Some peripheral benefit from hydrology enhancements to tributary (UT3) and mainstem.
Jurisdictional Wetland 1 (JDW1b) – Riparian					
Enhancement (2:1)	0.9	0.9	2:1	0.45	Existing jurisdictional wetland; enhancement proposed at 2:1 to include significant enhancements to hydrology and vegetation. UT3 will be raised to bring hydrology within 1’ of the surface and will be routed along the periphery of this wetland. In addition, hydrology from the mainstem will be augmented (base flow elevation raised by 0.5’) and will be routed closer to the wetland area. Mowed vegetation will be planted with woody bottomland wetland species.
Jurisdictional Wetland 2 (JDW2) –Riparian					
Enhancement (2:1)	0.51	0.51	2:1	0.25	Existing jurisdictional wetland; enhancement proposed at 2:1 (typical enhancement ratio) to include plug of existing drainage ditch which has altered wetland hydrology, planting of woody bottomland wetland species to replace mowed grasses, minor grading of lower part of wetland and increase of baseflow elevation of mainstem by approximately 1.5 feet.
Jurisdictional Wetland 3 (JDW3) – Riparian					
Enhancement (2:1)	0.03	0.03	2:1	0.02	Existing jurisdictional wetland; enhancement proposed at 2:1 to include minor grading to remove less than 12” of overburden, reduction of hydraulic gradient by plugging existing drainage ditch and raising baseflow elevation of mainstem (these will serve to decrease the gradient of groundwater flow within the project area, resulting in an increased hydroperiod for adjacent wetlands). The area will be planted with woody wetland species to replace mowed grasses.
Jurisdictional Wetland 4 (JDW4) – Riparian					
Enhancement (2:1)	0.24	0.24	2:1	0.12	Existing jurisdictional wetland; enhancement proposed at 2:1 to include reduction of hydraulic gradient to adjacent areas by plugging existing drainage ditch and raising baseflow elevation of mainstem. The mainstem will also be relocated which should increase the influence of its hydrology on adjacent areas and decrease the gradient of groundwater flow. The area will be planted with woody wetland species to replace mowed grasses.
Jurisdictional Wetland 5 (JDW5) – Riparian					
Enhancement (2:1)	.81	0.81	2:1	0.40	Existing jurisdictional wetland; enhancement proposed at 2:1 to include removal of overburden (fill) from areas where vegetation reflects the altered soil conditions, plugging/removal of ditching in the immediate vicinity and also upstream along the long linear ditch that parallels the stream,

					enhancement of wetland hydrology as a result of Priority I stream restoration and an increased base flow elevation, and increased storage/runoff retention by disconnecting direct ditch connections to the main channel and increasing ponding and recharge.
Jurisdictional Wetland 6 (JDW6) – Riparian					
Enhancement (2:1)	0.30	0.25	2:1	0.13	Existing jurisdictional wetland; enhancement proposed at 2:1 to include diversion of additional overland flow into the area, raising of mainstem of Silver Creek to create high level of groundwater and floodplain connectivity with wetland, replanting to establish woody wetland species to replace mowed grasses.
SUBTOTAL	*3.32*	*3.27*		*1.63*	
RESTORATION WETLANDS					
Restoration Wetland 1 (R1) – Riparian					
Restoration	0	0.21	1:1	0.21	Restoration wetland; credit proposed at 1:1. Proposed activities to include minor grading to create connectivity to hydric soils, route overland flow into areas to increase ponding and infiltration, and planting with target of hardwood bottomland forest ecosystem to replace mowed grasses.
Restoration Wetland 2 (R2) – Riparian					
Restoration	0	1.22	1:1	1.22	Restoration wetland; credit proposed at 1:1. Proposed activities to include removal of less than 12" of overburden from past fill activities thought to be associated with road construction, remeandering of UT3 through the middle of the proposed restoration wetland to restore hydrology, and replanting with wetland herbaceous and hardwood bottomland forest ecosystem to replace mowed grasses, predominantly fescue.
Restoration Wetland 3 (R3) – Riparian					
Restoration	0	0.18	1:1	0.18	Restoration wetland; credit proposed at 1:1. Proposed activities to include removal of less than 12" of overburden from past fill activities thought to be associated pasture enhancement, plugging of drainage ditch that extends into the area to restore hydrology (reduce hydraulic gradient), and potential to divert some larger stream flows from UT3 into this vicinity through overland channels that would mimic a complex floodplain with abandoned channels and abundant roughness elements affecting floodplain flow paths.
Restoration Wetland 4 (R4) – Riparian					
Restoration	0	0.62	1:1	0.62	Restoration wetland; credit proposed at 1:1. Proposed activities to include removal of less than 12" of overburden from past fill activities thought to be associated with channel dredging, channel restoration to include removal of levy along mainstem creek bank to enhance floodplain access and also to raise base flow elevation relative to floodplain elevation, and replanting with wetland herbaceous and hardwood bottomland forest ecosystem to replace mowed grasses (predominantly fescue).
Restoration Wetland 5 (R5) – Riparian					
Restoration	0	1.53	1:1	1.53	Restoration wetland; credit proposed at 1:1. Proposed activities to include removal of less than 12" of overburden from past fill activities thought to be associated with pasture enhancement, removal of adjacent ditch should reduce groundwater drawdown rate by raising the potentiometric surface in this area, and replanting with wetland herbaceous and hardwood bottomland forest ecosystem to replace mowed grasses.
Restoration Wetland 6 (R6) – Riparian					
Restoration	0	1.54	1:1	1.54	Restoration wetland; credit proposed at 1:1. Proposed activities will include removal of less than 12" of existing overburden thought to be placed for pasture enhancement, removal of ditch features at the top of the wetland and adjacent to the mainstem that are reducing ponding volumes and recharge,

					raising the baseflow level and modifying the typical design cross-section of the mainstem in this area to increase floodplain activation frequency, and constructing minor diversions of overland flow and flow from high flow events on UT1 into the area to further enhance hydrology. The area will be replanted with a target hardwood bottomland forest plant community to replace existing mowed grasses and herbaceous wetland species.
SUBTOTAL	*0*	*5.3*		*5.30*	
CREATION WETLANDS					
Creation Wetland 1 (C1) – Riparian					
Creation (3:1)	0	0.99	3:1	0.33	Creation wetland; credit proposed at 3:1. Proposed activities to include grading of existing drainage ditch to a more natural and broad swale with a low gradient and intermittent ponding areas. This is already a high recharge area, but reconnection of the main stem with the floodplain will create a significant increase in flooding to this area as well. Higher global water tables will reduce groundwater flow out of the area. The increase in hydrology and the grading efforts should create conditions necessary for wetland creation. The area will be replanted with a target hardwood bottomland forest plant community to replace existing mowed grasses and herbaceous wetland species.
SUBTOTAL	*0*	*0.99*		*0.33*	
Wetland Summary					

	Design Area (Ac)	**WMU Credit Ratio**	**WMUs**	**Notes**
Restoration	5.30	1:1	5.30	
Enhancement	3.27	2:1	1.63	
Creation	0.99	3:1	0.33	
TOTAL WMUs			7.26	

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

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

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

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1.0 RESTORATION PROJECT GOALS AND OBJECTIVES

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

The 2009 Catawba River Basin RBRP identified HUC 03050101-050050, or the Silver Creek watershed, as a TLW (http://www.nceep.net/services/restplans/Upper_Catawba_RBRP_2009.pdf). The Silver Creek watershed is characterized by forested land (59%), agricultural land (23%), and approximately 3% impervious surface cover (NCEEP 2009). In addition to the 28 permitted animal operations in the watershed, one-third of the riparian buffers in this watershed are degraded, leading to multiple opportunities to restore or enhance streams and buffers.

Prior mining disturbance, animal operations, agricultural development, channelization, disturbance of riparian buffers and other land-disturbing activities in the Silver Creek watershed have negatively impacted floodplain wetland hydrology, bank and stream stability, water quality and sediment dynamics along Silver Creek and the various tributaries which feed it. To improve watershed health, one of the 2009 Upper Catawba River Basin Restoration Priorities emphasized the need for increased implementation of agricultural best management practices (BMPs) in the Silver Creek watershed. The proposed Upper Silver Creek Mitigation Project will help address nutrient loading, sedimentation, streambank erosion, channel modification and loss of wetlands and riparian buffers, which are identified stressors within this TLW.

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

- Create geomorphically stable stream channels within the Upper Silver Creek project area;
- Restore, enhance and expand wetland functions in the project area;
- Enhance and restore natural stream, wetland and riparian functions;
- Improve water quality and potential for instream and floodplain nutrient removal;
- Restore headwater tributaries in the Silver Creek Watershed and the Catawba River;
- Improve floodplain storage to mitigate downstream flooding; and
- Improve aquatic and terrestrial habitat to support species including priority species identified in the basin.

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

- Work within natural and manmade constraints to restore an active floodplain under bankfull flow conditions via a combination of floodplain excavation and raising the existing channel – this addresses all of the above goals;
- Introduce woody debris into the stream channel and on the floodplain – this addresses habitat goals and maximizes carbon availability to enhance bioremediation of nutrients and other pollutants;
- Establish wide buffers and floodplain diversity (using vegetation and topography) to address water quality and habitat enhancement goals;
- Establish natural riffle pool sequences, including recognition of the importance of other stream profile facets (runs and glides) to enhance channel stability by facilitating sediment transport continuity;
- Use the same method to pursue a diverse bedform with aforementioned profile characteristics and including also higher quality substrate in riffles, creating deeper and more diverse pools, developing

areas that increase oxygenation, providing woody debris for habitat, and reducing bank erosion by creating vertical stability;

- Improve substrate and in-stream cover, addition of woody debris, reduction of water temperature, and restoration of terrestrial and wetland habitat;
- Connect tributaries to their floodplains via Priority I concepts for Restoration to enhance adjacent wetlands, reduce erosion sources from tributaries, and restore headwater habitat;
- Connect tributaries to the mainstem without creating aquatic passage issues (overcome the challenge of the mainstem being at a lower elevation through smaller grade drops spread over a longer distance and by reducing the slope of individual grade drops by incorporating cascading drops;
- Establish a stable cross-section that allows for natural recovery through sediment deposition on gently sloped banks to serve as an early-stage sediment sink and a long-term mechanism to allow for natural adaptation to watershed conditions – this addresses bank stability goals, habitat and water quality goals, and recognizes uncertainty in natural systems design through conservative design;
- Planting riparian areas with native vegetation at a density sufficient to achieve long-term density goals and with provisions to achieve short-term widespread coverage that will serve as habitat and erosion control;
- Establish a wide corridor protected by a permanent conservation easement to enhance storm water runoff filtering capacity, improve bank stability, provide shading to decrease water temperature and improve wildlife habitat, and increase rootmass and biomass for natural mulching and vegetative succession;
- Control invasive species and continue to monitor and treat if necessary over the project period; and
- Reduce the impact of the construction process and quicken recovery through a number of methods including the minimization of construction footprint, using livestakes and other bioengineering methods to jumpstart vegetation establishment, retaining connectivity to channel remnants where possible to do so without increasing risk of channel avulsion.

2.0 SITE SELECTION

2.1 Project Description and Directions to Project Site

The Silver Creek project site is located approximately twelve miles southwest of Morganton, in Burke County as shown in the Project Site Vicinity Map (Figure 2.1). To reach the project site from Asheville, follow Interstate 40 East and take the NC-226 exit, Exit 86 toward Marion and Shelby. From the exit, turn left onto NC-226 and continue for 10.5 miles before turning left to take the US-64 ramp. Turn left onto US-64 and continue for 2.5 miles before turning left onto Gold Mine Road. Once on Gold Mine Road, travel for approximately .75 miles and turn right at an access to a large field with a large deer stand that is visible from the road. The project site begins where Silver Creek intersects US-64 and continues downstream for approximately 2,400 LF. Unnamed tributary 1 (UT1) and unnamed tributary 3 (UT3) flow eastward under Gold Mine Road before converging with Silver Creek. Unnamed tributary 2 (UT2) is a channelized stream that enters Silver Creek not far upstream of the UT1 confluence and flows westward toward Silver Creek from a forested area.

2.2 Site Selection

The Upper Silver Creek stream and wetland mitigation area lies within cataloging unit 03050101050050 and DENR sub-basin 03-08-31of the Catawba River Basin (Figure 2.1). This project site includes a segment of Silver Creek, three unnamed tributaries to Silver Creek and a series of wetlands that have been previously disturbed. Silver Creek is shown as a “blue-line” stream on the USGS topographic quadrangle for the site while UT1 and UT3 are shown as intermittent streams. UT2 is not shown on the USGS topographic quadrangle. After referencing USGS topographic quadrangle maps to determine stream order, a field evaluation using the North Carolina Division of Water Quality (NCDWQ) stream assessment protocol was conducted. Based on field data, Silver Creek and the three tributaries to Silver Creek in the project area are perennial stream channels.

2.2.1 Historical Land Use and Development Trends

The Upper Silver Creek mitigation project streams drain a watershed that is predominantly forested with a considerable percentage of land also being in agriculture use (Table 2.1). A small number of residences are also located within the drainage area for the Upper Silver Creek project. Land use at the project site is characteristic of the greater watershed. Recent land use of the site includes timber production, hay production and lands managed as pasture. Potential for land use change in the area adjacent to the conservation easement is low given the rural setting of the project location.

Past intensive agricultural use of the property led to channel modification, dredging, riparian buffer removal, wetland conversion, ditching and the introduction of fill material in the floodplain. Stream channelization and dredging are evident on the project tributaries. Soil investigations identified buried A horizons in multiple locations, both in areas with hydric soils and without. Historic mining activity impacts are very likely, based on inexplicable floodplain topography and widespread mining characteristics from known intensive gold mining sites. In addition to stream and floodplain modification, wetlands on site have been previously filled and the wetland hydrology altered by the installation of a series of swales and ditches. The resulting stream instability has resulted in significant prior and on-going erosion and sedimentation, as well as nutrient loading to tributaries, Silver Creek, and to the Catawba River downstream.

Table 2.1 Silver Creek Watershed Land Use
Upper Silver Creek Mitigation Plan-EEP Project#94645

Land Use Category[1]	Area (acres)	Percent Area
Open Water	1.38	.06
Developed, Open Space	104.81	4.88
Developed, Low Intensity	2.75	.13
Developed, Medium Intensity	1.18	.05
Barren Rock (Rock/Sand/Clay)	1.38	.06
Deciduous Forest	1,367.28	63.68
Evergreen Forest	69.22	3.22
Mixed Forest	.79	.04
Shrub/Scrub	117.59	5.48
Grassland/Herbaceous	137.26	6.39
Pasture/Hay	305.98	14.25
Cultivated Crops	8.65	.40
Woody Wetlands	28.91	1.35

Note: Values calculated using USGS land use data from 2002.

2.2.2 Successional Trends

During development of the land for agricultural use, a significant portion of streambank woody vegetation was removed. In addition to riparian buffer impacts, dredging and fill activities have altered the connectivity of the project streams (particularly tributaries) to the floodplain in most areas. The following paragraphs briefly summarize the impacts of past land management practices on the project area. Sections 6 and 16 of this plan go on to discuss the restoration approach proposed to reverse the trend of watershed impacts originating from these land management practices.

UT1 crosses from the landowner’s property on the northwestern side of Goldmine Road and flows toward Silver Creek through a culvert under the road. There is aerial photographic and remaining topographic evidence of a prior road crossing near the confluence of UT1 and the mainstem. While the present pattern is somewhat sinuous, the tributary is deeply incised and the culvert at Goldmine Road is perched above the stream bed, presenting a hydraulic barrier to aquatic passage. A few lower benches were observed to be forming at the bankfull elevation, and in many areas, the banks are nearly vertical with a bank height ratio greater than 2.0. Mid-channel bars are present and incision is giving way to channel widening. Channel pattern and profile are not in-sync, exacerbating erosion and sediment transport concerns.

UT2 originates from a valley on the eastern side of Silver Creek. This tributary also flows through a smaller culvert near the beginning of the project area. Upstream of the project reach, the tributary is aggradational. A likely result of the culvert being undersized and the channel being altered during installation. A knick point is present at the beginning of the project area downstream of the culvert. In this section, UT2 is incised, and the channel has been dredged as evidenced by waste piles placed on the left floodplain.

UT3 also flows from the landowner’s property west of Goldmine Road through a culvert where the project reach on UT3 begins on the downstream end. Although UT3 exhibits more sinuosity than the other tributaries, it too shows signs of channel modification, particularly near a farm crossing in the field and its confluence with Silver Creek where it is less sinuous and incised. The reach immediately downstream of the culvert has been protected from an advancing headcut by the farm crossing, located less than halfway to the mainstem. Upstream, the stream is stable owing to streambank vegetation and a lower bank height ratio. Habitat in this reach, however, is poor owing to the channel shape, lack of structure and diversity, and high velocities.

Silver Creek is only somewhat incised, but beyond the point of self-correction. In some cases, past floodplain filling may be a factor. In other cases, it is uncertain why the fairly sinuous stream has downcut. Widespread erosion and fallen trees from severely eroding meander bends and poor floodplain access (and resulting impacts to wetland hydrology) are primary reasons for restoration of the mainstem. Streambank erosion has contributed to mid-channel and point bar formation and has led to an over widened channel in areas. Land immediately surrounding UT1 and UT3 as well as the left bank and a portion of the right bank of Silver Creek consists of open field. The remainder of the right bank on Silver Creek and UT2 is in forested cover. Figures 2.4 and 2.5 provide aerial photography that depicts current and historical conditions, respectively. Supplemental photos of the site before 1993 are provided in Figure 2.6.

Most of the project streams are slowly incising and/or widening. The soil types and variable presence of established riparian vegetation are such that erosion rates appear to be moderate. However, a progression towards greater instability and continued erosion is apparent. The result is poor habitat quality, steady erosion and sedimentation that impact water quality, and remnant manmade impacts that will take decades or longer to resolve themselves. Restoration will provide a channel that will narrow over time and provide floodplain access for bankfull flows, and restore and enhance wetland hydrology to floodplain wetlands. Restoration of a stable system will halt tree loss from bank failure, allow for stable and high quality habitat, and will result in immediate and continued functional lift.

2.3 Vicinity Map

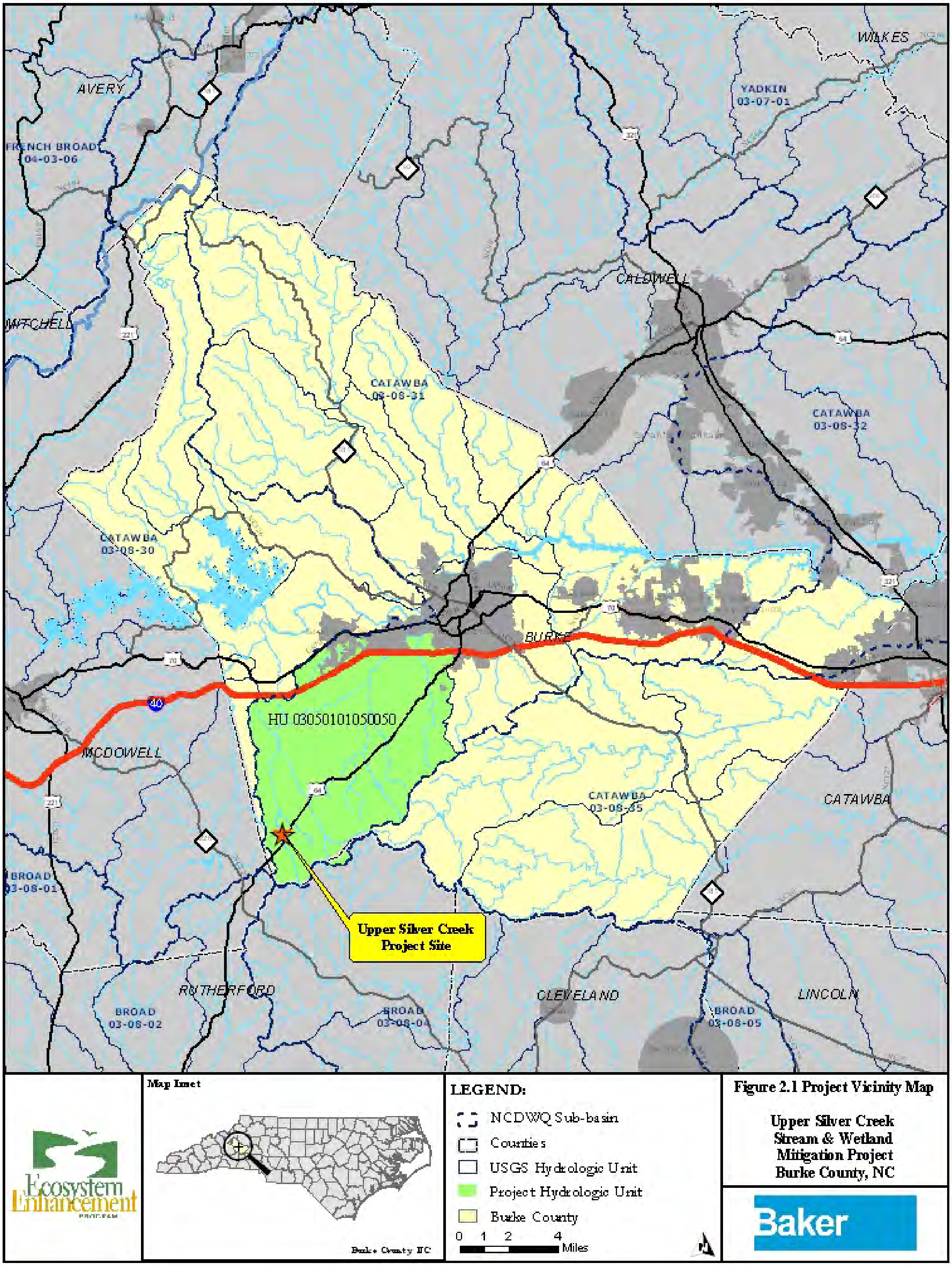


Figure 2.1 Project Vicinity Map

Upper Silver Creek
Stream & Wetland
Mitigation Project
Burke County, NC

2.4 Watershed Map

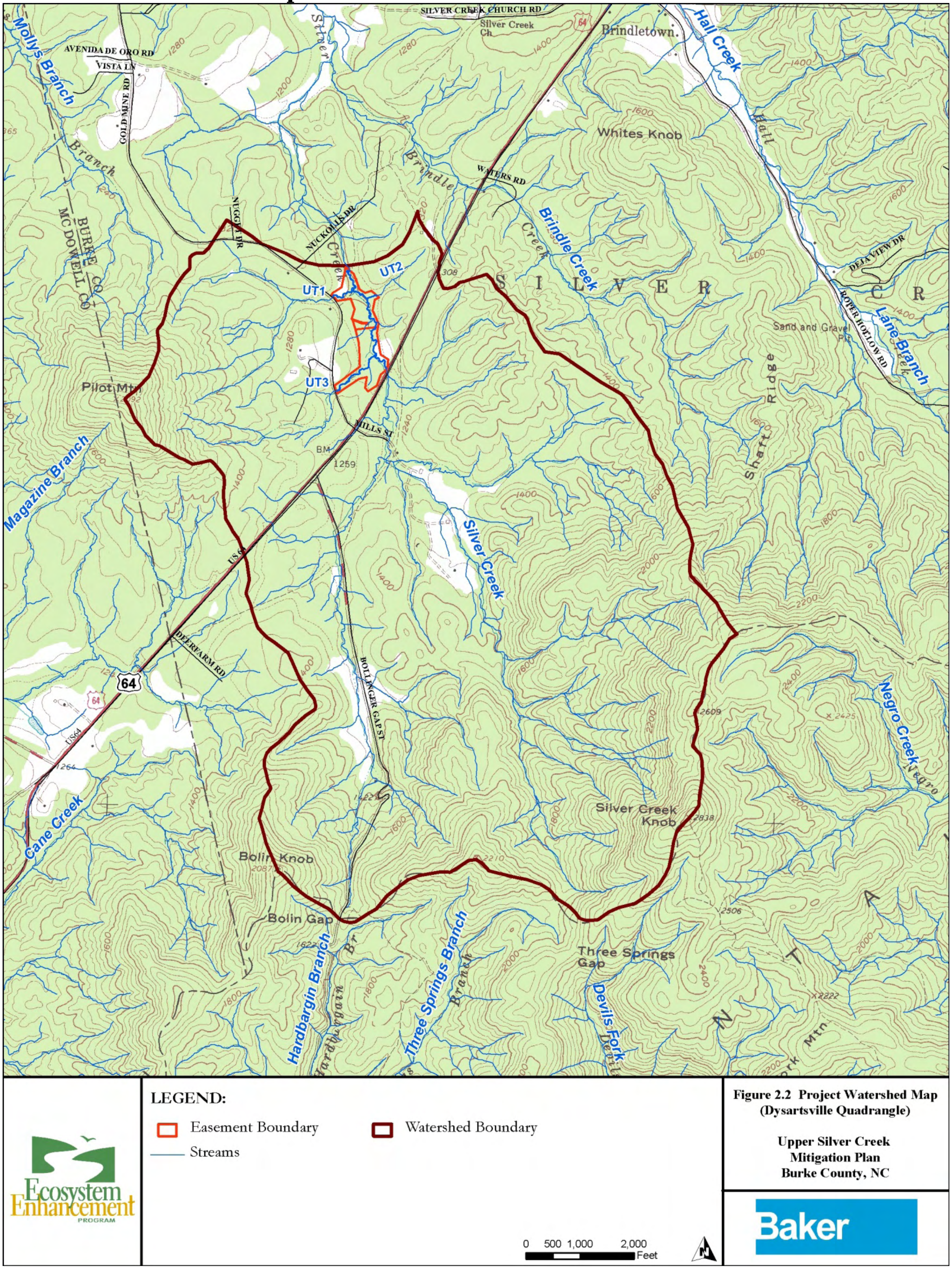


Figure 2.2 Project Watershed Map (Dysartsville Quadrangle)

Upper Silver Creek Mitigation Plan Burke County, NC

2.5 Soil Survey

The Upper Silver Creek mitigation site lies near the South Mountains along the border of the Blue Ridge physiographic province of western North Carolina. The local landscape is characterized by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) as a juncture where the hills and broader valleys of the Piedmont meet the foothills and mountains of western North Carolina (NRCS 2000).

The geology of the site was influenced by periodic uplifting and folding that occurred in this part of the Blue Ridge province and the Inner Piedmont-Belt which covers approximately 80% of the county. The Blue Ridge province in this area is composed of granite, gneiss, and schist. The Inner Piedmont Belt in this region is composed of biotite gneiss, amphibolites, layered mica schist and granitoid gneiss.

Soil types at the site were determined using NRCS) soil survey data for Burke County. The project area was also assessed during site visits to determine the potential presence of any hydric soil inclusions. A summary on the three primary soil series or complexes found within the project boundaries is presented in Tables 2.2 and 2.3. The boundaries of each soil type are depicted in Figure 2.3.

Table 2.2 Project Soil Types and Descriptions
Upper Silver Creek Mitigation Plan-EEP Project#94645

Soil Name	Taxonomic Class	Location	Description
Arkaqua	Fine-loamy, mixed, active, mesic Fluvaquents Dystrudepts	Valleys, floodplains	Moderately permeable, somewhat poorly drained soils; developed from loamy alluvial sediments washed largely from metamorphic rock residuum.
Fluvaquents-Udifluvents Complex	Fluvaquents, Udifluvents	Floodplains, terraces	Fluvaquents are somewhat poorly drained, with a very slow to moderately rapid permeability; Udifluvents are moderately well drained or well drained ,and are moderately rapid to rapid permeability. Loamy, micaeous material consisting of wasted soil and tailings from prior mining and site excavation activities.
Unison	Fine, mixed, semi-active, mesic Typic Hapludults	Terraces, alluvial fans	The Unison soil series consists of well-drained, moderately permeable soils. Formed from old alluvium. Slopes typically range between 2-8%.

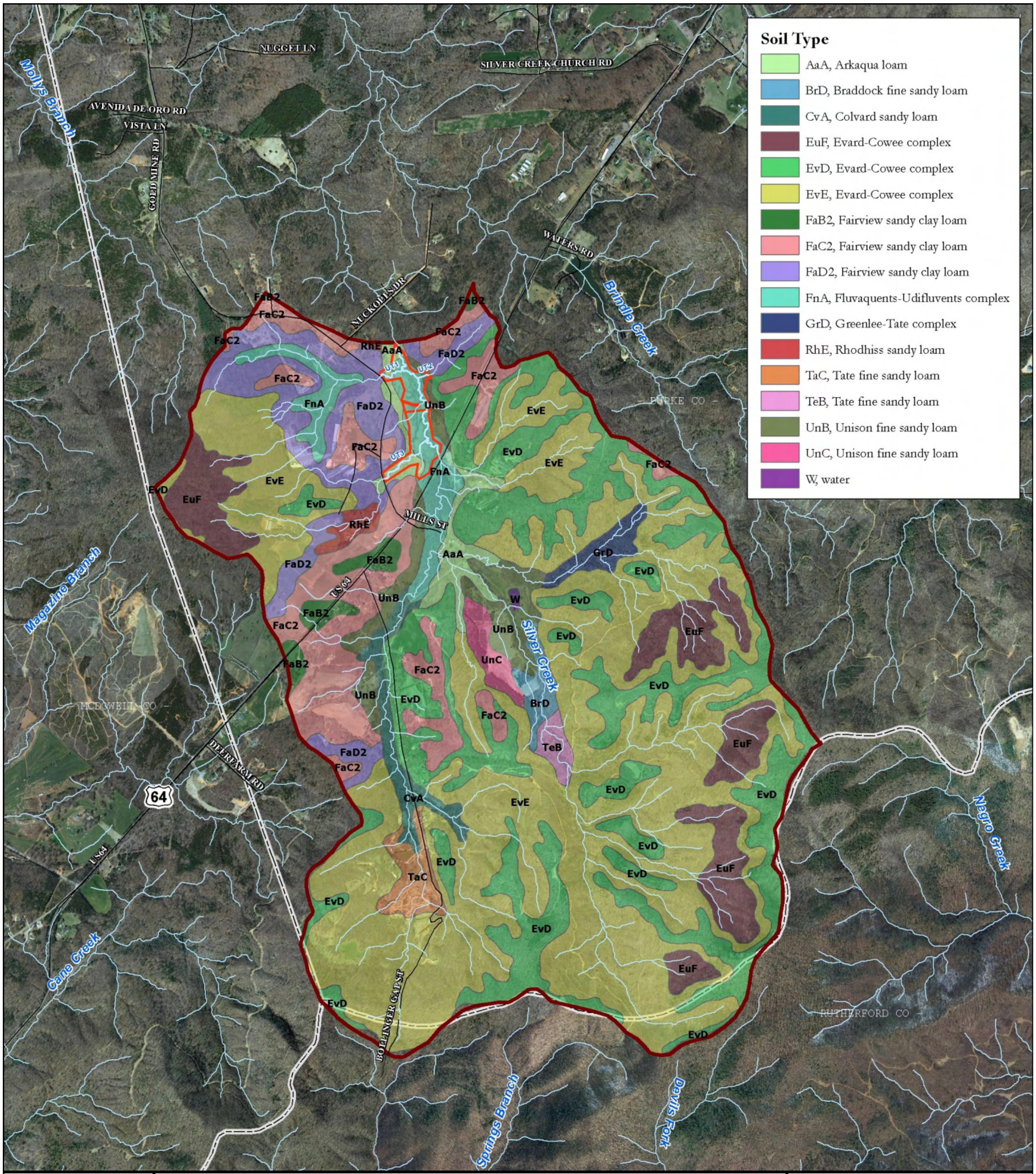
Note: NRCS, USDA. 2000 Burke County Soil Survey

Mapped soils within the Upper Silver Creek project area include the Arkaqua and Unison loamy soils series as well as a large area mapped as a Fluvaquents-Udifluvents Complex. The area mapped as Fluvaquents-Udifluvents covers the portion of the floodplain that has most likely been influenced by both anthropogenic (filling of the floodplain, wasting soil, mining activities and natural (colluvial processes, deposition of alluvium during flood events) processes. On-site observations of soil conditions do not indicate any limitations to performing the work prescribed under this project. More detailed information on floodplain and wetland soils is provided in Section 16.5.6.

Table 2.3 Project Soil Type Characteristics
Upper Silver Creek Mitigation Plan-EEP Project#94645

Series	Max Depth (in)	% Clay on Surface	Erosion Factor K	Erosion Factor T	Runoff Class	OM%
Arkaqua	>80	10-20	.28	4	Very Low	2.0-5.0
Fluvaquents-Udifluvents Complex	variable	5-18	.17	5	N/A	0-1.0
Unison	>80	10-25	.15-.17	4	Medium to rapid	1.0-6.0

Note: NRCS, USDA. 2000 Burke County Soil Survey



LEGEND:

Easement Boundary

Streams

Watershed Boundary

Counties

0 500 1,000 2,000 Feet

Figure 2.3 Project Soil Survey Map

Upper Silver Creek Mitigation Plan
Burke County, NC

2.6 Current Condition Plan View

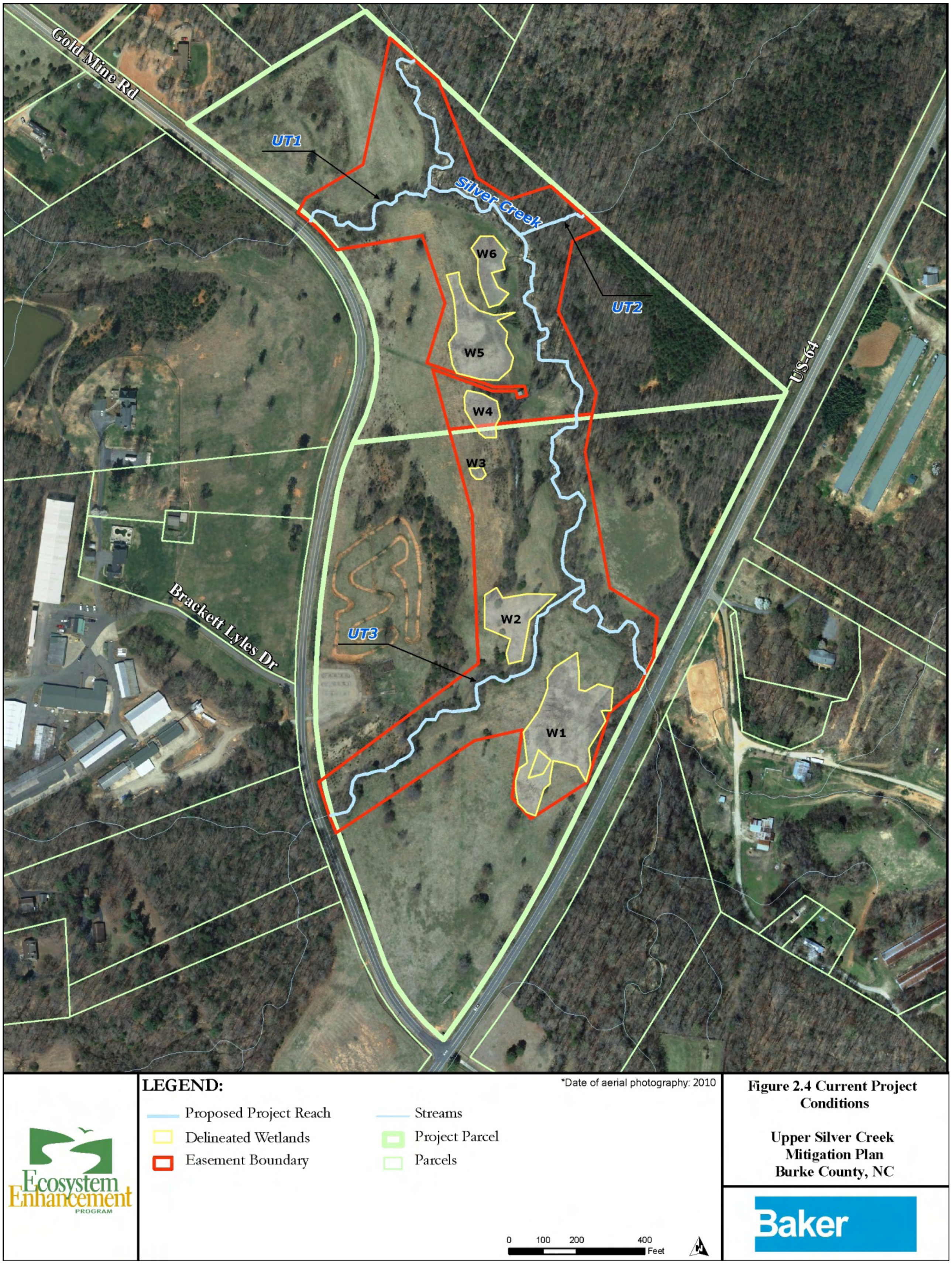
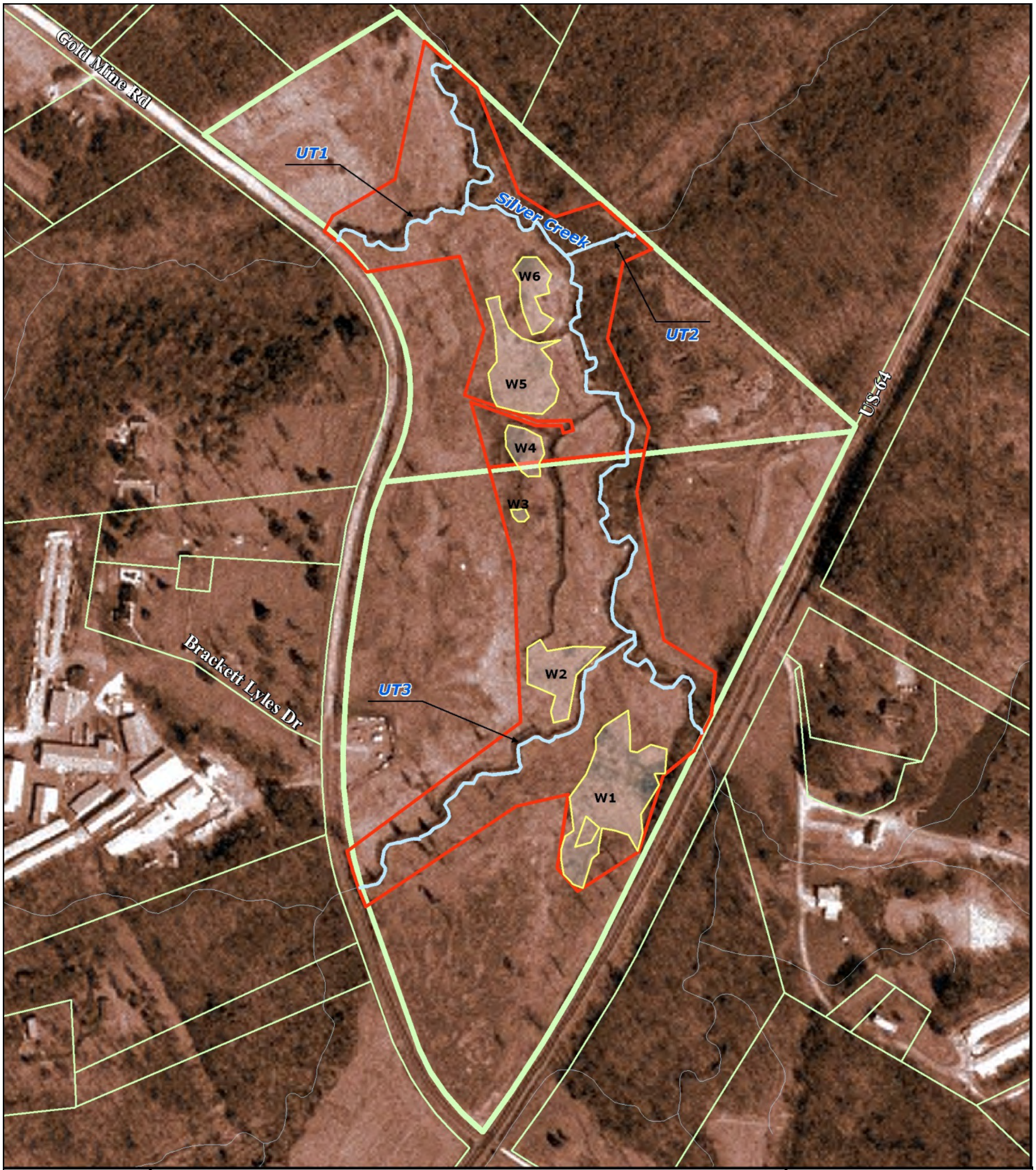


Figure 2.4 Current Project Conditions

Upper Silver Creek Mitigation Plan Burke County, NC

2.7 Historical Condition Plan View



LEGEND:

*Date of aerial photography: 1993

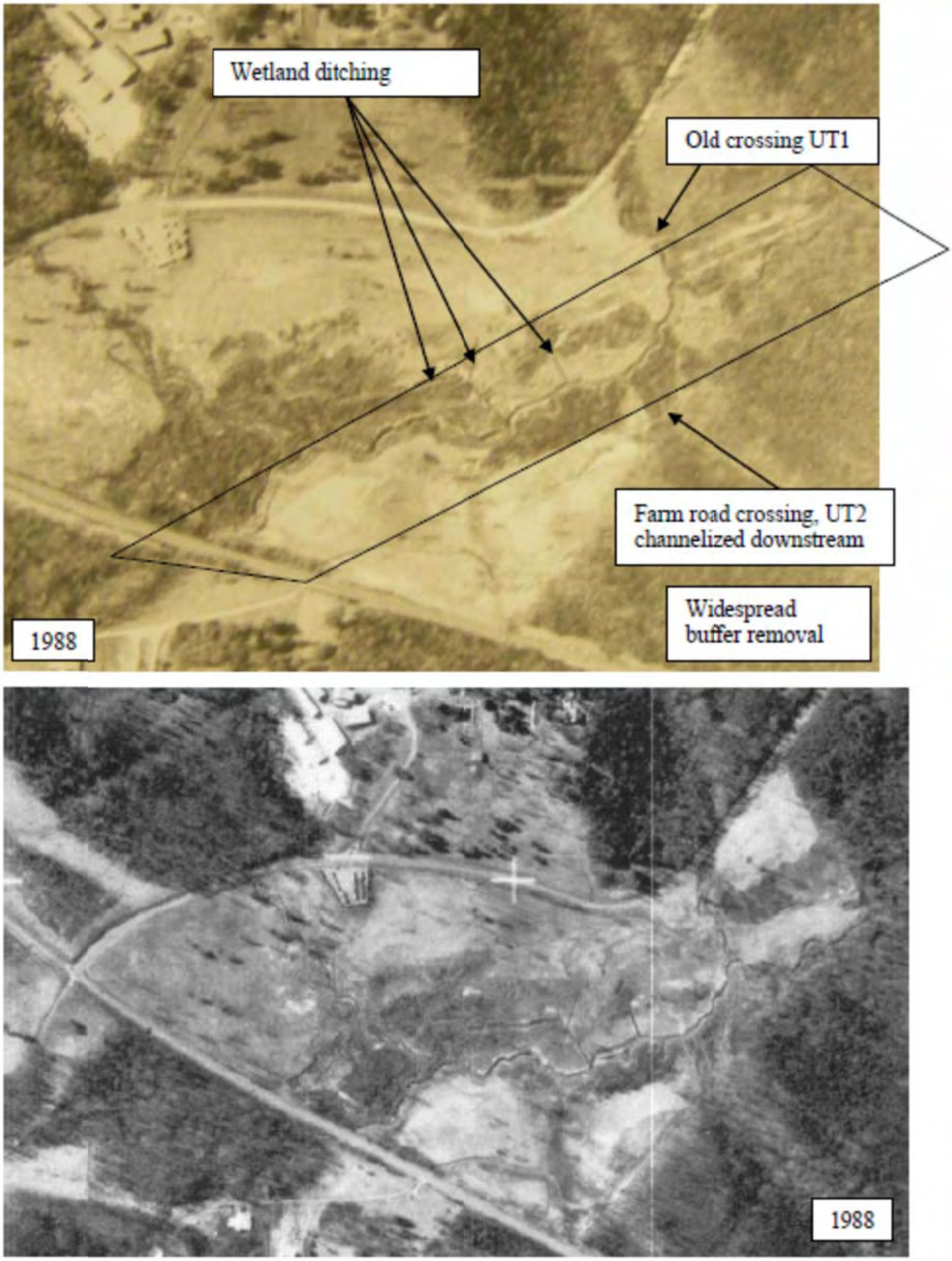
- ▬ Proposed Project Reach
- ☐ Delineated Wetlands
- 🟥 Easement Boundary
- ▬ Streams
- 🟩 Project Parcel
- ☐ Parcels

0 100 200 400 Feet

Figure 2.5 Historical Project Conditions

Upper Silver Creek
Mitigation Plan
Burke County, NC

Figure 2.6 Supplemental Historical Project Conditions



2.7.1 Silver Creek Photographs

SC.1.1 View looking at 3-barrel culvert at upstream terminus of project reach

Date: 6/30/2011- Near Proposed Sta. 0+00

SC1.2 Bank erosion and channel bar formation

Date: 2/23/2010 - Near Proposed Sta. 4+00

SC 1.3 Shows bank erosion typical of stream meander bends throughout project

Date: 12/3/2010 – Near Proposed Sta. 8+25

SC 1.4 View of vertical and eroding banks as well as mid-channel bar formation

Date: 3/23/2011 - Near Proposed Sta .12+00

SC.1.5 Survey setup along the mainstem of Silver Creek

Date: 3/25/2011 – Near Proposed Sta. 13+50

SC 1.6 Overflow in oxbow bend along Silver Creek

Date: 3/22/2011 - Near Proposed Sta. 15+50

SC 1.7 Shows bank erosion typical of stream meander bends throughout project

Date: 2/23/2010 - Near Proposed Sta. 21+00

SC 1.8 Beaver activity along Silver Creek

Date: 2/23/2010 - Intermittently present throughout along entire project area on Silver Creek

SC 1.9 Leaning and fallen trees along with bar formation typical of planform instability

Date: 3/22/2011 – Lower 1/3 of Silver Creek

SC 1.10 Buried hydric layer exposed on Silver Creek

Date: 2/23/2010 – Exact location on Silver Creek unknown; likely near wetlands 5 and 6

2.7.2 Unnamed Tributary 1 Photographs

UT1.1 Facing upstream-beginning of project reach

Date: 2/22/2011- Near Proposed Sta. 0+00

UT1.2 Mid-channel bar formation

Date: 2/22/2011 - Near Proposed Sta. 0+50

UT1.3 Leaning and falling trees also typical on UT1

Date: 2/22/2011 - Near Proposed Sta. 0+75

UT1.4 Example of vertical bank conditions present along UT1

Date: 2/23/2010- Near Proposed Sta. 3+00

UT1.5 Example of vertical bank conditions present along UT1

Date: 2/16/2010 – Near Proposed Sta. 4+00

UT1.6 Confluence of UT1 and Silver Cr.

Date: 2/23/2010 - Near Proposed Sta. 23+50

2.7.3 Unnamed Tributary 2 Photographs

	Date: 2/16/2010 – Near Proposed Sta. 0+00		Date: 2/16/2010 – Near Proposed Sta. 0+43
UT2.1 View looking upstream from culvert at head of UT2 Reach 1		UT2.2 Facing downstream from culvert at head of UT2 Reach 1. Note spoil deposits on left bank	
	Date: 2/23/2010 – Near Proposed Sa. 0+03		Date: /16/2010 – Near Proposed Sta. 2+30
UT2.3 Looking upstream at headcut above culvert on UT2		UT2.4 View looking upstream at channelized reach from lower third of UT2 Reach 1	

2.7.4 Unnamed Tributary 3 Photographs

UT3.1 Small headcut feature near beginning of project reach

Date: 2/16/2010 – Near Proposed Sta. 0+75

UT3.2 Evidence of prior channeliztion of UT3

Date: 4/2/2011– Near Proposed Sta. 5+00

UT3.3 Segment of channelized stream along UT3

Date: 2/16/2011 – Near Proposed Sta. 6+50

UT3.4 Facing confluence of UT3 and Silver Creek

Date: 2/23/2010 – Near Proposed Sta. 13+32

2.7.5 Miscellaneous Floodplain and Wetland Photographs

FPW 1.1 Test pit dug during wetland soils investigation (near Wetland 2)

Date: 12/3/2010 – Near Proposed Sta. 5+00

FPW 1.2 Floodplain on right bank of Silver Creek

Date: 2/16/2010 - Near Proposed Sta. 11+50

FPW 1.3 Pressure transducer used to monitor water levels in Silver Creek

Date: 8/15/2011 - Near Proposed Sta. 14+00

FPW 1.4 Wetland complex 5, note vegetative signatures indicating high ground from prior fill

Date: 4/22/2011 – Near Proposed Sta. 14+00

FPW 1.5 Example of another oxbow bend located along right bank of Silver Creek

Date: 2/23/2010 – Near Proposed Sta. 18+50

FPW 1.6 Wetland 6

Date: 2/16/2010 – Near Proposed Sta. 20+00

3.0 SITE PROTECTION INSTRUMENT

3.1 Site Protection Instrument Summary Information

The land required for the construction, management, and stewardship of this mitigation project includes portions of the following parcels. A copy of the land protection instrument is included in Appendix A.

Table 3.1 Site Protection Instrument Summary
Upper Silver Creek Mitigation Plan-EEP Project #94645

Parcel	Landowner	PIN	County	Site Protection Instrument	Deed Book and Page Number	Acreage Protected
Parcel CE-1	Ted, Jeanette, Chad, and Cheryl Brackett	1668284620	Burke	2011005375	1968; 631-637	10.00
Parcel CE-2	Ted, Jeanette, Chad, and Cheryl Brackett	1668275458	Burke	2011005374	1968; 624-630	12.07

Baker has obtained a conservation easement from the current landowners for the Upper Silver Creek project area. The easement is held by the State of North Carolina and has been recorded at the Burke County Courthouse (Deed Book 41, Page Numbers 11-13). The easement allows Baker to proceed with the mitigation project and restricts the land use in perpetuity.

3.1.1 Potential Constraints

Existing streams and wetlands, hydraulic structures at road and field crossings, utilities, existing easements, FEMA regulatory considerations, and hydraulic trespass were all considered when identifying potential project constraints. The channel and wetland designs work around existing water resources for the most part; minor temporary and permanent impacts are described in this report. Culverts are present on UT1, UT3 and the mainstem and impact the starting elevation at the top of the reaches that will guide stream restoration priority and transition lengths. For the perched culvert on UT1, the channel can be raised. UT3 has an embedded culvert and the grade coming out of the culvert will not be changed as the channel is being diverted around the culvert location. For the 3 barrel 8’x8’ culvert on the mainstem, the channel will be left at grade and floodplain grading will be conducted over the first 1,000 feet in order to transition from a Priority II to a Priority I approach. Although there are overhead utility lines present at an access point on Gold Mine Road, it was determined that utility location would not lead to any project constraints. No easements for power and telephone utilities are present within the conservation easement; existing right-of-ways have been excluded from the conservation easement. Riparian buffer widths will be at least 30 feet and greater over most of the stream reaches. Hydraulic modeling summarized in Appendix B did not result in any findings of hydraulic trespass that would be caused by the proposed project and hydraulic analysis demonstrated a “No-Rise/No-Impact” for the proposed activities. Other regulatory factors discussed in Appendix B were also not determined to pose potential site constraints. No fatal flaws have been identified. Construction access and staging areas have been identified on erosion control sheets.

3.2 Site Protection Instrument Figure

See Section 14, Appendix A.

4.0 BASELINE INFORMATION

Table 4.1 Baseline Information
Upper Silver Creek Mitigation Plan-EEP Project#94645

Project Information		
Project Name	Upper Silver Creek Mitigation Project	
County	Burke	
Project Area (acres)	22.0	
Project Coordinates	35.6078 N, -81.81742 W	
Project Watershed Summary Information		
Physiographic Province	Blue Ridge (borders Piedmont)	
River Basin	Catawba	
USGS Hydrologic Unit 8-digit	03050101	
DWQ Sub-basin	03-08-31	
Project Drainage Area (acres)	Mainstem 2.7-3.3, UT1 0.28, UT2 0.05, UT3 0.17	
Percentage of Impervious Area	<2%	
USGS Land Use Classification	Deciduous Forest (64%)	Woody Wetlands (1%)
	Evergreen Forest (3%)	Developed, Open Space (5%)
	Shrub/Scrub (5%)	Pasture/Hay (14%)
	Grassland/Herbaceous (6%)	
NCEEP Land Use Classification for Silver Creek Watershed [5]	Forest (59%)	
	Agriculture (23%)	
	Impervious Cover (2.9%)	

Stream Reach Summary Information

Parameters	**Silver Cr. Reach 1**	**Silver Cr. Reach 2**	**UT1**	**UT2 Reach 1**	**UT2 Reach 2**	**UT3 Reach 1**	**UT3 Reach 2**
Length of Reach (lf)	2,643		478	187		1,162	
Valley Classification	VIII	VIII	III	III	III	III	III
Drainage Area (acres)	1,746	2,147	177	32	32	123	123
NCDWQ Stream Identification Score	49.5		47.5	45		49.75	
NCDWQ Water Quality Classification	C	C	C	C	C	C	C
Stream type	E	E	Gc	B channelized	B channelized	B/E	E[1]
Evolutionary Trend	E→G, E→C/F	E→G, E→C/F	Gc→F	B→F→C	B→F→C	B/E stable	E→G
Mapped Soils	FnA	AaA/FnA	AaA/FnA	AaA/FnA	AaA/FnA	UnB/FnA	UnB/FnA
Drainage Class	Somewhat poorly to well drained	Somewhat poorly to well drained	Somewhat poorly to well drained	Somewhat poorly to well drained	Somewhat poorly to well drained	Somewhat poorly to well drained	Somewhat poorly to well drained
Soil Hydric Status	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific	No/Site-specific	No/Site-specific
Avg. Channel Slope (Water Surface Slp.)	.004		.016	.037		.015	

Table 4.1 Baseline Information
Upper Silver Creek Mitigation Plan-EEP Project#94645

FEMA Classification	Zone AE	Zone AE	N/A	N/A	N/A	N/A	N/A
Native Vegetation Community	Piedmont/ Mtn. Mixed Bottomland Hardwoods	Piedmont/ Mtn. Mixed Bottomland Hardwoods	Piedmont Dry-Mesic Oak and Hardwoods to Mixed Bottomland Hardwoods	Piedmont/ Mtn. Mixed Bottomland Hardwoods	Piedmont/ Mtn. Mixed Bottomland Hardwoods	Piedmont Dry-Mesic Oak and Hardwoods	Piedmont/ Mtn. Mixed Bottomland Hardwoods
%Composition Exotic Invasive Vegetation	10%	5%	5%	2%	2%	2%	2%

[1] Classifies as E/B, functioning like G

Wetland (W) Summary Information

Parameters	**JDW1**	**JDW2**	**JDW3**	**JDW4**	**JDW5**	**JDW6**
Size of Wetland (acres)	1.43	.51	0.03	0.24	0.81	0.3
Wetland Type	Riparian	Riparian	Riparian	Riparian	Riparian	Riparian
Mapped Soil Series[1]	FnA	FnA	FnA	FnA	FnA	FnA
Drainage Class	Somewhat poorly to well drained	Somewhat poorly to well drained	Somewhat poorly to well drained	Somewhat poorly to well drained	Somewhat poorly to well drained	Somewhat poorly drained to well drained
Soil Hydric Status	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific
Source of Hydrology (this is interpreted at the ideal contributing sources under restored conditions)	Hillslope Seepage; Baseflow; Overbank Flooding	Hillslope Seepage; Baseflow; Overbank Flooding	Hillslope Seepage; Baseflow; Overbank Flooding	Hillslope Seepage; Baseflow; Overbank Flooding	Hillslope Seepage; Baseflow; Overbank Flooding	Hillslope Seepage; Baseflow; Overbank Flooding
Hydrologic Impairment	Partially (JDW1a)	Yes	No	Partially	Partially	Partially
Native Vegetation Community[2]	Piedmont/Mountain Mixed Bottomland Hardwood Forest. Successional Deciduous Forest land was once also present near Wetlands 2 and 5.					
Percent Composition of Exotic Invasive Vegetation[3]	~30%	~55%	~10%	~40%	~55%	~35

Regulatory Considerations

Regulation	**Applicable**	**Resolved**	**Supporting Documentation**
Waters of the United States - Section 404 - Section 401	 Yes Yes	 Yes Yes	 Categorical Exclusion (Appendix B) Categorical Exclusion (Appendix B)
Endangered Species Act	Yes	Yes	Categorical Exclusion (Appendix B)
Historic Preservation Act	Yes	Yes	Categorical Exclusion (Appendix B)
Coastal Area Management Act	No	N/A	Categorical Exclusion (Appendix B)
FEMA Floodplain Compliance	Yes	Yes	Categorical Exclusion (Appendix B)
Essential Fisheries Habitat	No	N/A	Categorical Exclusion (Appendix B)

Notes: 1. See Figure 2.3 for key to soil series symbols. 2. All wetlands have been disturbed to some degree; until recently, some were still periodically mowed. As a result, only remnants of native vegetative communities exist in the wetland areas. 3. Fescue was considered as invasive vegetation; it and other field grasses were the dominant nonnative wetland vegetation observed. 4. USGS Land Use Data (2001) used rather than CGIA Land Use Classification data which is more outdated (1996) 5. Source: Upper Catawba River Basin Restoration Priorities (NCEEP 2009) (http://www.nceep.net/services/restplans/Upper_Catawba_RBRP_2009.pdf)

5.0 DETERMINATION OF CREDITS

Table 5.1 Project Components and Mitigation Credits
Upper Silver Creek Mitigation Plan-EEP Project #94645

Mitigation Credits

	Stream	Riparian Wetland	Non-riparian Wetland	Buffer	Nitrogen Nutrient Offset	Phosphorus Nutrient Offset
Type	R/EII	R/E/C				
Totals	4,924 SMU	7.26 WMU				

Project Components

Project Component	**Stationing**	**Existing Footage/ Acreage**	**Approach**	**Restoration/ Restoration Equivalent**	**Restoration Footage/ Acreage**	**Mitigation Ratio**
Silver Creek						
Reach 1	0+14 to 8+52	2,643 lf	R	838 SMU	838 lf	1:1
Reach 2	8+52 to 30+02		R	2,150 SMU	2,150 lf	1:1
UT1						
Reach 1	0+07 to 5+04	478 lf	R	497 SMU	497 lf	1:1
UT2						
Reach 1	0+00 to 1+04	187 lf	R	104 SMU	104 lf	1:1
Reach 2	1+04 to 3+13		R	209 SMU	209 lf	1:1
UT 3						
Reach 1	0+01 to 3+43	1,162 lf	EII	137 SMU	342 lf	2.5:1
Reach 2	3+43 to 13+32		R	989 SMU	989 lf	1:1
Wetlands						
JDW1a	---	0.53 ac	E^1	0.26 WMU	0.53 ac	2:1
JDW1b	---	0.90 ac	E^2	0.45 WMU	0.90 ac	2:1
JDW2	---	0.51 ac	E^1	0.25 WMU	0.51 ac	2:1
JDW3	---	0.03 ac	E^1	0.02 WMU	0.03 ac	2:1
JDW4	---	0.24 ac	E^1	0.12 WMU	0.24 ac	2:1
JDW5	---	0.81 ac	E^2	0.40 WMU	0.81 ac	2:1
JDW6	---	0.30 ac	E^2	0.13 WMU	0.25 ac.	2:1
R1	---	0	R	0.21 WMU	0.21 ac	1:1
R2	---	0	R	1.22 WMU	1.22 ac	1:1
R3	---	0	R	0.18 WMU	0.18 ac	1:1
R4	---	0	R	0.62 WMU	0.62 ac	1:1
R5	---	0	R	1.53 WMU	1.53 ac	1:1
R6	---	0	R	1.54 WMU	1.54 ac	1:1
C1	---	0	C	0.33 WMU	0.99 ac	3:1

Component Summation

Table 5.1 Project Components and Mitigation Credits
Upper Silver Creek Mitigation Plan-EEP Project #94645

Restoration Level	Stream (LF)	Riparian Wetland (ac.)	Non-riparian Wetland (ac.)	Buffer (sq. ft.)	Upland (ac.)
Restoration	4,787 (SMU)	5.3 (5.3 WMU)			
Enhancement I (All Wetlands)		3.27 (1.63 WMU)			
Enhancement II	137 (SMU)				
Creation		0.99 (0.33 WMU)			
Preservation					
High Quality Preservation					

[1] Enhancement of vegetation
[2] Enhancement of vegetation and hydrology

5.1 Credit Release Schedule

Initial Allocation of Released Credits

The initial allocation of released credits, as specified in the mitigation plan can be released by the NCEEP upon satisfactory completion of the following activities:

a. Approval of the Final Mitigation Plan

b. Recordation of the preservation mechanism, 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 NCEEP Instrument, construction means that a mitigation site has been constructed in its entirety, to include planting, and an as-built report has been produced. As-built reports must be sealed by an engineer prior to project closeout, if appropriate but not prior to the initial allocation of released credits.

d. Receipt of necessary Department of the Army (DA) permit authorization or written DA approval for projects where DA permit issuance is not required.

Subsequent Credit Releases

All subsequent credit releases must be approved by the District Engineer (DE), in consultation with the IRT, based on a determination that required performance standards have been achieved. For stream projects a reserve of 15% 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 NCEEP 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.

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 in Table 5.2 as follows:

Table 5.2 Credit Release Schedule
Upper Silver Creek Mitigation Plan-EEP Project #94645

Forested Wetland Credits

Monitoring Year	Credit Release Activity	Interim Release	Total Release
0	Initial Allocation - see requirements above	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 the NCEEP to discontinue hydrologic monitoring after the fifth year, 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 closeout approval.	10%	100%

Stream Credits

0	Initial Allocation - see requirements above	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% (65%*)
3	Third year monitoring report demonstrates performance standards are being met	10%	60% (75%*)
4	Fourth year monitoring report demonstrates performance standards are being met	10%	70% (85%*)
5	Fifth year monitoring report demonstrates performance standards are being met and project has received closeout approval.	15%	100%

Note: *For stream projects a reserve of 15% 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.

The credit release schedules for mitigation credits associated with monitoring activities are based on a 5 Year monitoring period for stream work and a 7 Year monitoring period for riparian wetland work. As stated in the May 13, 2013 letter from NCEEP to the IRT, “In the fourth year of monitoring, EEP will decide if the specific site may qualify to close out after five successful monitoring years. For those, EEP will submit to the IRT for early closure. For any … site that EEP does not think meet early closeout criteria, EEP will contact out to complete the final two years" of monitoring (NCEEP, 2013). A copy of the letter has been included in Appendix G for reference.

6.0 MITIGATION WORK PLAN

6.1 Target Stream Type(s), Wetland Type(s), and Plant Communities

6.1.1 Design Criteria Selection for Stream Restoration (Target Stream Types)

The goal of Baker's design is to engineer physical modifications and prescribe a planting plan that will restore a stable trajectory of ecosystem recovery and self-sustainability for project streams, floodplains, and wetlands. In depth data collection and analyses were incorporated in the development of site-specific natural channel design approaches for each of the project streams. Physical, easement, and regulatory constraints are prominent considerations that often guide the approach feasibility. Habitat assessment, erosion and stability assessment, and other constraints analyses were performed and the best practicable design approach was selected to maximize benefit and minimize unnecessary impacts. The methodology used to carry out design included existing site conditions data collection and geomorphic analysis, hydraulic and sediment analyses, watershed evaluation and incorporation of reference reach information where available, reference reach database consultation, employment of dimensionless design ratios based on past project experience, regime (e.g. regional curve) equations, and evaluation of results from past projects. The design stream type and approach are summarized in Table 6.1 below. The approach for the restoration of the Upper Silver Creek project site is based on an assessment of each stream, reach by reach, and their highest potential including assessment of any short term negative impacts that restoration may have (e.g. tree removal, habitat disruption, and higher stability risk). After determining the most appropriate restoration approach, specific design criteria were developed to provide for plan-view layout and cross-section dimension and profile design. These criteria are presented in the geomorphic design tables 16.8-16.11 in Section 16.1.3 of Appendix C, and are the basis for the stream construction plans.

The design approach was guided by physical characteristics of the valley with consideration of the existing and future hydrologic and sediment regimes. Reference and prior project information were considered, and stream type was designed with a higher width-to-depth ratio to allow for natural adjustment (narrowing) with increased bank roughness, and as a way to enhance coarsening of the bed through deposition of fines and sand on the gentler bank slopes. Following initial application of the design criteria, design layout was implemented to work around project constraints including avoidance of disturbance to wetlands, riparian habitat and large trees, and FEMA regulatory impacts. In addition, layout included pursuit of ways to maximize habitat value of abandoned channels, reconnect back into the existing channel in multiple locations to take advantage of shade and create a better opportunity for recolonization of flora and fauna, and run outside meander bends sufficiently close to existing riparian buffer so as to gain some shading benefit from existing trees.

The construction plans are tailored to produce a cost and resource efficient design that is constructible, using a level of detail that corresponds to the tools of construction. The design also reflects a philosophy that the stream will adapt to the inherent uniformity of the restoration project and be allowed to adjust over long periods of time under the processes of flooding, re-colonization of vegetation, and local topographic influences. Design criteria for the proposed stream concepts were selected based on consideration of the range of dimensionless ratios, reference reach and empirical curve data, and observed conditions at the project site.

Table 6.1 Project Design Stream Types
Upper Silver Creek Mitigation Plan-EEP Project #94645

Stream	Reach	Proposed Stream Type	Approach/Rationale[1]
Silver Creek	1	C	Priority II Restoration; upstream culvert and FEMA regulations dictate stream invert. Existing lack of adequate connectivity to floodplain requires that a new floodplain be excavated at a lower elevation.
	2	C	Priority I Restoration; Reach 1 is a transition reach necessary to facilitate Reach 2. Reach 2 will be raised sufficiently to be connected to the existing floodplain at the bankfull flow determined to be appropriate for this stream.
UT1	1	E (high W/D)	Priority I Restoration; raise bed at outlet of perched culvert at beginning of project which will connect the stream to the existing floodplain at bankfull. Some minor floodplain grading is proposed to enhance hydrologic function.
UT2	1	Cb	Priority I Restoration; raise stream at existing knick point at head of project to connect the stream to the existing floodplain at bankfull. Minor floodplain grading will be conducted to remove berms leftover from mining era and to shape the floodplain adjacent to banks for stability purposes.
	2	C	Priority I Restoration; the continuation of the raised stream bed will continue as the tributary enters the floodplain of the mainstem. This connectivity will allow UT2 to be a potential refuge for aquatic fauna during mainstem disturbances.
UT3	1	EII	Level II Enhancement; the approach will establish sufficient grade control (previously achieved by a downstream culvert to be removed) to ensure vertical stability. These will have the side benefit of increasing habitat diversity and reducing velocities. The buffer will be planted to extend the existing narrow buffer to the limits of the conservation easement[1].
	2		Priority I Restoration; the approach will relocate the tributary into its likely prior location to enhance existing and proposed wetland hydrology. This will have the benefit of removing incised condition that is resulting in vertical and raw banks within this reach under existing conditions. The proposed enhancements will reduce channel velocities and create a greater diversity of in-stream habitat.

Notes: [1] All project components will include riparian plantings that extend to the limits of the conservation easement.

6.1.2 Design Criteria Selection for Wetland Restoration (Target Wetland Types)

The goal of the wetland design component of the project is to restore, enhance and create wetland functions in jurisdictional, disturbed, and non-existing wetland areas (where evidence of previous hydric conditions are present). The hydrologic enhancement of wetlands depends on the stream restoration components that raise the level of the main stem of Silver Creek and its tributaries and relocate tributaries for optimal wetland enhancement within the confines of what would be natural for the valley. The intent is to restore the riparian hardwood forest for the wetland sites within the project.

Wetland restoration and enhancement approaches are based on detailed soil analyses by a licensed soil scientist, hydrologic monitoring using rainfall data, and groundwater level monitoring wells, as well as delineation of existing wetlands and other assessment information collected at the site. The four activities that will be used to restore, enhance, and create wetlands are outlined below:

- Minor grading to remove overburden from buried hydric soil layers,
- Re-establishing hydrology using a combination of ditch plugging and raising of the stream elevation,
- Re-establishing vegetation to support the development of bottomland hardwood forested wetlands,
- Creating wetlands, where appropriate, in segments of the abandoned stream (“oxbow-type” wetlands) and in the heavily wooded floodplain. It is felt that the raised channel base flow will

lead to the creation of riparian wetlands as it has in the existing oxbows within the project area, and on the floodplain where receptive soil types and raised channel base flow have a high probability of creating extensive riparian wetlands. (Some of these areas that are significant in size are being sought for credit, while other smaller areas are just a peripheral benefit of the project and are not being sought for credit). Tributary flows into constructed side channels (mimicking natural floodplain channels that have been abandoned) are also being used to feed created “oxbow-type” wetlands.

Wetland components that extend to the outer areas of the floodplain and are located at the toe of slope will be approached with the acknowledgment that much of their hydrology comes from groundwater seeps and hillslope run-off, as well as, overland bank flows. Areas demarcated for restoration have been impacted by prior filling to make areas suitable for farming; therefore, minor excavation (<12” and in many cases between 0-6”) will restore hydric soils to their approximate original depth. Exposed soils will be ripped and tilled to reduce compaction from past farming practices, and soil tests will be conducted to determine liming and fertilization rates that are appropriate for the targeted vegetation types.

Past land clearing activities, ditch installation, localized filling, manipulation of surface and subsurface hydrology, stream degradation, as well as, periodic mowing have altered present wetland conditions. Soil investigations indicate that natural and anthropomorphic activities have resulted in buried hydric soil layers across the site, as well as, areas with buried A-horizons and other disturbance characteristics. The original plant community located in these wetlands was most likely typical of other forested bottomland wetlands in the region. Although many of the wetland areas have been periodically mowed in recent years for hay production, vegetation observed elsewhere on-site, as well as the topographic location of these wetlands, support the belief that much of the area was historically bottomland hardwood forested wetlands. A review of the U.S. Fish and Wildlife Service’s National Wetland Inventory web mapper (2010) confirmed that wetland complexes on-site are considered freshwater forested/shrub wetlands.

Temporary and permanent impacts to jurisdictional waters associated with the restoration activities are considered minimal and are required for overall restoration success. Impacts to streams are those associated with Priority I and II Restoration and Enhancement II and filling a jurisdictional man-made ditch with a more natural broad drainage swale. Temporary and permanent impacts to wetlands are negligible in light of the benefits; these minor impacts discussed in Appendix C, Section 16.5.2.

Stream and wetland restoration measures will not negatively affect the hydrology, vegetation, and soils of the existing wetlands – in most or all cases, proposed efforts will improve these characteristics. Additional information regarding the existing wetlands and the design approach for wetland restoration and enhancement work is located in Appendix C, Sections 16.5-16.6.

6.1.3 Design Criteria Selection for Plant Communities

Native riparian vegetation will be established in both the restored stream buffer and wetland complexes on-site. Schafale and Weakley’s (1990) guidance on vegetation communities as well as the USACE Wetland Research Program (WRP) Technical Note VN-RS-4.1 (1997) were referenced during the development of riparian and wetland planting lists for the site. Bare root vegetation will be planted at a target density of 680 stems per acre on an 8’x8’ grid. Live stakes will be planted at a target density of 160 to 360 stakes per 1,000 square feet. Any areas of invasive vegetation will be removed so as not to threaten the newly established native plants within the conservation easement. Known invasive species to be treated include multiflora rose, japanese honeysuckle, and privet.

6.2 Design Parameters

The design proposed for the Upper Silver Creek mitigation project will include both Rosgen Priority Level 1 and 2 approaches. A Priority Level 1 approach will be applied to incised sections of the project area where the streambed will be raised to reconnect the stream to its floodplain as well as areas immediately downstream of perched culverts. A Priority Level 2 approach involves the excavation of a floodplain at a lower elevation where changes in the elevation of the streambed are not feasible, such as in areas upstream or downstream FEMA Regulatory Floodplains (Base Flood Elevations). Both priority levels will involve some use of the existing channels, and significant construction of new channel segments where design analyses have dictated changes to pool-to-pool spacing and other parameters related to planform in order to achieve stability.

Restoration of Silver Creek and tributaries UT1, UT2, and UT3 will involve raising the streams to create a better floodplain connection, establishment of stable stream pattern, and cross section adjustments that will reduce erosion. Restoration is justified by the following reasons:

1. Streams exhibit signs of either straightening or unsustainably tight meander patterns. No geologic controls exist to sustain the tight meanders. Both of these conditions are compromising in-stream habitat by causing erosion and sedimentation and by causing less favorable hydraulic conditions and habitat disruption. Straightened streams typically lack channel form diversity – they are deeper, rectangular, and lack the form and vegetative roughness that create habitat diversity. Tight meanders, such as are typical on the mainstem, are resulting bank erosion, tree undercutting, tree and riparian cover loss, and ultimately channel widening or avulsion as described under reason 6 below. These conditions of channelization and plan form instability are exacerbated by the incised conditions described under reason 2;
2. The streams are incised, with a Bank Height Ratio of 1.1 to 1.9 on the mainstem. A condition of 1.1 does not warrant restoration, but our analysis indicates that Bank Height Ratios on the mainstem are typically in the middle of this range and that the extremes identified are the exception (there is not a gradient of Bank Height Ratio within the project area, it is variable). Hydrologic and hydraulic modeling evaluation indicated that the resulting floodplain activation frequency is reduced from once every year to once every five to ten years. This incised condition is impairing floodplain functions, resulting in continued bank erosion and tree loss, and in observed meander bend cut-offs;
3. Stream bank erosion is common throughout the site, and fallen and undercut trees are prevalent. While the rate of erosion is slowed by cohesive soils and intact streambank vegetation, concerns expressed in item six below and the anticipated trajectory for conditions to worsen before they improve are rationale to implement a restoration approach that skips the downcutting and/or widening stage that is necessary to achieve a stable incised channel with an active floodplain within the incised channel;
4. Past and on-going agricultural activities in the floodplain have resulted in a narrow stream buffer. This buffer provides important benefits; but because it is narrow it is easily compromised by bank erosion and subsequent tree loss. Restoration will ensure the long term stability of existing riparian vegetation and will establish a wide buffer to serve important functions that a hay field does not;
5. Proposed restoration activities will increase stream bedform diversity. Observation of upstream reference conditions showed that coarse riffles and deep pools are sustainable in this system. Current conditions in the project reach do not support these features and the proposed restoration measures will construct these conditions and create the means by which they can be self-sustaining. One of the anticipated benefits is that the bank slopes will allow for a coarsening of the bed by providing gentler bank slopes and point bars for fine sediment to be removed from the system as well as a greater floodplain connectivity for fines to be deposited on the floodplain; and
6. Meander cut-offs, present in two locations within the downstream half of the mainstem project reach, were judged from assessment of historic aerial photography to be recent channel responses to the moderately incised condition of the channel, and the unstable plan form characterized by overly tight curve radii and lack of adequate spacing between bends. It is our assessment that these extreme events will continue on a periodic basis if the present progression of eroding outside meander bends is left to "self-adjust". We contend that the anticipated frequency of such events is abnormal with respect to natural conditions. Such avulsions create large sediment influxes and are only natural to the extent that they are natural responses to prior disturbance. The project proposes floodplain reconnection and reduction of meander bend curve radii to set a more stable trajectory. (Note that the

"self-adjustment" option also results in a new floodplain at a lower elevation in contrast to the proposed reconnection of the channel to its antecedent floodplain and thereby the reestablishment of wetland hydrology.)

Enhancement or preservation would not provide the same level of benefit that restoration will provide. The proposed approach to build a high percentage of the restored channels off-line is largely based on our assessment that on-line restoration would have been equally, and in many cases more, intrusive. On-line restoration would have required removal of more existing riparian vegetation, suffocation of the existing bed and banks with the reworking of those features and addition of riffle stone. It would have also been a compromise in the desired long-term stable plan form by leaving numerous tight meanders and closely spaced pools in place. The proposed approach ties back into the existing channel at multiple locations to try and capture some of the benefits in terms of shading and potential for recolonization of fauna and flora.

The stream types for the restored streams will be Rosgen "C", "Cb" and "E" channels with design dimensions based on reference reaches, hydraulic and sediment transport analyses and geomorphic ratios, and guidance from past projects. Where the valley slopes exceed 2%, a channel that dissipates energy both laterally (with slight meandering) and vertically (through step-pools) will be constructed. Evidence from surrounding valleys show that headwater streams in this region frequently have a stable meandering plan form with intermittent grade control lending support to the proposed approach.

Abandoned stream channels will be partially backfilled using fill material generated by the grading of new channel, floodplain benches, and wetland modifications. The design will allow stream flows larger than bankfull flows to spread onto the floodplain, dissipating flow energies, reducing the stress on streambanks and improving riparian wetland hydrology. In-stream structures will be used to control streambed grade, reduce stresses on streambanks, and promote bedform sequences and habitat diversity. In-stream structures are described in Appendix C, Section 16.8. When possible, wood will be incorporated into the structures to promote a diversity of habitat features in the restored channels. Streambanks will be stabilized using a combination of erosion matting, sod mats from on-site, and plantings (bare-root, live-stake, brush cuttings, transplants and other bioengineering structures as described in Appendix C).

6.3 Data Analysis

Detailed data and analyses are presented in Appendix C. The paragraph that follows provides a brief summary of the data analyses and approaches used. In general, existing conditions and reference data show that stream restoration is needed due to incised channel conditions and poor channel geometry leading to widespread erosion of meanders. Restoration will increase active floodplain area and create a new stable channel at a higher elevation. For wetlands, data and analysis indicates that the site has been subject to widespread disturbance from filling and hydrologic impacts to prior and existing wetlands. Mitigation activities will address prior filling with removal of overburden, and will enhance hydrology by increasing base flow levels in the main stem and tributary channels. The data indicates that proposed activities will result in reestablishment of functional stream, floodplain, and wetland ecosystems. Natural mechanisms of recovery cannot reestablish hydrology to project site wetlands and would require significant disturbance and water quality impacts to achieve stream stability, over an extended time period. Proposed restoration and enhancement efforts, along with a significant easement acquisition will result in the best potential for this parcel to provide the greatest ecological benefit, the most rapid recovery period, and a justifiable and reduced environmental impact over natural recovery that would otherwise occur through erosional processes with associated impacts on water quality and flooding.

7.0 MAINTENANCE PLAN

The Upper Silver Creek Mitigation Project site will be monitored on a regular basis and a physical inspection of the site will be conducted at least once a year throughout the post-construction monitoring period. These site inspections will identify site components and features that require corrective actions, as well as routine maintenance activities that should be conducted during this recovery period in order to protect and shepherd the system back to self-sustainability. Reports shall delineate the activities and timing of such activities. Examples of the types of corrective and maintenance actions that are typical include the following:

Table 7.1 Routine Maintenance Components
Upper Silver Creek Mitigation Plan-EEP Project #94645

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.
Wetland	Routine wetland maintenance and repair activities may include securing of loose coir matting and supplemental installations of live stakes and other target vegetation within the wetland. Areas where stormwater and floodplain flows intercept the wetland may also require maintenance to prevent scour.
Vegetation	Vegetation will 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 will 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.
Site Boundary	Site boundaries will be identified in the field to ensure clear distinction between the mitigation site and adjacent properties. Boundaries may be identified by fence, marker, bollard, post, tree-blazing, or other means as allowed by site conditions and/or conservation easement. Boundary markers disturbed, damaged, or destroyed will be repaired and/or replaced on an as needed basis.
Utility Right-of-Way	Utility rights-of-way within the site may be maintained only as allowed by Conservation Easement or existing easement, deed restrictions, rights of way, or corridor agreements.
Ford Crossing	Ford crossings within the site may be maintained only as allowed by Conservation Easement or existing easement, deed restrictions, rights of way, or corridor agreements.
Road Crossing	Road crossings within the site may be maintained only as allowed by Conservation Easement or existing easement, deed restrictions, rights of way, or corridor agreements.
Stormwater Management Device	Storm water management devices will be monitored and maintained per the protocols and procedures defined by the NC Division of Water Quality Storm Water Best Management Practices Manual.

8.0 PERFORMANCE STANDARDS

8.1 Stream Monitoring

Post-restoration monitoring for stream related mitigation work will be conducted for five years post construction, based on May 13, 2013 letter from NCEEP to the IRT in regards to "EEP sites-seven year monitoring". As stated in the letter, "In the fourth year of monitoring, EEP will decide if the specific site may qualify to close out after five successful monitoring years. For those, EEP will submit to the IRT for early closure. For any … site that EEP does not think meet early closeout criteria, EEP will contact out to complete the final two years" of monitoring (NCEEP, 2013). A copy of the letter has been included in Appendix G for reference.

Monitored stream parameters include stream dimension (cross-sections), pattern (longitudinal survey), profile (profile survey), and photographic documentation. The methods used and related success criteria are described below for each parameter.

8.1.1 Bankfull Events

The occurrence of bankfull events within the monitoring period will be documented by the use of a crest gage(s) and photographs. The crest gage will be installed on the floodplain within 10 feet of the restored channel. The crest gage will record the highest watermark between site visits, and the gage will be checked each time there is a site visit to determine if a bankfull event has occurred. Continuous flow depth gages may be used as an alternate; in such cases data will be downloaded on a regular basis and analysis of flow depth and frequency will delineate bankfull events at the gage location or within the project area based on hydraulic modeling using the gage location as a calibration point. Photographs will be used to document the occurrence of debris lines and sediment deposition on the floodplain during monitoring site visits.

Two bankfull flow events in separate years must be documented within the 5-year monitoring period. Otherwise, the stream monitoring will continue until two bankfull events have been documented in separate years.

8.1.2 Cross-Sections

EEP guidance for baseline monitoring will be used to determine the number of cross-sections per reach. Each cross-section will be marked on both banks with rebar to establish the exact transect used. Proposed cross-section locations are depicted in Figure 8.1. A common benchmark will be used for cross-sections and consistently used to facilitate easy comparison of year-to-year data. The annual cross-section survey will include points measured at all breaks in slope, including top of bank, bankfull, inner berm, edge of water, and thalweg, if the features are present. Cross-sections will be classified using the Rosgen Stream Classification System (1994).

There should be little change in as-built cross-sections, although narrowing of the channel is anticipated and not a concern so long as significant deepening does not also occur. If changes do take place, they should be evaluated to determine if they represent a movement toward a more unstable condition (e.g. down-cutting or erosion) or a movement toward increased stability (e.g. settling, vegetative changes, deposition along the banks, or decrease in width/depth ratio).

8.1.3 Longitudinal Profile

For all Restoration and Enhancement I stream segments, a longitudinal profile will be surveyed immediately after construction. Measurements will include thalweg, water surface, bankfull, and top of low bank. Each of these measurements will be taken at the head of each feature (e.g. riffle, pool) and at the maximum pool depth. The survey will be tied to a permanent benchmark. The as-built survey will be used as the baseline if additional profile survey is required to quantify and/or address widespread changes. Additional profile survey will not be conducted if there are no profile adjustment concerns identified by visual observation.

Annual visual observations will include hand measurement of significant drops (0.5’ or greater for the mainstem and tributaries of Silver Creek). These significant drops will be assessed and monitored for potential stability concerns. For the as-built, no drops on the mainstem should be greater than 0.5’ unless the engineer has approved field changes to the design plans to address unforeseen conditions.

8.1.4 Bed Material Analyses

For the mainstem only, four substrate samples will be collected during the as-built survey. To establish a relevant baseline, these substrate samples will occur in two steeper riffles (one steeper “constructed” riffle constructed with a high percentage of quarried stone, and one steeper “natural” riffle constructed primarily with native material) and in two less steep riffles (as describe previously). If possible, cross-sections will be located to coincide with sampling locations. Substrate samples will consist of pavement and subpavement samples and a 50-count zig-zag pebble count.

No additional substrate sampling will be conducted until Year 5 on the mainstem unless riffle stability issues are identified. If riffle stability is a problem, repetition of some or all of the baseline samples may be used to evaluate corrective action. In Year 5, zig-zag pebbles counts will be repeated and compared to the as-built condition. Substrate photographs will be taken at each of the four sampling locations during each yearly monitoring event.

For the tributaries, two 50-count zig-zag pebble counts will be conducted in Restoration and Enhancement I reaches during the as-built to establish a baseline, one in a constructed riffle and one in a natural riffle (as described above). The zig-zag pebble count may be collected over two to three adjacent riffles due to the short riffle lengths of the tributaries.

The pebble count will be repeated in Year 5 to assess the change over time. If the need arises to assess vertical instability in the tributaries, Baker will evaluate whether additional repetitions of pebble counts in the as-built locations would be effective. Substrate photographs will be taken at each of the four sampling locations during each yearly monitoring event.

Each annual report will include a visual observation of the sampling locations with the photograph to support visual assessment. Visual assessment of riffle material shall be complemented by observation of the vertical and lateral stability in the immediate vicinity, and by other observations considered relevant.

8.1.5 Photo Reference Sites

Photographs will be used to visually document restoration success. Reference stations will be photographed before construction and continued annually for at least five years following construction. Photographs will be taken from a height of approximately five to six feet. Permanent markers will be established to ensure that the same locations (and view directions) on the site are monitored in each monitoring period.

Lateral reference photos. Reference photo transects will be taken at each permanent cross-section. Photographs will be taken of both banks at each cross-section. The survey tape will be centered in the photographs of the bank. The water line will be located in the lower edge of the frame, and as much of the bank as possible will be included in each photo. Photographers should make an effort to maintain consistent areas in each photo over time.

Structure photos. Photographs will be taken of grade control structures along the restored stream and will be limited to boulder and log steps. Photographers will make every effort to maintain consistent areas in each photo over time.

Photographs will be used to evaluate channel aggradation or degradation, bank erosion, success of riparian vegetation, and effectiveness of erosion control measures subjectively. Lateral photos should not indicate excessive erosion or continuing degradation of the banks. A series of photos over time should indicate successive maturation of riparian vegetation.

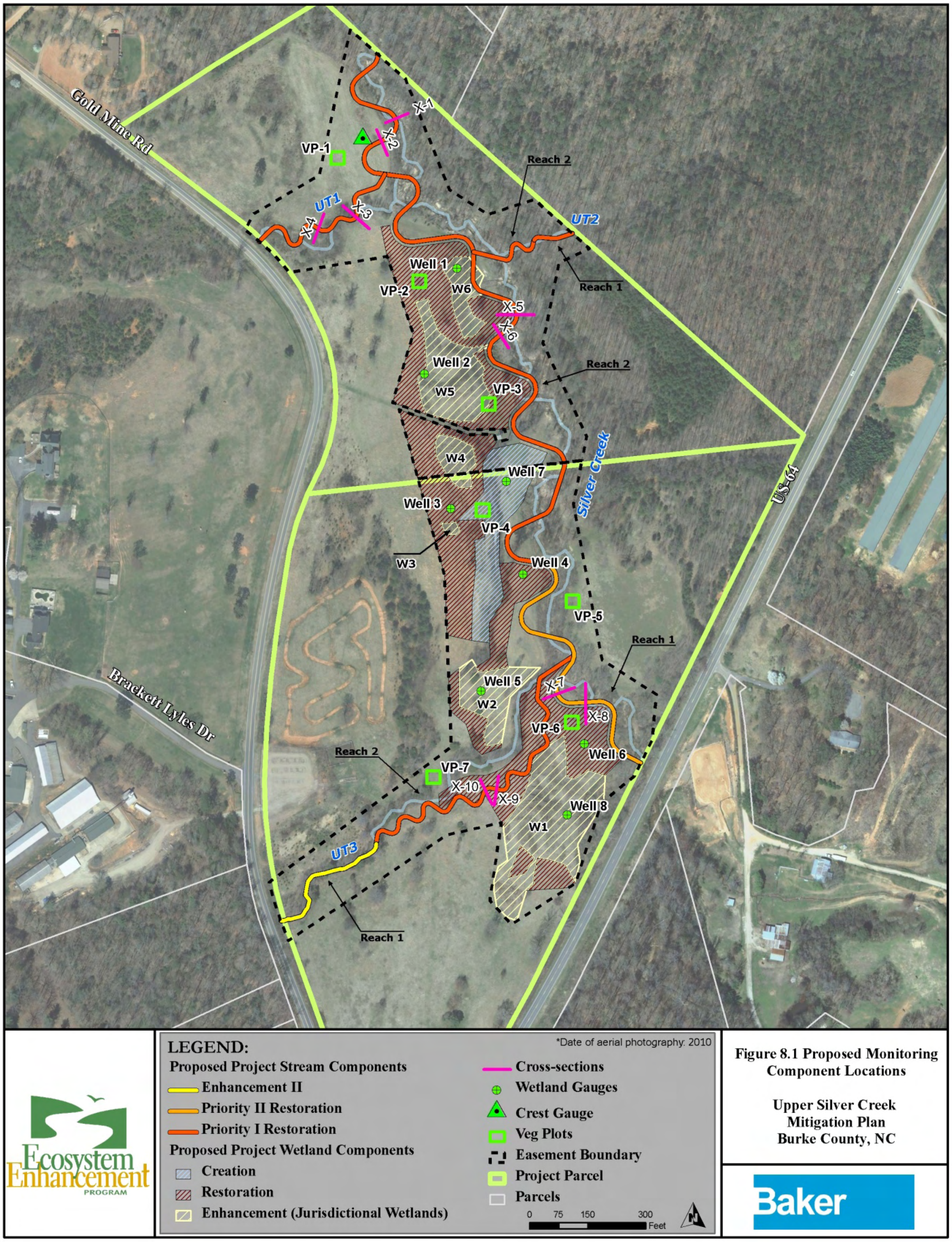


Figure 8.1 Proposed Monitoring Component Locations

Upper Silver Creek
Mitigation Plan
Burke County, NC

8.2 Wetland Monitoring

Groundwater monitoring stations will be installed in created, restored, and enhanced wetland areas within the project area to document post construction hydrologic conditions. Up to ten (10) groundwater monitoring stations will be installed across the site; at least two will be located within existing wetland (enhancement) area to serve as the project's wetland reference sites. See Figure 8.1 for proposed groundwater station locations.

Installation and monitoring of the groundwater stations will follow the USACE standard methods outlined in the technical note ERDC TN-WRAP-05-2 and NCEEP Guidance Topics for the Development of EEP Mitigation Plans (USACE, 2005 and NCEEP, 2010). Groundwater monitoring station locations will be collected as part of the As-built survey and will be demarked on the As-built Plan Set. Data from each of the gages will be downloaded on a quarterly basis. Wetland sites will be monitored for seven years following construction. If project success criteria are not met by the final monitoring year (Year 7), monitoring will continue until unmet criteria are successfully met.

Groundwater levels will be compared to pre-restoration conditions and onsite reference stations. Success criteria for wetland hydrology will be based on standards for atypical wetland areas (USACE, 2005). Criteria have been met when each wetland site is saturated within 12 inches of the soil surface for "fourteen (14) or more consecutive days during the growing season during a period when antecedent precipitation has been…drier than normal…for a minimum frequency of 5 years in 10 or 50%" of the monitoring time frame (USACE, 2010 and 2005) or for 12% of the growing season (NCEEP, 2010) when rainfall amounts mimic normal conditions.

In order to determine if the rainfall is normal for the given year, rainfall amounts will be tallied using data obtained from the Burke County Morganton WETS Station NC5838 (NRCS, Established 1971) and from the nearby automated weather station in Rutherford County at Casar, NC (311538) that has been in operation since 1956. Data from this station can be obtained from the Southeast Regional Climate Center (SERCC) website (http://www.sercc.com/cgi-bin/sercc/cliMAIN.pl?nc1538, 2011). Overbank flooding from the adjacent channel will also be noted during monitoring.

Baker will evaluate wetland areas annually for jurisdictional status and the results will be reported in the annual monitoring report.

8.3 Vegetation Monitoring

Successful restoration of the vegetation on a site is dependent upon hydrologic restoration, active planting of preferred canopy species, and volunteer regeneration of the native plant community. In order to determine if the criteria are achieved, vegetation monitoring quadrants will be installed across the restoration site. Vegetation monitoring quadrant locations will be collected as part of the As-built survey and will be demarked on the As-built Plan Set. The EEP's methodology for determining the number of vegetation plots required per mitigation site will be used. See Figure 8.1 for proposed vegetation plot locations. The size of individual quadrants will vary from 100 square meters for tree species to 1 square meter for herbaceous vegetation. Vegetation monitoring will occur in spring, after leaf-out has occurred. Individual quadrant data will be provided and will include diameter, height, density, and coverage quantities. Relative values will be calculated, and importance values will be determined. Individual seedlings will be marked to ensure that they can be found in succeeding monitoring years. Mortality will be determined from the difference between the previous year's living, planted seedlings and the current year's living, planted seedlings.

At the end of the first growing season, species composition, density, and survival will be evaluated. For each subsequent year, until the final success criteria are achieved, the restored site will be evaluated between May and November. Specific and measurable success criteria for plant density on the project site will be based on the recommendations found in the WRP Technical Note and past project experience.

The interim measure of vegetative success for the site will be the survival of at least 320, 3-year old, planted trees per acre at the end of year three of the monitoring period. The final vegetative success criteria will be the survival of 260, 5-year old, planted trees per acre at the end of year five of the monitoring period. While measuring species density is the currently accepted methodology for evaluating vegetation success on mitigation projects, species density alone may be inadequate for assessing plant community health. For this reason, the vegetation monitoring plan will incorporate the evaluation of additional plant community indices to assess overall vegetative success.

9.0 MONITORING REQUIREMENTS

Table 9.1 Monitoring Requirements
Upper Silver Creek Mitigation Plan-EEP Project #94645

Required	Parameter	Quantity	Frequency	Notes
X	Pattern	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	As-built Year, as needed	Pattern data will be collected only if there are indications through profile and dimensional data that significant geomorphological adjustments occurred.
X	Dimension	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	Annually	The number of cross-sections, 5 riffle and 5 pool, to be installed is in accordance with dimension guidelines listed on page 9 of EEP's Baseline Monitoring Document, Version 1.0, dated 11/19/09.
X	Profile	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	As-built Year, as needed	For restoration or enhancement I components, 3,000 linear feet or less, the entire length will be surveyed. For mitigation segments in excess of this footage, 30% of the length or 3,000 feet will be surveyed, whichever is greater.
X	Substrate	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines; Most recent EEP Guidance	As-built Year & Year 5, as needed	A substrate sample will be collected if constructed riffles were installed as part of the project. One constructed riffle substrate sample will be compared to riffle substrate data collected during the design phase.
X	Surface Water Hydrology	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	Quarterly	A Crest Gage and/or Pressure Transducer will be installed on site; the device will be inspected on a quarterly basis to document the occurrence of bankfull events on the project.
X	Groundwater Hydrology	Will be determined in consultation with EEP as applicable	Quarterly	Eight groundwater monitoring gages with data recording devices will be installed as necessary to characterize the degree of attainment of the reference hydrology. The data will be downloaded on a quarterly basis during the growing season.
X	Vegetation	EEP-CVS Guidance	Annually	Seven vegetation monitoring quadrants will be installed throughout the project. Vegetation will be monitored using the Carolina Vegetation Survey (CVS) protocols.
	Exotic and Nuisance Vegetation		Annually	Locations of exotic and nuisance vegetation will be mapped and treated.
	Project Boundary		As-Needed	Locations of vegetation damage, boundary encroachments, etc. will be mapped.
X	Digital Photos		Annually	Photo stations will capture the state of the channel and vegetation. Stream photos will be preferably taken when the vegetation is minimal and within the same 2-month window between monitoring years.

Annual monitoring reports containing the information defined within the above table will be submitted to EEP by December 31 of the year during which the monitoring was conducted. The monitoring report shall provide a project data chronology for EEP to document the project status and trends. Project success criteria must be met by the final monitoring year (based on the May 13, 2013 letter from NCEEP to the IRT) prior to project closeout, or monitoring will continue until unmet criteria are successfully met.

10.0 LONG-TERM MANAGEMENT PLAN

Upon approval for close-out by the Interagency Review Team (IRT) the site will be transferred to the EEP. 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.

11.0 ADAPTIVE MANAGEMENT PLAN

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

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

12.0 FINANCIAL ASSURANCES

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

13.0 OTHER INFORMATION

13.1 References

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14.0 APPENDIX A – SITE PROTECTION INSTRUMENT

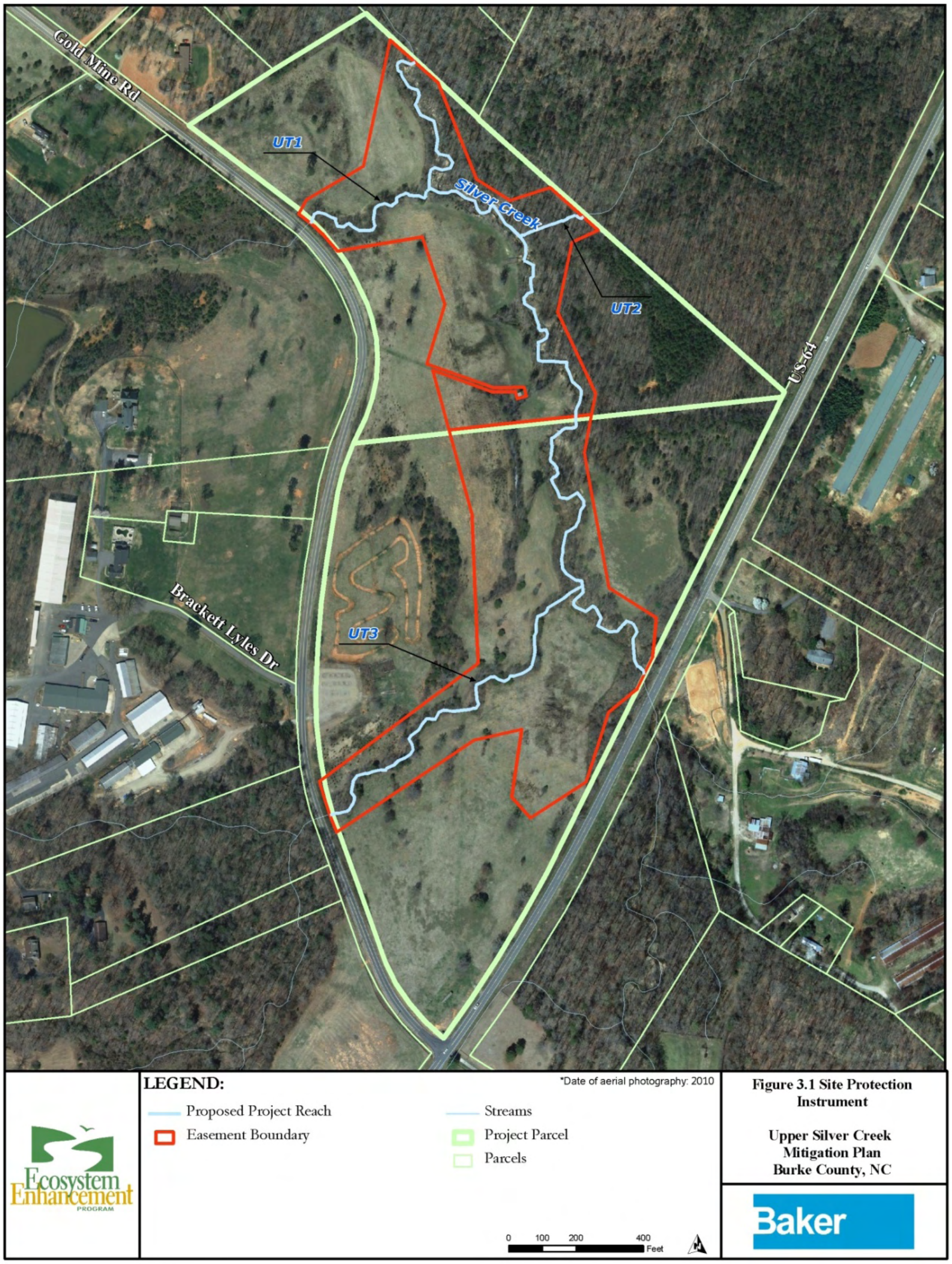

Figure 3.1 Site Protection Instrument

Upper Silver Creek Mitigation Plan
Burke County, NC

15.0 APPENDIX B - BASELINE INFORMATION DATA / REGULATORY CONSIDERATIONS

15.1 USACE Routine Wetland Determination Forms – per regional supplement to 1987 Manual

Correct
ID=2010-02157

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action Id. **201002517** County: **Burke** U.S.G.S. Quad: **NC-Dysartville**

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owner/Agent: **Chad Brackett**
Address: **4936 Brackett Lyles Drive**
Morganton, N.C. 28655

Telephone No.: **N/A**

Property description:

Size (acres)	**55.7**	Nearest Town	**Morganton**
Nearest Waterway	**Lyles Creek**	River Basin	**Catawba**
USGS HUC	**03050101**	Coordinates	N **35.609790** W **-81.819620**

Location description **Project site is located between Gold Mine Road (SR 1123) and US-64 near Dysartville, Burke County, NC. Property is currently in hay production and partially forested.**

Indicate Which of the Following Apply:

A. Preliminary Determination

_ Based on preliminary information, there may be waters of the U.S. including wetlands on the above described 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).

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 of the U.S. including 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 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 wetland 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 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.

_ The property is located in one of the 20 Coastal Counties subject to regulation under the Coastal Area Management Act (CAMA). You should contact the Division of Coastal Management in Washington, NC, at (252) 946-6481 to determine their requirements.

This delineation/determination has been conducted to identify limits of COE's 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.

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 **Tyler Crumbley** at **828-271-7980x232**.

C. Basis For Determination

The site contains wetlands as determined by the USACE 1987 Wetland Delineation Manual that directly abut stream channels located on the property which exhibit indicators of ordinary high water marks. The stream channel on the property is a UT to Upper Silver Creek, which flows into the Catawba River, which is Section 10 Navigable at the Mountain Island Lake Dam on the Mecklenburg/Gaston county line in NC.

D. Remarks

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

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

District Engineer, Wilmington Regulatory Division
Attn:Tyler Crumbley, Project Manager,
Asheville Regulatory Field Office
151 Patton Ave., Room 208
Asheville, North Carolina 28801-5006

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 District Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by **05 JUN 11**.

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

Corps Regulatory Official: Tyler A. Crumbley

Date **07 April, 2011** Expiration Date **04/07/2016**

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://regulatory.usacesurvey.com/ to complete the survey online.

Copy furnished:
Carmen Horne-McIntyre, Michael Baker Engineering, Inc.

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: Chad Brackett	File Number: 2010-02157	Date: 07 APR 11
Attached is:		See Section below
☐ INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)		A
☐ PROFFERED PERMIT (Standard Permit or Letter of permission)		B
☐ PERMIT DENIAL		C
☒ APPROVED JURISDICTIONAL DETERMINATION		D
☐ PRELIMINARY JURISDICTIONAL DETERMINATION		E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://www.usace.army.mil/CEW/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 district engineer. This form must be received by the division engineer within 60 days of the date of this notice.

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

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

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

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

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:
Mr. Tyler Crumbley
U.S. Army Corps of Engineers
151 Patton Avenue, Room 208
Asheville, NC 28801-5006

If you only have questions regarding the appeal process you may also contact:
Mr. Jason Steele
Administrative Appeals Review Officer
60 Forsyth Street, SW (Room 9M10)
Atlanta, Georgia 30303-8801
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:

U.S. ARMY CORPS OF ENGINEERS

WILMINGTON DISTRICT

Action Id. 201002517 County: Burke U.S.G.S. Quad: NC-Dysartville

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owner/Agent: **Chad Brackett**

Address: **4936 Brackett Lyles Drive**
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Telephone No.: **N/A**

Property description:

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Nearest Waterway	**Upper Silver Creek**	River Basin	**Catawba**
USGS HUC	**03050101**	Coordinates	N **35.609790** W **-81.819620**

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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 of the U.S. including 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 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 wetland 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.

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_ 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.

Modification: 7APR11

November 4, 2010

Ms. Liz Hair, Project Manager
Asheville Regulatory Field Office
U.S. Army Corps of Engineers
151 Patton Avenue, Room 208
Asheville, North Carolina 28801

Reference: Agent Authorization and Site Access Authorization
Jurisdictional Wetland Determination
N.C. Ecosystem Enhancement Program Upper Silver Creek Mitigation Site
U.S. Hwy. 64 and Gold Mine Road
Morganton, Burke County, North Carolina

Dear Ms. Hair:

As the property owner, I am hereby authorizing you and/or other employees of the U.S. Army Corps of Engineers (USACE), to enter and inspect the above-referenced project site. Michael Baker Engineering, Inc. (Baker) will be providing engineering services and permitting assistance in support of the NCEEP Upper Silver Creek Mitigation Project. In this contractual relationship, Baker will act as the NCEEP's agent for the purpose of accomplishing this work.

As the property owner, I hereby authorize Michael Baker Engineering, Inc. to act as my authorized agent regarding wetlands and streams within the limits of the Upper Silver Creek Stream Mitigation Project site specifically for the purposes of taking those actions necessary to obtain environmental permits from the U. S. Army Corps of Engineers, N. C. Division of Water Quality, and N. C. Division of Land Quality.

(Owner Signature)

CHAR Beckett
(Print Name)

Date: Nov. 5 2010

4936 Beckett Lyles Drive
Morganton, N.C. 28655
(Address)

December 17, 2010

Asheville Regulatory Field Office
US Army Corps of Engineers
Attn: Ms. Liz Hair
151 Patton Avenue, Room 208
Asheville, NC 28801-5006

Subject: Request for USACE review and approval of jurisdictional determination for Silver Creek, three unnamed tributaries to Silver Creek, and three wetlands, Catawba River Basin – CU# 03050101, Burke County, NC.

Dear Ms. Hair:

Please review the attached material for stream and wetland jurisdictional determinations at the N.C. Ecosystem Enhancement Program's Upper Silver Creek Stream and Wetland Mitigation Project site. The site is located across from 4938 Brackett Lyles Drive at the juncture of U.S. Highway 64 and Gold Mine Road in the southwestern corner of Burke County. Approximately 12 miles southwest of Morganton, the site is further identified as a portion of Burke County Parcel Identification No.s 1668284620 and 1668275458. At the time of the wetland delineation, the subject site was in use as a hayfield.

Stream jurisdictional determinations were made February 16, 2010. On September 23-24, 2010, Michael Baker Engineering delineated three wetland areas at the site, labeled as Wetland 1(W1), Wetland 2 (W2) and Wetland 3 (W3). The three wetland areas are situated from south to north in the vicinity of Silver Creek and unnamed tributary 3 (UT3). Vegetation in the wetland areas consisted of *Juncus effusus*, *Arundunaria gigantea*, *Carex sp*., and *Polygonum arifolium*. Soils for the site are recorded in the Burke County Soil Survey as being Fluvaquents-Udifluvents and Arkaqua loams; these soils displayed hydric soil indicators within the areas delineated as wetlands.

Stream determinations were made using the N.C. Division of Water Quality Stream Identification Form, Version 3.1. Wetland delineations were performed based upon the hydrology of the wetland, hydric characteristics of the soil and the presence of hydrophytic vegetation, as described in the 1987, U.S. Corps of Engineers, Wetland Delineation Manual. On-site topographic features were also relied upon as portions of the wetland areas had been mowed prior to the delineation and as site conditions were dry at the time.

The following materials have been enclosed to assist in the jurisdictional review of the wetland boundaries:

- Figures depicting hydrological unit, topographic, soils, U.S. Fish and Wildlife Service National Wetland Inventory, site location and delineation information;
- Copies of the N.C. Division of Water Quality Stream Identification Forms;
- Copies of the Routine Wetland Delineation Forms;
- Jurisdictional Determination Forms;
- Information from a preliminary soil investigation performed by a licensed soil scientist;

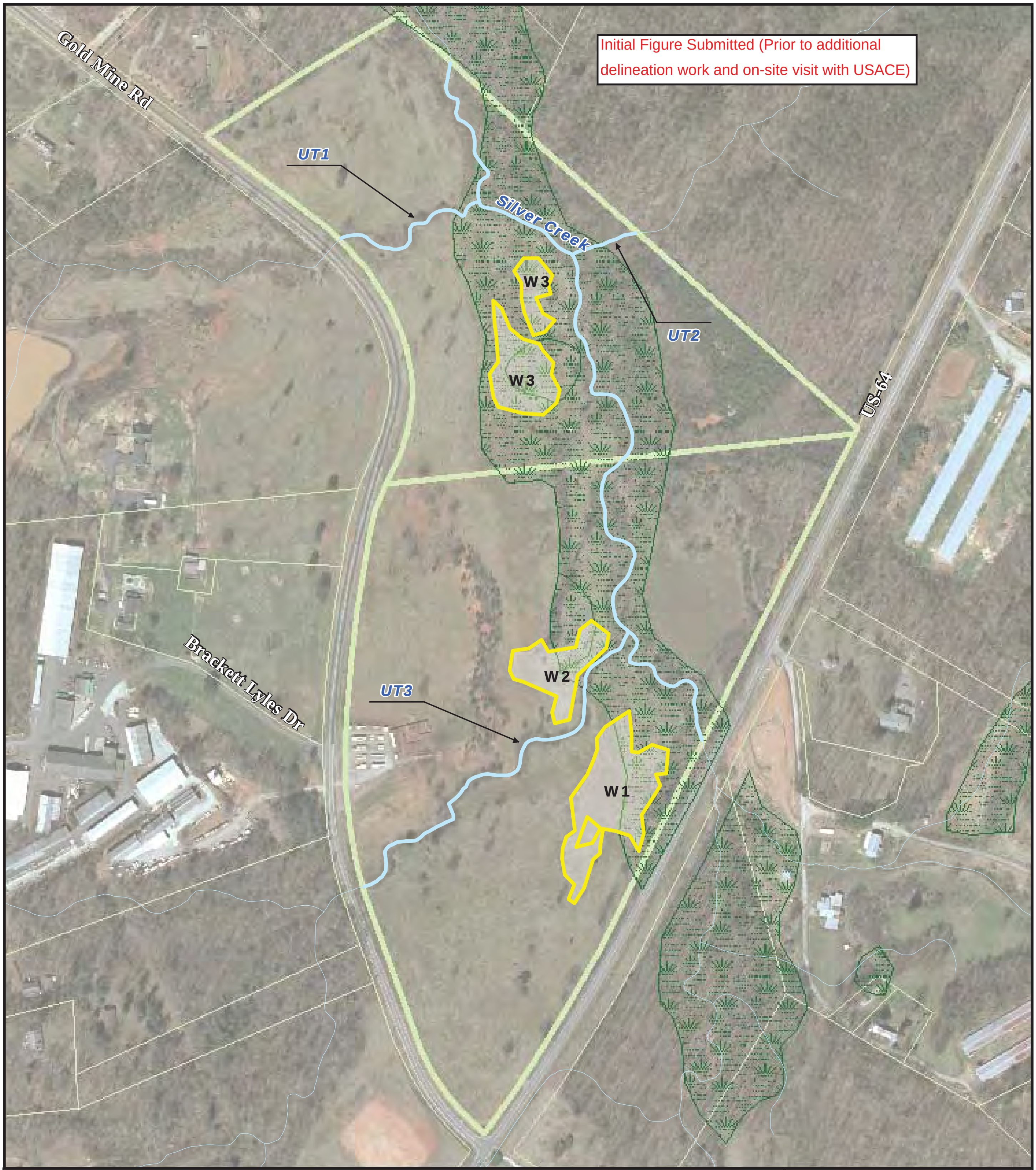
- Photo log; and
- an Agent Authorization Form.

We would like to meet with you on-site as you complete the jurisdictional review process for this project so that we can adjust the jurisdictional boundaries as needed and proceed with surveying of the project site.

Thank you for your consideration of this request. If you have any questions, please feel free to contact me at 828-350-1408 ext. 2010 or by email at cmcintyre@mbakercorp.com.

Sincerely,
Michael Baker Engineering, Inc.

Carmen Horne-McIntyre
Environmental Scientist



Initial Figure Submitted (Prior to additional delineation work and on-site visit with USACE)

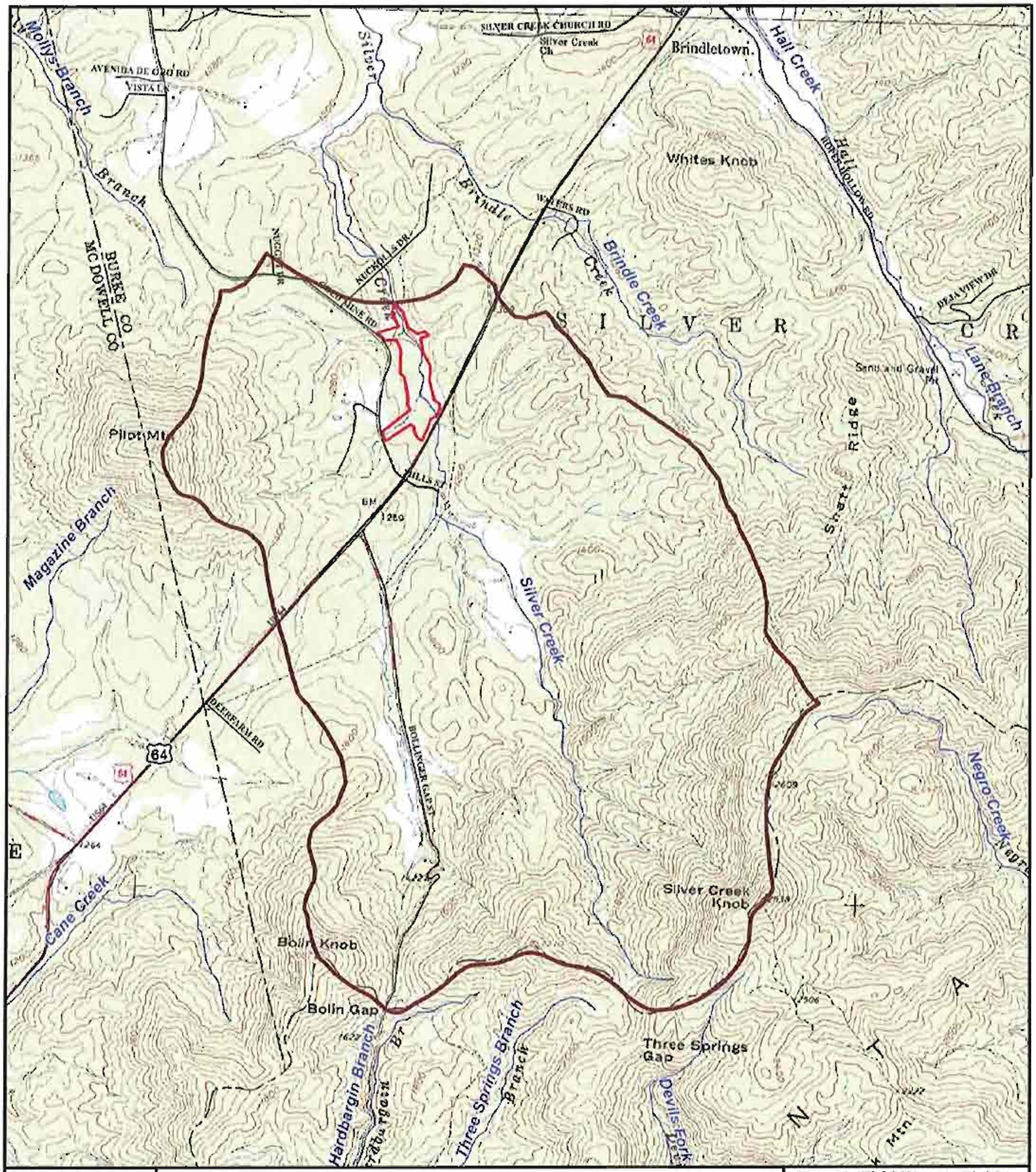
LEGEND:

▭	Delineated Wetlands	—	Streams
▨	National Wetlands Inventory (NWI)	▣	Project Parcel
—	Proposed Project Reach	▭	Parcels

0 100 200 400
Feet

Figure 1. Map of Delineated Wetlands

Upper Silver Creek
Stream & Wetland
Restoration Project
Burke County, NC



LEGEND:

🟥 Proposed Easement Boundary

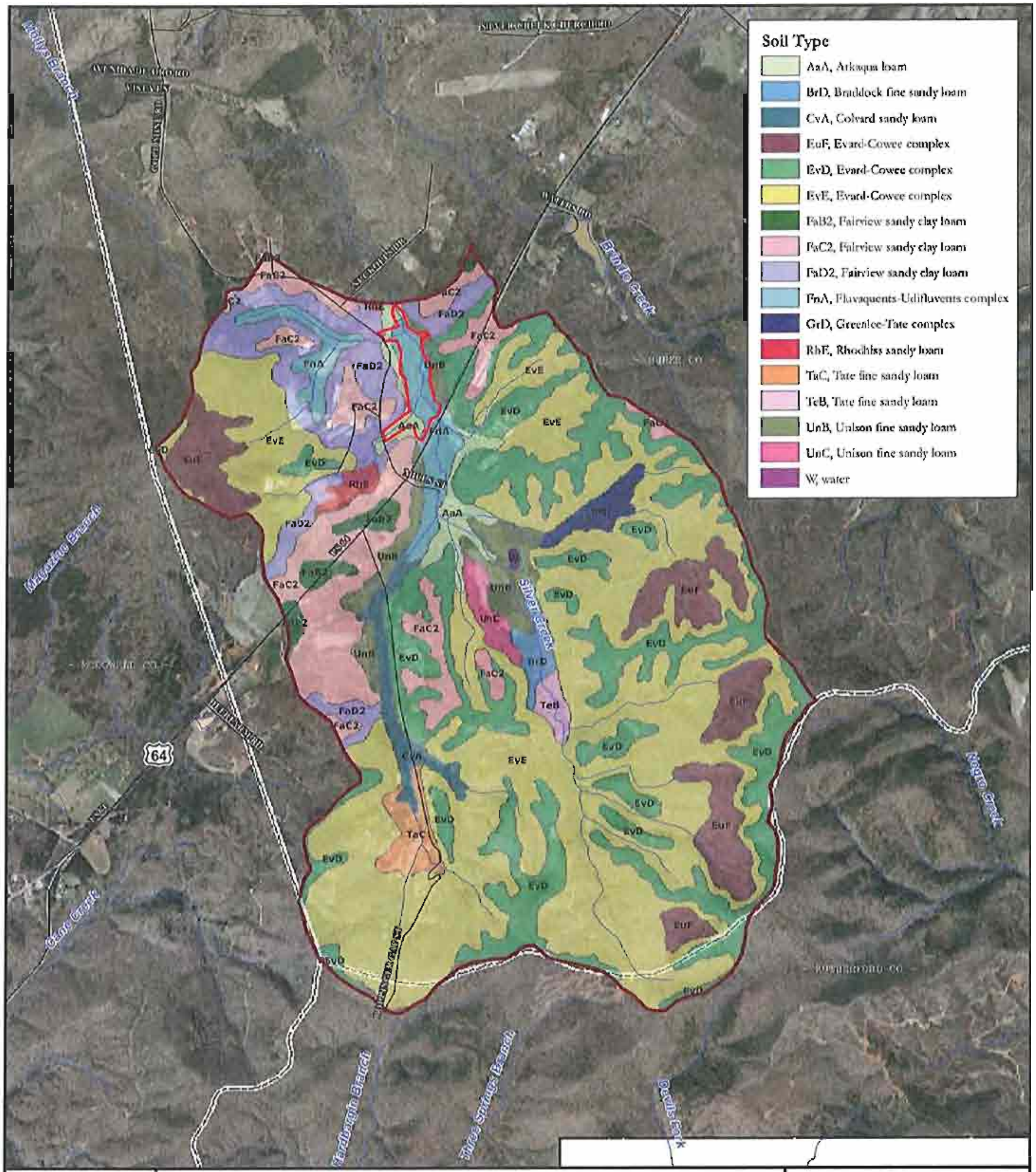
▨ Watershed Boundary

—— Streams

0 500 1,000 2,000 Feet

Figure 2. USGS Topographic Map (Dysartsville Quadrangle)

Upper Silver Creek
Stream & Wetland
Restoration Project
Burke County, NC



LEGEND:

🟥 Proposed Easement Boundary

— Streams

▢ Watershed Boundary

▢ Counties

0 500 1,000 2,000 Feet

Figure 2.1 Project Soil Types

Upper Silver Creek
Stream & Wetland
Restoration Project
Burke County, NC

March 31, 2011

Mr. Tyler Crumbley
U.S. Army Corps of Engineers
Asheville Regulatory Field Office
151 Patton Avenue, Room 208
Asheville, North Carolina 28801-5006

RE: Supplemental Information for the Stream and Wetland Jurisdictional Review: Upper Silver Creek NCEEP Mitigation Site, Morganton, Burke County, North Carolina

Dear Tyler,

Please find enclosed a revised map and other supplemental information for the jurisdictional streams and wetlands we reviewed for the proposed Upper Silver Creek mitigation site in February. The project site is located near the intersection of U.S. Highway 64 and Gold Mine Road, in the southwestern corner of Burke County near Morganton, North Carolina. The project site is further identified as a portion of Cherokee County Tax Parcel No. 1668275458. The site lies in the Catawba River Basin within North Carolina Division of Water Quality (NCDWQ) sub-basin 03-08-31 and local watershed unit 03050101-050050.

The revised map includes two small wetlands (W3 and W4) that are located in a section of the property that was not previously assessed. These wetlands were flagged after we submitted the jurisdictional determination request; however, both wetlands were reviewed during the Corps' site visit and were determined to be jurisdictional. Please note that the wetlands depicted in the figure enclosed have been renumbered to include the newly added wetlands.

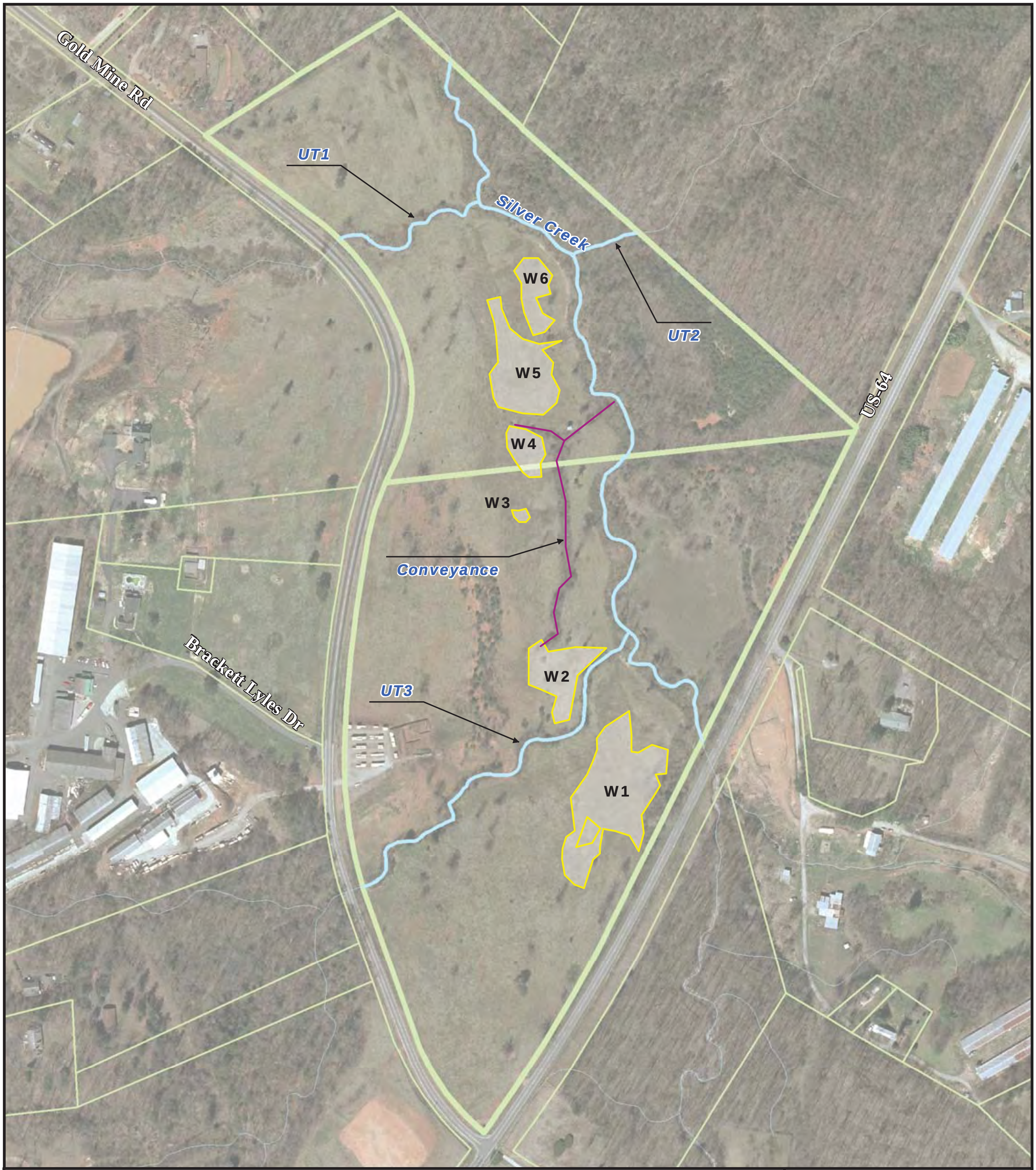
In addition, I have also enclosed a JD form for the conveyance located near Wetlands 2 through 5 that was determined to be jurisdictional during the site visit. If you have any questions or need additional information to finalize the jurisdictional determination for the Upper Silver Creek mitigation site, please contact me at your earliest convenience at 828.350.1408 ext. 2010 or by email at Cmcintyre@mbakercorp.com.

Sincerely,

Michael Baker Engineering, Inc.

Carmen Horne-McIntyre
Environmental Scientist

Enclosures: Attachments



LEGEND:

- 🟨 Delineated Wetlands
- Proposed Project Reach
- Conveyance
- Streams
- 🟩 Project Parcel
- ☐ Parcels

0 100 200 400
Feet

Figure 1. Revised Map of Delineated Wetlands

Upper Silver Creek
Stream & Wetland
Restoration Project
Burke County, NC

Baker

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: UPPER SILVER CREEK (W1)
Applicant/Owner: NCEEP
Investigator: CA/CHM

Date: 9/23/10
County: BURKE
State: NC

Do Normal Circumstances exist on the site? [✓ Yes] No
Is the site significantly disturbed (Atypical Situation)? Yes [✓ No]
Is the area a potential Problem Area? Yes [✓ No]
(If needed, explain on reverse.)

Community ID:
Transect ID:
Plot ID: W1

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1.	Solidago (Ragweed) sp.	HERB	OBL-FACW	9.	Carex sp.	HERB	FAC-OBL
2.	Vernonia noveboracensis (L.) Michx.	HERB	FAC+	10.	Platanus occidentalis L.	TREE	FACW-
3.	Arundinaria gigantea	HERB	FACW	11.			
4.	Rubus sp.	SHRUB	FAC-UPL	12.			
5.	Polygonum arifolium L.	HERB	OBL	13.			
6.	Salix nigra Marsh.	TREE	OBL	14.			
7.	Liquidambar styraciflua	TREE	FAC+	15.			
8.	Juncus effusus	HERB	FACW-OBL	16.			

"Percent of Dominant Species that are OBL, FACW or FAC" (excluding FAC-). 75%

Remarks:

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: — (in.)

Depth to Free Water in Pit: — (in.)

Depth to Saturated Soil: — (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ✓ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ✓ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ✓ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name (Series and Phase): 1) Udifluvents 2) Fluvaquents

Drainage Class: 1) Moderately well drained or well drained 2) Somewhat poorly drained

Taxonomy (Subgroup): 1) Udifluvents 2) Fluvaquents

Field Observations Confirm Mapped Type? [✓ Yes] No

Profile Descriptions.

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-3		7.5YR 5/8	7.5YR 6/2	common, distinct	silty loam
3-10		10YR 6/1	7.5YR 5/6	common, distinct	silty clay
10-12+		10YR 5/8	5YR 5/8	common, faint	silty clay

Hydric Soil Indicators:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☑ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks

Clay appears to have cracking; redox features around peds

WETLAND DETERMINATION

Hydrophytic Vegetation Present? [✓ Yes] No (Circle)

Wetland Hydrology Present? [✓ Yes] No

Hydric Soils Present? [✓ Yes] No

(Circle)

Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks

W1 extends over a fenceline. Wetland area beyond fence is wooded with large areas of tear-thumb. The fence has acted and continues to serve as a barrier from mowing, so the veg. beyond the fence is different. At time of delineation, some mowing had occurred in wetland area, making veg. identification somewhat difficult. Conditions were also very dry during time delineation occurred.

Approved by HQUSACE 3/92

35.60599'N
-81.81726W

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:North Carolina County/parish/borough: Burke City: Morganton

Center coordinates of site (lat/long in degree decimal format): Lat. 35.60599° **N**, Long. -81.81726° **W**.

Universal Transverse Mercator:

Name of nearest waterbody: Silver Creek

Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Catawba River

Name of watershed or Hydrologic Unit Code (HUC): 03050101-050050

☒ 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):

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: 2,643 linear feet: 12-15 width (ft) and/or acres.
      Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known):Not 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: 3.35 **square miles**
Drainage area: 2147 **acres**
Average annual rainfall: 49.51 inches
Average annual snowfall: 7.3 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 **5-10** river miles from TNW.
Project waters are **1 (or less)** river miles from RPW.
Project waters are **5-10** aerial (straight) miles from TNW.
Project waters are **1 (or less)** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

---

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.

Identify flow route to TNW[5]: Overland flow from Wetland 1 (W1) flows in a northeasterly direction into Silver Creek near Pilot Mountain. W1 is located less than one mile from Silver Creek which flows directly into the Catawba River more than five miles downstream of the project area.
Tributary stream order, if known: Silver Creek is a 3rd order stream in the project area.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☒ Natural
☐ Artificial (man-made). Explain: .
☒ Manipulated (man-altered). Explain: Channel was likely moved in the past..

Tributary properties with respect to top of bank (estimate):
Average width: Silver Creek: 20 feet
Average depth: Silver Creek: 4 feet
Average side slopes: **Vertical (1:1 or less).**

Primary tributary substrate composition (check all that apply):
☒ Silts
☒ Cobbles
☐ Bedrock
☐ Other. Explain: .
☒ Sands
☒ Gravel
☐ Vegetation. Type/% cover:
☐ Concrete
☐ Muck

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: Incised and unstable over the reach.
Presence of run/riffle/pool complexes. Explain: Bedform characterized by long riffles and infrequently spaced pools.
Tributary geometry: **Meandering**
Tributary gradient (approximate average slope): ~2 %

(c) Flow:

Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **11-20**
Describe flow regime: Flow is perennial; noticeably low during time of wetland delineation.
Other information on duration and volume: .

Surface flow is: **Confined.** Characteristics: In the review area, surface flow is largely confined to a channel that exhibits perennial characteristics. Surface flow based on storm events. Groundwater appears to contribute to baseflow in this segment of the channel.

Subsurface flow: **Unknown**. 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
  ☐ changes in the character of soil
  ☐ shelving
  ☒ vegetation matted down, bent, or absent
  ☒ leaf litter disturbed or washed away
  ☒ sediment deposition
  ☐ water staining
  ☐ other (list):
  ☐ the presence of litter and debris
  ☒ destruction of terrestrial vegetation
  ☐ the presence of wrack line
  ☒ sediment sorting
  ☐ scour
  ☐ multiple observed or predicted flow events
  ☐ abrupt change in plant community
☐ 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:
  ☐ oil or scum line along shore objects
  ☐ fine shell or debris deposits (foreshore)
  ☐ physical markings/characteristics
  ☐ tidal gauges
  ☐ other (list):
☐ Mean High Water Mark indicated by:
  ☐ survey to available datum;
  ☐ physical markings;
  ☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:

---

[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.
[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.

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).

Explain: Silver Creek was running clear at the time of the delineation; water level was somewhat low but had good flow. Riparian width variable, but generally ~15 feet wide. Riparian breaks are infrequent and the buffer is composed of herbaceous, shrub and immature tree layers in most areas. Exotic, invasive vegetation also present riparian zone. Watershed above project area contains low-density residential developments, and agricultural lands with the majority of land upstream being in forested cover.

Identify specific pollutants, if known: sediment, nutrients.

(iv) Biological Characteristics. Channel supports (check all that apply):

☒ Riparian corridor. Characteristics (type, average width): Riparian corridor contains mix of native and exotic, invasive vegetation and is variable in width (~ 15'wide on average) and not continuous.

☐ 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: Macrobenthos and small fish found in stream, few salamanders. Minimal buffer located on either side of stream may provide minimal habitat for terrestrial wildlife.

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:1.45 acres

Wetland type. Explain: Palustrine.

Wetland quality. Explain: Dry conditions at time of survey. Fairly good quality with well established wetland species and drainage patterns in various parts of wetland.

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **Intermittent flow**. Explain: .

Surface flow is**: Discrete and confined**

Characteristics: .

Subsurface flow: **Yes**. Explain findings: Wetland hydrology appears to come from base of a hillslope and trends towards confluence of Unnamed Tributary 3 and Silver Creek.

☐ 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: Deposition or fill material is present between W1 and Silver Creek in areas as evidenced by topography in the vicinity of W1.

(d) Proximity (Relationship) to TNW

Project wetlands are **5-10** 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 **50 - 100-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: Site conditions dry at time of delineation; general watershed characteristics noted in previous section.

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

☒ Riparian buffer. Characteristics (type, average width):Partial buffer on one side of wetland near fenceline; remainder of wetland surrounded by mowed field.

☒ Vegetation type/percent cover. Explain:Established vegetative cover in wetland. Periodic mowing has prevented more woody vegetation from being present. Vegetative cover in wetland that extends beyond fenceline is differs from what is observed in greater area of W1 and is likely due to differences in frequency of disturbance.

☐ 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**

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)
W1 N	1.45		

Summarize overall biological, chemical and physical functions being performed: Primary beneficial functions are sediment and nutrient removal during flooding events of Silver Creek and enhancement of habitat diversity on-site.

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: Site topography and surface drainage patterns indicate W1 flows approximately 150 to 200 feet before entering Silver Creek Silver Creek then continues downstream for 5-10 miles where it directly flows into the Catawba River.

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: A NCDWQ Stream Identification Form was completed for Silver Creek which scored out as a perennial stream. This is also confirmed by the identification of Silver Creek as a perennial stream on the USGS quad for the project area.

☐ 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: **2,643** linear feet **~30** 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 jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: **1.45** 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.

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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.***

☐ 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: Dysartsville Quad.
☐ 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): .
  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): NC State Climate Office database (CRONOS) and representative photographs taken of W1.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: UPPER SILVER CREEK (W2)
Applicant/Owner: NCEEP
Investigator: CA/CHM

Date: 9/24/10
County: BURKE
State: NC

Do Normal Circumstances exist on the site? [✓ Yes] No
Is the site significantly disturbed (Atypical Situation)? Yes [✓ No]
Is the area a potential Problem Area? Yes [✓ No]
(If needed, explain on reverse.)

Community ID:
Transect ID:
Plot ID: W2

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. FESCUE	HERB	NI	9. Arundinaria gigantea	HERB	FACW
2. Liquidambar styraciflua	TREE	FAC+	10.		
3. SOLIDAGO SP.	HERB	OBL-FACU	11.		
4. Carex sp.	HERB	FAC-OBL	12.		
5. JUNCUS EFFUSUS	HERB	FACW-OBL	13.		
6. Smilax rotundifolia L.	HERB	FAC	14.		
7. Campsis radicans (L.) Seem. ex Bureau	VINE	FAC	15.		
8. Rosa multiflora Thunb.	VINE	UPL	16.		

"Percent of Dominant Species that are OBL, FACW or FAC" (excluding FAC-). > 50%

Remarks:
Wetland dominated by open pasture type. Origins: hillside seeps, stream flooding. Delineation weighted more towards presence of soils due to recent mowing of vegetation w/in [illegible] of wetland & drought conditions. Topography also used.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available

Field Observations:

Depth of Surface Water: – (in.)

Depth to Free Water in Pit: – (in.)

Depth to Saturated Soil: – (in.)

Wetland Hydrology Indicators:

Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
✓ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
✓ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
✓ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks:
Dry conditions at time of delineation. Lower water levels observed in tributaries w/in project area. Flow appeared to be most likely from groundwater contribution to stream flow.

SOILS

Map Unit Name (Series and Phase): 1) Udifluvents 2) Fluvaquents

Drainage Class 1) Moderately well drained or well-drained 2) somewhat poorly drained

Taxonomy (Subgroup) Udifluvents / Fluvaquents

Field Observations Confirm Mapped Type? [✓ Yes] No

Profile Descriptions:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-4		7.5YR 4/4	7.5YR 6/3	common, distinct	clayey loam
4-12+		7.5YR 6/1	7.5YR 5/8	common distinct	loamy, clay, silt

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
✓ Gleyed or Low-Chroma Colors

___ Concretions
___ High Organic Content In Surface Layer In Sandy Soils
___ Organic Streaking In Sandy Soils
___ Listed on Local Hydric Soils List
Other (Explain in Remarks)

Remarks

WETLAND DETERMINATION

Hydrophytic Vegetation Present? [✓ Yes] No (Circle)
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks
35.60668°N, -81.81774°W

Approved by HQUSACE 3/92

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:North Carolina County/parish/borough: Burke City: Morganton
Center coordinates of site (lat/long in degree decimal format): Lat. 35.60668° **N**, Long. -81.81774° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Unnamed Tributary (UT) 3 to Silver Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Catawba River
Name of watershed or Hydrologic Unit Code (HUC): 03050101-050050

☒ 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):

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: 1,162 linear feet: 3 width (ft) and/or acres.
      Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known):Not 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: .

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[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: .19 **square miles**
Drainage area: 123 **acres**
Average annual rainfall: 49.51 inches
Average annual snowfall: 7.3 inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☒ Tributary flows through **2** tributaries before entering TNW.

Project waters are **5-10** river miles from TNW.
Project waters are **1 (or less)** river miles from RPW.
Project waters are **5-10** aerial (straight) miles from TNW.
Project waters are **1 (or less)** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: Overland flow from Wetland 2 (W2) flows in an easterly direction into a ditch that drains directly into Silver Creek, and in times of flooding, likely drains into an unnamed tributary in the project area (UT3) to

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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.

Silver Creek. W2 is located less than one mile from UT3 and Silver Creek which flows directly into the Catawba River more than five miles downstream of the project area.
Tributary stream order, if known: UT3 is a 1st order stream.

(b) General Tributary Characteristics (check all that apply):
Tributary is: ☒ Natural
☐ Artificial (man-made). Explain: .
☒ Manipulated (man-altered). Explain: Channel was likely moved in the past.

Tributary properties with respect to top of bank (estimate):
Average width: 4-6 feet
Average depth: ..75-3 feet
Average side slopes: **Vertical (1:1 or less).**

Primary tributary substrate composition (check all that apply):
☒ Silts
☒ Cobbles
☐ Bedrock
☐ Other. Explain: .
☒ Sands
☒ Gravel
☐ Vegetation. Type/% cover:
☐ Concrete
☐ Muck

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: A segment of UT3 in the upper half of the project reach is aggrading while the lower half of UT3, which contains headcuts, is incised.
Presence of run/riffle/pool complexes. Explain: Bedform characterized by long riffles and infrequently spaced pools.
Tributary geometry: **Meandering**
Tributary gradient (approximate average slope): ~3 %

(c) Flow:
Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **11-20**
Describe flow regime: Flow is perennial; noticeably low during time of wetland delineation.
Other information on duration and volume: .

Surface flow is: **Confined.** Characteristics: In the review area, surface flow is largely confined to a channel that exhibits perennial characteristics. Surface flow based on storm events. Groundwater appears to contribute to baseflow in this segment of the channel.

Subsurface flow: **Unknown**. 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
  ☒ changes in the character of soil
  ☐ shelving
  ☒ vegetation matted down, bent, or absent
  ☒ leaf litter disturbed or washed away
  ☒ sediment deposition
  ☐ water staining
  ☐ other (list):
  ☐ the presence of litter and debris
  ☐ destruction of terrestrial vegetation
  ☐ the presence of wrack line
  ☒ sediment sorting
  ☐ scour
  ☐ multiple observed or predicted flow events
  ☐ abrupt change in plant community
☐ 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:
  ☐ oil or scum line along shore objects
  ☐ fine shell or debris deposits (foreshore)
  ☐ physical markings/characteristics
  ☐ tidal gauges
  ☐ other (list):
☐ Mean High Water Mark indicated by:
  ☐ survey to available datum;
  ☐ physical markings;
  ☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:

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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.

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).

Explain: UT3 was running clear at the time of the delineation; water level was somewhat low but had good flow. Riparian width variable, but generally ~ 12 feet in most areas. Riparian breaks are infrequent and the buffer is composed of herbaceous, shrub and tree layers in most areas. Watershed above project area contains low-density residential developments, and agricultural lands with the majority of land upstream being in forested cover.

Identify specific pollutants, if known: sediment.

(iv) Biological Characteristics. Channel supports (check all that apply):

☒ Riparian corridor. Characteristics (type, average width): Riparian corridor contains mix of native and exotic, invasive vegetation and is variable in width (~ 12'wide on average).

☐ 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: Macrobenthos found in stream, two salamanders. The narrow buffer located on either side of stream currently provides minimal habitat for terrestrial wildlife.

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: .71 acres

Wetland type. Explain: Palustrine.

Wetland quality. Explain: Dry conditions at time of survey. Although much of the wetland had been mowed prior to the delineation, areas of unmowed vegetation contained established wetland species.

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **Intermittent flow**. Explain: .

Surface flow is**: Discrete and confined**

Characteristics: .

Subsurface flow: **Yes**. Explain findings: Wetland hydrology appears to come from base of a hillslope west of UT3 and trends towards confluence of UT3 and Silver Creek.

☐ 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: Deposition or fill material is present between Wetland 2 (W2) and Silver Creek in areas as evidenced by topography in the vicinity of W2.

(d) Proximity (Relationship) to TNW

Project wetlands are **5-10** 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 **5 - 10-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: Site conditions dry at time of delineation; general watershed characteristics noted in previous section.

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

☒ Riparian buffer. Characteristics (type, average width): W2 is primarily in a mowed field although it is bounded by a buffer along UT3 one one side and a small forested area near the beginning of a ditchline.

☒ Vegetation type/percent cover. Explain:Established vegetative cover exists in wetland and is dominated by grasses and other herbaceous cover. Periodic mowing has largely prevented woody vegetation from being present within the wetland.

☐ 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 (.71) 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)
W2 N	.71		

Summarize overall biological, chemical and physical functions being performed: Primary beneficial functions are sediment and nutrient removal during flooding events of Silver Creek and enhancement of habitat diversity on-site.

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: Site topography and soils indicate W2 flows approximately less than 100 to 200 feet before entering Silver Creek Silver Creek then continues downstream for 5-10 miles where it directly flows into the Catawba River.

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: A NCDWQ Stream Identification Form was completed for Silver Creek which scored out as a perennial stream. This is also confirmed by the identification of Silver Creek as a perennial stream on the USGS quad for the project area.

☐ 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: **1162** 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: **.**

☐ 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: **.71** 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: Dysartsville Quad.
☐ 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): .
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): NC State Climate Office database (CRONOS) and representative photographs taken of W1.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: UPPER SILVER CR (W4)
Applicant/Owner: NCEEP
Investigator: CHM / MR

Date: 1/20/11
County: BURKE
State: NC

Do Normal Circumstances exist on the site? [✓ Yes] No
Is the site significantly disturbed (Atypical Situation)? Yes [✓ No]
Is the area a potential Problem Area? Yes [✓ No]
(If needed, explain on reverse.)

Community ID:
Transect ID:
Plot ID: W3

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Juncus eFFusus	HERB	FACW-OBL	9.		
2. FIELD GRASSES/FESCUE	HERB	NI	10.		
3.			11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

"Percent of Dominant Species that are OBL, FACW or FAC" (excluding FAC-). 50%

Remarks: WETLAND MOWED. POSSIBLE SOURCE: HILLSIDE SEEP

HYDROLOGY

Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: — (in.)

Depth to Free Water in Pit: 8-9" (in.)

Depth to Saturated Soil: ___ (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ✓ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ✓ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ✓ Local Soil Survey Data
- ✓ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name (Series and Phase): 1)UDIFLUVENTS 2)FLUVAQUENTS

Drainage Class: 1)MODERATELY WELL DRAINED TO WELL DRAINED 2) SOMEWHAT POORLY DRAINED

Field Observations Confirm Mapped Type? [✓ Yes] No

Taxonomy (Subgroup): UDIFLUVENTS/FLUVAQUENTS

Profile Descriptions:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-2"	A	10 YR 4/4			
2-6"	B	7.5YR 4/6	7.5YR 5/2	common/distinct	clayey loam
6-12"		5YR 4/6	7.5YR 5/2	common/distinct	clayey loam

* Small O-Horizon

Hydric Soil Indicators:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ✓ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks

WETLAND DETERMINATION

Hydrophylic Vegetation Present? [✓ Yes] No (Circle)
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

Is this Sampling Point Within a Wetland? (Circle) [✓ Yes] No .

Remarks
35.60773°N, -81.81821°W

Approved by HQUSACE 3/92

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:North Carolina County/parish/borough: Burke City: Morganton
Center coordinates of site (lat/long in degree decimal format): Lat. 35.60773° **N**, Long. -81.81821° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Silver Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Catawba River
Name of watershed or Hydrologic Unit Code (HUC): 03050101-050050

☒ 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):

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: 2,643 linear feet: 12-15 width (ft) and/or acres.
      Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known):Not 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: .

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[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: 3.35 **square miles**
Drainage area: 2147 **acres**
Average annual rainfall: 49.51 inches
Average annual snowfall: 7.3 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 **5-10** river miles from TNW.
Project waters are **1 (or less)** river miles from RPW.
Project waters are **5-10** aerial (straight) miles from TNW.
Project waters are **1 (or less)** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

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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.

Identify flow route to TNW[5]: Subsurface flow from Wetland 3 (W3) flows in an easterly direction into a ditch that drains directly into Silver Creek. W3 is located less than one mile from Silver Creek which flows directly into the Catawba River more than five miles downstream of the project area.
Tributary stream order, if known: Silver Creek is a 3rd order stream in the project area.

(b) General Tributary Characteristics (check all that apply):
Tributary is: ☒ Natural
☐ Artificial (man-made). Explain: .
☒ Manipulated (man-altered). Explain: Channel was likely moved in the past.

Tributary properties with respect to top of bank (estimate):
Average width: 20 feet
Average depth: 4 feet
Average side slopes: **Vertical (1:1 or less).**

Primary tributary substrate composition (check all that apply):
☒ Silts
☒ Cobbles
☐ Bedrock
☐ Other. Explain: .
☒ Sands
☒ Gravel
☐ Vegetation. Type/% cover:
☐ Concrete
☐ Muck

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: Incised and unstable over the reach. .
Presence of run/riffle/pool complexes. Explain: Bedform characterized by long riffles and infrequently spaced pools.
Tributary geometry: **Meandering**
Tributary gradient (approximate average slope): ~2 %

(c) Flow:
Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **11-20**
Describe flow regime: Flow is perennial.
Other information on duration and volume: .

Surface flow is: **Confined.** Characteristics: In the review area, surface flow is largely confined to a channel that exhibits perennial characteristics. Surface flow based on storm events. Groundwater appears to contribute to baseflow in this segment of the channel.

Subsurface flow: **Unknown**. 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
  ☒ changes in the character of soil
  ☐ shelving
  ☒ vegetation matted down, bent, or absent
  ☒ leaf litter disturbed or washed away
  ☒ sediment deposition
  ☐ water staining
  ☐ other (list):
  ☒ the presence of litter and debris
  ☒ destruction of terrestrial vegetation
  ☒ the presence of wrack line
  ☒ sediment sorting
  ☒ scour
  ☐ multiple observed or predicted flow events
  ☐ abrupt change in plant community
☐ 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:
  ☐ oil or scum line along shore objects
  ☐ fine shell or debris deposits (foreshore)
  ☐ physical markings/characteristics
  ☐ tidal gauges
  ☐ other (list):
☐ Mean High Water Mark indicated by:
  ☐ survey to available datum;
  ☐ physical markings;
  ☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:

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[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.
[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.

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).

Explain: Silver Creek was running clear at the time of the delineation; water level was somewhat low but had good flow. Riparian width variable, but generally ~15 feet wide. Riparian breaks are infrequent and the buffer is composed of herbaceous, shrub and immature tree layers in most areas. Exotic, invasive vegetation also present riparian zone. Watershed above project area contains low-density residential developments, and agricultural lands with the majority of land upstream being in forested cover.

Identify specific pollutants, if known: sediment, nutrients.

(iv) Biological Characteristics. Channel supports (check all that apply):

☒ Riparian corridor. Characteristics (type, average width): Riparian corridor contains mix of native and exotic, invasive vegetation and is variable in width (~ 15' wide on average) and not continuous.

☐ 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: Macrobenthos and small fish found in stream, few salamanders. Minimal buffer located on either side of stream may provide minimal habitat for terrestrial wildlife.

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: .04 acres

Wetland type. Explain: Palustrine.

Wetland quality. Explain: Wetland had been mowed prior to the delineation, making it difficult to determine vegetation present. However, a distinct difference in vegetation is present when observing W3 and surrounding field.

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **No Flow** . Explain: .

Surface flow is**: Not present**

Characteristics: .

Subsurface flow: **Yes**. Explain findings: Wetland hydrology appears to come from a hillslope west of a ditchline near Silver Creek. This wetland is also located downslope of a buried layer of hydric soil which was likely buried during historic land-disturbing activities. It is likely that subsurface hydrology associated with this wetland site (W3) trends towards the ditchline which ultimately converges with Silver Creek.

☐ 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: Ditchline is present between W3 and Silver Creek that would impact subsurface hydrology of W3. Surface water in ditchline appears to be fed by hillslope seepage including that which supports W3.

(d) Proximity (Relationship) to TNW

Project wetlands are **5-10** 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 **5 - 10-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: Site conditions somewhat wet at time of delineation due to snowmelt; general watershed characteristics noted in previous section.

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:Established vegetative cover exists in wetland and is dominated by grasses and other herbaceous cover. Periodic mowing has largely prevented woody vegetation from being present within the wetland.

☐ 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**

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)
W3 N	.04		

Summarize overall biological, chemical and physical functions being performed: Primary beneficial functions are sediment and nutrient removal during flooding events of Silver Creek and enhancement of habitat diversity on-site.

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: Site topography and hydrologic conditions present in W3 and a nearby ditchline indicate W3 flows approximately less than 500 feet before entering Silver Creek. Silver Creek then continues downstream for 5-10 miles where it directly flows into the Catawba River.

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: A NCDWQ Stream Identification Form was completed for Silver Creek which scored out as a perennial stream. This is also confirmed by the identification of Silver Creek as a perennial stream on the USGS quad for the project area.

☐ 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: **2643** linear feet **12-15** 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 jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: **.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: Dysartsville Quad.
☐ 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): .
  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): .

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: UPPER SILVER CR (W5)
Applicant/Owner: NCEEP
Investigator: CHM/MR

Date: 1/20/11
County: BURKE
State: NC

Do Normal Circumstances exist on the site? [✓ Yes] No
Is the site significantly disturbed (Atypical Situation)? Yes [✓ No]
Is the area a potential Problem Area? Yes [✓ No]
(If needed, explain on reverse.)

Community ID:
Transect ID:
Plot ID: W4

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. JUNCUS EFFUSUS	HERB	FACW-OBL	9.		
2. PINUS STROBUS	TREE	FACU	10.		
3. JUNIPERUS VIRGINIANA L.	TREE	FACU-	11.		
4. ARUNDINARIA GIGANTEA	HERB	FACW	12.		
5. SMILAX ROTUNDIFOLIA L.	HERB	FAC	13.		
6.			14.		
7.			15.		
8.			16.		

"Percent of Dominant Species that are OBL, FACW or FAC" (excluding FAC-). 50% OR GREATER

Remarks: WETLAND DOMINATED BY OPEN PASTURE TYPE.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available

Field Observations:

Depth of Surface Water: — (in.)

Depth to Free Water in Pit: 1" (in.)

Depth to Saturated Soil: ___ (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ✓ Saturated in Upper 12 Inches WATER ALMOST TO TOP OF HOLE (W/IN 1")
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits OTHER HOLES [illegible] 1/19 WERE FILLED [illegible]
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ✓ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ✓ Local Soil Survey Data
- ✓ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): 1) UDIFLUVENTS
2) FLUVAQUENTS

Drainage Class 1) MODERATELY WELL-DRAINED OR WELL DRAINED. 2) SOMEWHAT POORLY DRAINED

Taxonomy (Subgroup) UDIFLUVENTS / FLUVAQUENTS

Field Observations
Confirm Mapped Type? [✓ Yes] No

Profile Descriptions:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-2"	O	10YR 4/3			loamy
2-4	A	10YR 4/4	10YR 4/2	common/distinct	clayey loam
4-12		5YR 4/6		common/distinct	clayey loam

Hydric Soil Indicators:

☐ Histosol
☐ Histic Epipedon
☐ Sulfidic Odor
☐ Aquic Moisture Regime
☑ Gleyed or Low-Chroma Colors
☐ Concretions
☐ High Organic Content in Surface Layer in Sandy Soils
☐ Organic Streaking in Sandy Soils
☐ Listed on Local Hydric Soils List
Other (Explain in Remarks)

Remarks

WETLAND DETERMINATION

Hydrophylic Vegetation Present? [✓ Yes] No (Circle)
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

Is this Sampling Point Within a Wetland? (Circle) [✓ Yes] No

Remarks

35.60829°N, -81.81818°W

Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: UPPER SILVER CREEK (W1)
Applicant/Owner: NCEEP
Investigator: CA/CHM

Date: 9/23/10
County: BURKE
State: NC

Do Normal Circumstances exist on the site? [✓ Yes] No
Is the site significantly disturbed (Atypical Situation)? Yes [✓ No]
Is the area a potential Problem Area? Yes [✓ No]
(If needed, explain on reverse.)

Community ID:
Transect ID:
Plot ID: W1

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Solidago (Ragweed) sp.	HERB	OBL-FACW	9. Carex sp.	HERB	FAC-OBL
2. Vernonia noveboracensis (L.) Michx.	HERB	FAC+	10. Platanus occidentalis L.	TREE	FACW-
3. Arundinaria gigantea	HERB	FACW	11.		
4. Rubus sp.	SHRUB	FAC-UPL	12.		
5. Polygonum arifolium L.	HERB	OBL	13.		
6. Salix nigra Marsh.	TREE	OBL	14.		
7. Liquidambar styraciflua	TREE	FAC+	15.		
8. Juncus effusus	HERB	FACW-OBL	16.		

"Percent of Dominant Species that are OBL, FACW or FAC" (excluding FAC-). 75%

Remarks:

HYDROLOGY

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other

No Recorded Data Available

Field Observations:

Depth of Surface Water: — (in.)

Depth to Free Water in Pit: — (in.)

Depth to Saturated Soil: — (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- ✓ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ✓ Oxidized Root Channels in Upper 12 Inches
- Water-Stained Leaves
- Local Soil Survey Data
- ✓ FAC-Neutral Test
- Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name (Series and Phase): 1) Udifluvents 2) Fluvaquents

Drainage Class: 1) Moderately well drained or well drained 2) Somewhat poorly drained

Taxonomy (Subgroup): 1) Udifluvents 2) Fluvaquents

Field Observations Confirm Mapped Type? [✓ Yes] No

Profile Descriptions.

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-3		7.5YR 5/8	7.5YR 6/2	common, distinct	silty loam
3-10		10YR 6/1	7.5YR 5/6	common, distinct	silty clay
10-12+		10YR 5/8	5YR 5/8	common, faint	silty clay

Hydric Soil Indicators:

☐ Histosol
☐ Histic Epipedon
☐ Sulfidic Odor
☐ Aquic Moisture Regime
☑ Gleyed or Low-Chroma Colors

☐ Concretions
☐ High Organic Content in Surface Layer in Sandy Soils
☐ Organic Streaking in Sandy Soils
☐ Listed on Local Hydric Soils List
Other (Explain in Remarks)

Remarks

Clay appears to have cracking; redox features around peds

WETLAND DETERMINATION

Hydrophytic Vegetation Present? [✓ Yes] No (Circle)
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

Is this Sampling Point Within a Wetland? (Circle) [✓ Yes] No

Remarks

W1 extends over a fenceline. Wetland area beyond fence is wooded with large areas of tear-thumb. The fence has acted and continues to serve as a barrier from mowing, so the veg. beyond the fence is different. At time of delineation, some mowing had occurred in wetland area, making veg. identification somewhat difficult. Conditions were also very dry during time delineation occurred.

Approved by HQUSACE 3/92

35.60599'N
-81.81726°W

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:North Carolina County/parish/borough: Burke City: Morganton

Center coordinates of site (lat/long in degree decimal format): Lat. 35.60599° **N**, Long. -81.81726° **W**.

Universal Transverse Mercator:

Name of nearest waterbody: Silver Creek

Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Catawba River

Name of watershed or Hydrologic Unit Code (HUC): 03050101-050050

☒ 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):

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: 2,643 linear feet: 12-15 width (ft) and/or acres.
      Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known):Not 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: .

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[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: 3.35 **square miles**
Drainage area: 2147 **acres**
Average annual rainfall: 49.51 inches
Average annual snowfall: 7.3 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 **5-10** river miles from TNW.
Project waters are **1 (or less)** river miles from RPW.
Project waters are **5-10** aerial (straight) miles from TNW.
Project waters are **1 (or less)** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

---

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.

Identify flow route to TNW[5]: Overland flow from Wetland 1 (W1) flows in a northeasterly direction into Silver Creek near Pilot Mountain. W1 is located less than one mile from Silver Creek which flows directly into the Catawba River more than five miles downstream of the project area.
Tributary stream order, if known: Silver Creek is a 3rd order stream in the project area.

(b) General Tributary Characteristics (check all that apply):
Tributary is: ☒ Natural
☐ Artificial (man-made). Explain: .
☒ Manipulated (man-altered). Explain: Channel was likely moved in the past..

Tributary properties with respect to top of bank (estimate):
Average width: Silver Creek: 20 feet
Average depth: Silver Creek: 4 feet
Average side slopes: **Vertical (1:1 or less).**

Primary tributary substrate composition (check all that apply):
☒ Silts
☒ Cobbles
☐ Bedrock
☐ Other. Explain: .
☒ Sands
☒ Gravel
☐ Vegetation. Type/% cover:
☐ Concrete
☐ Muck

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: Incised and unstable over the reach.
Presence of run/riffle/pool complexes. Explain: Bedform characterized by long riffles and infrequently spaced pools.
Tributary geometry: **Meandering**
Tributary gradient (approximate average slope): ~2 %

(c) Flow:
Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **11-20**
Describe flow regime: Flow is perennial; noticeably low during time of wetland delineation.
Other information on duration and volume: .

Surface flow is: **Confined.** Characteristics: In the review area, surface flow is largely confined to a channel that exhibits perennial characteristics. Surface flow based on storm events. Groundwater appears to contribute to baseflow in this segment of the channel.

Subsurface flow: **Unknown**. 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
  ☐ changes in the character of soil
  ☐ shelving
  ☒ vegetation matted down, bent, or absent
  ☒ leaf litter disturbed or washed away
  ☒ sediment deposition
  ☐ water staining
  ☐ other (list):
  ☐ the presence of litter and debris
  ☒ destruction of terrestrial vegetation
  ☐ the presence of wrack line
  ☒ sediment sorting
  ☐ scour
  ☐ multiple observed or predicted flow events
  ☐ abrupt change in plant community
☐ 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:
  ☐ oil or scum line along shore objects
  ☐ fine shell or debris deposits (foreshore)
  ☐ physical markings/characteristics
  ☐ tidal gauges
  ☐ other (list):
▨ Mean High Water Mark indicated by:
  ☐ survey to available datum;
  ☐ physical markings;
  ☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:

---

[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.
[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.

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).

Explain: Silver Creek was running clear at the time of the delineation; water level was somewhat low but had good flow. Riparian width variable, but generally ~15 feet wide. Riparian breaks are infrequent and the buffer is composed of herbaceous, shrub and immature tree layers in most areas. Exotic, invasive vegetation also present riparian zone. Watershed above project area contains low-density residential developments, and agricultural lands with the majority of land upstream being in forested cover.

Identify specific pollutants, if known: sediment, nutrients.

(iv) Biological Characteristics. Channel supports (check all that apply):

☒ Riparian corridor. Characteristics (type, average width): Riparian corridor contains mix of native and exotic, invasive vegetation and is variable in width (~ 15'wide on average) and not continuous.

☐ 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: Macrobenthos and small fish found in stream, few salamanders. Minimal buffer located on either side of stream may provide minimal habitat for terrestrial wildlife.

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:1.45 acres

Wetland type. Explain: Palustrine.

Wetland quality. Explain: Dry conditions at time of survey. Fairly good quality with well established wetland species and drainage patterns in various parts of wetland.

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **Intermittent flow**. Explain: .

Surface flow is**: Discrete and confined**

Characteristics: .

Subsurface flow: **Yes**. Explain findings: Wetland hydrology appears to come from base of a hillslope and trends towards confluence of Unnamed Tributary 3 and Silver Creek.

☐ 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: Deposition or fill material is present between W1 and Silver Creek in areas as evidenced by topography in the vicinity of W1.

(d) Proximity (Relationship) to TNW

Project wetlands are **5-10** 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 **50 - 100-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: Site conditions dry at time of delineation; general watershed characteristics noted in previous section.

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

☒ Riparian buffer. Characteristics (type, average width):Partial buffer on one side of wetland near fenceline; remainder of wetland surrounded by mowed field.

☒ Vegetation type/percent cover. Explain:Established vegetative cover in wetland. Periodic mowing has prevented more woody vegetation from being present. Vegetative cover in wetland that extends beyond fenceline is differs from what is observed in greater area of W1 and is likely due to differences in frequency of disturbance.

☐ 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**

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)
W1 N	1.45		

Summarize overall biological, chemical and physical functions being performed: Primary beneficial functions are sediment and nutrient removal during flooding events of Silver Creek and enhancement of habitat diversity on-site.

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: Site topography and surface drainage patterns indicate W1 flows approximately 150 to 200 feet before entering Silver Creek Silver Creek then continues downstream for 5-10 miles where it directly flows into the Catawba River.

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: A NCDWQ Stream Identification Form was completed for Silver Creek which scored out as a perennial stream. This is also confirmed by the identification of Silver Creek as a perennial stream on the USGS quad for the project area.

☐ 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: **2,643** linear feet **~30** 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 jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: **1.45** 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.

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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.***

☐ 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: Dysartsville Quad.
☐ 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): .
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): NC State Climate Office database (CRONOS) and representative photographs taken of W1.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: UPPER SILVER CREEK (W2)
Applicant/Owner: NCEEP
Investigator: CA/CHM

Date: 9/24/10
County: BURKE
State: NC

Do Normal Circumstances exist on the site? [✓ Yes] No
Is the site significantly disturbed (Atypical Situation)? Yes [✓ No]
Is the area a potential Problem Area? Yes [✓ No]
(If needed, explain on reverse.)

Community ID:
Transect ID:
Plot ID: W2

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. FESCUE	HERB	NI	9. Arundinaria gigantea	HERB	FACW
2. Liquidambar styraciflua	TREE	FAC+	10.		
3. SOLIDAGO SP.	HERB	OBL-FACU	11.		
4. Carex sp.	HERB	FAC-OBL	12.		
5. JUNCUS EFFUSUS	HERB	FACW-OBL	13.		
6. Smilax rotundifolia L.	HERB	FAC	14.		
7. Campsis radicans (L.)	VINE	FAC	15.		
8. Rosa multiflora Thunb.	VINE	UPL	16.		
Seem. ex Bureau					

"Percent of Dominant Species that are OBL, FACW or FAC" (excluding FAC-). > 50%

Remarks:
Wetland dominated by open pasture type. Origins: hillside seep, stream flooding. Delineation weighted more towards presence of soils due to recent mowing of vegetation w/in [illegible] of wetland & drought conditions. Topography also used.

HYDROLOGY

Recorded Data (Describe in Remarks):
____ Stream, Lake, or Tide Gauge
____ Aerial Photographs
____ Other
____ No Recorded Data Available

Field Observations:

Depth of Surface Water: – (in.)

Depth to Free Water in Pit: – (in.)

Depth to Saturated Soil: – (in.)

Wetland Hydrology Indicators:

Primary Indicators:
____ Inundated
____ Saturated in Upper 12 Inches
____ Water Marks
____ Drift Lines
____ Sediment Deposits
✓ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
✓ Oxidized Root Channels in Upper 12 Inches
____ Water-Stained Leaves
____ Local Soil Survey Data
✓ FAC-Neutral Test
____ Other (Explain in Remarks)

Remarks:
Dry conditions at time of delineation. Lower water levels observed in tributaries w/in project area. Flow appeared to be most likely from groundwater contribution to stream flow.

SOILS

Map Unit Name (Series and Phase): 1) Udifluvents 2) Fluvaquents

Drainage Class: 1) Moderately well drained or well-drained 2) somewhat poorly drained

Taxonomy (Subgroup): Udifluvents / Fluvaquents

Field Observations Confirm Mapped Type? [✓ Yes] No

Profile Descriptions:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-4		7.5 YR 4/4	7.5 YR 6/3	common, distinct	clayey loam
4-12+		7.5 YR 6/1	7.5 YR 5/8	common distinct	loamy, clay, silt

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
✓ Gleyed or Low-Chroma Colors

___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Other (Explain in Remarks)

Remarks

WETLAND DETERMINATION

Hydrophytic Vegetation Present? [✓ Yes] No (Circle)
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks
35.60668°N, -81.81774°W

Approved by HQUSACE 3/92

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:North Carolina County/parish/borough: Burke City: Morganton
Center coordinates of site (lat/long in degree decimal format): Lat. 35.60668° **N**, Long. -81.81774° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Unnamed Tributary (UT) 3 to Silver Creek

Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Catawba River
Name of watershed or Hydrologic Unit Code (HUC): 03050101-050050
☒ 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):

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: 1,162 linear feet: 3 width (ft) and/or acres.
      Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known):Not 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: .

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[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: .19 **square miles**
   Drainage area: 123 **acres**
   Average annual rainfall: 49.51 inches
   Average annual snowfall: 7.3 inches

   (ii) Physical Characteristics:
   (a) Relationship with TNW:
   ☐ Tributary flows directly into TNW.
   ☒ Tributary flows through **2** tributaries before entering TNW.

   Project waters are **5-10** river miles from TNW.
   Project waters are **1 (or less)** river miles from RPW.
   Project waters are **5-10** aerial (straight) miles from TNW.
   Project waters are **1 (or less)** aerial (straight) miles from RPW.
   Project waters cross or serve as state boundaries. Explain: .

   Identify flow route to TNW[5]: Overland flow from Wetland 2 (W2) flows in an easterly direction into a ditch that drains directly into Silver Creek, and in times of flooding, likely drains into an unnamed tributary in the project area (UT3) to

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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.

Silver Creek. W2 is located less than one mile from UT3 and Silver Creek which flows directly into the Catawba River more than five miles downstream of the project area.
Tributary stream order, if known: UT3 is a 1st order stream.

(b) General Tributary Characteristics (check all that apply):
Tributary is: ☒ Natural
☐ Artificial (man-made). Explain: .
☒ Manipulated (man-altered). Explain: Channel was likely moved in the past.

Tributary properties with respect to top of bank (estimate):
Average width: 4-6 feet
Average depth: ..75-3 feet
Average side slopes: **Vertical (1:1 or less).**

Primary tributary substrate composition (check all that apply):

- ☒ Silts
- ☒ Cobbles
- ☐ Bedrock
- ☐ Other. Explain: .
- ☒ Sands
- ☒ Gravel
- ☐ Vegetation. Type/% cover:
- ☐ Concrete
- ☐ Muck

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: A segment of UT3 in the upper half of the project reach is aggrading while the lower half of UT3, which contains headcuts, is incised.
Presence of run/riffle/pool complexes. Explain: Bedform characterized by long riffles and infrequently spaced pools.
Tributary geometry: **Meandering**
Tributary gradient (approximate average slope): ~3 %

(c) Flow:
Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **11-20**
Describe flow regime: Flow is perennial; noticeably low during time of wetland delineation.
Other information on duration and volume: .

Surface flow is: **Confined.** Characteristics: In the review area, surface flow is largely confined to a channel that exhibits perennial characteristics. Surface flow based on storm events. Groundwater appears to contribute to baseflow in this segment of the channel.

Subsurface flow: **Unknown**. 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
  - ☒ changes in the character of soil
  - ☐ shelving
  - ☒ vegetation matted down, bent, or absent
  - ☒ leaf litter disturbed or washed away
  - ☒ sediment deposition
  - ☐ water staining
  - ☐ other (list):
  - ☐ the presence of litter and debris
  - ☐ destruction of terrestrial vegetation
  - ☐ the presence of wrack line
  - ☒ sediment sorting
  - ☐ scour
  - ☐ multiple observed or predicted flow events
  - ☐ abrupt change in plant community
- ☐ 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:
  - ☐ oil or scum line along shore objects
  - ☐ fine shell or debris deposits (foreshore)
  - ☐ physical markings/characteristics
  - ☐ tidal gauges
  - ☐ other (list):
- ☐ Mean High Water Mark indicated by:
  - ☐ survey to available datum;
  - ☐ physical markings;
  - ☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:

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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.

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).

Explain: UT3 was running clear at the time of the delineation; water level was somewhat low but had good flow. Riparian width variable, but generally ~ 12 feet in most areas. Riparian breaks are infrequent and the buffer is composed of herbaceous, shrub and tree layers in most areas. Watershed above project area contains low-density residential developments, and agricultural lands with the majority of land upstream being in forested cover.

Identify specific pollutants, if known: sediment.

(iv) Biological Characteristics. Channel supports (check all that apply):

☒ Riparian corridor. Characteristics (type, average width): Riparian corridor contains mix of native and exotic, invasive vegetation and is variable in width (~ 12'wide on average).

☐ 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: Macrobenthos found in stream, two salamanders. The narrow buffer located on either side of stream currently provides minimal habitat for terrestrial wildlife.

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: .71 acres

Wetland type. Explain: Palustrine.

Wetland quality. Explain: Dry conditions at time of survey. Although much of the wetland had been mowed prior to the delineation, areas of unmowed vegetation contained established wetland species.

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **Intermittent flow**. Explain: .

Surface flow is**: Discrete and confined**

Characteristics: .

Subsurface flow: **Yes**. Explain findings: Wetland hydrology appears to come from base of a hillslope west of UT3 and trends towards confluence of UT3 and Silver Creek.

☐ 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: Deposition or fill material is present between Wetland 2 (W2) and Silver Creek in areas as evidenced by topography in the vicinity of W2.

(d) Proximity (Relationship) to TNW

Project wetlands are **5-10** 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 **5 - 10-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: Site conditions dry at time of delineation; general watershed characteristics noted in previous section.

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

☒ Riparian buffer. Characteristics (type, average width): W2 is primarily in a mowed field although it is bounded by a buffer along UT3 one one side and a small forested area near the beginning of a ditchline.

☒ Vegetation type/percent cover. Explain:Established vegetative cover exists in wetland and is dominated by grasses and other herbaceous cover. Periodic mowing has largely prevented woody vegetation from being present within the wetland.

☐ 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 (.71) 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)
W2 N	.71		

Summarize overall biological, chemical and physical functions being performed: Primary beneficial functions are sediment and nutrient removal during flooding events of Silver Creek and enhancement of habitat diversity on-site.

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: Site topography and soils indicate W2 flows approximately less than 100 to 200 feet before entering Silver Creek Silver Creek then continues downstream for 5-10 miles where it directly flows into the Catawba River.

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: A NCDWQ Stream Identification Form was completed for Silver Creek which scored out as a perennial stream. This is also confirmed by the identification of Silver Creek as a perennial stream on the USGS quad for the project area.

☐ 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: **1162** 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: **.**

☐ 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: **.71** 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: Dysartsville Quad.
☐ 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): .
  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): NC State Climate Office database (CRONOS) and representative photographs taken of W1.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: UPPER SILVER CR (W4)
Applicant/Owner: NCEEP
Investigator: CHM / MR

Date: 1/20/11
County: BURKE
State: NC

Do Normal Circumstances exist on the site? [✓ Yes] No
Is the site significantly disturbed (Atypical Situation)? Yes [✓ No]
Is the area a potential Problem Area? Yes [✓ No]
(If needed, explain on reverse.)

Community ID:
Transect ID:
Plot ID: W3

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. JUNCUS EFFUSUS	HERB	FACW-OBL	9.		
2. FIELD GRASSES/FESCUE	HERB	NI	10.		
3.			11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

"Percent of Dominant Species that are OBL, FACW or FAC" (excluding FAC-). 50%

Remarks: WETLAND MOWED. POSSIBLE SOURCE: HILLSIDE SEEP

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available

Field Observations:

Depth of Surface Water: — (in.)

Depth to Free Water in Pit: 8-9" (in.)

Depth to Saturated Soil: ___ (in.)

Wetland Hydrology Indicators:

Primary Indicators:
___ Inundated
✓ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
✓ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
✓ Local Soil Survey Data
✓ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name (Series and Phase): 1) UDIFLUVENTS 2) FLUVAQUENTS

Drainage Class: 1) MODERATELY WELL DRAINED TO WELL DRAINED 2) SOMEWHAT POORLY DRAINED

Taxonomy (Subgroup): UDIFLUVENTS/FLUVAQUENTS

Field Observations Confirm Mapped Type? [✓ Yes] No

Profile Descriptions:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-2"	A	10YR 4/4			
2-6"	B	7.5YR 4/6	7.5YR 5/2	common/distinct	clayey loam
6-12"		5YR 4/6	7.5YR 5/2	common/distinct	clayey loam

* Small O-Horizon

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ✓ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks

WETLAND DETERMINATION

Hydrophylic Vegetation Present? [✓ Yes] No (Circle)

Wetland Hydrology Present? [✓ Yes] No

Hydric Soils Present? [✓ Yes] No

Is this Sampling Point Within a Wetland? (Circle) [✓ Yes] No

Remarks

35.60773°N, -81.81821°W

Approved by HQUSACE 3/92

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:North Carolina County/parish/borough: Burke City: Morganton

Center coordinates of site (lat/long in degree decimal format): Lat. 35.60773° **N**, Long. -81.81821° **W**.

Universal Transverse Mercator:

Name of nearest waterbody: Silver Creek

Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Catawba River

Name of watershed or Hydrologic Unit Code (HUC): 03050101-050050

☒ 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):

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: 2,643 linear feet: 12-15 width (ft) and/or acres.
      Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known):Not 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: .

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[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: 3.35 **square miles**
Drainage area: 2147 **acres**
Average annual rainfall: 49.51 inches
Average annual snowfall: 7.3 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 **5-10** river miles from TNW.
Project waters are **1 (or less)** river miles from RPW.
Project waters are **5-10** aerial (straight) miles from TNW.
Project waters are **1 (or less)** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

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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.

Identify flow route to TNW[5]: Subsurface flow from Wetland 3 (W3) flows in an easterly direction into a ditch that drains directly into Silver Creek. W3 is located less than one mile from Silver Creek which flows directly into the Catawba River more than five miles downstream of the project area.
Tributary stream order, if known: Silver Creek is a 3rd order stream in the project area.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☒ Natural
☐ Artificial (man-made). Explain: .
☒ Manipulated (man-altered). Explain: Channel was likely moved in the past.

Tributary properties with respect to top of bank (estimate):
Average width: 20 feet
Average depth: 4 feet
Average side slopes: **Vertical (1:1 or less).**

Primary tributary substrate composition (check all that apply):

☒ Silts
☒ Cobbles
☐ Bedrock
☐ Other. Explain: .
☒ Sands
☒ Gravel
☐ Vegetation. Type/% cover:
☐ Concrete
☐ Muck

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: Incised and unstable over the reach. .
Presence of run/riffle/pool complexes. Explain: Bedform characterized by long riffles and infrequently spaced pools.
Tributary geometry: **Meandering**
Tributary gradient (approximate average slope): ~2 %

(c) Flow:

Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **11-20**
Describe flow regime: Flow is perennial.
Other information on duration and volume: .

Surface flow is: **Confined.** Characteristics: In the review area, surface flow is largely confined to a channel that exhibits perennial characteristics. Surface flow based on storm events. Groundwater appears to contribute to baseflow in this segment of the channel.

Subsurface flow: **Unknown**. 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
  ☒ changes in the character of soil
  ☐ shelving
  ☒ vegetation matted down, bent, or absent
  ☒ leaf litter disturbed or washed away
  ☒ sediment deposition
  ☐ water staining
  ☐ other (list):
  ☒ the presence of litter and debris
  ☒ destruction of terrestrial vegetation
  ☒ the presence of wrack line
  ☒ sediment sorting
  ☒ scour
  ☐ multiple observed or predicted flow events
  ☐ abrupt change in plant community
☐ 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:
  ☐ oil or scum line along shore objects
  ☐ fine shell or debris deposits (foreshore)
  ☐ physical markings/characteristics
  ☐ tidal gauges
  ☐ other (list):
☐ Mean High Water Mark indicated by:
  ☐ survey to available datum;
  ☐ physical markings;
  ☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:

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[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.

[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.

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).

Explain: Silver Creek was running clear at the time of the delineation; water level was somewhat low but had good flow. Riparian width variable, but generally ~15 feet wide. Riparian breaks are infrequent and the buffer is composed of herbaceous, shrub and immature tree layers in most areas. Exotic, invasive vegetation also present riparian zone. Watershed above project area contains low-density residential developments, and agricultural lands with the majority of land upstream being in forested cover.

Identify specific pollutants, if known: sediment, nutrients.

(iv) Biological Characteristics. Channel supports (check all that apply):

☒ Riparian corridor. Characteristics (type, average width): Riparian corridor contains mix of native and exotic, invasive vegetation and is variable in width (~ 15' wide on average) and not continuous.

☐ 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: Macrobenthos and small fish found in stream, few salamanders. Minimal buffer located on either side of stream may provide minimal habitat for terrestrial wildlife.

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: .04 acres

Wetland type. Explain: Palustrine.

Wetland quality. Explain: Wetland had been mowed prior to the delineation, making it difficult to determine vegetation present. However, a distinct difference in vegetation is present when observing W3 and surrounding field.

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **No Flow** . Explain: .

Surface flow is**: Not present**

Characteristics: .

Subsurface flow: **Yes**. Explain findings: Wetland hydrology appears to come from a hillslope west of a ditchline near Silver Creek. This wetland is also located downslope of a buried layer of hydric soil which was likely buried during historic land-disturbing activities. It is likely that subsurface hydrology associated with this wetland site (W3) trends towards the ditchline which ultimately converges with Silver Creek.

☐ 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: Ditchline is present between W3 and Silver Creek that would impact subsurface hydrology of W3. Surface water in ditchline appears to be fed by hillslope seepage including that which supports W3.

(d) Proximity (Relationship) to TNW

Project wetlands are **5-10** 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 **5 - 10-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: Site conditions somewhat wet at time of delineation due to snowmelt; general watershed characteristics noted in previous section.

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:Established vegetative cover exists in wetland and is dominated by grasses and other herbaceous cover. Periodic mowing has largely prevented woody vegetation from being present within the wetland.

☐ 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**

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)
W3 N	.04		

Summarize overall biological, chemical and physical functions being performed: Primary beneficial functions are sediment and nutrient removal during flooding events of Silver Creek and enhancement of habitat diversity on-site.

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: Site topography and hydrologic conditions present in W3 and a nearby ditchline indicate W3 flows approximately less than 500 feet before entering Silver Creek. Silver Creek then continues downstream for 5-10 miles where it directly flows into the Catawba River.

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: A NCDWQ Stream Identification Form was completed for Silver Creek which scored out as a perennial stream. This is also confirmed by the identification of Silver Creek as a perennial stream on the USGS quad for the project area.

☐ 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: **2643** linear feet **12-15** 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 jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: **.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.

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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.***

☐ 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: Dysartsville Quad.
☐ 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): .
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): .

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: UPPER SILVER CR (W5)
Applicant/Owner: NCEEP
Investigator: CHM/MR

Date: 1/20/11
County: BURKE
State: NC

Do Normal Circumstances exist on the site? [✓ Yes] No
Is the site significantly disturbed (Atypical Situation)? Yes [✓ No]
Is the area a potential Problem Area? Yes [✓ No]
(If needed, explain on reverse.)

Community ID: ___
Transect ID: ___
Plot ID: W4

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1.	JUNCUS EFFUSUS	HERB	FACW-OBL	9.			
2.	PINUS STROBUS	TREE	FACU	10.			
3.	JUNIPERUS VIRGINIANA L	TREE	FACU-	11.			
4.	ARUNDINARIA GIGANTEA	HERB	FACW	12.			
5.	SMILAX ROTUNDIFOLIA L	HERB	FAC	13.			
6.				14.			
7.				15.			
8.				16.			

"Percent of Dominant Species that are OBL, FACW or FAC" (excluding FAC-). 50% OR GREATER

Remarks: WETLAND DOMINATED BY OPEN PASTURE TYPE.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: — (in.)

Depth to Free Water in Pit: 1" (in.)

Depth to Saturated Soil: ___ (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ✓ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

WATER ALMOST TO TOP OF HOLE (W/IN 1")

[illegible] 1/19 [illegible]

Secondary Indicators (2 or more required):
- ✓ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ✓ Local Soil Survey Data
- ✓ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name (Series and Phase): 1) UDIFLUVENTS 2) FLUVAQUENTS

Drainage Class: 1) MODERATELY WELL-DRAINED OR WELL DRAINED. 2) SOMEWHAT POORLY DRAINED

Taxonomy (Subgroup): UDIFLUVENTS / FLUVAQUENTS

Field Observations Confirm Mapped Type? [✓ Yes] No

Profile Descriptions:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-2"	O	10YR 4/3			loamy
2-4	A	10YR 4/4	10YR 4/2	common/distinct	clayey loam
4-12		5YR 4/6		common/distinct	clayey loam

Hydric Soil Indicators:

- ____ Histosol
- ____ Histic Epipedon
- ____ Sulfidic Odor
- ____ Aquic Moisture Regime
- ✓ Gleyed or Low-Chroma Colors
- ____ Concretions
- ____ High Organic Content in Surface Layer in Sandy Soils
- ____ Organic Streaking in Sandy Soils
- ____ Listed on Local Hydric Soils List
- ____ Other (Explain in Remarks)

Remarks

WETLAND DETERMINATION

Hydrophylic Vegetation Present? [✓ Yes] No (Circle)

Wetland Hydrology Present? [✓ Yes] No

Hydric Soils Present? [✓ Yes] No

Is this Sampling Point Within a Wetland? (Circle) [✓ Yes] No

Remarks

35.60829°N, -81.81818°W

Approved by HQUSACE 3/92

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:North Carolina County/parish/borough: Burke City: Morganton
Center coordinates of site (lat/long in degree decimal format): Lat. 35.60829° **N**, Long. -81.81818° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Silver Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Catawba River
Name of watershed or Hydrologic Unit Code (HUC): 03050101-050050

☒ 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):

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: 2,643 linear feet: 12-15 width (ft) and/or acres.
      Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known):Not 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: .

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[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: 3.35 **square miles**
Drainage area: 2147 **acres**
Average annual rainfall: 49.51 inches
Average annual snowfall: 7.3 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 **5-10** river miles from TNW.
Project waters are **1 (or less)** river miles from RPW.
Project waters are **5-10** aerial (straight) miles from TNW.
Project waters are **1 (or less)** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

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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.

Identify flow route to TNW[5]: Subsurface flow from Wetland 4 (W4) flows in an easterly-northeasterly direction into a drainage ditch system that drains directly into Silver Creek. W4 is located less than one mile from Silver Creek which flows directly into the Catawba River more than five miles downstream of the project area.
Tributary stream order, if known: Silver Creek is a 3rd order stream in the project area.

(b) General Tributary Characteristics (check all that apply):

Tributary is:
☒ Natural
☐ Artificial (man-made). Explain: .
☒ Manipulated (man-altered). Explain: Channel was likely moved in the past.

Tributary properties with respect to top of bank (estimate):
Average width: 20 feet
Average depth: 4 feet
Average side slopes: **Vertical (1:1 or less).**

Primary tributary substrate composition (check all that apply):
☒ Silts
☒ Cobbles
☐ Bedrock
☐ Other. Explain: .
☒ Sands
☒ Gravel
☐ Vegetation. Type/% cover:
☐ Concrete
☐ Muck

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: Incised and unstable over the reach. .
Presence of run/riffle/pool complexes. Explain: Bedform characterized by long riffles and infrequently spaced pools.
Tributary geometry: **Meandering**
Tributary gradient (approximate average slope): ~2 %

(c) Flow:
Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **11-20**
Describe flow regime: Flow is perennial.
Other information on duration and volume: .

Surface flow is: **Confined.** Characteristics: In the review area, surface flow is largely confined to a channel that exhibits perennial characteristics. Surface flow based on storm events. Groundwater appears to contribute to baseflow in this segment of the channel.

Subsurface flow: **Unknown**. 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
  ☒ changes in the character of soil
  ☐ shelving
  ☒ vegetation matted down, bent, or absent
  ☒ leaf litter disturbed or washed away
  ☒ sediment deposition
  ☐ water staining
  ☐ other (list):
  ☒ the presence of litter and debris
  ☒ destruction of terrestrial vegetation
  ☒ the presence of wrack line
  ☒ sediment sorting
  ☒ scour
  ☐ multiple observed or predicted flow events
  ☐ abrupt change in plant community
☐ 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:
  ☐ oil or scum line along shore objects
  ☐ fine shell or debris deposits (foreshore)
  ☐ physical markings/characteristics
  ☐ tidal gauges
  ☐ other (list):
☐ Mean High Water Mark indicated by:
  ☐ survey to available datum;
  ☐ physical markings;
  ☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:

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[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.
[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.

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).

Explain: Silver Creek was running clear at the time of the delineation; water level was somewhat low but had good flow. Riparian width variable, but generally ~15 feet wide. Riparian breaks are infrequent and the buffer is composed of herbaceous, shrub and immature tree layers in most areas. Exotic, invasive vegetation also present riparian zone. Watershed above project area contains low-density residential developments, and agricultural lands with the majority of land upstream being in forested cover.

Identify specific pollutants, if known: sediment, nutrients.

(iv) Biological Characteristics. Channel supports (check all that apply):

☒ Riparian corridor. Characteristics (type, average width): Riparian corridor contains mix of native and exotic, invasive vegetation and is variable in width (~ 15' wide on average) and not continuous.

☐ 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: Macrobenthos and small fish found in stream, few salamanders. Minimal buffer located on either side of stream may provide minimal habitat for terrestrial wildlife.

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: .22 acres

Wetland type. Explain: Palustrine.

Wetland quality. Explain: Wetland has been mowed in the past, impacting vegetation present. Multiple small pines were located within and adjacent to W4. Herbaceous vegetation is more diverse in W4 and consists of juncus, greenbriar, and several types of grasses. W4 is bounded on two sides by a ditchline system that was presumably put in place sometime in the past to convey hillslope seepage to Silver Creek. The remainder of W4 is bounded by a field that is periodically mowed, making it difficult to fully assess the differences in vegetation communities. However, the portion of the field in which W4 is located was noticeably wetter and contained a greater concentration of juncus than other portions of the field in which hydric soils were mapped.

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **No Flow** . Explain: .

Surface flow is**: Not present**

Characteristics: .

Subsurface flow: **Yes**. Explain findings: Wetland hydrology appears to come from a hillslope west of a ditchline near Silver Creek. This wetland is also located downslope of a buried layer of hydric soil which was likely buried during historic land-disturbing activities. It is likely that subsurface hydrology associated with this wetland site (W4) trends towards the ditchline system which ultimately converges with Silver Creek.

☐ 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: Ditchline is present between W4 and Silver Creek that would impact subsurface hydrology of W4. Surface water in ditchline appears to be fed by hillslope seepage including that which supports W4.

(d) Proximity (Relationship) to TNW

Project wetlands are **5-10** 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 **5 - 10-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: Site conditions somewhat wet at time of delineation due to snowmelt; general watershed characteristics noted in previous section.

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: Established vegetative cover exists in wetland and is dominated by grasses and other herbaceous cover although several small pine trees and other saplings are also present. This area appears to have only been left unmowed within the past 5 years or so, given the size of the trees present.

☐ 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 (.22) 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)
W4 N	.22		

Summarize overall biological, chemical and physical functions being performed: Primary beneficial functions are sediment and nutrient removal during flooding events of Silver Creek and enhancement of habitat diversity on-site.

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: Site topography and hydrologic conditions present in W4 and a nearby ditchline system indicate W4 flows approximately less than 500 feet before entering Silver Creek. Silver Creek then continues downstream for 5-10 miles where it directly flows into the Catawba River.

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: A NCDWQ Stream Identification Form was completed for Silver Creek which scored out as a perennial stream. This is also confirmed by the identification of Silver Creek as a perennial stream on the USGS quad for the project area.

☐ 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: **2643** linear feet **12-15** 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 jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: **.22** 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.

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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.***

☐ 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: Dysartsville Quad.
☐ 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): .
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): .

Based on revised wetland map submitted 3/31/11, the original "Wetland 3" consisting of two wetlands, was changed to Wetland 5 and Wetland 6.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: UPPER SILVER CREEK (W3)
Applicant/Owner: NCEEP
Investigator: CA/CHM

Date: 9/24/10
County: BURKE
State: NC

Do Normal Circumstances exist on the site? [✓ Yes] No
Is the site significantly disturbed (Atypical Situation)? Yes [✓ No]
Is the area a potential Problem Area? Yes [✓ No]
(If needed, explain on reverse.)

Community ID:
Transect ID:
Plot ID: W3

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Vernonia noveboracensis	HERB	FAC+	9. Platanus occidentalis L.	SHRUB	FACW-
2. Juncus effusus	HERB	FACW-OBL	10. Campsis radicans (L.)	HERB	FAC
3. Solidago sp.	HERB	OBL-FACW	11. Seem. ex Bureau		
4. Salix nigra	TREE/SHRUB	OBL	12.		
5. Arundinaria gigantea	HERB	FACW	13.		
6. Fescue sp	HERB	NI	14.		
7. Rubus sp.	HERB	FAC-UPL	15.		
8. Liquidambar styraciflua	SHRUB	FAC+	16.		

"Percent of Dominant Species that are OBL, FACW or FAC" (excluding FAC-). >50%.

Remarks: MUCH OF AREA MOWED WHEN WETLAND DELINEATED. DRY CONDITIONS.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: — (in.)

Depth to Free Water in Pit: — (in.)

Depth to Saturated Soil: — (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ✓ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ✓ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ✓ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks: Dry conditions at time of survey.

SOILS

Map Unit Name (Series and Phase): 1) Udifluvents 2) Fluvaquents

Drainage Class: 1) Moderately well drained or 2) Somewhat poorly drained

well-drained

Taxonomy (Subgroup): Udifluvents / Fluvaquents

Field Observations Confirm Mapped Type? [✓ Yes] No

Profile Descriptions:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-12		5YR 4/2	5YR 4/6	common, faint	loamy

Hydric Soil Indicators:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☑ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks: SOIL NOT WELL DEVELOPED, BUT BASED ON LOW CHROMA INDICATOR SOIL HYDRIC. IN WINTER AREA VERY SATURATED IN AREAS - POTENTIAL AQUIC MOISTURE REGIME

WETLAND DETERMINATION

Hydrophytic Vegetation Present? [✓ Yes] No (Circle)

Wetland Hydrology Present? [✓ Yes] No

Hydric Soils Present? [✓ Yes] No

(Circle)

Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks

35.60813°N, -81.8183

W3 actually 2 wetlands separated by upland area (very gentle slope). Small swale in field drains surface (subsurface?) flow from W3 to Silver Creek.

Approved by HQUSACE 3/92

Based on revised wetland map submitted
3/31/11, Wetland 3a= Wetland 6
Wetland 3b= Wetland 5.

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:North Carolina County/parish/borough: Burke City: Morganton
Center coordinates of site (lat/long in degree decimal format): Lat. 35.60873° **N**, Long. -81.8183° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Silver Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Catawba River
Name of watershed or Hydrologic Unit Code (HUC): 03050101-050050
☒ 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):

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: 2,643 linear feet: 12-15 width (ft) and/or acres.
      Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known):Not 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: .

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[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: 3.35 **square miles**
Drainage area: 2,147 **acres**
Average annual rainfall: 49.51 inches
Average annual snowfall: 7.3 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 **5-10** river miles from TNW.
Project waters are **1 (or less)** river miles from RPW.
Project waters are **5-10** aerial (straight) miles from TNW.
Project waters are **1 (or less)** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: W3 is comprised of two wetland areas separated by a gradual berm-like stretch of land in the lower extent of the project area. Both wetlands are separated from Silver Creek by a natural berm. Overland flow

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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.

from the wetlands that make up W3 move in an easterly direction toward Silver Creek via natural subsurface drainage of the wetland or by a ditch that drains directly into Silver Creek. Most of W3 is located less than 200 LF from Silver Creek and lies within the 100-year floodplain of the stream. Silver Creek flows directly into the Catawba River more than five miles downstream of the project area.
Tributary stream order, if known: 3rd order.

(b) General Tributary Characteristics (check all that apply):
Tributary is: ☒ Natural
☐ Artificial (man-made). Explain: .
☒ Manipulated (man-altered). Explain: Channel was likely moved in the past.

Tributary properties with respect to top of bank (estimate):
Average width: 20 feet
Average depth: 4 feet
Average side slopes: **Vertical (1:1 or less).**

Primary tributary substrate composition (check all that apply):
☒ Silts
☒ Cobbles
☐ Bedrock
☐ Other. Explain: .
☒ Sands
☒ Gravel
☐ Vegetation. Type/% cover:
☐ Concrete
☐ Muck

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: Incised and unstable over the reach.
Presence of run/riffle/pool complexes. Explain: Bedform characterized by long riffles and infrequently spaced pools.
Tributary geometry: **Meandering**
Tributary gradient (approximate average slope): ~2 %

(c) Flow:
Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **11-20**
Describe flow regime: Flow is perennial; noticeably low during time of wetland delineation.
Other information on duration and volume: .

Surface flow is: **Confined.** Characteristics: In the review area, surface flow is largely confined to a channel that exhibits perennial characteristics. Surface flow based on storm events. Groundwater appears to contribute to baseflow in this segment of the channel.

Subsurface flow: **Unknown**. 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
  ☒ changes in the character of soil
  ☐ shelving
  ☒ vegetation matted down, bent, or absent
  ☒ leaf litter disturbed or washed away
  ☒ sediment deposition
  ☐ water staining
  ☐ other (list):
  ☐ the presence of litter and debris
  ☐ destruction of terrestrial vegetation
  ☐ the presence of wrack line
  ☒ sediment sorting
  ☒ scour
  ☐ multiple observed or predicted flow events
  ☐ abrupt change in plant community
☐ 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:
  ☐ oil or scum line along shore objects
  ☐ fine shell or debris deposits (foreshore)
  ☐ physical markings/characteristics
  ☐ tidal gauges
  ☐ other (list):
☐ Mean High Water Mark indicated by:
  ☐ survey to available datum;
  ☐ physical markings;
  ☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:

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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.

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).

Explain: Silver Creek was running clear at the time of the delineation; water level was somewhat low but had good flow. Riparian width variable, but generally ~15 feet wide. Riparian breaks are infrequent and the buffer is composed of herbaceous, shrub and immature tree layers in most areas. Exotic, invasive vegetation also present riparian zone. Watershed above project area contains low-density residential developments, and agricultural lands with the majority of land upstream being in forested cover.

Identify specific pollutants, if known: sediment, nutrients.

(iv) Biological Characteristics. Channel supports (check all that apply):

☒ Riparian corridor. Characteristics (type, average width): Riparian corridor contains mix of native and exotic, invasive vegetation and is variable in width (~ 15'wide on average) and not continuous.

☐ 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: Macrobenthos and small fish found in stream, few salamanders. Minimal buffer located on either side of stream may provide minimal habitat for terrestrial wildlife.

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:1.07 acres

Wetland type. Explain: Palustrine.

Wetland quality. Explain: Dry conditions at time of survey. Although much of the wetland had been mowed prior to the delineation and vegetation was harder to identify, areas of unmowed vegetation contained established wetland species.

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **Intermittent flow**. Explain: .

Surface flow is**: Confined**

Characteristics: Surface flow appears to trend across field in an east west direction toward Silver Creek. While the smaller of the two wetlands is depressional in nature and did not have easily identifiable drainage patters an old ditch is present and was likely dug to either drain the wetland for agricultural purposes or to provide an outlet for draining the field more quickly in times of flooding.

Subsurface flow: **Yes**. Explain findings: Other contributions to wetland hydrology may come from a seep near western edge of larger wetland .

☐ 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: As noted above, a natural berm exists between Silver Creek and Wetland 3 (W3). The two wetlands that make up W3 are separated by a small upland feature that did not appear jurisdictional.

(d) Proximity (Relationship) to TNW

Project wetlands are **5-10** 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 **50 - 100-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: Site conditions dry at time of delineation; general watershed characteristics noted in previous section.

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

☒ Riparian buffer. Characteristics (type, average width): Although this function has been limited to some degree by the ditch present, W3 functions as a flood storage area when Silver Creek floods. It also filters sediment and nutrients out of the flood waters and its vegetative cover has prevented excess sediment from overland flow from degrading the riparian buffer along Silver Creek.

☒ Vegetation type/percent cover. Explain: W3 is located in a partially mowed field although. Established vegetative cover exists in wetland and is dominated by grasses and other herbaceous cover although several small trees (willow, sweetgum) were observed. Periodic mowing has largely prevented more woody vegetation from being present within the wetland.

☐ 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: **2**
Approximately (1.07) 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)
W3(a) N	.3		
W3(b) N	.77		

Summarize overall biological, chemical and physical functions being performed: Primary beneficial functions are sediment and nutrient removal during flooding events of Silver Creek and enhancement of habitat diversity on-site.

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: Site topography and soils indicate W2 flows approximately less than 100 to 200 feet before entering Silver Creek Silver Creek then continues downstream for 5-10 miles where it directly flows into the Catawba River.

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: A NCDWQ Stream Identification Form was completed for Silver Creek which scored out as a perennial stream. This is also confirmed by the identification of Silver Creek as a perennial stream on the USGS quad for the project area.

☐ 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: **2,643** linear feet **~20** 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 jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: **1.07** 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.

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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.***

☐ 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: Dysartsville Quad.
☐ 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): .
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): NC State Climate Office database (CRONOS) and representative photographs taken of W1.

Vegetation common in Wetland #W1. Note wetland extends into woodline.

Note subtle topographic contours which help define wetland boundary of W1.

Typical gleying and mottling in W1. Soils towards middle of wetland shows more gleying.

Wetland #W2 mowed prior to delineation. Minor slope change apparent; intact vegetation in background.

Close-up of wetland vegetation in unmowed area of W2.

Soil gleying and mottling common in W2.

North facing view of Wetland complex #5 and #6 (Formerly labeled Wetland #3.

South-facing view of W6 (Formerly labeled Wetland #3 .

Soil gleying and mottling in W3.

15.2 NCWAM Forms – Existing wetlands

(NC Wetland Assessment Method (WAM) Forms were not provided for this project as the NC Division of Water Quality did not require them at the time this project was designed.)

15.3 NCDWQ Stream Classification Forms

North Carolina Division of Water Quality Stream Identification Form. Version 3.1

Date: 2/16/10	**Project:** UPPER SILVER CR.	**Latitude:**
Evaluator: CHM	**Site:** SILVER CR.	**Longitude:**
Total Points: 49.5 *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30*	**County:** BURKE	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 25)	**Absent**	**Weak**	**Moderate**	**Strong**
1[a]. Continuous bed and bank	0	1	2	[✓ 3]
2. Sinuosity	0	1	2	[✓ 3]
3. In-channel structure: riffle-pool sequence	0	1	2	[✓ 3]
4. Soil texture or stream substrate sorting	0	1	2	[✓ 3]
5. Active/relic floodplain	0	1	2	[✓ 3]
6. Depositional bars or benches	0	1	2	[✓ 3]
7. Braided channel	[✓ 0]	1	2	3
8. Recent alluvial deposits	0	1	2	[✓ 3]
9[a]. Natural levees	[✓ 0]	1	2	3
10. Headcuts	[✓ 0]	1	2	3
11. Grade controls	[✓ 0]	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	[✓ 1]	1.5
13. Second or greater order channel on <u>existing</u> USGS or NRCS map or other documented evidence.	No = 0		Yes = [✓ 3]	

post disturbance

[a]Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 12)				
14. Groundwater flow/discharge	0	1	2	[✓ 3]
5. Water in channel and > 48 hrs since rain, <u>or</u> Water in channel -- dry or growing season	0	1	2	[✓ 3]
16. Leaf litter	[✓ 1.5]	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	[✓ 1.5]
18. Organic debris lines or piles (wrack lines)	0	0.5	1	[✓ 1.5]
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = [✓ 1.5]	

C. Biology (Subtotal = 11.5)				
20[b]. Fibrous roots in channel	[✓ 3]	2	1	0
21[b]. Rooted plants in channel	[✓ 3]	2	1	0
22. Crayfish	0	0.5	1	[✓ 1.5]
23. Bivalves	[✓ 0]	1	2	3
24. Fish	[✓ 0]	0.5	1	1.5
25. Amphibians	0	0.5	[✓ 1]	1.5
26. Macrobenthos (note diversity and abundance)	0	0.5	1	[✓ 1.5]
27. Filamentous algae; periphyton	0	[✓ 1]	2	3
28. Iron oxidizing bacteria/fungus.	0	[✓ 0.5]	1	1.5
29[b]. Wetland plants in streambed	FAC=0.5 FACW=0.75 OBL=1.5 SAV=2.0 Other = [✓ 0]			
[b] Items 20 and 21 focus on the presence of upland plants. Item 29 focuses on the presence of aquatic or wetland plants.				

Notes: (use back of form for additional notes)

At property line - boxed channel [illegible]

Sketch:

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:North Carolina County/parish/borough: Burke City: Morganton
Center coordinates of site (lat/long in degree decimal format): Lat. 35.60767° **N**, Long. -81.81745° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Silver Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Catawba River
Name of watershed or Hydrologic Unit Code (HUC): 03050101-050050

☒ 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):

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: 2,643 linear feet: 12-15 width (ft) and/or acres.
      Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known):Not 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: .

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[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: 3.35**square miles**
Drainage area: 2147 **acres**
Average annual rainfall: 49.51 inches
Average annual snowfall: 7.3 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 **5-10** river miles from TNW.
Project waters are **1 (or less)** river miles from RPW.
Project waters are **5-10** aerial (straight) miles from TNW.
Project waters are **1 (or less)** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: The greater project area includes a segment of Silver Creek that is in close proximity to the intersection of Hwy 64 and Gold Mine Road. This section of Silver Creek also lies near the base of Pilot Mountain.

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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.

Silver Creek flows in a northeasterly direction and empties directly into the Catawba River more than five miles downstream of the project area.
Tributary stream order, if known: Silver Creek is a 3rd order stream in the project area.

(b) General Tributary Characteristics (check all that apply):

Tributary is:
☒ Natural
☐ Artificial (man-made). Explain: .
☒ Manipulated (man-altered). Explain: Channel was likely moved in the past..

Tributary properties with respect to top of bank (estimate):
Average width: Silver Creek: 20 feet
Average depth: Silver Creek: 4 feet
Average side slopes: **Vertical (1:1 or less).**

Primary tributary substrate composition (check all that apply):
☒ Silts
☒ Cobbles
☐ Bedrock
☐ Other. Explain: .
☒ Sands
☒ Gravel
☐ Vegetation. Type/% cover:
☐ Concrete
☐ Muck

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: Incised and unstable over the reach.
Presence of run/riffle/pool complexes. Explain: Bedform characterized by long riffles and infrequently spaced pools.
Tributary geometry: **Meandering**
Tributary gradient (approximate average slope): ~2 %

(c) Flow:
Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **11-20**
Describe flow regime: Flow is perennial; noticeably low during time of wetland delineation.
Other information on duration and volume: .

Surface flow is: **Confined.** Characteristics: In the review area, surface flow is largely confined to a channel that exhibits perennial characteristics. Surface flow based on storm events. Groundwater appears to contribute to baseflow in this segment of the channel.

Subsurface flow: **Unknown**. 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
  ☐ changes in the character of soil
  ☒ shelving
  ☒ vegetation matted down, bent, or absent
  ☒ leaf litter disturbed or washed away
  ☒ sediment deposition
  ☐ water staining
  ☐ other (list):
  ☒ the presence of litter and debris
  ☒ destruction of terrestrial vegetation
  ☒ the presence of wrack line
  ☒ sediment sorting
  ☒ scour
  ☐ multiple observed or predicted flow events
  ☐ abrupt change in plant community
☐ 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:
  ☐ oil or scum line along shore objects
  ☐ fine shell or debris deposits (foreshore)
  ☐ physical markings/characteristics
  ☐ tidal gauges
  ☐ other (list):
☐ Mean High Water Mark indicated by:
  ☐ survey to available datum;
  ☐ physical markings;
  ☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: Silver Creek was running clear at the time of the delineation; water level was somewhat low but had good flow.

---

[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.

Riparian width variable, but generally ~15 feet wide. Riparian breaks are infrequent and the buffer is composed of herbaceous, shrub and immature tree layers in most areas. Exotic, invasive vegetation also present riparian zone. Watershed above project area contains low-density residential developments, and agricultural lands with the majority of land upstream being in forested cover.

Identify specific pollutants, if known: sediment, nutrients.

(iv) Biological Characteristics. Channel supports (check all that apply):

☒ Riparian corridor. Characteristics (type, average width): Riparian corridor contains mix of native and exotic, invasive vegetation and is variable in width (~ 15'wide on average) and not continuous.

☐ 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: Macrobenthos and small fish found in stream, few salamanders. Minimal buffer located on either side of stream may provide minimal habitat for terrestrial wildlife.

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: A NCDWQ Stream Identification Form was completed for Silver Creek which scored out as a perennial stream. This is also confirmed by the identification of Silver Creek as a perennial stream on the USGS quad for the project area.
   ☐ 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: **2,643** linear feet **~20** 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 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: Dysartsville Quad.

☐ 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): .

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): NC State Climate Office database (CRONOS) and representative photographs taken of W1.

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

North Carolina Division of Water Quality Stream Identification Form. Version 3.1

Date: 4/16/10

Project: UPPER SILVER CREEK

Latitude:

Evaluator:

Site: UT1

Longitude:

Total Points: 47.5
Stream is at least intermittent if ≥ 19 or perennial if ≥ 30

Trib adjacent to lowest field past deer stand

County: BURKE

Other
e.g. Quad Name:

A. Geomorphology (Subtotal = 24)	Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	0	1	2	[✓ 3]
2. Sinuosity	0	1	2	[✓ 3]
3. In-channel structure: riffle-pool sequence	0	1	2	[✓ 3]
4. Soil texture or stream substrate sorting	0	1	2	[✓ 3]
5. Active/relic floodplain	0	[✓ 1]	2	3
6. Depositional bars or benches	0	1	2	[✓ 3]
7. Braided channel	[✓ 0]	1	2	3
8. Recent alluvial deposits	0	1	[✓ 2]	3
9[a]. Natural levees	[✓ 0]	1	2	3
10. Headcuts	0	[✓ 1]	2	3
11. Grade controls	0	0.5	[✓ 1]	1.5
12. Natural valley or drainageway	0	0.5	[✓ 1]	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

Incised

DISTURBANCE

[a]Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 11)				
14. Groundwater flow/discharge	0	1	2	[✓ 3]
15. Water in channel and > 48 hrs since rain, or Water in channel -- dry or growing season	0	1	2	[✓ 3]
16. Leaf litter	1.5	[✓ 1]	0.5	0
17. Sediment on plants or debris	0	0.5	[✓ 1]	1.5
18. Organic debris lines or piles (wrack lines)	0	0.5	1	[✓ 1.5]
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = [✓ 1.5]	

C. Biology (Subtotal = 12.5)				
20[b]. Fibrous roots in channel	[✓ 3]	2	1	0
21[b]. Rooted plants in channel	[✓ 3]	2	1	0
22. Crayfish	0	[✓ 0.5]	1	1.5
23. Bivalves	[✓ 0]	1	2	3
24. Fish	0	[✓ 0.5]	1	1.5
25. Amphibians	0	0.5	[✓ 1]	1.5
26. Macrobenthos (note diversity and abundance)	0	0.5	[✓ 1]	1.5
27. Filamentous algae; periphyton	0	1	[✓ 2]	3
28. Iron oxidizing bacteria/fungus.	0	0.5	1	[✓ 1.5]
29[b]. Wetland plants in streambed	FAC=0.5 FACW=0.75 OBL=1.5 SAV=2.0 Other = [✓ 0]			

[b] Items 20 and 21 focus on the presence of upland plants. Item 29 focuses on the presence of aquatic or wetland plants.

Notes: (use back of form for additional notes)

Sketch:

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:North Carolina County/parish/borough: Burke City: Morganton

Center coordinates of site (lat/long in degree decimal format): Lat. 35.60979° **N**, Long. -81.81962° **W**.

Universal Transverse Mercator:

Name of nearest waterbody: UT1 to Silver Creek

Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Catawba River

Name of watershed or Hydrologic Unit Code (HUC): 03050101-050050

☒ 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):

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: 478 linear feet: 12 width (ft) and/or acres.
      Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known):Not 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: .28 **square miles**
Drainage area: 177.4 **acres**
Average annual rainfall: 49.51 inches
Average annual snowfall: 7.3 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 **5-10** river miles from TNW.
Project waters are **1 (or less)** river miles from RPW.
Project waters are **5-10** aerial (straight) miles from TNW.
Project waters are **1 (or less)** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

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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.

Identify flow route to TNW[5]: Unnamed Tributary 1 originates on the Brackett property, crosses under Gold Mine Road and flows in an easterly direction to its confluence with Silver Creek on the left bank of Silver Creek. Silver Creek then flows directly into the Catawba River more than five miles downstream of the project area.
Tributary stream order, if known: Unnamed Tributary 1 is a 2nd order stream in the project area.

(b) General Tributary Characteristics (check all that apply):

Tributary is:
☒ Natural
☐ Artificial (man-made). Explain: .
☒ Manipulated (man-altered). Explain: Channel was likely moved in the past..

Tributary properties with respect to top of bank (estimate):
Average width: ~12 feet
Average depth: ~ 4 feet
Average side slopes: **Vertical (1:1 or less).**

Primary tributary substrate composition (check all that apply):
☒ Silts
☒ Cobbles
☐ Bedrock
☐ Other. Explain: .
☒ Sands
☒ Gravel
☐ Vegetation. Type/% cover:
☐ Concrete
☐ Muck

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: Channel predominantly incised, banks exhibiting moderate amount of erosion in some areas.
Presence of run/riffle/pool complexes. Explain: Bedform characterized by long riffles and infrequently spaced pools.
Tributary geometry: **Relatively straight**
Tributary gradient (approximate average slope): ~3 %

(c) Flow:

Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **11-20**
Describe flow regime: Flow is perennial; noticeably low during time of wetland delineation.
Other information on duration and volume: .

Surface flow is: **Confined.** Characteristics: In the review area, surface flow is largely confined to a channel that exhibits perennial characteristics. Surface flow based on storm events. Groundwater contributes to baseflow in this segment of the channel.

Subsurface flow: **Unknown**. 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
  ☐ changes in the character of soil
  ☐ shelving
  ☒ vegetation matted down, bent, or absent
  ☒ leaf litter disturbed or washed away
  ☒ sediment deposition
  ☐ water staining
  ☐ other (list):
  ☐ the presence of litter and debris
  ☒ destruction of terrestrial vegetation
  ☐ the presence of wrack line
  ☒ sediment sorting
  ☐ scour
  ☐ multiple observed or predicted flow events
  ☐ abrupt change in plant community
☐ 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:
  ☐ oil or scum line along shore objects
  ☐ fine shell or debris deposits (foreshore)
  ☐ physical markings/characteristics
  ☐ tidal gauges
  ☐ other (list):
☐ Mean High Water Mark indicated by:
  ☐ survey to available datum;
  ☐ physical markings;
  ☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:

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[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.
[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.

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).

Explain: Unnamed Tributary 1 was running clear at the time of the delineation; water level was somewhat low but had good flow. Riparian width variable, but generally ~10 feet. Riparian breaks are infrequent and the buffer is composed of herbaceous and shrub layers in most areas. Some mature trees present in riparian zone, but most are younger trees. Watershed above project area contains sparse, low-density residential development, a small pond, and pastureland for horses.

Identify specific pollutants, if known: sediment, nutrients.

(iv) Biological Characteristics. Channel supports (check all that apply):

☒ Riparian corridor. Characteristics (type, average width): Riparian corridor contains mix of native and exotic, invasive vegetation and is variable in width (~ 10' wide on average).

☐ 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: Macrobenthos and a few salamanders found in stream. The narrow buffer located on either side of stream provides minimal habitat for terrestrial wildlife.

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: A NCDWQ Stream Identification Form was completed for Unnamed Tributary 1 which scored out as a perennial stream. This is also confirmed by the identification of Unnamed Tributary 1 as a perennial stream on the USGS quad for the project area.
   ☐ 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: **478** linear feet **~12**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 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: Dysartsville Quad.
☐ 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): .
  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): NC State Climate Office database (CRONOS) and representative photographs taken of W1.

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

North Carolina Division of Water Quality Stream Identification Form. Version 3.1

Date: 2/16/10	**Project:** UPPER SILVER CREEK **Latitude:**
Evaluator: CHM	**Site:** UT2 Trib in wooded area across from fields. Taken at **Longitude:** property boundary
Total Points: 45 *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30*	**County:** BURKE **Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 24)	Absent	Weak	Moderate	Strong
1ª. Continuous bed and bank	0	1	2	[✓ 3]
2. Sinuosity	0	1	[✓ 2]	3
3. In-channel structure: riffle-pool sequence	0	1	2	[✓ 3]
4. Soil texture or stream substrate sorting	0	1	2	[✓ 3]
5. Active/relic floodplain	0	1	2	[✓ 3]
6. Depositional bars or benches	0	1	2	[✓ 3]
7. Braided channel	[✓ 0]	1	2	3
8. Recent alluvial deposits	0	1	[✓ 2]	3
9ª. Natural levees	[✓ 0]	1	2	3
10. Headcuts	[✓ 0]	1	2	3
11. Grade controls	0	0.5	[✓ 1]	1.5
12. Natural valley or drainageway	0	0.5	[✓ 1]	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

some channel [illegible]

[illegible] effluded

channelized

ªMan-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 10.5)				
14. Groundwater flow/discharge	0	1	2	[✓ 3]
15. Water in channel and > 48 hrs since rain, or Water in channel -- dry or growing season	0	1	2	[✓ 3]
16. Leaf litter	1.5	[✓ 1]	0.5	0
17. Sediment on plants or debris	0	0.5	[✓ 1]	1.5
18. Organic debris lines or piles (wrack lines)	0	0.5	[✓ 1]	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = [✓ 1.5]	

C. Biology (Subtotal = 10.5)				
20ᵇ. Fibrous roots in channel	3	[✓ 2]	1	0
21ᵇ. Rooted plants in channel	[✓ 3]	2	1	0
22. Crayfish	0	0.5	[✓ 1]	1.5
23. Bivalves	[✓ 0]	1	2	3
24. Fish	[✓ 0]	0.5	1	1.5
25. Amphibians	0	0.5	[✓ 1]	1.5
26. Macrobenthos (note diversity and abundance)	0	0.5	[✓ 1]	1.5
27. Filamentous algae; periphyton	0	[✓ 1]	2	3
28. Iron oxidizing bacteria/fungus.	0	0.5	1	[✓ 1.5]
29ᵇ. Wetland plants in streambed	FAC=0.5 FACW=0.75 OBL=1.5 SAV= 2.0 Other = [✓ 0]			

ᵇ Items 20 and 21 focus on the presence of upland plants. Item 29 focuses on the presence of aquatic or wetland plants.

Notes: (use back of form for additional notes)

Sketch:

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:North Carolina County/parish/borough: Burke City: Morganton
Center coordinates of site (lat/long in degree decimal format): Lat. 35.60992° **N**, Long. -81.81825° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: UT2 to Silver Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Catawba River
Name of watershed or Hydrologic Unit Code (HUC): 03050101-050050

☒ 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):

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: 187 linear feet: 6' width (ft) and/or acres.
      Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known):Not 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: .

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[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: .05 **square miles**
Drainage area: 32 **acres**
Average annual rainfall: 49.51 inches
Average annual snowfall: 7.3 inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☒ Tributary flows through **2** tributaries before entering TNW.

Project waters are **5-10** river miles from TNW.
Project waters are **1 (or less)** river miles from RPW.
Project waters are **5-10** aerial (straight) miles from TNW.
Project waters are **1 (or less)** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

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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.

Identify flow route to TNW[5]: Unnamed Tributary 2 flows in a westward direction to its confluence with Silver Creek on the right bank of Silver Creek. Silver Creek flows directly into the Catawba River more than five miles downstream of the project area.
Tributary stream order, if known: Unnamed Tributary 2 is a 1st order stream in the project area.

(b) General Tributary Characteristics (check all that apply):
Tributary is:
☒ Natural
☐ Artificial (man-made). Explain: .
☒ Manipulated (man-altered). Explain: Channel has been moved in the past..

Tributary properties with respect to top of bank (estimate):
Average width: 4 feet
Average depth: Silver Creek: 2 feet
Average side slopes: **Vertical (1:1 or less).**

Primary tributary substrate composition (check all that apply):
☒ Silts
☐ Cobbles
☐ Bedrock
☐ Other. Explain: .
☒ Sands
☒ Gravel
☐ Vegetation. Type/% cover:
☐ Concrete
☐ Muck

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: Channel is an incised by channelization with banks that are nearly vertical. Upstream of property line, channel experiencing some aggradation which is probably caused in part by an improperly sized culvert installed near the property line. Upstream of the aggraded area, the channel becomes much more sinuous.
Presence of run/riffle/pool complexes. Explain: Bedform characterized by long riffles and infrequently spaced pools.
Tributary geometry: **Relatively straight**
Tributary gradient (approximate average slope): ~2 %

(c) Flow:
Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **11-20**
Describe flow regime: Flow is perennial; noticeably low during time of wetland delineation.
Other information on duration and volume: .

Surface flow is: **Confined.** Characteristics: In the review area, surface flow is largely confined to a channel that exhibits perennial characteristics. Surface flow based on storm events; groundwater contributes to baseflow in this segment of the channel.

Subsurface flow: **Unknown**. 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
  ☐ changes in the character of soil
  ☐ shelving
  ☒ vegetation matted down, bent, or absent
  ☒ leaf litter disturbed or washed away
  ☒ sediment deposition
  ☐ water staining
  ☐ other (list):
  ☐ the presence of litter and debris
  ☐ destruction of terrestrial vegetation
  ☐ the presence of wrack line
  ☒ sediment sorting
  ☐ scour
  ☐ multiple observed or predicted flow events
  ☐ abrupt change in plant community
☐ 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:
  ☐ oil or scum line along shore objects
  ☐ fine shell or debris deposits (foreshore)
  ☐ physical markings/characteristics
  ☐ tidal gauges
  ☐ other (list):
☐ Mean High Water Mark indicated by:
  ☐ survey to available datum;
  ☐ physical markings;
  ☐ vegetation lines/changes in vegetation types.

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[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.
[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.

(iii) Chemical Characteristics:

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).

Explain: Unnamed Tributary 2 was running clear at the time of the delineation; iron oxidizing bacteria present; water level was somewhat low but had good flow. Riparian width is generally greater than 25 feet. Riparian breaks are infrequent and the buffer is composed of herbaceous, shrub and tree layers in most areas. Watershed above project area contains sparse development and agricultural lands with the majority of land upstream being in forested cover. Landscape alteration, likely associated with historic gold mining, is evident upstream of the project area on the adjacent landowner's property.

Identify specific pollutants, if known: sediment.

(iv) Biological Characteristics. Channel supports (check all that apply):

☒ Riparian corridor. Characteristics (type, average width): Riparian corridor contains mix of native and exotic, invasive vegetation and is generally greater 25'wide.

☐ 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: Few macrobenthos and salamanders found in stream. Buffer located on either side of stream also provides habitat for terrestrial wildlife (sign of deer and turker present).

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: A NCDWQ Stream Identification Form was completed for Unnamed Tributary 2 which scored out as a perennial stream.
   ☐ 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: **187** linear feet **6**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 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: Dysartsville Quad.
☐ 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): .
  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): NC State Climate Office database (CRONOS) and representative photographs taken of W1.

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

North Carolina Division of Water Quality Stream Identification Form. Version 3.1

Date: 2/16/10	**Project:** UPPER SILVER CREEK	**Latitude:**
Evaluator: CHM	**Site:** UT3	**Longitude:**
Total Points: 49.75 *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30*	TRIB AT UPPER END OF PROJECT ACROSS RD FROM HUNTING **County:** BURKE	**Other** RD *e.g. Quad Name:*

A. Geomorphology (Subtotal = 28)	Absent	Weak	Moderate	Strong
1ᵃ. Continuous bed and bank	0	1	2	[✓ 3]
2. Sinuosity	0	1	2	[✓ 3]
3. In-channel structure: riffle-pool sequence	0	1	2	[✓ 3]
4. Soil texture or stream substrate sorting	0	1	2	[✓ 3]
5. Active/relic floodplain	0	1	2	[✓ 3]
6. Depositional bars or benches	0	1	2	[✓ 3]
7. Braided channel	[✓ 0]	1	2	3
8. Recent alluvial deposits	0	1	2	[✓ 3]
9ᵃ. Natural levees	[✓ 0]	1	2	3
10. Headcuts	0	[✓ 1]	2	3
11. Grade controls	0	0.5	1	[✓ 1.5]
12. Natural valley or drainageway	0	0.5	1	[✓ 1.5]
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

some channelization

incised ~[illegible]

ᵃMan-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 11.5)				
14. Groundwater flow/discharge	0	1	2	[✓ 3]
5. Water in channel and > 48 hrs since rain, or Water in channel -- dry or growing season	0	1	2	[✓ 3]
16. Leaf litter	1.5	[✓ 1]	0.5	0
17. Sediment on plants or debris	0	0.5	1	[✓ 1.5]
18. Organic debris lines or piles (wrack lines)	0	0.5	1	[✓ 1.5]
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = [✓ 1.5]	

C. Biology (Subtotal = 10.25)				
20ᵇ. Fibrous roots in channel	3	[✓ 2]	1	0
21ᵇ. Rooted plants in channel	[✓ 3]	2	1	0
22. Crayfish	0	[✓ 0.5]	1	1.5
23. Bivalves	[✓ 0]	1	2	3
24. Fish	[✓ 0]	0.5	1	1.5
25. Amphibians salamander	0	0.5	[✓ 1]	1.5
26. Macrobenthos (note diversity and abundance)	0	0.5	[✓ 1]	1.5
27. Filamentous algae; periphyton	0	[✓ 1]	2	3
28. Iron oxidizing bacteria/fungus.	0	0.5	[✓ 1]	1.5
29ᵇ. Wetland plants in streambed	FAC=0.5 FACW=[✓ 0.75] OBL=1.5 SAV=2.0 Other = 0			

ᵇ Items 20 and 21 focus on the presence of upland plants. Item 29 focuses on the presence of aquatic or wetland plants.

Notes: (use back of form for additional notes)

winter stoneflies

Sketch:

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:North Carolina County/parish/borough: Burke City: Morganton
Center coordinates of site (lat/long in degree decimal format): Lat. 35.60581° **N**, Long. -81.81821° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Unnamed Tributary 3 to Silver Creek

Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Catawba River
Name of watershed or Hydrologic Unit Code (HUC): 03050101-050050
☒ 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):

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: 1162 linear feet: 3 width (ft) and/or acres.
      Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known):Not 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: .

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[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: .19 **square miles**
Drainage area: 123 **acres**
Average annual rainfall: 49.51 inches
Average annual snowfall: 7.3 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 **5-10** river miles from TNW.
Project waters are **1 (or less)** river miles from RPW.
Project waters are **5-10** aerial (straight) miles from TNW.
Project waters are **1 (or less)** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: UT3 flows in an easterly direction into Silver Creek with its confluence on the left bank of Silver Creek. Silver Creek flows directly into the Catawba River more than five miles downstream of the project area.

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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.

Tributary stream order, if known: Unnamed Tributary 3 is a 1st order stream in the project area.

(b) General Tributary Characteristics (check all that apply):

Tributary is:
☒ Natural
☐ Artificial (man-made). Explain: .
☒ Manipulated (man-altered). Explain: Channel was likely moved in the past..

Tributary properties with respect to top of bank (estimate):
Average width: 4-6 feet
Average depth: .75-3 feet
Average side slopes: **Vertical (1:1 or less).**

Primary tributary substrate composition (check all that apply):
☒ Silts
☒ Cobbles
☐ Bedrock
☐ Other. Explain: .
☒ Sands
☒ Gravel
☐ Vegetation. Type/% cover:
☐ Concrete
☐ Muck

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: A segment of UT3 in the upper half of the project reach is aggrading while the lower half of UT3, which contains headcuts, is incised.
Presence of run/riffle/pool complexes. Explain: Bedform characterized by long riffles and infrequently spaced pools.
Tributary geometry: **Meandering**
Tributary gradient (approximate average slope): ~3 %

(c) Flow:
Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **11-20**
Describe flow regime: Flow is perennial; noticeably low during time of wetland delineation.
Other information on duration and volume: .

Surface flow is: **Confined.** Characteristics: In the review area, surface flow is largely confined to a channel that exhibits perennial characteristics. Surface flow based on storm events. Groundwater appears to contribute to baseflow in this segment of the channel.

Subsurface flow: **Unknown**. 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
  ☐ changes in the character of soil
  ☐ shelving
  ☒ vegetation matted down, bent, or absent
  ☒ leaf litter disturbed or washed away
  ☒ sediment deposition
  ☐ water staining
  ☐ other (list):
  ☐ the presence of litter and debris
  ☐ destruction of terrestrial vegetation
  ☐ the presence of wrack line
  ☒ sediment sorting
  ☐ scour
  ☐ multiple observed or predicted flow events
  ☐ abrupt change in plant community
☐ 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:
  ☐ oil or scum line along shore objects
  ☐ fine shell or debris deposits (foreshore)
  ☐ physical markings/characteristics
  ☐ tidal gauges
  ☐ other (list):
☐ Mean High Water Mark indicated by:
  ☐ survey to available datum;
  ☐ physical markings;
  ☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: UT3 was running clear at the time of the delineation; water level was somewhat low but had good flow. Riparian width variable, but generally ~ 12 feet in most areas. Riparian breaks are infrequent and the buffer is composed

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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.

of herbaceous, shrub and tree layers in most areas. Watershed above project area contains low-density development and agricultural lands with the majority of land upstream being in forested cover.

Identify specific pollutants, if known: sediment.

(iv) Biological Characteristics. Channel supports (check all that apply):

☒ Riparian corridor. Characteristics (type, average width): Riparian corridor contains mix of native and exotic, invasive vegetation and is variable in width (~ 12'wide on average).

☐ 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: Macrobenthos found in stream, two salamanders. The narrow buffer located on either side of stream currently provides minimal habitat for terrestrial wildlife, both deer and turkey sign present.

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: A NCDWQ Stream Identification Form was completed for Unnamed Tributary 3 which scored out as a perennial stream. This is also confirmed by the identification of Unnamed Tributary 3 as a perennial stream on the USGS quad for the project area.
   ☐ 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: **1162** 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: **.**

☐ 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: Dysartsville Quad.
☐ 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): .
    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): NC State Climate Office database (CRONOS) and representative photographs taken of W1.

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

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:North Carolina County/parish/borough: Burke City: Morganton
Center coordinates of site (lat/long in degree decimal format): Lat. 35.60768° **N**, Long. -81.81784° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Silver Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Catawba River
Name of watershed or Hydrologic Unit Code (HUC): 03050101-050050

☒ 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):

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: 917 linear feet: 4 width (ft) and/or acres.
      Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known):Not 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: .

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[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: .04 **square miles**
Drainage area: 26 **acres**
Average annual rainfall: 49.51 inches
Average annual snowfall: 7.3 inches

(ii) Physical Characteristics:

(a) Relationship with TNW:

☐ Tributary flows directly into TNW.
☒ Tributary flows through **2** tributaries before entering TNW.

Project waters are **5-10** river miles from TNW.
Project waters are **1 (or less)** river miles from RPW.
Project waters are **5-10** aerial (straight) miles from TNW.
Project waters are **1 (or less)** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

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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.

Identify flow route to TNW[5]: A conveyance located near Wetland 2 (W2) and Wetlands 3 and 4 (W3, W4) flows in a northerly direction before it takes an easterly route and converges with Silver Creek. Silver Creek flows directly into the Catawba River more than five miles downstream of the project area.
Tributary stream order, if known: 1st order.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☒ Artificial (man-made). Explain: Given the extensive manipulation that has occurred, it is not known whether the hydrology present was part of a greater network of the wetlands present or whether this was hillslope seepage that had a defined surface flow pattern. It appears on the landscape as a ditched conveyance that was likely installed when the land was converted for agricultural use. The uppermost third of the conveyance exhibits evidence of flow; the remainder of the conveyance exhibits ponding due to sediment and debris deposition from overbank flows that have occurred on Silver Creek.
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: 4-5 feet
Average depth: 1.5-3 feet
Average side slopes: **Vertical (1:1 or less).**

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: The conveyance is channelized and generally appears incised (likely from previous maintenance of the conveyance as a ditch) with the exception of the the segment nearest Silver Creek. Overbank sediment and debris flows from Silver Creek has gradually accumulated at the confluence of the conveyance and Silver Creek and has thus effectively created a ponding situation in the conveyance. A narrow, wooded buffer is present around the swale and has contributed to the stability of the conveyance.

Presence of run/riffle/pool complexes. Explain: Bedform characterized by long riffles and infrequently spaced pools in uppermost segment of conveyance. The remainder of the conveyance exhibits ponded conditions.
Tributary geometry: **Relatively straight**
Tributary gradient (approximate average slope): ~2 %

(c) Flow:
Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **11-20**
Describe flow regime: Flow is perennial; noticeably low during time of wetland delineation.
Other information on duration and volume: .

Surface flow is: **Confined.** Characteristics: In the review area, surface flow is largely confined to a conveyance. Surface flow based on storm events and hillslope seepage. Subsurface flow from nearby wetlands is likely; groundwater flow appears to contribute to baseflow in this segment of the channel.

Subsurface flow: **Unknown**. 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: .

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[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.
[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.

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

- ☐ High Tide Line indicated by:
  - ☐ oil or scum line along shore objects
  - ☐ fine shell or debris deposits (foreshore)
  - ☐ physical markings/characteristics
  - ☐ tidal gauges
  - ☐ other (list):
- ☐ Mean High Water Mark indicated by:
  - ☐ survey to available datum;
  - ☐ physical markings;
  - ☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).

Explain: The conveyance was running clear at the time of the delineation; the segment of the conveyance most impacted by ponding is characterized by brownwater; the water level was somewhat elevated due to recent precipitation. Riparian width variable, but generally ~ 10 to 15 feet in most areas. Riparian breaks are infrequent and the buffer is composed of herbaceous, shrub and tree layers in most areas. Watershed above project area contains low-density development and agricultural lands with the majority of land upstream being in forested cover.

Identify specific pollutants, if known: sediment.

(iv) Biological Characteristics. Channel supports (check all that apply):

☒ Riparian corridor. Characteristics (type, average width): Riparian corridor contains mix of native and exotic, invasive vegetation and is variable in width (~ 12'wide on average).

☐ 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: Macrobenthos found in stream, two salamanders. The narrow buffer located on either side of stream currently provides minimal habitat for terrestrial wildlife, both deer and turkey sign present.

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: .

S ubsurface 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: **4**

Approximately (1.58) 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)
W2-Y	.51		
W3-N	.03		
W4-Y	.24		
W5-Y	.81		

Summarize overall biological, chemical and physical functions being performed: Wetlands 2-5 function to provide storage and filtration of runoff during precipitation events. These wetlands also contribute to habitat diversity on-site.

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: .

☒ 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: The conveyance observed contains at a minimum, seasonal flow. Although a NCDWQ Stream Identification Form has not been completed for this conveyance at this time, based on site observations, it is likely that the conveyance would be classified as a perennial stream.

Provide estimates for jurisdictional waters in the review area (check all that apply):
☒ Tributary waters: **917** linear feet **4-5** 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 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]

---

[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.***

☐ 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: .

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: Dysartsville Quad.
☐ 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: (N ational Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): Burke County, 2006.
  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): Prior site visit with COE personnel.

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

15.4 FHWA Categorical Exclusion Form

COPY

Categorical Exclusion Form for Ecosystem Enhancement Program Projects

Part 1: General Project Information

Project Name:	Upper Silver Creek Mitigation Project
County Name:	Burke County
EEP Number:	003270
Project Sponsor:	Michael Baker Engineering, Inc. ("Baker")
Project Contact Name:	Micky Clemmons
Project Contact Address:	797 Haywood Rd., Suite 201 Asheville, NC 28806
Project Contact E-mail:	mclemmons@mbakercorp.com
EEP Project Manager:	Paul Wiesner

Project Description

Michael Baker Engineering, Inc., proposes to conduct stream restoration and enhancement activities on Silver Creek and its tributaries, approximately 12 miles southwest of Morganton in Burke County. The segment of Silver Creek within the project area is classified as a Class C water and is located within cataloging unit 03050101050050 and DENR sub-basin 03-08-31 of the Catawba River Basin. Project goals include the restoration or enhancement of approximately 4,230 linear feet of stream. This project will also include the restoration and enhancement of approximately 8.63 acres of wetlands that have been previously disturbed. This work will be done for the purpose of obtaining stream and wetland mitigation credit in the Catawba River Basin.

For Official Use Only

Reviewed By:

Guy C Pearce 2/24/2011 Guy C. Pearce

Date **EEP Project Manager**

Conditional Approved By:

Date

For Division Administrator
FHWA

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

Final Approval By:

2-23-11

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 local important farmland?	☒ Yes ☐ No ☐ N/A
3. Has the completed Form AD-1006 been submitted to NRCS?	☒ Yes ☐ No ☐ N/A
Fish and Wildlife Coordination Act (FWCA)	
1. Will the project impound, divert, channel deepen, or otherwise control/modify any water body?	☒ Yes ☐ No
2. Have the USFWS and the NCWRC been consulted?	☒ Yes ☐ No ☐ N/A
Land and Water Conservation Fund Act (Section 6(f))	
1. Will the project require the conversion of such property to a use other than public, outdoor recreation?	☐ Yes ☒ No
2. Has the NPS approved of the conversion?	☐ Yes ☐ No ☒ N/A
Magnuson-Stevens Fishery Conservation and Management Act (Essential Fish Habitat)	
1. Is the project located in an estuarine system?	☐ Yes ☒ No
2. Is suitable habitat present for EFH-protected species?	☐ Yes ☐ No ☒ N/A
3. Is sufficient design information available to make a determination of the effect of the project on EFH?	☐ Yes ☐ No ☒ N/A
4. Will the project adversely affect EFH?	☐ Yes ☐ No ☒ N/A
5. Has consultation with NOAA-Fisheries occurred?	☐ Yes ☐ No ☒ N/A
Migratory Bird Treaty Act (MBTA)	
1. Does the USFWS have any recommendations with the project relative to the MBTA?	☐ Yes ☒ No
2. Have the USFWS recommendations been incorporated?	☐ Yes ☐ No ☒ N/A
Wilderness Act	
1. Is the project in a Wilderness area?	☐ Yes ☒ No
2. Has a special use permit and/or easement been obtained from the maintaining federal agency?	☐ Yes ☐ No ☒ N/A

Categorical Exclusion – Summary

Project Background

The Upper Silver Creek Mitigation Project involves the restoration or enhancement of approximately 4,230 linear feet of Silver Creek and its tributaries in Burke County. In addition to stream restoration and enhancement activities proposed, approximately 8.63 acres of wetlands will be restored or enhanced under this project. This work is being done for the purpose of obtaining stream mitigation credit for the NC Ecosystem Enhancement Program (NCEEP). The project is predominantly in a portion of the Silver Creek floodplain that has been converted to agricultural land use in the past. The project also extends into a wooded area, the location of a channelized unnamed tributary to Silver Creek, and in additional hay fields not located within the 100-year floodplain of Silver Creek. A series of houses and a small lumber operation belonging to the landowner and his family are located across the site, further upslope of Gold Mine Road.

This project will involve the restoration of Silver Creek and three perennial unnamed tributaries (UTs) to Silver Creek. These streams have been channelized and have been damaged by livestock in the past and are incised to varying degrees. This area was also mined for gold in the past and legacy affects from this activity are still impacting streams and wetlands at the site. Wetlands on site were formerly much more extensive and hydric soils appear to have been covered with alluvium, perhaps due to extensive erosion during mining and periodic flood events. Drainage ditches continue to inhibit the maintenance of wetlands on site. Restoration practices will involve removal of alluvium that presently covers hydric soils to re-establish wetland hydrology, reconnecting streams to the floodplain using a Priority I approach, plugging and filling drainage ditches, enhancing existing wetland areas by enhancing hydrology and vegetation and constructing new wetlands where hydrology and vegetation will support the approach. A minimum 30-foot buffer will be established along all reaches, and all work will be protected by a perpetual conservation easement.

The National Environmental Policy Act of 1969 (NEPA) requires agencies to use an interdisciplinary approach in planning and decision-making for actions that will have an impact on the environment. The Federal Highway Administration (FHWA) and NC Department of Transportation (NCDOT) have determined that NCEEP projects will not involve significant impacts and therefore a Categorical Exclusion (CE) is the appropriate type of environmental document for this project. FHWA has also determined that stream restoration projects are considered land disturbing activities, so Parts 2 and 3 of the NCEEP checklist and the following environmental laws are applicable to this project (supporting information is located in the Appendix):

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)

Environmental Data Resources, Inc. (EDR) prepared a Radius Map Report with GeoCheck on August 27, 2010. Based on the EDR report, there are no known or potential hazardous waste sites within or adjacent to the project area. The Executive Summary of the EDR report is included in the Appendix.

National Historic Preservation Act (Section 106)

Baker requested review and comment from the North Carolina State Historic Preservation Office (SHPO) on any possible issues that might emerge with respect to architectural or archaeological resources from the restoration project on August 13, 2010. Baker also requested review and comment from the Tribal Historic Preservation Office of the Eastern Band of Cherokee Indians (EBCI) and the Real Estate and Other Rights Protection Office of the Catawba Indian Nation on August 13, 2010. The SHPO responded on September 9, 2010, and requested that a Phase I Archaeological Survey be completed based on the high probability that prehistoric or historic archaeological sites may be present due to the topography and hydrological features of the area. Baker contracted with Archaeological Consultants of the Carolinas, Inc. (ACC) to perform a Phase I archaeological survey which was completed in October, 2010. The archaeological consulting group did not locate any sites within the project area and, given the lack of findings, recommended that no further archaeological investigations be conducted for the purposes of this project. On November 10, 2010, the SHPO submitted correspondence to Baker agreeing with the findings. As of January 5, 2011, the EBCI Tribal Historic Preservation Office nor the Catawba Nation have commented with concerns regarding the proposed project and the archaeological consultant's findings. All correspondence on this issue is included in the Appendix.

Uniform Relocation Assistance and Real Property Act

Land owners participating in the stream and wetland mitigation project were notified of the fair market value of their land coincident with the project and that Baker did not have condemnation authority prior to signing the Option Agreement for the Conservation Easement.

American Indian Religious Freedom Act (AIRFA)

Baker requested review and comment from the Eastern Band of Cherokee Indians' Tribal Historic Preservation Office (THPO) and the Catawba Indian Nation's Real Estate and Other Rights Protection Office on any possible issues that might emerge with respect to any architectural or archaeological resources from the restoration project on August 13, 2010. At this time, the neither Tribe has commented on the project. Baker will continue working with both nations to ensure they do not have any concerns regarding the project. All correspondence on this issue is included in the Appendix.

Endangered Species Act (ESA)

Baker reviewed both the NC Natural Heritage Program (NCNHP) and the US Fish and Wildlife Service (USFWS) lists of rare and protected animal and plant species and found that eight federally listed species are known to occur in Burke County: Bald Eagle (*Haliaeetus leucocephalus*), Bog Turtle (*Clemmys muhlenbergii)*, Spreading Avens (*Geum radiatum*), Dwarf-flowered Heartleaf (*Hexastylis naniflora*), Mountain Golden-heather (*Hudsonia montana),* Small Whorled Pogonia (*Isotria medeoloides*), Heller's Blazing Star (*Liatris helleri*), and White irisette (*Sisyrinchium dichotomum*).

It was determined that suitable habitat was not present for any of the eight species listed for Burke County. Therefore, a "no effect" determination was made for all eight species listed. More detail on each species and their habitat is listed in the following paragraphs.

Bald Eagle, (Federally Protected): Bald eagles have been sighted in Burke County where large open waters like Lake James are present. According to the NC Natural Heritage Program website, bald eagle habitat in the southeast typically consists of "dominant live pines or cypress trees that provide a clear flight path and are located within 0.5 miles of open water. Winter roosting usually occurs farther inland, within dominant tree types that are also used for nesting in warmer seasons. Based on information posted on the NC Natural Heritage Program website, there are no occurrences of the bald eagle that have been recorded within 2 miles of the project area. With the exception of Silver Creek, the project area consists of headwater streams with small drainage areas. The streams within the project area are not identified as trout supporting streams and are unlikely to hold prey-sized fish to support bald eagle populations.

Biological Conclusion: No Effect

Improvements made through this project will not impact any bald eagle populations or habitat. In addition to the project area not being located within a half mile of open water, stream restoration and enhancement activities will ultimately result in improved channel stability and water quality downstream through a reduction in sediment loading. Wetland restoration and enhancement will also result in an increased capacity of the project site to serve as flood storage, and increased filtering capabilities of wetlands on-site which also supports water quality improvements downstream. Therefore, a determination was made that the proposed project will have no effect on this species.

Bog Turtle, (Threatened): The NCNHP lists the preferred habitat for bog turtles as "*shallow, spring-fed fens, sphagnaceous bogs, marshy meadows and pasture, with thick, grassy cover and crossed by slow, muddy bottomed streams, and swamps with aquatic and semiaquatic plants.*" With the exception of forest land to the east of Silver Creek, the project site is predominantly hayfields with pocket wetlands. Some wetlands were found to have smaller pockets of shallow, standing water during field surveys conducted in the winter of 2010. Streams within the project area have all been manipulated in the past. Each stream displays varying degrees of incision which has also likely impacted the hydrology of wetlands present. Wetlands in the project area contain both exotic, invasive plant vegetation, but also possess some hydrophytic vegetation such as sedges. These wetlands are located in hayfields that are periodically mowed. No evidence of bog turtle habitation or observations of bog turtles were made during the aforementioned field surveys during which site assessments were conducted. A search of the NCNHP database did not reveal any recorded observations of the bog turtle within two miles of the project area.

Biological Conclusion: No Effect
Correspondence was submitted to the USFWS and NCWRC requesting information to aid in the determination of the presence of critical habitat or known occurrences of threatened or endangered species at or near the vicinity of the project site. Much of the floodplain adjacent to Silver Creek consists of hayfields and wetlands of marginal quality that do not conform to the preferred habitat of the bog turtle. Correspondence received from the USFWS and NCWRC did not indicate concern over impacts the project might have on potential bog turtle occurrences within Burke County. Although the proposed project includes a wetland restoration and enhancement component, the restoration measures proposed will not result in a conversion of wetlands present to wetlands types preferred by the bog turtle. Based on the lack of habitat as well as a lack of recorded species observation in the NCNHP database, it was determined that this project will have no effect on any known populations of bog turtle that may occur within Burke County.

Spreading Avens, (Endangered): Spreading avens is a perennial herb of the rose family. It can grow 8-20 inches (20-50 cm) high and has dense, spreading hairs. Most leaves of the spreading avens grow from a rosette at the plant base. These leaves are large and kidney shaped, with uneven, serrated edges. Spreading avens plant stems typically have between two to five smaller leaves. According to the NCNHP species account, the spreading avens has "…an indefinite cyme of 1-3 flowers grows at the end of each stem, with 5 lance-shaped sepals, and 5 bright yellow petals 0.5-0.8 inch (1.3-2 cm) long, with numerous stamens and pistils." Similar to the Roan Mountain Bluet, the spreading avens thrives on (preferably north-facing) high-elevation cliffs, outcrops, grassy balds, and steep slopes that receive full sunlight. Adjacent forests in which the spreading avens occurs are dominated by red spruce *(Picea rubrens)* and Fraser fir *(Abies fraseri).* Spreading avens prefers shallow, acidic soils located in the cracks and crevices of weathering igneous, metamorphic and metasedimentary rocks. This plant can survive in well drained soil, though the soil must receive a constant source of moisture.

Biological Conclusion: No Effect
Based on information about the plant provided in species accounts by the USFWS and the NCNHP there is no suitable habitat within the project area. The project area is primarily located in a floodplain; what forest land is present is not dominated by red spruce and Fraser fir. Due to the lack on habitat on-site and the topographic location favored by the spreading avens, this project will not affect any populations of spreading avens which may be located in Burke County.

Dwarf-flowered Heartleaf, (Threatened): Dwarf-flowered heartleaf is a low-growing, spicy-smelling, evergreen, perennial herb. Leaves are heart-shaped, alternate, leathery, untoothed, and 1.6 to 2.4 inches wide. Each leaf is supported by a long, thin stalk that rises directly from the subsurface rhizome. This species has the smallest flowers of any North American plant in the genus *Hexastylis*. The solitary flowers are fleshy, firm, grow at the end of the short stalks, and are often found under forest litter and leaves near the base of the leafstalks. Every year, each rhizome section produces one leaf, one flower, and a leaf scale. The flowers are jug-shaped, less than 0.4 inches long, and have a narrow sepal tube, ranging in color from brown to greenish or purple. Flowering occurs from mid-March to early June; fruiting begins in late May.

This plant grows along bluffs and north-facing slopes, boggy areas along streams, and adjacent hillsides and ravines in rich, deciduous forests. It is usually associated with mountain laurel (*Kalmia latifolia*) or pawpaw (*Asimina triloba*) and requires acidic, sandy loam soils. The species needs Pacolet, Madison gravelly sandy loam, or Musella fine, sandy loam soils to grow and survive. Provided the soil type is right, the plant can survive in either dry or moderately moist habitat. For maximum flowering, the plant needs sunlight in early spring. Creek heads where shrubs are rare and bluffs with light gaps are the habitat types most conducive to flowering and high seed production.

Found in the upper Piedmont regions of South Carolina and North Carolina, this species has 24 known populations in an eight-county area. North Carolina has one population in Catawba County, two in Lincoln County, and three populations each in Rutherford, Cleveland, and Burke Counties. Rutherford County also supported another site, but it was reportedly eliminated by road construction. In addition to its known range, the plant may occur in isolated areas in northwestern Gaston County, western Iredell County, and Yadkin County, all in North Carolina (USFWS, 1992a).

Biological Conclusion: No Effect
Although some wetland complexes exist near Silver Creek within the project area, suitable habitat is not present at the site. Besides lacking bluffs, north-facing slopes, boggy areas and deciduous forest cover habitat described, soils crucial to supporting populations of *Hexastylis naniflora* including the series Pacolet, Madison gravelly sandy loam, and Musella fine sandy loam are absent. Based on the lack of habitat features present, it was determined that the project will have no effect on the Dwarf-flowered heartleaf.

Mountain Golden-heather (Threatened): Mountain Golden-heather, a member of the Family Rockrose, is a small shrub that has needle-shaped leaves that resembles large moss or a small juniper when not flowering. Its showy yellow flowers bloom from early to mid-June. Clustered in masses 4-8 inches wide, *Hudsonia Montana* is found on exposed quartzite ledges between bare rock and myrtle-dominated heath balds that transition into pine/oak forests.

Biological Conclusion: No Effect
The entirety of the project site is located in a valley setting that is absent of transitions to balds. Based on the lack of habitat favored by Mountain Golden-heather and the topographic setting of the project, this species will not be affected by the Upper Silver Creek Mitigation Project.

Small Whorled Pogonia (Threatened): The small-whorled pogonia is a member of the Orchidaceae family. These plants arise from long slender roots, with hollow stems terminating in a whorl of five or six light green leaves. The single flower is approximately one inch long, with yellowish-green to white petals and three longer green sepals. This orchid blooms in late spring, from mid-May to mid-June. Populations of this plant are reported to have extended periods of dormancy and to bloom sporadically. This small orchid is not observable outside of the spring growing season. When not in flower, young plants of Indian cucumber-root (*Medeola virginiana*) also resemble small-whorled pogonia; however, the hollow stout stem of *Isotria* separates it from the genus *Medeola*, which has a solid, more slender stem (U.S. Fish and Wildlife Service County Listing, 2009). Small-whorled pogonias may occur in young as well as maturing forests, but typically grows in open, dry, deciduous woods and areas along streams with acidic soil. It also grows in rich, mesic woods in association with white pine and rhododendron.

Biological Conclusion: No Effect
Suitable habitat as described above does not exist for the small-whorled pogonia in the restoration and enhancement reaches of the Upper Silver Creek project area. No plants were located during field assessments performed and a review of the NCNHP database did not reveal any recorded observations within two miles of the project limits. Therefore this project will have no effect on any small-whorled pogonia populations occurring in Burke County.

Heller's Blazing Star (Threatened): According to the NCNHP and USFWS species accounts, Heller's Blazing-star is a perennial herb of the aster family. It can have one or more erect stems that grow to 16 inches (40 cm) tall, out of a tuft of pale green leaves at the base of the plant. Its upper leaves are alternate, long and narrow. The flowers of this perennial are scattered in 3-8 inch long spiky clusters along the stem(s). Individual flowers are tubular-shaped and lavender in color. Habitat conditions suited for Heller's Blazing-star consist of high-elevation, rock ledges and outcrops with shallow acidic soils that are exposed to full sunlight.

Biological Conclusion: No Effect

The lack of high-elevation rock ledges and outcrops in the project site is not conducive to the presence of Heller's Blazing-star. Due to the lack of suitable habitat within the project area and the topographic setting of the project area in relation to habitat favored by Heller's Blazing Star, it was determined that this project will have no effect on this species.

White Irisette (Endangered): White irisette is a perennial herb with branching stems 4 to 8 inches tall. Leaves at the base of the plant are pale to bluish green and grow one-third to one-half the height of the plant. The flowers are tiny, occurring in clusters of four to six at the tops of winged stems. Flowering occurs from late May to July. The fruit is a pale to medium brown capsule containing three to six rounded black seeds.

White irisette is endemic to the upper Piedmont of North and South Carolina. It is currently known from four populations in North Carolina and one in South Carolina. North Carolina's extant populations are in the following counties: Polk (six populations), Henderson (one population), and Rutherford (one population). The Greenville County, South Carolina, site is contiguous with one of the Polk County, North Carolina, sites. This species has apparently always been limited to an area in the Carolinas bounded by White Oak Mountain, Sugarloaf Mountain, Chimney Rock, and Melrose Mountain. Two of the remaining populations are within highway rights of way, and a third is inside a commercial recreation area.

White irisette occurs on rich, basic soils probably weathered from amphibolite. It grows in clearings and the edges of upland woods, where the canopy is thin, and often where down-slope runoff has removed much of the deep litter layer ordinarily present on these sites. The irisette is dependent on some form of disturbance to maintain the open quality of its habitat. Currently, artificial disturbances such as power line and right of way maintenance, when they do not involve herbicides or occur during the reproductive cycle of this species, are providing openings that may have been provided by native grazing animals and periodic, naturally-occurring fires.

Biological Conclusion: No Effect

Although there are portions of the project area that consist of low-elevation, woodland edge, the majority of the project area is in an alluvial floodplain. A search of the NCNHP database of rare species and unique habitats, conducted on August 24, 2010, shows the project site is located within 2 miles of a potential occurrence of White irisette that was recorded in June of 2007. Although the project site is periodically mowed presenting potential habitat, particularly along the edge of forested areas, most herbaceous cover present on-site consists of rushes, sedges and various grasses. In addition, forested areas within the project boundary are located in a floodplain setting and are not on a sufficient slope to prevent forest litter from accumulating over time. In fact, with the exception of forested areas along stream channels, the forested area within the project site is located along a toeslope which does not present suitable habitat conditions for the White irisette to thrive. Therefore, it is concluded that the project will have no effect on this species.

Baker submitted a letter to the North Carolina Wildlife Resource Commission (NCWRC) regarding the proposed project on August 16, 2010. A letter was submitted to the USFWS August 13, 2010. Baker received comments from NCWRC on September 13, 2010, which indicated that there are no federally listed species occurrences recorded at the site and that the agency has no objections to the project provided applicable permits for stream and wetland restoration work are obtained prior to project construction. In addition, the NCWRC noted that Silver Creek is not a trout stream. The USFWS did not submit any comments regarding the potential occurrences of federally listed species occurring within the project area. Correspondence on this issue is included in the Appendix.

Farmland Protection Policy Act (FPPA)

On August 13, 2010 Baker submitted the AD-1006 form for the Upper Silver Creek project site to the Regional Natural Resources Conservation Service (NRCS) office in Waynesville, NC. The NRCS responded on August 20, 2010, with the determination that implementation of this restoration project would result in the conversion of 5.6 acres of prime farmland or farmland of state or local importance. The completed AD-1006 form and other correspondence on this issue is included in the Appendix.

Fish and Wildlife Coordination Act (FWCA)

A letter was sent by Baker to the NCWRC on August 16, 2010, requesting their comment and review on the Upper Silver Creek Mitigation Project. The NCWRC responded on August 30, 2010, and expressed no concerns regarding anticipated impacts to federally listed species for the county. Correspondence on this issue is included in the Appendix.

Baker submitted a letter to the USFWS on August 13, 2010 requesting their comment and review of the Upper Silver Creek Mitigation Project site. The USFWS has not indicated any concerns regarding the proposed project or the potential presence of species listed for the county within the project area. All correspondence on this issue is included in the Appendix.

Migratory Bird Treaty Act (MBTA)

A letter was sent by Baker to the USFWS on August 13, 2010 requesting their comment and review on the Upper Silver Creek Mitigation Project in relation to migratory birds. The USFWS did not express any concerns with the proposed project as relates to the protection of migratory birds or their habitat. All correspondence on this issue is included in the Appendix.

Upper Silver Creek Mitigation Project
4936 Brackett Lyle Drive
Morganton, NC 28655

Inquiry Number: 2852340.6s
August 27, 2010

The EDR Radius Map™ Report with Geocheck®

with ToxiCheck®

EDR® Environmental Data Resources Inc

440 Wheelers Farms Road
Milford, CT 06461
Toll Free: 800.352.0050
www.edrnet.com

TABLE OF CONTENTS

SECTION **PAGE**

GEOCHECK ADDENDUM

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 results of this search follow:

TARGET PROPERTY ADDRESS

UPPER SILVER CREEK MITIGATION PROJECT
4936 BRACKETT LYLE DRIVE
MORGANTON, NC 28655
Elevation: 1263 ft.
EDR Inquiry Number: 2852340.6s

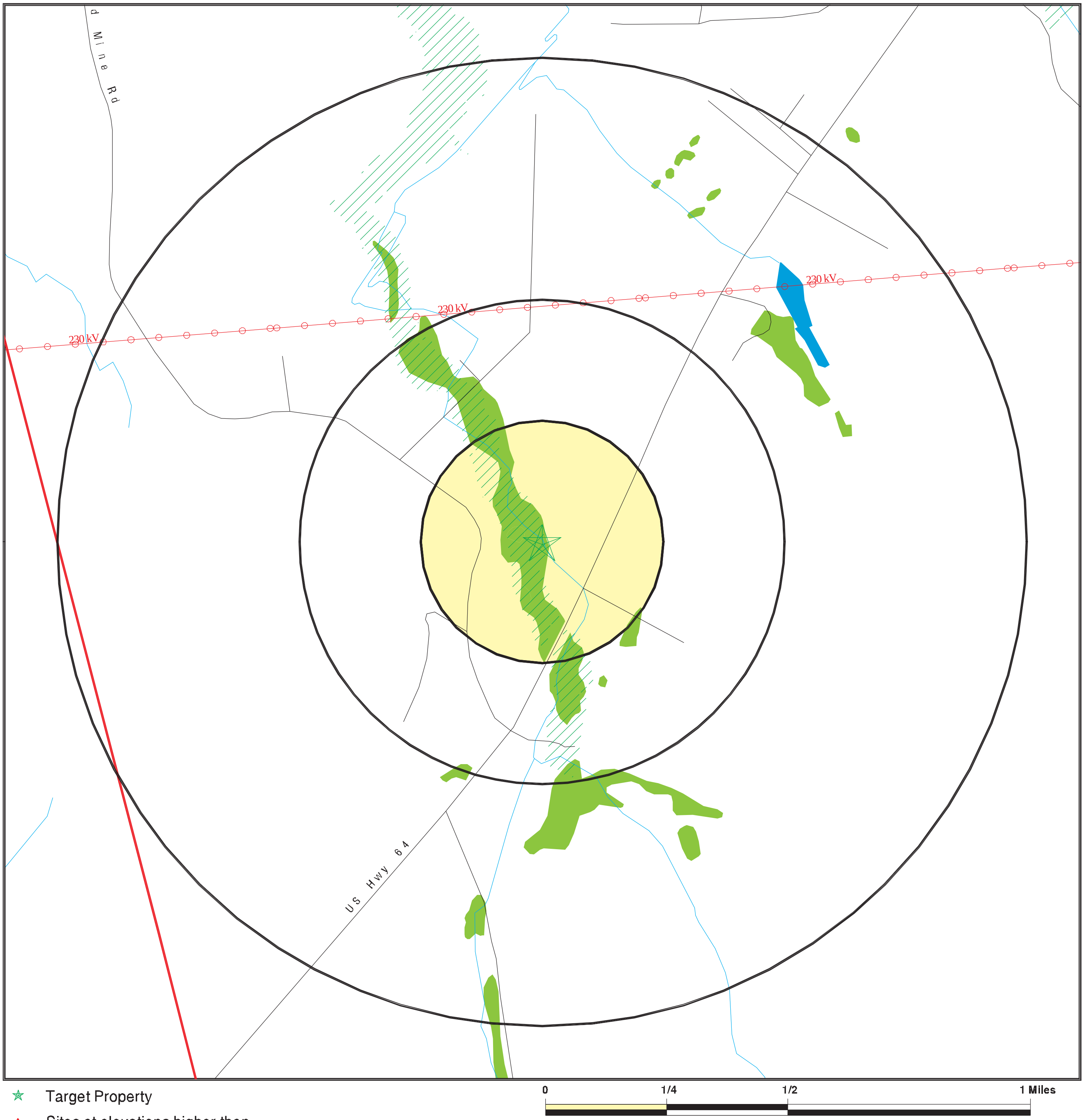
TARGET PROPERTY SEARCH RESULTS	Direction Distance Distance ft.	FEDERAL RECORDS																																														
		NPL	Proposed NPL	Delisted NPL	NPL LIENS	CERCLIS	CERC-NFRAP	LIENS 2	CORRACTS	RCRA-TSDF	RCRA-LQG	RCRA-SQG	RCRA-CESQG	RCRA-NonGen	US ENG CONTROLS	US INST CONTROL	ERNS	HMIRS	DOT OPS	US CDL	US BROWNFIELDS	DOD	FUDS	LUCIS	CONSENT	ROD	UMTRA	DEBRIS REGION 9	ODI	MINES	TRIS	TSCA	FTTS	HIST FTTS	SSTS	ICIS	PADS	MLTS	RADINFO	FINDS	RAATS	US HIST CDL	COAL ASH EPA	SCRD DRYCLEANERS	PCB TRANSFORMER	FEDERAL FACILITY	COAL ASH DOE	FEMA UST
Site																																																

TARGET PROPERTY SEARCH RESULTS	Direction Distance Distance ft.	STATE AND LOCAL RECORDS																
		SHWS	IMD	NC HSDS	SWF/LF	OLI	UIC	HIST LF	LUST	LUST TRUST	UST	AST	INST CONTROL	VCP	DRYCLEANERS	BROWNFIELDS	NPDES	COAL ASH
Site																		

TARGET PROPERTY SEARCH RESULTS	Direction Distance Distance ft.	TRIBAL RECORDS					EDR PROPRIETARY RECORDS
		INDIAN RESERV	INDIAN ODI	INDIAN LUST	INDIAN UST	INDIAN VCP	EDR MGP
Site							

Surrounding sites were not identified.

OVERVIEW MAP - 2852340.6s



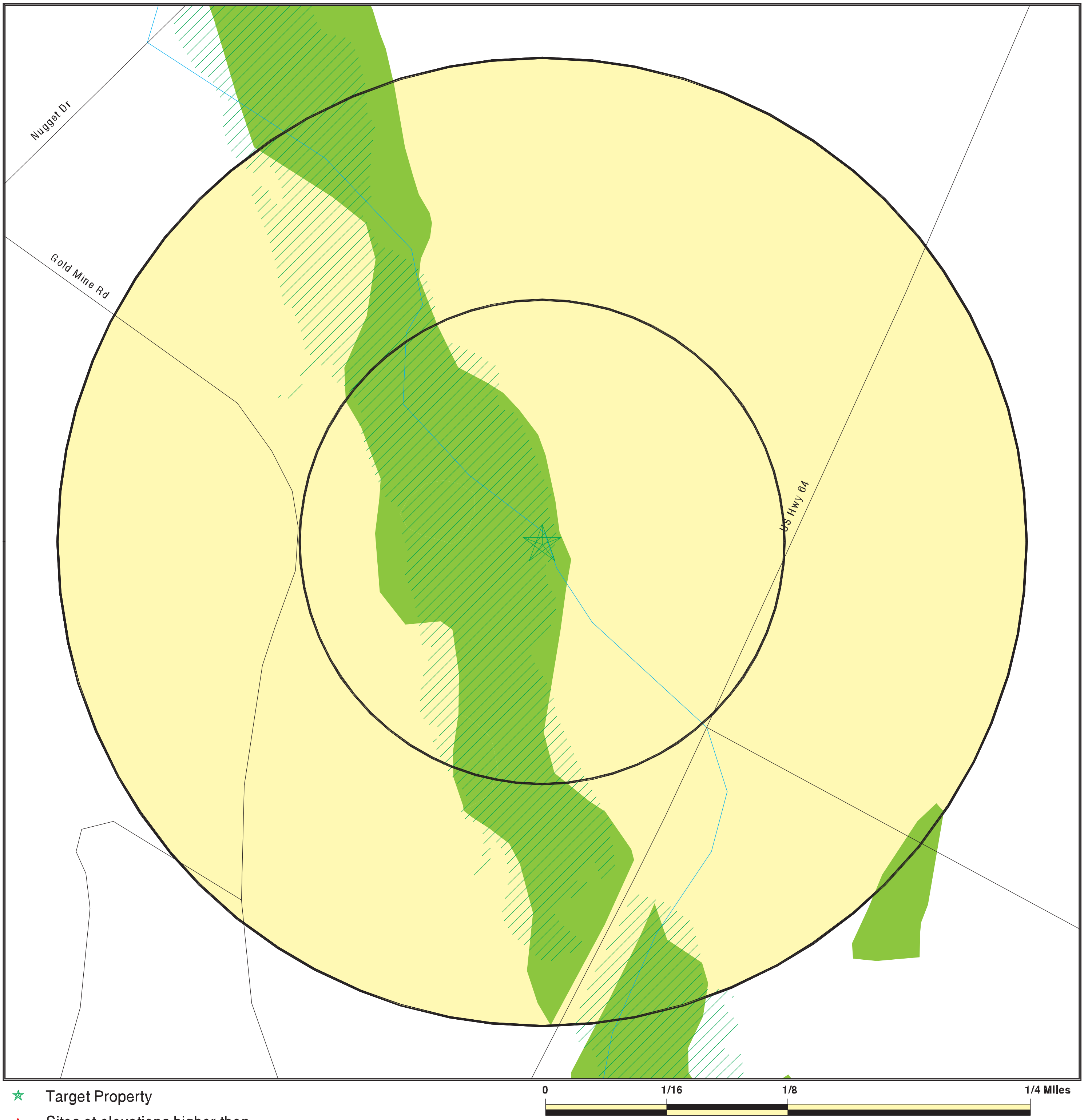
- ☆ Target Property
- ▲ Sites at elevations higher than or equal to the target property
- ◆ Sites at elevations lower than the target property
- ♟ Manufactured Gas Plants
- ▨ National Priority List Sites
- ▨ Dept. Defense Sites

- ▨ Indian Reservations BIA
- County Boundary
- Power transmission lines
- Oil & Gas pipelines
- ▨ 100-year flood zone
- ▨ 500-year flood zone
- 🟩 National Wetland Inventory
- 🟩 State Wetlands

- ▨ Hazardous Substance Disposal Sites

SITE NAME:	Upper Silver Creek Mitigation Project	INQUIRY #:	2852340.6s
ADDRESS:	4936 Brackett Lyle Drive Morganton NC 28655	DATE:	August 27, 2010 11:19 am
LAT/LONG:	35.6086 / 81.8171		

DETAIL MAP - 2852340.6s



- ☆ 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
- Oil & Gas pipelines
- ▨ 100-year flood zone
- ▨ 500-year flood zone
- 🟩 National Wetland Inventory
- 🟩 State Wetlands
- ▨ Hazardous Substance
  Disposal Sites

SITE NAME: Upper Silver Creek Mitigation Project ADDRESS: 4936 Brackett Lyle Drive Morganton NC 28655 LAT/LONG: 35.6086 / 81.8171	INQUIRY #: 2852340.6s DATE: August 27, 2010 11:19 am

MAP FINDINGS SUMMARY

Database	Target Property	Search Distance (Miles)	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
FEDERAL RECORDS								
NPL		1.000	0	0	0	0	NR	0
Proposed NPL		1.000	0	0	0	0	NR	0
Delisted NPL		1.000	0	0	0	0	NR	0
NPL LIENS		TP	NR	NR	NR	NR	NR	0
CERCLIS		0.500	0	0	0	NR	NR	0
CERC-NFRAP		0.500	0	0	0	NR	NR	0
LIENS 2		TP	NR	NR	NR	NR	NR	0
CORRACTS		1.000	0	0	0	0	NR	0
RCRA-TSDF		0.500	0	0	0	NR	NR	0
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
RCRA-NonGen		0.250	0	0	NR	NR	NR	0
US ENG CONTROLS		0.500	0	0	0	NR	NR	0
US INST CONTROL		0.500	0	0	0	NR	NR	0
ERNS		TP	NR	NR	NR	NR	NR	0
HMIRS		TP	NR	NR	NR	NR	NR	0
DOT OPS		TP	NR	NR	NR	NR	NR	0
US CDL		TP	NR	NR	NR	NR	NR	0
US BROWNFIELDS		0.500	0	0	0	NR	NR	0
DOD		1.000	0	0	0	0	NR	0
FUDS		1.000	0	0	0	0	NR	0
LUCIS		0.500	0	0	0	NR	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
DEBRIS REGION 9		0.500	0	0	0	NR	NR	0
ODI		0.500	0	0	0	NR	NR	0
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
US HIST CDL		TP	NR	NR	NR	NR	NR	0
COAL ASH EPA		0.500	0	0	0	NR	NR	0
SCRD DRYCLEANERS		0.500	0	0	0	NR	NR	0
PCB TRANSFORMER		TP	NR	NR	NR	NR	NR	0
FEDERAL FACILITY		1.000	0	0	0	0	NR	0
COAL ASH DOE		TP	NR	NR	NR	NR	NR	0
FEMA UST		0.250	0	0	NR	NR	NR	0
STATE AND LOCAL RECORDS								
SHWS		1.000	0	0	0	0	NR	0

MAP FINDINGS SUMMARY

Database	Target Property	Search Distance (Miles)	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
IMD		0.500	0	0	0	NR	NR	0
NC HSDS		1.000	0	0	0	0	NR	0
SWF/LF		0.500	0	0	0	NR	NR	0
OLI		0.500	0	0	0	NR	NR	0
UIC		TP	NR	NR	NR	NR	NR	0
HIST LF		0.500	0	0	0	NR	NR	0
LUST		0.500	0	0	0	NR	NR	0
LUST TRUST		0.500	0	0	0	NR	NR	0
UST		0.250	0	0	NR	NR	NR	0
AST		0.250	0	0	NR	NR	NR	0
INST CONTROL		0.500	0	0	0	NR	NR	0
VCP		0.500	0	0	0	NR	NR	0
DRYCLEANERS		0.250	0	0	NR	NR	NR	0
BROWNFIELDS		0.500	0	0	0	NR	NR	0
NPDES		TP	NR	NR	NR	NR	NR	0
COAL ASH		0.500	0	0	0	NR	NR	0
TRIBAL RECORDS								
INDIAN RESERV		1.000	0	0	0	0	NR	0
INDIAN ODI		0.500	0	0	0	NR	NR	0
INDIAN LUST		0.500	0	0	0	NR	NR	0
INDIAN UST		0.250	0	0	NR	NR	NR	0
INDIAN VCP		0.500	0	0	0	NR	NR	0
EDR PROPRIETARY RECORDS								
Manufactured Gas Plants		1.000	0	0	0	0	NR	0

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

GEOCHECK ®- PHYSICAL SETTING SOURCE ADDENDUM

TARGET PROPERTY ADDRESS

UPPER SILVER CREEK MITIGATION PROJECT
4936 BRACKETT LYLE DRIVE
MORGANTON, NC 28655

TARGET PROPERTY COORDINATES

Latitude (North):	35.60860 - 35˚ 36’ 31.0’’
Longitude (West):	81.8171 - 81˚ 49’ 1.6’’
Universal Tranverse Mercator:	Zone 17
UTM X (Meters):	425992.0
UTM Y (Meters):	3940645.8
Elevation:	1263 ft. above sea level

USGS TOPOGRAPHIC MAP

Target Property Map:	35081-E7 DYSARTSVILLE, NC
Most Recent Revision:	2003
North Map:	35081-F7 GLEN ALPINE, NC
Most Recent Revision:	1994

EDR’s GeoCheck Physical Setting Source Addendum is provided to assist the environmental professional in forming an opinion about the impact of potential contaminant migration.

Assessment of the impact of contaminant migration generally has two principle investigative components:

1. Groundwater flow direction, and
2. Groundwater flow velocity.

Groundwater flow direction may be impacted by surface topography, hydrology, hydrogeology, characteristics of the soil, and nearby wells. Groundwater flow velocity is generally impacted by the nature of the geologic strata.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW DIRECTION INFORMATION

Groundwater flow direction for a particular site is best determined by a qualified environmental professional using site-specific well data. If such data is not reasonably ascertainable, it may be necessary to rely on other sources of information, such as surface topographic information, hydrologic information, hydrogeologic data collected on nearby properties, and regional groundwater flow information (from deep aquifers).

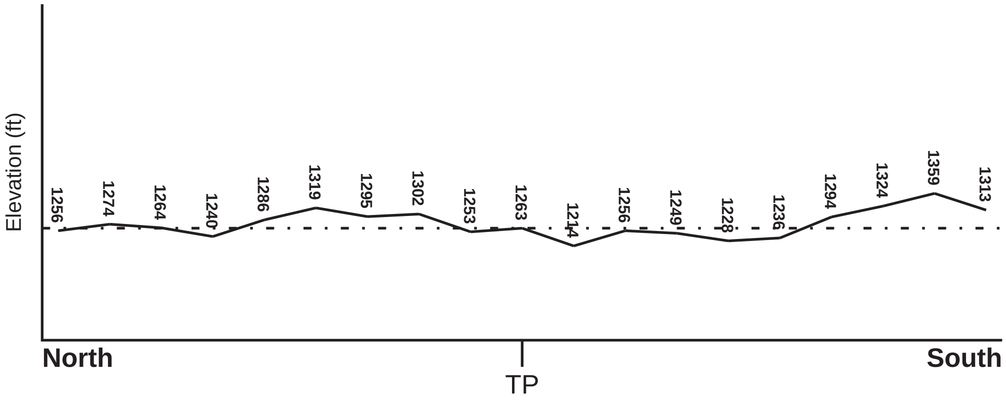
TOPOGRAPHIC INFORMATION

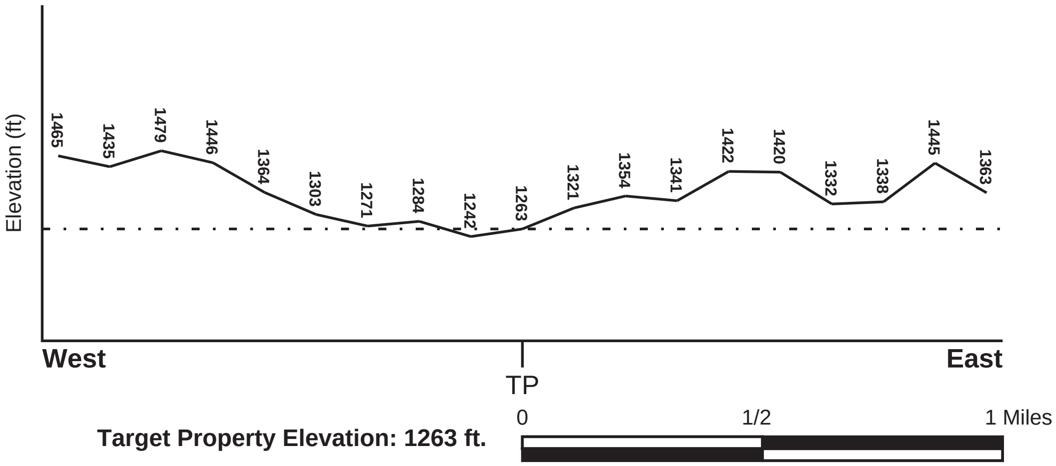
Surface topography may be indicative of the direction of surficial groundwater flow. This information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

TARGET PROPERTY TOPOGRAPHY

General Topographic Gradient: General SW

SURROUNDING TOPOGRAPHY: ELEVATION PROFILES





Target Property Elevation: 1263 ft.

Source: Topography has been determined from the USGS 7.5' Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

HYDROLOGIC INFORMATION

Surface water can act as a hydrologic barrier to groundwater flow. Such hydrologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Refer to the Physical Setting Source Map following this summary for hydrologic information (major waterways and bodies of water).

FEMA FLOOD ZONE

Target Property County	FEMA Flood Electronic Data
BURKE, NC	YES - refer to the Overview Map and Detail Map

Flood Plain Panel at Target Property: 37023C - FEMA DFIRM Flood data

Additional Panels in search area: 37111C - FEMA DFIRM Flood data

NATIONAL WETLAND INVENTORY

NWI Quad at Target Property	NWI Electronic Data Coverage
DYSARTSVILLE	YES - refer to the Overview Map and Detail Map

HYDROGEOLOGIC INFORMATION

Hydrogeologic information obtained by installation of wells on a specific site can often be an indicator of groundwater flow direction in the immediate area. Such hydrogeologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

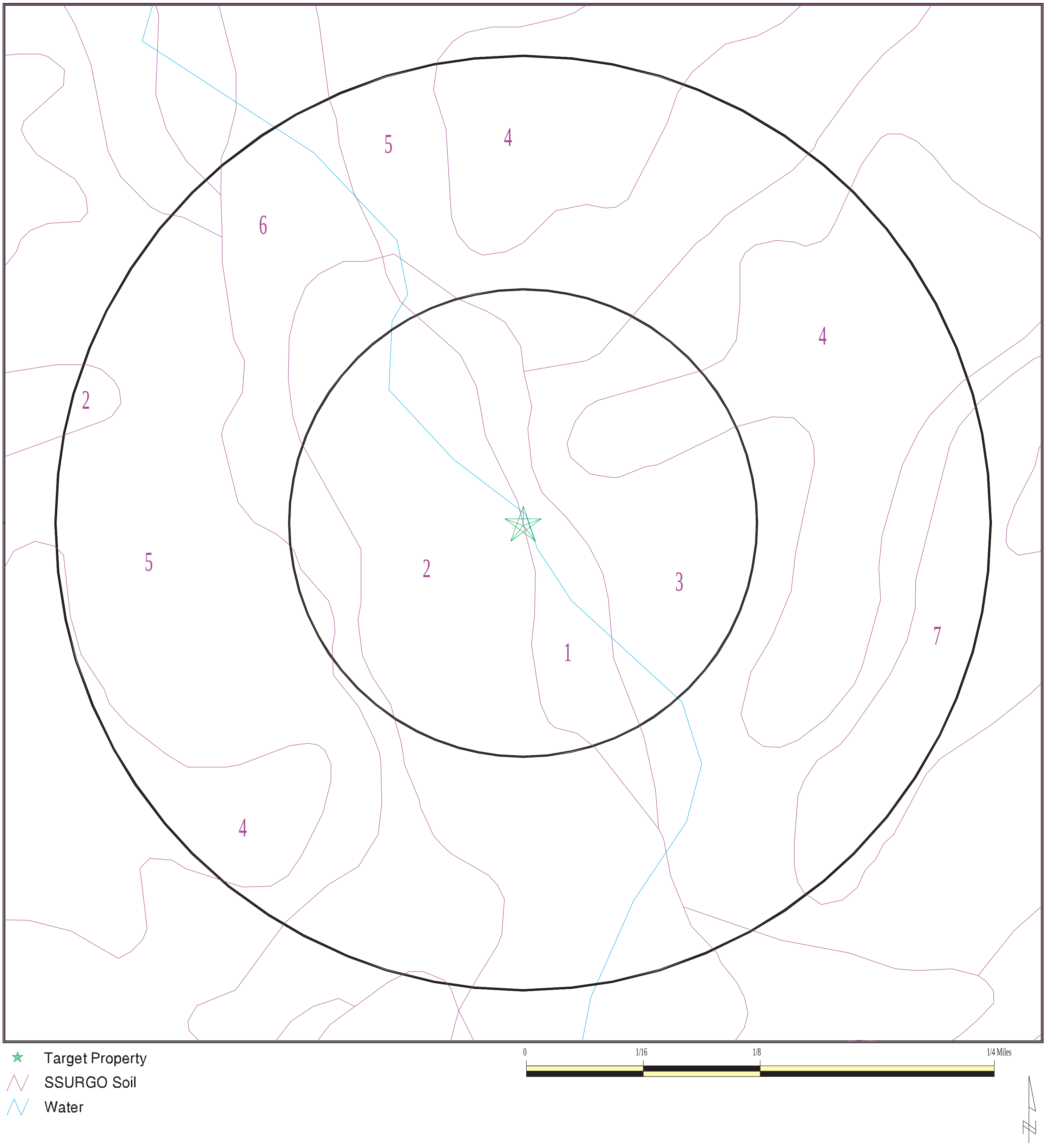
AQUIFLOW®

Search Radius: 1.000 Mile.

EDR has developed the AQUIFLOW Information System to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted by environmental professionals to regulatory authorities at select sites and has extracted the date of the report, groundwater flow direction as determined hydrogeologically, and the depth to water table.

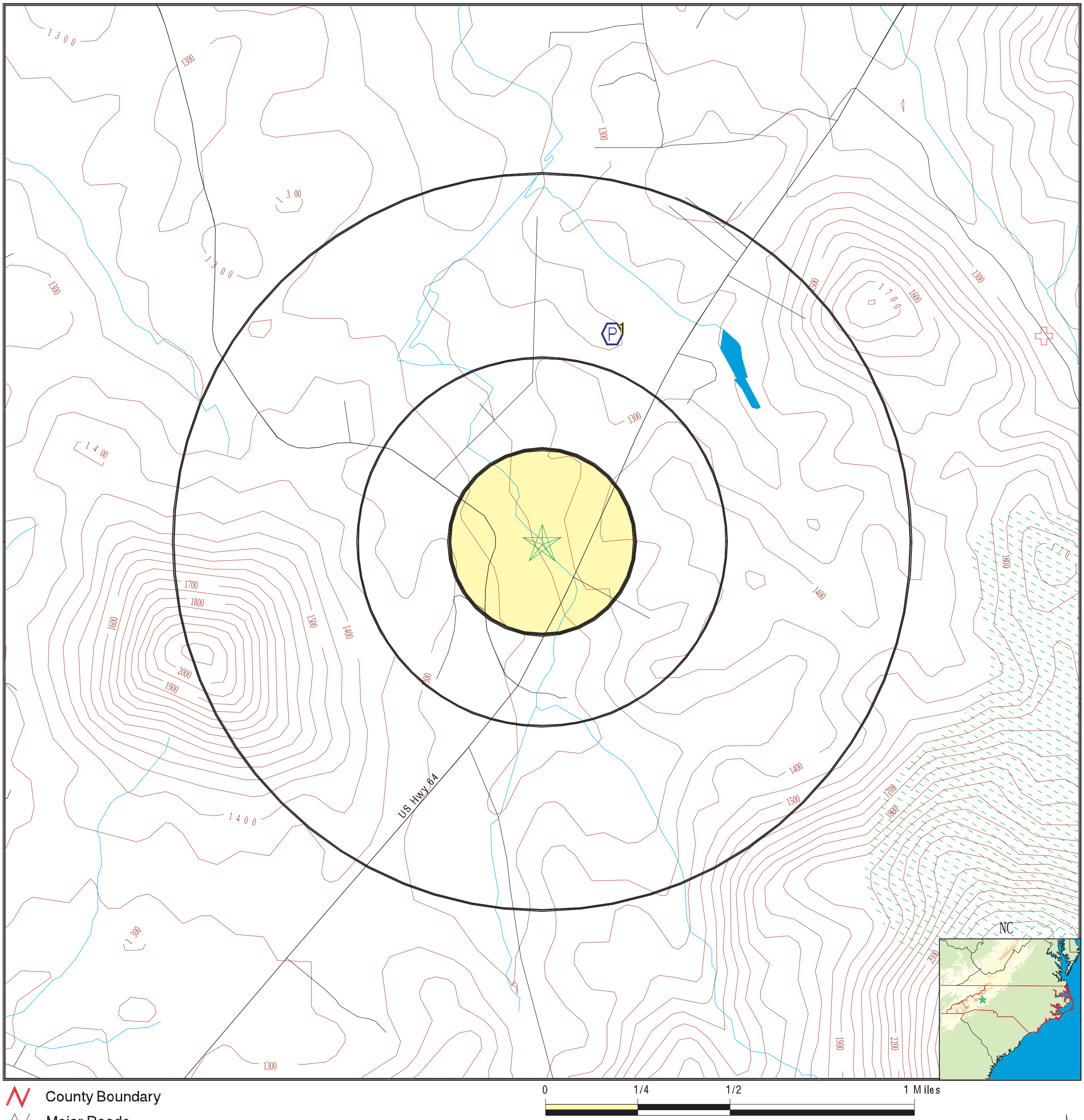
MAP ID	LOCATION FROM TP	GENERAL DIRECTION GROUNDWATER FLOW
Not Reported		

SSURGO SOIL MAP - 2852340.6s



SITE NAME:	Upper Silver Creek Mitigation Project	INQUIRY #:	2852340.6s
ADDRESS:	4936 Brackett Lyle Drive Morganton NC 28655	DATE:	August 27, 2010 11:19 am
LAT/LONG:	35.6086 / 81.8171		

PHYSICAL SETTING SOURCE MAP - 2852340.6s



- 🟥 County Boundary
- ╱╲ Major Roads
- ╱╲ Contour Lines
- ◎ Earthquake epicenter, Richter 5 or greater
- Ⓦ Water Wells
- Ⓟ Public Water Supply Wells
- ● Cluster of Multiple Icons

- ↑ Groundwater Flow Direction
- (GI) Indeterminate Groundwater Flow at Location
- (GV) Groundwater Flow Varies at Location

- ▨ Wildlife Areas
- ▨ Natural Areas
- ✚ Rare & Endangered Species

SITE NAME: Upper Silver Creek Mitigation Project
ADDRESS: 4936 Brackett Lyle Drive
Morganton NC 28655
LAT/LONG: 35.6086 / 81.8171

INQUIRY #: 2852340.6s
DATE: August 27, 2010 11:19 am

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

FEDERAL USGS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No Wells Found		

FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
1	NC0112443	1/2 - 1 Mile NNE

Note: PWS System location is not always the same as well location.

STATE DATABASE WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No Wells Found		

OTHER STATE DATABASE INFORMATION

NORTH CAROLINA NATURAL HERITAGE ELEMENT OCCURRENCES

ID	Class
NC50003282	Plants

NORTH CAROLINA SIGNIFICANT NATURAL HERITAGE AREAS DATABASE:

ID	Name
NC10001374	BRINDLETOWN FORESTS
NC10002571	ROLLINS/SOUTH MOUNTAINS NATURAL AREA

NORTH CAROLINA WILDLIFE RESOURCES COMMISSION GAME LANDS DATABASE

Site Name
NC30000565

EDR LoanCheck® Basic: Environmental Risk Review

August 27, 2010

Property Name

UPPER SILVER CREEK MITIGATION PROJECT
4936 BRACKETT LYLE DRIVE
MORGANTON, NC 28655

440 Wheelers Farms Road
Milford, CT 06460
Phone:800-352-0050
Fax:800-231-6802
Web:www.edrnet.com

EDR® Environmental Data Resources Inc

ENVIRONMENTAL RISK LEVEL

To help evaluate environmental risk, the *EDR LoanCheck® Basic* provides an Environmental Risk Level, based on a search of current government records requested to be searched by Michael Baker Engineering, Inc..

☐	**ELEVATED RISK**	Based on the records found in this report, the environmental risk level for this property is elevated.
☒	**LOW RISK**	Based on the records found in this report, the environmental risk level for this property is minimal.

User Instructions

For more information regarding this Environmental Risk Level, please refer to page 2 and other supporting reports.

User Comments

Reports and Databases

The following reports an/or databases were requested by customer and were included in the Environmental Risk Level where available:

- EDR Radius Map Report

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EDR LoanCheck® Basic: Environmental Risk Review

FINDINGS CONTRIBUTING TO THE ENVIRONMENTAL RISK LEVEL

The environmental LOW RISK is based upon the findings listed below. Refer to the supporting report(s) for additional detail.

TARGET PROPERTY

Current Govt. Records

No records identified (if any) were determined to be of elevated risk.

EDR Proprietary Records

No records identified (if any) were determined to be of elevated risk.

SURROUNDING PROPERTIES

Current Govt. Records

No records identified (if any) were determined to be of elevated risk.

EDR Proprietary Records

No records identified (if any) were determined to be of elevated risk.

Baker

Michael Baker Engineering, Inc.
797 Haywood Road
Suite 201
Asheville, North Carolina 28806

828-350-1408
FAX 828-350-1409

NC State Historic Preservation Office
Attn: Ms. Renee Gledhill-Earley
4617 Mail Service Center
Raleigh, NC 27699-4617

August 13, 2010

Subject: North Carolina Ecosystem Enhancement Program (NCEEP) Stream and Wetland Mitigation Project on Silver Creek and Tributaries, Burke County, NC.

Dear Ms. Gledhill-Earley,

The North Carolina Ecosystem Enhancement Program (EEP) requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with a potential stream and wetland restoration project area identified on the maps attached (a vicinity map, a USGS site map, and a restoration plan figure with areas of potential ground disturbance are enclosed).

The Silver Creek site has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel and wetland impacts in the Catawba River Basin. The project may involve restoration or enhancement of approximately 4,230 linear feet of Silver Creek and sections of three unnamed tributaries (UTs) that have been identified as being significantly degraded. Approximately 7.68 acres of wetlands will also be enhanced or restored.

Buried hydric soils have been located on-site in the vicinity of the existing wetlands and were likely buried by both alluvial and colluvial processes as well as the filling of some areas to increase agricultural production. To determine the extent of wetland restoration work required, further analysis of the site is proposed. The location where wetland restoration may occur is provided in Figure 3b.

No architectural structures or archaeological artifacts have been observed or noted during preliminary surveys of the site. The project area consists of the floodplain of Silver Creek and several small tributaries, several wetland complexes, and transitional upland areas that have been cleared for agricultural production. Some woodland fringe is also located within the project area to the east of Silver Creek. The elevation of the project site ranges from approximately 1,040' to 1,120' above sea level (ASL) within the general floodplain area and upland fringe. The project site on the floodplain and sections of the upland project area has historically been disturbed by agricultural land uses. The majority of the area within the construction limits of the site consists of floodplain that has been converted to agricultural use and various wetland complexes scattered across the floodplain.

Mapped soils within the upland portion of the project area include the Ark aqua loams, Unison fine sandy loam and fill or depositional soils mapped as a Fluvaquents-Udifluvents complex. Soils mapped within the floodplain portion of the project area are predominantly Fluvaquents-Udifluvents although the Ark aqua loam series is located in isolated floodplains areas within the easement. The Ark aqua loams within the project appear to be somewhat poorly drained and only temporarily flooded during high flow events. Whereas the depth to the water table where Ark aqua loams are present is approximately 24 to 72 inches, water is at the ground surface in some wetland areas where the soils are mapped as the Fluvaquents-Udifluvents complex. Unison fine sandy loams are present near the easement boundary on the eastern side of the project area near the woodline. This soil complex is well drained, does not typically flood and has a seasonal high water table depth greater than 72 inches. Soils data presented in this letter were assembled from information provided in the Natural Resources Conservation Service Soil Survey of Burke County, North Carolina accessed at the following URL Internet address: http://soildatamart.nrcs.usda.gov/Manuscripts/NC023/0/Burke.pdf.

We ask that you review this site based on the attached information to determine the presence of any historic properties or other objects of cultural significance. Thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the extent of site disturbance associated with this project.
Sincerely,

Carmen Horne-McIntyre
Carmen Horne-McIntyre
Michael Baker Engineering, Inc.
797 Haywood Rd., Suite 201
Asheville, NC 28806
Phone: 828.350.1408 ext. 2010, Email: cmcintyre@mbakercorp.com

Cc:
Eastern Band of Cherokee Indians
Mr. Tyler Howe
Tribal Historic Preservation Office
P.O. Box 455
Cherokee, NC 28719

Catawba Indian Nation
Ms. Denise Williams
Real Estate and Other Rights Protection Office
996 Avenue of the Nations
Rock Hill, SC 29730

North Carolina Department of Cultural Resources
State Historic Preservation Office
Peter B. Sandbeck, Administrator

Beverly Eaves Perdue, Governor
Linda A. Carlisle, Secretary
Jeffrey J. Crow, Deputy Secretary

Office of Archives and History
Division of Historical Resources
David Brook, Director

September 9, 2010

Carmen Horne-McIntyre
Michael Baker Engineering, Inc.
797 Haywood Road
Suite 201
Asheville, NC 28806

Re: Silver Creek and Tributaries Stream and Wetland Restoration, Burke County, ER 10-1586

Dear Ms. Horne-McIntyre:

Thank you for your letter of August 13, 2010, concerning the above project.

There are no known recorded archaeological sites within the project boundaries. However, the project area has never been systematically surveyed to determine the location or significance of archaeological resources. Based on the topographic and hydrological situation, there is a high probability for the presence of prehistoric or historic archaeological sites.

We recommend that a comprehensive survey be conducted by an experienced archaeologist to identify and evaluate the significance of archaeological remains that may be damaged or destroyed by the proposed project. Potential effects on unknown resources must be assessed prior to the initiation of construction activities.

Two copies of the resulting archaeological survey report, as well as one copy of the appropriate site forms, should be forwarded to us for review and comment as soon as they are available and well in advance of any construction activities.

A list of archaeological consultants who have conducted or expressed an interest in contract work in North Carolina is available at www.arch.dcr.state.nc.us/consults.htm. The archaeologists listed, or any other experienced archaeologist, may be contacted to conduct the recommended survey.

We have determined that the project as proposed will not have an effect on any historic structures.

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

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

Sincerely,

Renee Gledhill-Earley

for Peter Sandbeck

North Carolina Department of Cultural Resources
State Historic Preservation Office
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November 10, 2010

Dawn Reid
Archaeological Consultants of the Carolinas, inc.
121 East First Street
Clayton, NC 27520

Re: Silver Creek and Tributaries Stream and Wetland Restoration, Burke County, ER 10-1586

Dear Ms. Reid:

Thank you for your letter of October 13, 2010, transmitting the archaeological survey report by Michael Keith O'Neal for the above project.

During the course of the survey, no sites were located within the project area. Mr. O'Neal has recommended that no further archaeological investigation be conducted in connection with this project. We concur with this recommendation since the project will not involve significant archaeological resources.

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

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Sincerely,

Renee Gledhill-Earley

for Peter Sandbeck

cc: Carmen Horne-McIntyre, Michael Baker Engineering, Inc.

MAP FINDINGS SUMMARY

Database	Target Property	Search Distance (Miles)	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
FEDERAL RECORDS								
NPL		1.000	0	0	0	0	NR	0
Proposed NPL		1.000	0	0	0	0	NR	0
Delisted NPL		1.000	0	0	0	0	NR	0
NPL LIENS		TP	NR	NR	NR	NR	NR	0
CERCLIS		0.500	0	0	0	NR	NR	0
CERC-NFRAP		0.500	0	0	0	NR	NR	0
LIENS 2		TP	NR	NR	NR	NR	NR	0
CORRACTS		1.000	0	0	0	0	NR	0
RCRA-TSDF		0.500	0	0	0	NR	NR	0
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
RCRA-NonGen		0.250	0	0	NR	NR	NR	0
US ENG CONTROLS		0.500	0	0	0	NR	NR	0
US INST CONTROL		0.500	0	0	0	NR	NR	0
ERNS		TP	NR	NR	NR	NR	NR	0
HMIRS		TP	NR	NR	NR	NR	NR	0
DOT OPS		TP	NR	NR	NR	NR	NR	0
US CDL		TP	NR	NR	NR	NR	NR	0
US BROWNFIELDS		0.500	0	0	0	NR	NR	0
DOD		1.000	0	0	0	0	NR	0
FUDS		1.000	0	0	0	0	NR	0
LUCIS		0.500	0	0	0	NR	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
DEBRIS REGION 9		0.500	0	0	0	NR	NR	0
ODI		0.500	0	0	0	NR	NR	0
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
US HIST CDL		TP	NR	NR	NR	NR	NR	0
COAL ASH EPA		0.500	0	0	0	NR	NR	0
SCRD DRYCLEANERS		0.500	0	0	0	NR	NR	0
PCB TRANSFORMER		TP	NR	NR	NR	NR	NR	0
FEDERAL FACILITY		1.000	0	0	0	0	NR	0
COAL ASH DOE		TP	NR	NR	NR	NR	NR	0
FEMA UST		0.250	0	0	NR	NR	NR	0
STATE AND LOCAL RECORDS								
SHWS		1.000	0	0	0	0	NR	0

MAP FINDINGS SUMMARY

Database	Target Property	Search Distance (Miles)	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
IMD		0.500	0	0	0	NR	NR	0
NC HSDS		1.000	0	0	0	0	NR	0
SWF/LF		0.500	0	0	0	NR	NR	0
OLI		0.500	0	0	0	NR	NR	0
UIC		TP	NR	NR	NR	NR	NR	0
HIST LF		0.500	0	0	0	NR	NR	0
LUST		0.500	0	0	0	NR	NR	0
LUST TRUST		0.500	0	0	0	NR	NR	0
UST		0.250	0	0	NR	NR	NR	0
AST		0.250	0	0	NR	NR	NR	0
INST CONTROL		0.500	0	0	0	NR	NR	0
VCP		0.500	0	0	0	NR	NR	0
DRYCLEANERS		0.250	0	0	NR	NR	NR	0
BROWNFIELDS		0.500	0	0	0	NR	NR	0
NPDES		TP	NR	NR	NR	NR	NR	0
COAL ASH		0.500	0	0	0	NR	NR	0
TRIBAL RECORDS								
INDIAN RESERV		1.000	0	0	0	0	NR	0
INDIAN ODI		0.500	0	0	0	NR	NR	0
INDIAN LUST		0.500	0	0	0	NR	NR	0
INDIAN UST		0.250	0	0	NR	NR	NR	0
INDIAN VCP		0.500	0	0	0	NR	NR	0
EDR PROPRIETARY RECORDS								
Manufactured Gas Plants		1.000	0	0	0	0	NR	0

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		

GEOCHECK ®- PHYSICAL SETTING SOURCE ADDENDUM

TARGET PROPERTY ADDRESS

UPPER SILVER CREEK MITIGATION PROJECT
4936 BRACKETT LYLE DRIVE
MORGANTON, NC 28655

TARGET PROPERTY COORDINATES

Latitude (North):	35.60860 - 35˚ 36’ 31.0’’
Longitude (West):	81.8171 - 81˚ 49’ 1.6’’
Universal Tranverse Mercator:	Zone 17
UTM X (Meters):	425992.0
UTM Y (Meters):	3940645.8
Elevation:	1263 ft. above sea level

USGS TOPOGRAPHIC MAP

Target Property Map:	35081-E7 DYSARTSVILLE, NC
Most Recent Revision:	2003
North Map:	35081-F7 GLEN ALPINE, NC
Most Recent Revision:	1994

EDR’s GeoCheck Physical Setting Source Addendum is provided to assist the environmental professional in forming an opinion about the impact of potential contaminant migration.

Assessment of the impact of contaminant migration generally has two principle investigative components:

1. Groundwater flow direction, and
2. Groundwater flow velocity.

Groundwater flow direction may be impacted by surface topography, hydrology, hydrogeology, characteristics of the soil, and nearby wells. Groundwater flow velocity is generally impacted by the nature of the geologic strata.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW DIRECTION INFORMATION

Groundwater flow direction for a particular site is best determined by a qualified environmental professional using site-specific well data. If such data is not reasonably ascertainable, it may be necessary to rely on other sources of information, such as surface topographic information, hydrologic information, hydrogeologic data collected on nearby properties, and regional groundwater flow information (from deep aquifers).

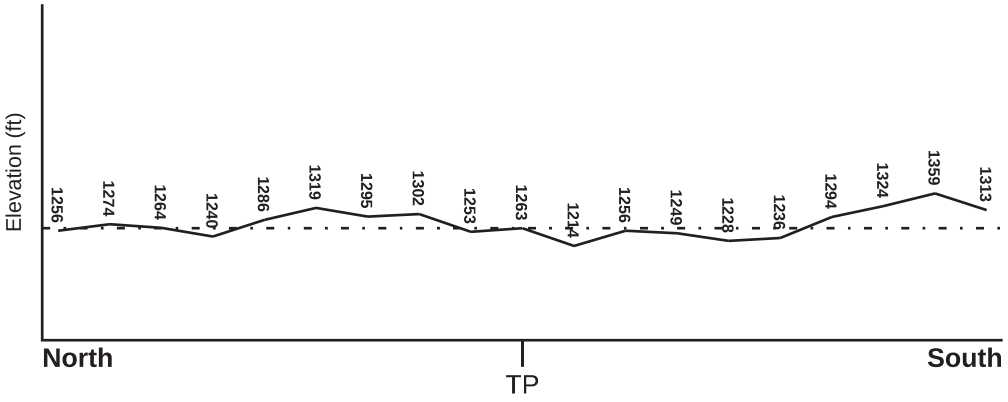
TOPOGRAPHIC INFORMATION

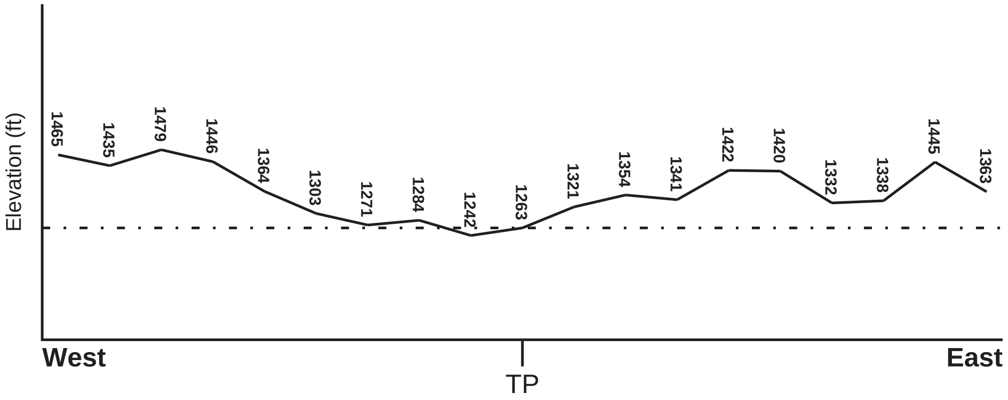
Surface topography may be indicative of the direction of surficial groundwater flow. This information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

TARGET PROPERTY TOPOGRAPHY

General Topographic Gradient: General SW

SURROUNDING TOPOGRAPHY: ELEVATION PROFILES





Target Property Elevation: 1263 ft.

Source: Topography has been determined from the USGS 7.5' Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

HYDROLOGIC INFORMATION

Surface water can act as a hydrologic barrier to groundwater flow. Such hydrologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Refer to the Physical Setting Source Map following this summary for hydrologic information (major waterways and bodies of water).

FEMA FLOOD ZONE

Target Property County	FEMA Flood Electronic Data
BURKE, NC	YES - refer to the Overview Map and Detail Map

Flood Plain Panel at Target Property: 37023C - FEMA DFIRM Flood data

Additional Panels in search area: 37111C - FEMA DFIRM Flood data

NATIONAL WETLAND INVENTORY

NWI Quad at Target Property	NWI Electronic Data Coverage
DYSARTSVILLE	YES - refer to the Overview Map and Detail Map

HYDROGEOLOGIC INFORMATION

Hydrogeologic information obtained by installation of wells on a specific site can often be an indicator of groundwater flow direction in the immediate area. Such hydrogeologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

AQUIFLOW®

Search Radius: 1.000 Mile.

EDR has developed the AQUIFLOW Information System to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted by environmental professionals to regulatory authorities at select sites and has extracted the date of the report, groundwater flow direction as determined hydrogeologically, and the depth to water table.

MAP ID	LOCATION FROM TP	GENERAL DIRECTION GROUNDWATER FLOW
Not Reported		

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

FEDERAL USGS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No Wells Found		

FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
1	NC0112443	1/2 - 1 Mile NNE

Note: PWS System location is not always the same as well location.

STATE DATABASE WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No Wells Found		

OTHER STATE DATABASE INFORMATION

NORTH CAROLINA NATURAL HERITAGE ELEMENT OCCURRENCES

ID	Class
NC50003282	Plants

NORTH CAROLINA SIGNIFICANT NATURAL HERITAGE AREAS DATABASE:

ID	Name
NC10001374	BRINDLETOWN FORESTS
NC10002571	ROLLINS/SOUTH MOUNTAINS NATURAL AREA

NORTH CAROLINA WILDLIFE RESOURCES COMMISSION GAME LANDS DATABASE

Site Name
NC30000565

EDR LoanCheck® Basic: Environmental Risk Review

August 27, 2010

Property Name

UPPER SILVER CREEK MITIGATION PROJECT
4936 BRACKETT LYLE DRIVE
MORGANTON, NC 28655

440 Wheelers Farms Road
Milford, CT 06460
Phone:800-352-0050
Fax:800-231-6802
Web:www.edrnet.com

EDR® Environmental Data Resources Inc

ENVIRONMENTAL RISK LEVEL

To help evaluate environmental risk, the *EDR LoanCheck® Basic* provides an Environmental Risk Level, based on a search of current government records requested to be searched by Michael Baker Engineering, Inc..

☐	**ELEVATED RISK**	Based on the records found in this report, the environmental risk level for this property is elevated.
☒	**LOW RISK**	Based on the records found in this report, the environmental risk level for this property is minimal.

User Instructions

For more information regarding this Environmental Risk Level, please refer to page 2 and other supporting reports.

User Comments

Reports and Databases

The following reports an/or databases were requested by customer and were included in the Environmental Risk Level where available:

- EDR Radius Map Report

Disclaimer - Copyright and Trademark Notice

This Report contains certain information obtained from a variety of public and other sources reasonably available to Environmental Data Resources, Inc. It cannot be concluded from this Report that coverage information for the target and surrounding properties does not exist from other sources. **NO WARRANTY EXPRESSED OR IMPLIED, IS MADE WHATSOEVER IN CONNECTION WITH THIS REPORT. ENVIRONMENTAL DATA RESOURCES, INC. SPECIFICALLY DISCLAIMS THE MAKING OF ANY SUCH WARRANTIES, INCLUDING WITHOUT LIMITATION, MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE OR PURPOSE. ALL RISK IS ASSUMED BY THE USER. IN NO EVENT SHALL ENVIRONMENTAL DATA RESOURCES, INC. BE LIABLE TO ANYONE, WHETHER ARISING OUT OF ERRORS OR OMISSIONS, NEGLIGENCE, ACCIDENT OR ANY OTHER CAUSE, FOR ANY LOSS OF DAMAGE, INCLUDING, WITHOUT LIMITATION, SPECIAL, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES. ANY LIABILITY ON THE PART OF ENVIRONMENTAL DATA RESOURCES, INC. IS STRICTLY LIMITED TO A REFUND OF THE AMOUNT PAID FOR THIS REPORT.** Purchaser accepts this Report "AS IS". Any analyses, estimates, ratings, environmental risk levels or risk codes provided in this Report are provided for illustrative purposes only, and are not intended to provide, nor should they be interpreted as providing any facts regarding, or prediction or forecast of, any environmental risk for any property. Only a Phase I Environmental Site Assessment performed by an environmental professional can provide information regarding the environmental risk for any property. Additionally, the information provided in this Report is not to be construed as legal advice.

EDR LoanCheck® Basic: Environmental Risk Review

FINDINGS CONTRIBUTING TO THE ENVIRONMENTAL RISK LEVEL

The environmental LOW RISK is based upon the findings listed below. Refer to the supporting report(s) for additional detail.

TARGET PROPERTY

Current Govt. Records

No records identified (if any) were determined to be of elevated risk.

EDR Proprietary Records

No records identified (if any) were determined to be of elevated risk.

SURROUNDING PROPERTIES

Current Govt. Records

No records identified (if any) were determined to be of elevated risk.

EDR Proprietary Records

No records identified (if any) were determined to be of elevated risk.

Baker

Michael Baker Engineering, Inc.
797 Haywood Road
Suite 201
Asheville, North Carolina 28806

828-350-1408
FAX 828-350-1409

NC State Historic Preservation Office
Attn: Ms. Renee Gledhill-Earley
4617 Mail Service Center
Raleigh, NC 27699-4617

August 13, 2010

Subject: North Carolina Ecosystem Enhancement Program (NCEEP) Stream and Wetland Mitigation Project on Silver Creek and Tributaries, Burke County, NC.

Dear Ms. Gledhill-Earley,

The North Carolina Ecosystem Enhancement Program (EEP) requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with a potential stream and wetland restoration project area identified on the maps attached (a vicinity map, a USGS site map, and a restoration plan figure with areas of potential ground disturbance are enclosed).

The Silver Creek site has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel and wetland impacts in the Catawba River Basin. The project may involve restoration or enhancement of approximately 4,230 linear feet of Silver Creek and sections of three unnamed tributaries (UTs) that have been identified as being significantly degraded. Approximately 7.68 acres of wetlands will also be enhanced or restored.

Buried hydric soils have been located on-site in the vicinity of the existing wetlands and were likely buried by both alluvial and colluvial processes as well as the filling of some areas to increase agricultural production. To determine the extent of wetland restoration work required, further analysis of the site is proposed. The location where wetland restoration may occur is provided in Figure 3b.

No architectural structures or archaeological artifacts have been observed or noted during preliminary surveys of the site. The project area consists of the floodplain of Silver Creek and several small tributaries, several wetland complexes, and transitional upland areas that have been cleared for agricultural production. Some woodland fringe is also located within the project area to the east of Silver Creek. The elevation of the project site ranges from approximately 1,040' to 1,120' above sea level (ASL) within the general floodplain area and upland fringe. The project site on the floodplain and sections of the upland project area has historically been disturbed by agricultural land uses. The majority of the area within the construction limits of the site consists of floodplain that has been converted to agricultural use and various wetland complexes scattered across the floodplain.

Mapped soils within the upland portion of the project area include the Ark aqua loams, Unison fine sandy loam and fill or depositional soils mapped as a Fluvaquents-Udifluvents complex. Soils mapped within the floodplain portion of the project area are predominantly Fluvaquents-Udifluvents although the Ark aqua loam series is located in isolated floodplains areas within the easement. The Ark aqua loams within the project appear to be somewhat poorly drained and only temporarily flooded during high flow events. Whereas the depth to the water table where Ark aqua loams are present is approximately 24 to 72 inches, water is at the ground surface in some wetland areas where the soils are mapped as the Fluvaquents-Udifluvents complex. Unison fine sandy loams are present near the easement boundary on the eastern side of the project area near the woodline. This soil complex is well drained, does not typically flood and has a seasonal high water table depth greater than 72 inches. Soils data presented in this letter were assembled from information provided in the Natural Resources Conservation Service Soil Survey of Burke County, North Carolina accessed at the following URL Internet address: http://soildatamart.nrcs.usda.gov/Manuscripts/NC023/0/Burke.pdf.

We ask that you review this site based on the attached information to determine the presence of any historic properties or other objects of cultural significance. Thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the extent of site disturbance associated with this project.
Sincerely,

Carmen Horne-McIntyre
Carmen Horne-McIntyre
Michael Baker Engineering, Inc.
797 Haywood Rd., Suite 201
Asheville, NC 28806
Phone: 828.350.1408 ext. 2010, Email: cmcintyre@mbakercorp.com

Cc:
Eastern Band of Cherokee Indians
Mr. Tyler Howe
Tribal Historic Preservation Office
P.O. Box 455
Cherokee, NC 28719

Catawba Indian Nation
Ms. Denise Williams
Real Estate and Other Rights Protection Office
996 Avenue of the Nations
Rock Hill, SC 29730

North Carolina Department of Cultural Resources
State Historic Preservation Office
Peter B. Sandbeck, Administrator

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Office of Archives and History
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David Brook, Director

September 9, 2010

Carmen Horne-McIntyre
Michael Baker Engineering, Inc.
797 Haywood Road
Suite 201
Asheville, NC 28806

Re: Silver Creek and Tributaries Stream and Wetland Restoration, Burke County, ER 10-1586

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Two copies of the resulting archaeological survey report, as well as one copy of the appropriate site forms, should be forwarded to us for review and comment as soon as they are available and well in advance of any construction activities.

A list of archaeological consultants who have conducted or expressed an interest in contract work in North Carolina is available at www.arch.dcr.state.nc.us/consults.htm. The archaeologists listed, or any other experienced archaeologist, may be contacted to conduct the recommended survey.

We have determined that the project as proposed will not have an effect on any historic structures.

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Sincerely,

Renee Gledhill-Earley

for Peter Sandbeck

North Carolina Department of Cultural Resources
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November 10, 2010

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121 East First Street
Clayton, NC 27520

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Sincerely,

Renee Gledhill-Earley

for Peter Sandbeck

cc: Carmen Horne-McIntyre, Michael Baker Engineering, Inc.

Location: 109 East Jones Street, Raleigh NC 27601 **Mailing Address:** 4617 Mail Service Center, Raleigh NC 27699-4617 **Telephone/Fax:** (919) 807-6570/807-6599

Baker

Michael Baker Engineering, Inc.
797 Haywood Road
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Asheville, North Carolina 28806

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FAX 828-350-1409

Eastern Band of Cherokee Indians
Attn: Mr. Tyler Howe
Tribal Historic Preservation Office
P.O. Box 455
Cherokee, NC 28719

August 13, 2010

Subject: North Carolina Ecosystem Enhancement Program (NCEEP) Stream and Wetland Mitigation Project on Silver Creek and Tributaries, Burke County, NC.

Dear Mr. Howe,

The North Carolina Ecosystem Enhancement Program (EEP) requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with a potential stream and wetland restoration project area identified on the maps attached (a vicinity map, a USGS site map, and a restoration plan figure with areas of potential ground disturbance are enclosed).

The Silver Creek site has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel and wetland impacts in the Catawba River Basin. The project may involve restoration or enhancement of approximately 4,230 linear feet of Silver Creek and sections of three unnamed tributaries (UTs) that have been identified as being significantly degraded. Approximately 7.68 acres of wetlands will also be enhanced or restored.

Buried hydric soils have been located on-site in the vicinity of the existing wetlands and were likely buried by both alluvial and colluvial processes as well as the filling of some areas to increase agricultural production. To determine the extent of wetland restoration work required, further analysis of the site is proposed. The location where wetland restoration may occur is provided in Figure 3b.

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The Silver Creek site has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel and wetland impacts in the Catawba River Basin. The project may involve restoration or enhancement of approximately 4,230 linear feet of Silver Creek and sections of three unnamed tributaries (UTs) that have been identified as being significantly degraded. Approximately 7.68 acres of wetlands will also be enhanced or restored.

Buried hydric soils have been located on-site in the vicinity of the existing wetlands and were likely buried by both alluvial and colluvial processes as well as the filling of some areas to increase agricultural production. To determine the extent of wetland restoration work required, further analysis of the site is proposed. The location where wetland restoration may occur is provided in Figure 3b.

No architectural structures or archaeological artifacts have been observed or noted during preliminary surveys of the site. The project area consists of the floodplain of Silver Creek and several small tributaries, several wetland complexes, and transitional upland areas that have been cleared for agricultural production. Some woodland fringe is also located within the project area to the east of Silver Creek. The elevation of the project site ranges from approximately 1,040' to 1,120' above sea level (ASL) within the general floodplain area and upland fringe. The project site on the floodplain and sections of the upland project area has historically been disturbed by agricultural land uses. The majority of the area within the construction limits of the site consists of floodplain that has been converted to agricultural use and various wetland complexes scattered across the floodplain.

Mapped soils within the upland portion of the project area include the Ark aqua loams, Unison fine sandy loam and fill or depositional soils mapped as a Fluvaquents-Udifluvents complex. Soils mapped within the floodplain portion of the project area are predominantly Fluvaquents-Udifluvents although the Ark aqua loam series is located in isolated floodplains areas within the easement. The Ark aqua loams within the project appear to be somewhat poorly drained and only temporarily flooded during high flow events. Whereas the depth to the water table where Ark aqua loams are present is approximately 24 to 72 inches, water is at the ground surface in some wetland areas where the soils are mapped as the Fluvaquents-Udifluvents complex. Unison fine sandy loams are present near the easement boundary on the eastern side of the project area near the woodline. This soil complex is well drained, does not typically flood and has a seasonal high water table depth greater than 72 inches. Soils data presented in this letter were assembled from information provided in the Natural Resources Conservation Service Soil Survey of Burke County, North Carolina accessed at the following URL Internet address: http://soildatamart.nrcs.usda.gov/Manuscripts/NC023/0/Burke.pdf.

We ask that you review this site based on the attached information to determine the presence of any historic properties or other objects of cultural significance. Thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Carmen Horne-McIntyre

Carmen Horne-McIntyre
Michael Baker Engineering, Inc.
797 Haywood Rd., Suite 201
Asheville, NC 28806
Phone: 828.350.1408 ext. 2010, Email: cmcintyre@mbakercorp.com

Cc:
State Historic Preservation Office
Ms. Renee Gledhill-Earley
4617 Mail Service Center
Raleigh, NC 27699-4617

Catawba Indian Nation
Ms. Denise Williams
Real Estate and Other Rights Protection Office
996 Avenue of the Nations
Rock Hill, SC 29730

Baker

Michael Baker Engineering, Inc.
797 Haywood Road
Suite 201
Asheville, North Carolina 28806

828-350-1408
FAX 828-350-1409

Catawba Indian Nation
Ms. Denise Williams
Real Estate and Other Rights Protection Office
996 Avenue of the Nations
Rock Hill, SC 29730

August 13, 2010

Subject: North Carolina Ecosystem Enhancement Program (NCEEP) Stream and Wetland Mitigation Project on Silver Creek and Tributaries, Burke County, NC.

Dear Ms. Williams,

The North Carolina Ecosystem Enhancement Program (EEP) requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with a potential stream and wetland restoration project area identified on the maps attached (a vicinity map, a USGS site map, and a restoration plan figure with areas of potential ground disturbance are enclosed).

The Silver Creek site has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel and wetland impacts in the Catawba River Basin. The project may involve restoration or enhancement of approximately 4,230 linear feet of Silver Creek and sections of three unnamed tributaries (UTs) that have been identified as being significantly degraded. Approximately 7.68 acres of wetlands will also be enhanced or restored.

Buried hydric soils have been located on-site in the vicinity of the existing wetlands and were likely buried by both alluvial and colluvial processes as well as the filling of some areas to increase agricultural production. To determine the extent of wetland restoration work required, further analysis of the site is proposed. The location where wetland restoration may occur is provided in Figure 3b.

No architectural structures or archaeological artifacts have been observed or noted during preliminary surveys of the site. The project area consists of the floodplain of Silver Creek and several small tributaries, several wetland complexes, and transitional upland areas that have been cleared for agricultural production. Some woodland fringe is also located within the project area to the east of Silver Creek. The elevation of the project site ranges from approximately 1,040' to 1,120' above sea level (ASL) within the general floodplain area and upland fringe. The project site on the floodplain and sections of the upland project area has historically been disturbed by agricultural land uses. The majority of the area within the construction limits of the site consists of floodplain that has been converted to agricultural use and various wetland complexes scattered across the floodplain.

Mapped soils within the upland portion of the project area include the Ark aqua loams, Unison fine sandy loam and fill or depositional soils mapped as a Fluvaquents-Udifluvents complex. Soils mapped within the floodplain portion of the project area are predominantly Fluvaquents-Udifluvents although the Ark aqua loam series is located in isolated floodplains areas within the easement. The Ark aqua loams within the project appear to be somewhat poorly drained and only temporarily flooded during high flow events. Whereas the depth to the water table where Ark aqua loams are present is approximately 24 to 72 inches, water is at the ground surface in some wetland areas where the soils are mapped as the Fluvaquents-Udifluvents complex. Unison fine sandy loams are present near the easement boundary on the eastern side of the project area near the woodline. This soil complex is well drained, does not typically flood and has a seasonal high water table depth greater than 72 inches. Soils data presented in this letter were assembled from information provided in the Natural Resources Conservation Service Soil Survey of Burke County, North Carolina accessed at the following URL Internet address: http://soildatamart.nrcs.usda.gov/Manuscripts/NC023/0/Burke.pdf.

We ask that you review this site based on the attached information to determine the presence of any historic properties or other objects of cultural significance. Thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

CARMEN HORNE-McINTYRE

Carmen Horne-McIntyre
Michael Baker Engineering, Inc.
797 Haywood Rd., Suite 201
Asheville, NC 28806
Phone: 828.350.1408 ext. 2010, Email: cmcintyre@mbakercorp.com

Cc:
State Historic Preservation Office
Ms. Renee Gledhill-Earley
4617 Mail Service Center
Raleigh, NC 27699-4617

Eastern Band of Cherokee Indians
Attn: Mr. Tyler Howe
Tribal Historic Preservation Office
P.O. Box 455
Cherokee, NC 28719

Baker

Michael Baker Engineering, Inc.
797 Haywood Road
Suite 201
Asheville, North Carolina 28806

828-350-1408
FAX 828-350-1409

December 14, 2010

Eastern Band of Cherokee Indians (EBCI)
Mr. Tyler Howe
Tribal Historic Preservation Office
PO Box 455
Cherokee, NC 28719

RE: Phase I Archaeological Survey Report (ER 10-1586) for stream restoration site on Silver Creek and Tributaries, Burke County, NC.

This letter and the enclosed report are provided to your office at the State Historic Preservation Office's request that Michael Baker Engineering, Inc. conduct a comprehensive survey of areas to be impacted during a stream restoration project on Silver Creek and three adjoining unnamed tributaries.

A Phase I Archaeological Survey was conducted by Archaeological Consultants of the Carolinas, Inc. (ACC) in October 2010. The enclosed report details the approach that ACC used for this survey, as well as research conducted and findings from their field survey. A copy of this report has also been submitted to the State Historic Preservation Office for their review as well.

Based on our understanding of this report, no significant archaeological remains were found within the project area. In addition, no previously recorded archaeological sites have been recorded within 1 km of the project tract. We are submitting this information for your review and consideration of the report findings.

We have received comment back from the State Historic Preservation Office regarding restoration or enhancement of Silver Creek and tributaries located within the project area. The State Historic Preservation Office has concluded that the project, as proposed, **will not result in any potential archaeological or historic resources being affected**. I am enclosing a copy of the previous letter submitted to the THPO which summarizes the extent of work being performed on Silver Creek and three unnamed tributaries within the project area.

Michael Baker Engineering, Inc. intends to proceed in the approval process for the environmental review of this project site. If you would like to discuss the project or report findings, please contact me by January 5, 2011. I can be reached via email at cmcintyre@mbakercorp.com or by phone (828.674.8541 or 828.350.1408 x.2010). Thank-you for your assistance in this matter.

Sincerely,
Carmen Horne-McIntyre
Carmen Horne-McIntyre
Environmental Scientist

Enclosure: Archaeological Survey Report for Silver Creek Mitigation Project, Silver Creek and Tributaries
Project Letter

Michael Baker Engineering, Inc.
797 Haywood Road
Suite 201
Asheville, North Carolina 28806

828-350-1408
FAX 828-350-1409

December 14, 2010

Catawba Indian Nation
Ms. Denise Williams
Real Estate and Other Rights Protection Office
996 Avenue of the Nations
Rock Hill, SC 29730

RE: Phase I Archaeological Survey Report (ER 10-1586) for stream restoration site on Silver Creek and Tributaries, Burke County, NC.

This letter and the enclosed report are provided to your office at the State Historic Preservation Office's request that Michael Baker Engineering, Inc. conduct a comprehensive survey of areas to be impacted during a stream restoration project on Silver Creek and three adjoining unnamed tributaries.

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Based on our understanding of this report, no significant archaeological remains were found within the project area. In addition, no previously recorded archaeological sites have been recorded within 1 km of the project tract. We are submitting this information for your review and consideration of the report findings.

We have received comment back from the State Historic Preservation Office regarding restoration or enhancement of Silver Creek and tributaries located within the project area. The State Historic Preservation Office has concluded that the project, as proposed, **will not result in any potential archaeological or historic resources being affected**. I am enclosing a copy of the previous letter submitted to the Real Estate and Other Rights Protection Office which summarizes the extent of work being performed on Silver Creek and three unnamed tributaries within the project area.

Michael Baker Engineering, Inc. intends to proceed in the approval process for the environmental review of this project site. If you would like to discuss the project or report findings, please contact me by January 5, 2011. I can be reached via email at cmcintyre@mbakercorp.com or by phone (828.674.8541 or 828.350.1408 x.2010). Thank-you for your assistance in this matter.

Sincerely,
Carmen Horne - McIntyre
Carmen Horne-McIntyre
Environmental Scientist

Enclosure: Archaeological Survey Report for Silver Creek Mitigation Project, Silver Creek and Tributaries Project Letter

Baker

Michael Baker Engineering, Inc.
797 Haywood Road
Suite 201
Asheville, North Carolina 28806

828-350-1408
FAX 828-350-1409

North Carolina Wildlife Resources Commission
Habitat Conservation Program
Attn: Mr. Ron Linville
3855 Idlewild Road
Kernersville, NC 27284

August 16, 2010

Subject: North Carolina Ecosystem Enhancement Program (NCEEP) Stream Mitigation Project on Silver Creek and Tributaries, Burke County, NC.

Dear Mr. Linville,

The North Carolina Ecosystem Enhancement Program (EEP) requests review and comment on any possible issues that might emerge with respect to fish and wildlife resources in the vicinity of a potential stream and wetland restoration project in the headwaters of the Silver Creek watershed, a drainage of the Catawba River. The potential stream restoration project area is identified on the attached maps which consist of a vicinity map, a U.S. Geological Survey site map and a restoration plan figure with areas of potential ground disturbance identified.

The Silver Creek site has been identified for the purpose of providing in-kind mitigation for unavoidable stream and wetland impacts. The project may involve restoration or enhancement of a section of Silver Creek, and sections of three unnamed tributaries (UTs) that have been identified as being significantly degraded. Project goals include the restoration or enhancement of 4,230 linear feet of stream and approximately 7.68 acres of wetlands for the purpose of obtaining stream mitigation credit in the Catawba River Basin.

Buried hydric soils have been located on-site in the vicinity of the existing wetlands and were likely buried by both alluvial and colluvial processes as well as the filling of some areas to increase agricultural production. To determine the extent of wetland restoration work required, further analysis of the site is proposed. The location where stream and wetland restoration measures will be implemented is provided in Figure 3b.

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

Sincerely,
Carmen Horne-McIntyre
Carmen Horne-McIntyre
Michael Baker Engineering, Inc.
797 Haywood Rd., Suite 201
Asheville, NC 28806
Phone: 828.350.1408, Email: cmcintyre@mbakercorp.com

North Carolina Wildlife Resources Commission
Gordon Myers, Executive Director

August 30, 2010

Ms. Carmen Horne-McIntyre
Michael Baker Engineering, Inc.
797 Haywood Road, Suite 201
Asheville, North Carolina 28806

RE: EEP Stream & Wetland Mitigation Project, Silver Creek, Burke County

Dear Ms. Horne-McIntyre:

This correspondence is in response to your undated letter (received by this office on August 30, 2010) requesting wildlife site determinations. Biologists with the North Carolina Wildlife Resources Commission (NCWRC) are familiar with habitat values in the area. The NCWRC is authorized to comment and make recommendations which relate to the impacts of this project on fish and wildlife pursuant to pursuant to the Clean Water Act of 1977, North Carolina Environmental Policy Act, US National Environmental Policy Act, Endangered Species Act (16 U. S. C. 1531-1543; 87 Stat 884), and Fish and Wildlife Coordination Act (48 Stat. 401, as amended.

The proposed project is to restore about 4,230 linear feet of stream and potentially restore about 7.68 acres of wetlands. No listed species are indicated for the site and no trout are present.

Based on our review of your letter and the maps provided, we find no reason to object to the restoration and enhancement project providing Clean Water Act permits and certifications are obtained prior to beginning any restoration work and providing that native plants are used for the project.

Thank you for the opportunity to comment on this project during its early planning stages. If you have any questions regarding these comments, please contact me at 336-769-9453.

Sincerely,

Ron Linville
Regional Coordinator
Habitat Conservation Program

Mailing Address: Division of Inland Fisheries • 1721 Mail Service Center • Raleigh, NC 27699-1721
Telephone: (919) 707-0220 • **Fax:** (919) 707-0028

Baker

Michael Baker Engineering, Inc.
797 Haywood Road
Suite 201
Asheville, North Carolina 28806

828-350-1408
FAX 828-350-1409

U. S. Fish and Wildlife Service
Attn: Ms. Marella Buncick
Asheville Field Office
Asheville, NC 28801

August 13, 2010

Subject: North Carolina Ecosystem Enhancement Program (NCEEP) Stream and Wetland Mitigation Project on Silver Creek and Tributaries, Burke County, NC.

Dear Ms. Buncick,

The North Carolina Ecosystem Enhancement Program (EEP) requests review and comment on the presence of federally listed species, their habitat, and any other issues that might emerge with respect to a potential stream restoration project area identified on the maps attached (a vicinity map, a USGS site map, and a restoration plan figure with areas of potential ground disturbance are enclosed).

The Silver Creek site has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel and wetland impacts in the Catawba River Basin. The project may involve restoration or enhancement of approximately 4,230 linear feet of Silver Creek and sections of three unnamed tributaries (UTs) that have been identified as being significantly degraded. Approximately 7.68 acres of wetlands will also be enhanced or restored.

We have already obtained an updated species list for Burke County from your web site (http://www.fws.gov/nc-es/es/countyfr.html). The threatened, endangered or otherwise federally protected species for this county are: Bald Eagle (*Haliaeetus leucocephalus*), Bog Turtle (*Clemmys muhlenbergii*), Dwarf-flowered heartleaf (*Hexastylis naniflora*), Heller's blazing star (*Liatris helleri*), Mountain golden heather (*Hudsonia montana*), Spreading avens (*Geum radiatum*), White irisette (*Sisyrinchium dichotomum*), and the Small whorled pogonia (*Isotria medeoloides*). The USFWS has also designated a portion of Burke County as critical habitat for Mountain golden heather, although no known designation exists within or adjacent to the project area.

Please provide any known information for each species in the county and comments on any possible issues that might emerge with respect to endangered species, migratory birds or other trust resources from the construction of a stream and wetland restoration project on the subject property. The USFWS will be contacted immediately if the agency determines that suitable habitat for a federally listed species exists within the project area or if the agency has records indicating the presence of a federally listed species on-site.

If we have not heard from you in 30 days, we will assume that our species list is correct, that you do not have any comments regarding associated laws, and that you do not have any information relevant to this project at the current time.

Please feel free to contact us with any questions that you may have concerning the extent of site disturbance associated with this project. I can be reached at 828.350.1408 ext. 2010 or by email at cmcintyre@mbakercorp.com . We thank you in advance for your timely response and cooperation.

Sincerely,

Carmen Horne-McIntyre

Carmen Horne-McIntyre
Michael Baker Engineering, Inc.
797 Haywood Rd., Suite 201
Asheville, NC 28806
Phone: 828.350.1408, Email: cmcintyre@mbakercorp.com

From: Marella_Buncick@fws.gov
Sent: Tuesday, November 09, 2010 10:43 AM
To: McIntyre, Carmen
Cc: Donnie.Brew@fhwa.dot.gov
Subject: Re: NCEEP Upper Silver Creek Stream and Wetland Mitigation Project (Burke Co)-Request for Comment

Carmen,

Without knowing what you all have done or not done regarding assessing habitat or surveying for endangered species or assessing impacts to migratory birds, I don't have any comments at this time.
If you have questions, please let me know.

marella

Marella Buncick
USFWS
160 Zillicoa St.
Asheville, NC 28801
828-258-3939 ext 237

Hope is the thing with feathers that perches in the soul and sings the tune, without the words, and never stops at all.
Dickinson

"McIntyre, Carmen"
<Cmcintyre@mbakercorp.com>
11/08/2010 09:20 AM
To "Marella_Buncick@fws.gov" <Marella_Buncick@fws.gov>

Subject
NCEEP Upper Silver Creek Stream and Wetland Mitigation Project
(Burke Co)-Request for Comment

Hi Marella,
Michael Baker Engineering, Inc. is in the process of submitting a categorical exclusion (CE) form to the NCEEP and FHWA for a stream and wetland mitigation project located on Silver Creek and sections of three unnamed tributaries to Silver Creek near the intersection of Hwy 64 and Gold Mine Road in Burke County. However, before we submitted the form, I wanted to confirm whether the USFWS has any comment on potential issues with regards to endangered species, migratory birds or other trust resources. Please find enclosed a copy of the letters originally submitted to the USFWS and NCWRC as well as several figures that provide information about the site and areas that may be affected by restoration and enhancement measures proposed. If you have any questions about the project or need additional information, please let me know at your earliest convenience. Assuming the USFWS has no concerns regarding this project, we would like to mail out the CE at the end of this week or early next week at the latest. Thank you in advance for your consideration of this request!

Sincerely,
Carmen Horne-McIntyre

Carmen Horne-McIntyre
Environmental Scientist
Michael Baker Engineering, Inc.
797 Haywood Road, Suite 201
Asheville, North Carolina 28806
Phone: 828.350.1408 (ext. 2010)
Fax: 828.350.1409

Baker

Michael Baker Engineering, Inc.
797 Haywood Road
Suite 201
Asheville, North Carolina 28806

828-350-1408
FAX 828-350-1409

Mr. M. Kent Clary
USDA-NRCS Area Resource Soil Scientist
589 Raccoon Road, Suite 246
Waynesville, NC 28786

August 16, 2010

Subject: Prime and Important Farmland Soils RE: Upper Silver Creek Stream and Wetland Mitigation Project a NCEEP Full-Delivery Project in Burke County, NC.

Dear Mr. Clary,

The North Carolina Ecosystem Enhancement Program (NCEEP) requests your review and assistance in completing a Farmland Conversion Impact Rating form for the subject site. Enclosed please find a copy of the AD-1006 form, and site and location mapping for the project (Figures 1-2). The Upper Silver Creek Stream and Wetland Mitigation site has been identified for the purpose of providing in-kind mitigation for unavoidable stream and wetland impacts in the Catawba River Basin. The project may involve restoration or enhancement of approximately 4,230 linear feet of Silver Creek and sections of three unnamed tributaries (UTs) that have been identified as being significantly degraded. Approximately 7.68 acres of wetlands will also be enhanced or restored.

Buried hydric soils have been located on-site in the vicinity of the existing wetlands and were likely buried by both alluvial and colluvial processes as well as the filling of some areas to increase agricultural production. To determine the extent of wetland restoration work required, further analysis of the site is proposed. The location where wetland restoration may occur is provided in Figure 3b.

The project area is located in a large field and includes some woodland fringe. Mapped soils within the upland portion of the project area include the Ark aqua loams, Unison fine sandy loam and fill or depositional soils mapped as a Fluvaquents-Udifluvents complex. Soils mapped within the floodplain portion of the project area are predominantly Fluvaquents-Udifluvents although the Ark aqua loam series is located in isolated floodplains areas within the easement. The Ark aqua loams within the project appear to be somewhat poorly drained and only temporarily flooded during high flow events. Whereas the depth to the water table where Ark aqua loams are present is approximately 24 to 72 inches, water is at the ground surface in some wetland areas where the soils are mapped as the Fluvaquents-Udifluvents complex. Unison fine sandy loams are present near the easement boundary on the eastern side of the project area near the woodline. This soil complex is well drained, does not typically flood and has a seasonal high water table depth greater than 72 inches. Soils data presented in this letter were assembled from information provided in the Natural Resources Conservation Service Soil Survey of Burke County, North Carolina accessed at the following URL Internet address: http://soildatamart.nrcs.usda.gov/Manuscripts/NC023/0/Burke.pdf

Based on our review, the Unison fine sandy loam is considered a Prime Farmland Soil while the Ark aqua loam series can be considered Prime Farmland soil depending on site conditions. No additional prime and important farmland designations were noted for soils within the project easement boundaries. The total acreage of Prime and Important Farmland that would be directly converted under this project is approximately 5.6 acres.

We ask that you review this site based on the attached information to determine if there are any other existing resources that we should be aware of. We know that you have greater familiarity with farmland issues in this area than we do, and we will be happy to make any changes to the form that you deem appropriate. Please return the form to us with your determinations and we will complete the remainder of the form if needed. In addition, please let us know the level of involvement you may require (if needed), as it is anticipated this project will be implemented in the Fall of 2011. If we have not received a response from you within 30 days, we will assume that you have no comment regarding the project. This letter is intended to satisfy any requirements of the Farmland Protection Policy Act.

If you have any questions, please feel free to contact me at cmcintyre@mbakercorp.com or by phone at 828.350.1408 ext. 2010. Our fax number is 828.350.1409.
Thank-you for your assistance in this matter.

Sincerely,

Carmen Horne-McIntyre

Carmen Horne-McIntyre
Environmental Scientist
Michael Baker Engineering, Inc.
797 Haywood Rd., Suite 201
Asheville, NC 28806

Carmen,

You don't have to send a copy of the completed forms to me, but thanks for the courtesy of doing it. Have a good day.
Kent

M. Kent Clary
Area Resource Soil Scientist
USDA-NRCS
589 Raccoon Road Suite 246
Waynesville, NC 28786
828.456.6341 ext. 105
FAX: 828.452.7031

From: McIntyre, Carmen [mailto:Cmcintyre@mbakercorp.com]
Sent: Wednesday, September 15, 2010 10:49 AM
To: Clary, Kent - Waynesville, NC
Subject: RE: Burke AD-1006

Hi Kent,
Here's the completed Farmland Conversion Impact Rating for the NCEEP's Upper Silver Creek Stream and Wetland Mitigation Project (Burke County). Thanks for completing the agency sections of the form so quickly.
If you'd like a hard copy as well, just let me know and I'll get one in the mail to you.
Thanks!
Carmen

Carmen Horne-McIntyre
Environmental Scientist
Michael Baker Engineering, Inc.
797 Haywood Road, Suite 201
Asheville, North Carolina 28806
Phone: 828.350.1408 (ext. 2010)
Fax: 828.350.1409
P Please consider the environment before printing this e-mail

From: Clary, Kent - Waynesville, NC [mailto:Kent.Clary@nc.usda.gov]
Sent: Friday, August 20, 2010 3:26 PM
To: McIntyre, Carmen
Subject: Burke AD-1006

Carmen,

See attached. Let me know if you have questions.
M. Kent Clary
Area Resource Soil Scientist
USDA-NRCS
589 Raccoon Road Suite 246
Waynesville, NC 28786
828.456.6341 ext. 105
FAX: 828.452.7031

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*

Date Of Land Evaluation Request 8/12/10

Name Of Project Upper Silver Creek Stream and Wetland Project

Federal Agency Involved FHWA

Proposed Land Use Stream, Wetland and Riparian Restoration

County And State Burke, NC

PART II *(To be completed by NRCS)*

Date Request Received By NRCS 8/13/10

Does the site contain prime, unique, statewide or local important farmland? Yes ☑ No ☐
(If no, the FPPA does not apply -- do not complete additional parts of this form).

Acres Irrigated -

Average Farm Size 60 Acres

Major Crop(s) Hay, Corn

Farmable Land In Govt. Jurisdiction Acres: 175,304 % 53

Amount Of Farmland As Defined in FPPA Acres: 124,713 % 38

Name Of Land Evaluation System Used Burke Cales

Name Of Local Site Assessment System

Date Land Evaluation Returned By NRCS 8/20/10

	Maximum Points	Alternative Site Rating			
		Site A	Site B	Site C	Site D
PART III *(To be completed by Federal Agency)*					
A. Total Acres To Be Converted Directly		24.0			
B. Total Acres To Be Converted Indirectly					
C. Total Acres In Site		24.0	0.0	0.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information					
A. Total Acres Prime And Unique Farmland		5.6			
B. Total Acres Statewide And Local Important Farmland		0.0			
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted		0.0 (<.01)			
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value		50.0			
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*		20	0	0	0
PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use		15			
2. Perimeter In Nonurban Use		10			
3. Percent Of Site Being Farmed		10			
4. Protection Provided By State And Local Government		20			
5. Distance From Urban Builtup Area		15			
6. Distance To Urban Support Services		10			
7. Size Of Present Farm Unit Compared To Average		10			
8. Creation Of Nonfarmable Farmland		0			
9. Availability Of Farm Support Services		5			
10. On-Farm Investments		5			
11. Effects Of Conversion On Farm Support Services		0			
12. Compatibility With Existing Agricultural Use		0			
TOTAL SITE ASSESSMENT POINTS	160	100	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	20	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	100	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	120	0	0	0

Site Selected:

Date Of Selection

Was A Local Site Assessment Used? Yes ☐ No ■

Reason For Selection:

Full delivery contract with NC-Ecosystem Enhancement Program to improve watershed health and obtain mitigation credits within the Catawba River Basin.

(See instructions on reverse side)

This form was electronically produced by National Production Services Staff

Form AD-1006 (10-83)

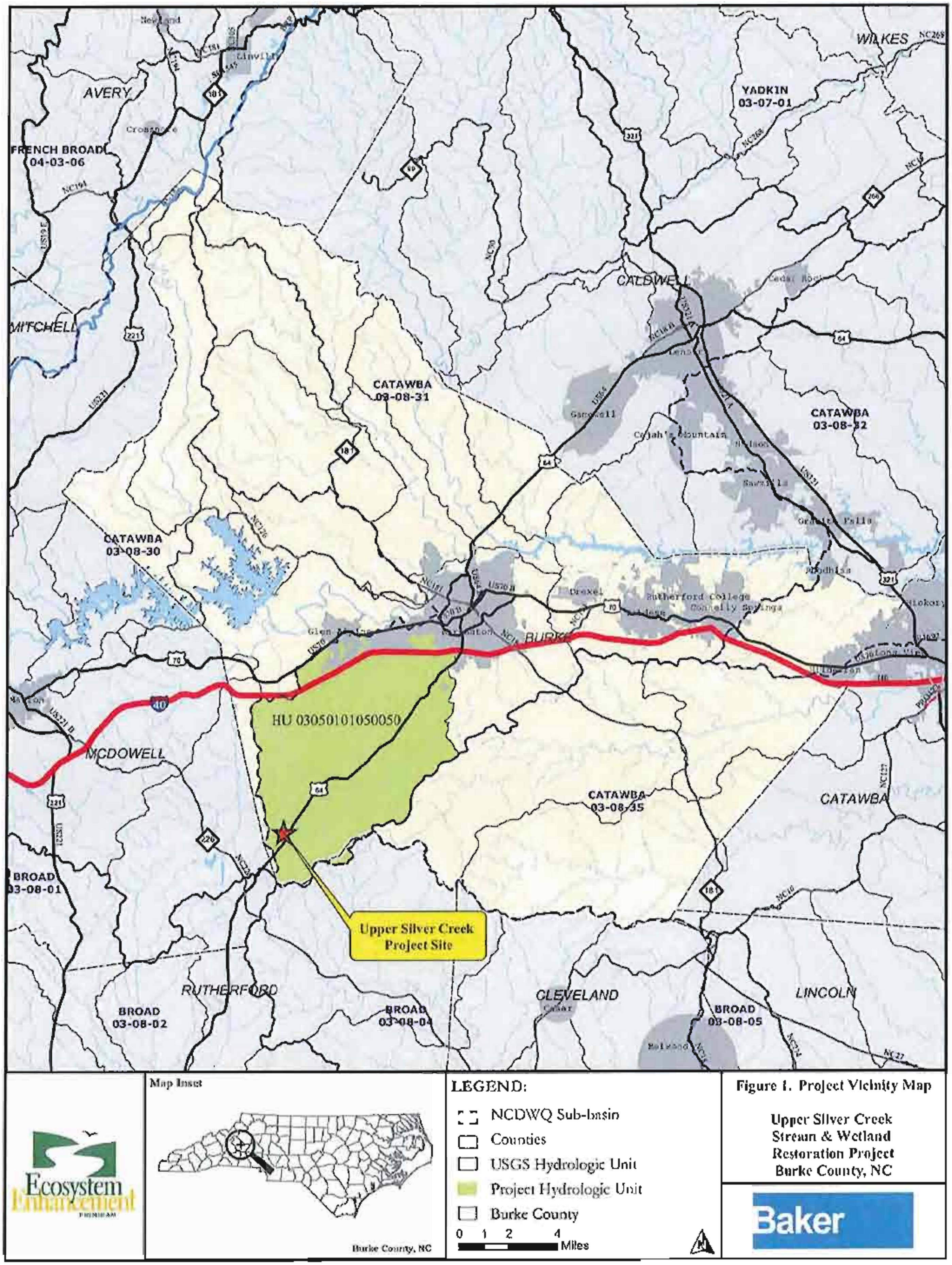
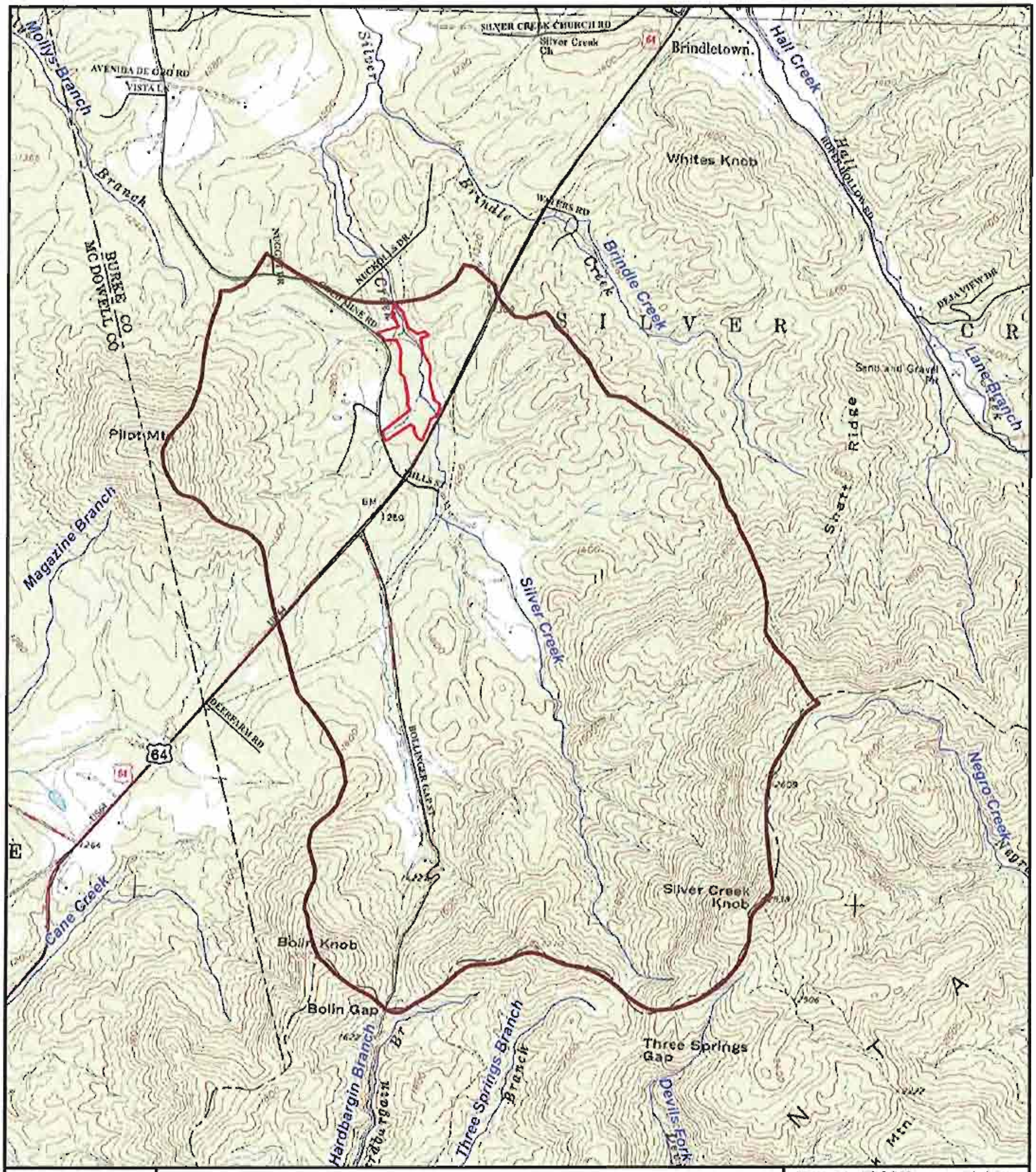


Figure 1. Project Vicinity Map

Upper Silver Creek
Stream & Wetland
Restoration Project
Burke County, NC



LEGEND:

🟥 Proposed Easement Boundary

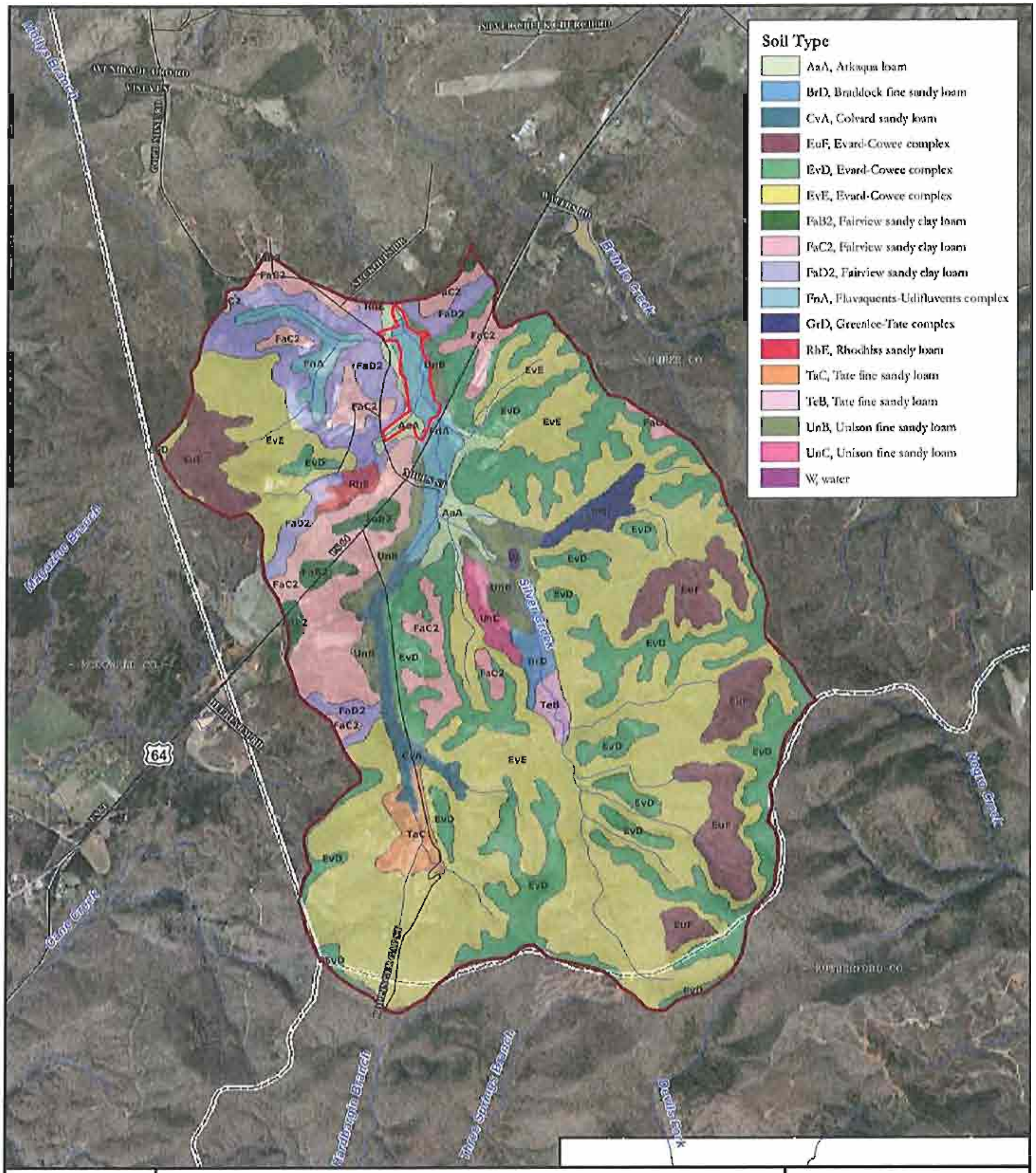
🟫 Watershed Boundary

—— Streams

0 600 1,000 2,000
Feet

Figure 2. USGS Topographic Map
(Dysartsville Quadrangle)

Upper Silver Creek
Stream & Wetland
Restoration Project
Burke County, NC



LEGEND:

Proposed Easement Boundary

Streams

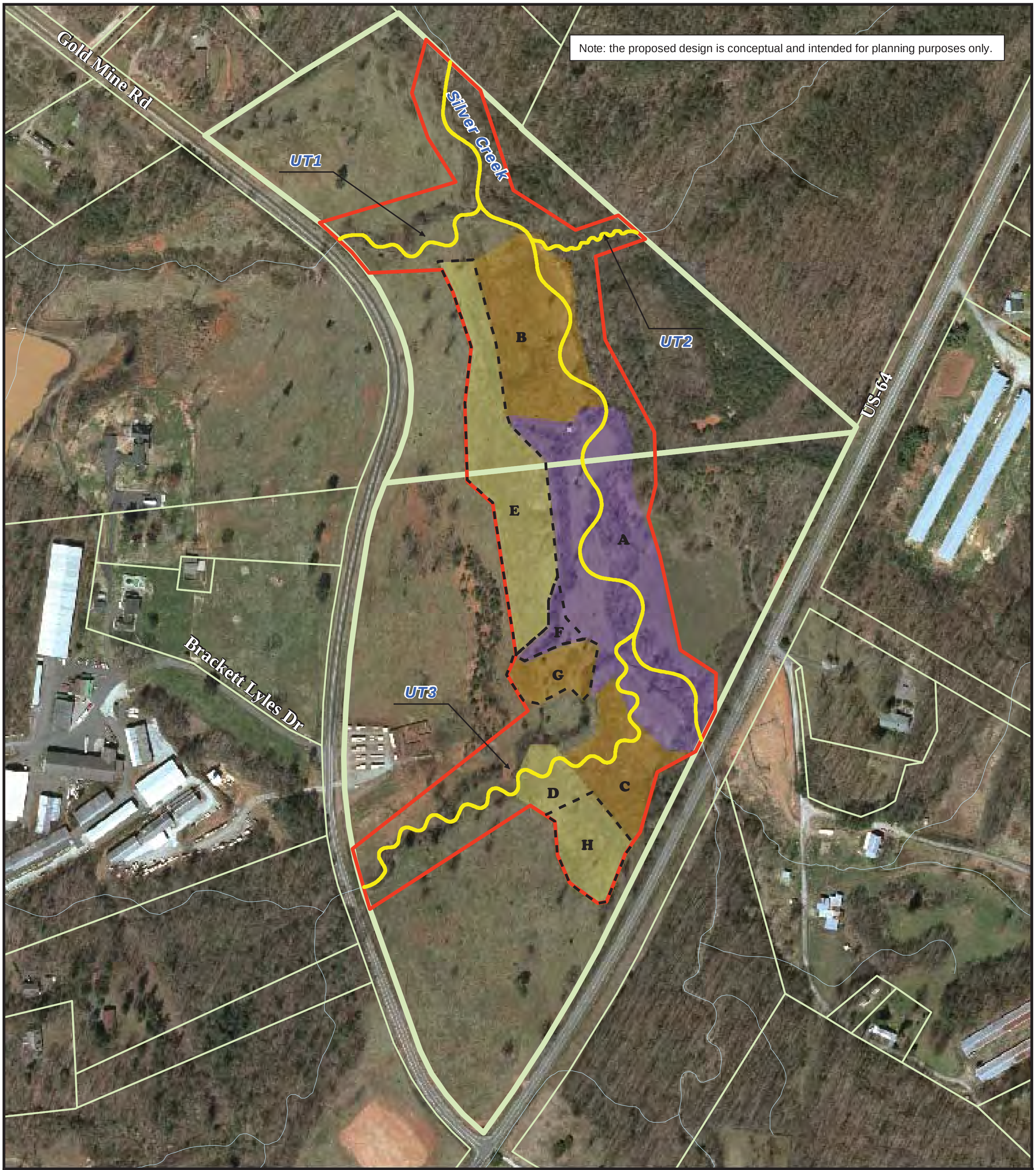
Watershed Boundary

Counties

0 500 1,000 2,000 Feet

Figure 2.1 Project Soil Types

Upper Silver Creek
Stream & Wetland
Restoration Project
Burke County, NC



LEGEND:

Proposed Stream Restoration

Proposed Wetland Components

- Creation
- Enhancement
- Restoration

Non-Riparian Wetlands

Proposed Easement Boundary

Streams

Project Parcel

Parcels

0 100 200 400
Feet

N

Figure 3b. Proposed Restoration Plan

Upper Silver Creek
Stream & Wetland
Restoration Project
Burke County, NC

Ecosystem Enhancement Program

Baker

15.5 Hydrologic Trespass and Floodplain Characterization

15.5.1 HEC-RAS Analysis

15.5.1.1 Preliminary Modeling and Hydrologic Trespass

The topography of the site supports the design without creating the potential for hydrologic trespass. The site is a FEMA mapped area. A Hydraulic Analysis has been conducted resulting in a “No-Rise/No-Impact” certification. The project will require a Letter of Map Revision (LOMR) following construction in order to document changes (reductions) to Base Flood Elevations (BFEs). The NCEEP Floodplain Checklist was provided to the Burke County Floodplain Manager along with the Hydraulic Analysis report. The County agrees with the submitted analysis. All reductions to BFEs are contained within the project area.

15.5.2 NCEEP Floodplain Checklist

EEP Floodplain Requirements Checklist

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

Project Location

Name of project:	Silver Creek (Brackett Site) EEP Project Number #003270
Name if stream or feature:	Silver Creek
County:	Burke
Name of river basin:	Catawba
Is project urban or rural?	Rural
Name of Jurisdictional municipality/county:	Burke County
DFIRM panel number for entire site:	1668
Consultant name:	Michael Baker Engineering, Inc.
Phone number:	828-350-1408 x2007
Address:	797 Haywood Road, Suite 201

Design Information

Provide a general description of project (one paragraph). Include project limits on a reference orthophotograph at a scale of 1" = 500'.

At this project site, the only regulated stream is the mainstem of Silver Creek. It has non-encroachment areas and the Limited Detailed study extends upstream and downstream of the project area. The project starts just downstream of Hwy 64. Reach 1 starts here and extends approximately 850 feet downstream. Restoration of this reach will consist of constructing a new channel and a new floodplain at a lower elevation. This reach will gradually transition into the Priority 1 Reach 2 which will be restored by connecting a newly constructed channel to the existing floodplain. At the end of Reach 2, the channel will tie back in to existing grade. The project involves two landowners; they are father and son. The modeled flood impacts of the proposed project (decreases in BFE) are limited to the landowners' property. As a result of the corrected effective model, there will be modifications to the non-encroachment area when the Letter of Map Revision is prepared after project construction.

Summarize stream reaches or wetland areas according to their restoration priority.

Reach	Length	Priority
Silver Creek Reach 1[1]	*850*	*Two(Restoration)*
Silver Creek Reach 2	*2150*	*One (Restoration)*

[1] **Only Mainstem components listed; tributaries do not have regulated floodplains.**

Floodplain Information

Is project located in a Special Flood Hazard Area (SFHA)?

☒ Yes ☐ No

If project is located in a SFHA, check how it was determined:

☐ Redelineation

☐ Detailed Study

☒ Limited Detail Study

☐ Approximate Study

☐ Don't know

List flood zone designation:

Check if applies:

☐ AE Zone

- ☐ Floodway
- ☒ Non-Encroachment
- ☐ None

☐ A Zone

- ☐ Local Setbacks Required
- ☐ No Local Setbacks Required

If local setbacks are required, list how many feet:

Does proposed channel boundary encroach outside floodway/non-encroachment/setbacks?

☐ Yes ☒ No

Base on corrected non-encroachment area revised as part of corrected/existing effective – see report for details.

Land Acquisition (Check)

☐ State owned (fee simple)

☐ Conservation easment (Design Bid Build)

☒ Conservation Easement (Full Delivery Project)

Note: if the project property is state-owned, then all requirements should be addressed to the Department of Administration, State Construction Office (attn: Herbert Neily, (919) 807-4101)

Is community/county participating in the NFIP program?

☒ Yes ☐ No

Note: if community is not participating, then all requirements should be addressed to NFIP (attn: Edward Curtis, (919) 715-8000 x369)

Name of Local Floodplain Administrator: Steve Holden, sholden@co.burke.nc.us
Phone Number: 828-438-5419, 828-438-5420

Floodplain Requirements

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

☐ No Action

☒ No Rise

☐ Letter of Map Revision

☐ Conditional Letter of Map Revision

☐ Other Requirements

OK Steve Holden 4-12-12

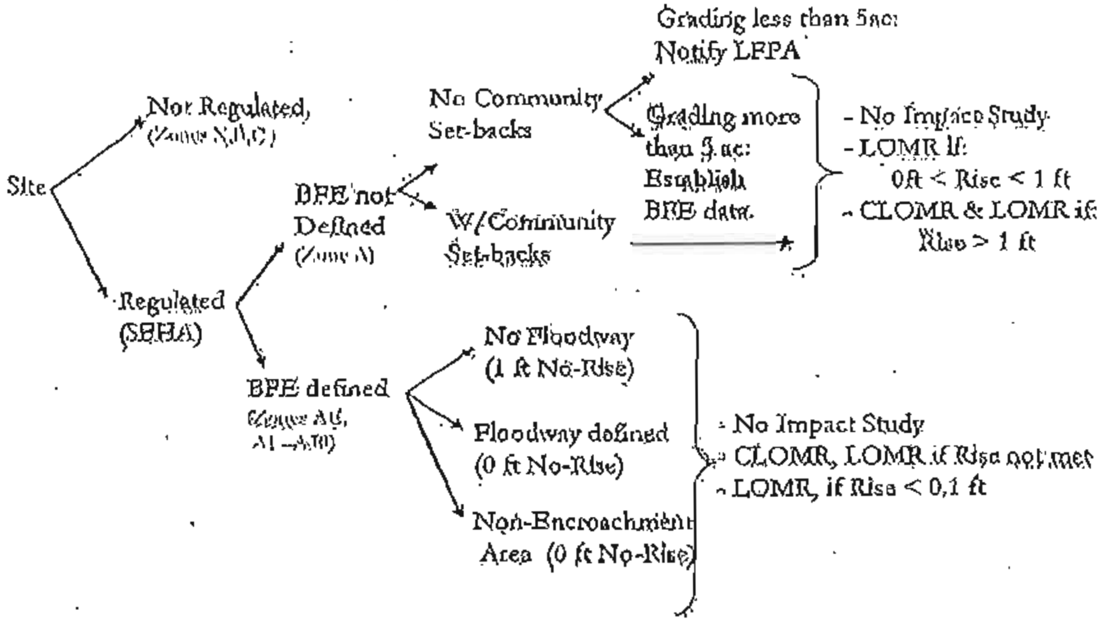
List other requirements:
Post-project Letter of Map Revision to document decreases in BFE. Will also document the changes to the non-encroachment area revised as part of the corrected/existing effective model.

Comments:
Base Flood Elevations are not changed outside of the property limits.

Name: Jacob P. McLean Signature: Jacob P McLean

Title: PE, CFM Date: 12-9-2011

Criteria for Flooding Requirements



Summary of Scenarios					
Zone (map)	SFHA	BFE	Floodway Or Non-Encroachment	Comm. Set-back	Floodplain Criteria
X,B,C	No	No	No	No	a. Notify Floodplain Administration b. FP Dev. Permit maybe required
A	Yes	No	No	No	a. If grading < 5 ac, notify LFPA.
A	Yes	No	No	Yes	a. If No-Rise = 0 ft, LOMR not required b. If Rise > 0 ft, LOMR is Required c. If Rise ≥ 1 ft, CLOMR is required
AE, A1-A30	Yes	Yes	No	n/a	a. No-Rise Study b. CLOMR if ≥ 1ft c. LOMR
AEFW A1-A30	Yes	Yes	Yes	n/a	a. No-Rise Study b. CLOMR if ≥ 0 ft c. LOMR

"NO-RISE / NO-IMPACT" CERTIFICATION

This document is to certify that I am duly qualified engineer licensed to practice in the State of North Carolina (State). It is to further certify that the attached technical data supports the fact that proposed Upper Silver Creek Stream and Wetland Restoration Project ~ Option C (Name of Development) will not impact the base flood Elevations on Silver Creek (Name of Stream) at published cross sections in the Flood Insurance Study for Burke County (Name of community), dated 9/5/2007 (Date) and will not impact the base flood elevations at the unpublished cross-sections in the area of the proposed development.

12-9-11

JACOB McLEAN

SEAL, SIGNATURE AND DATE

Jacob P. McLean
Name

P.E., CFM
Title

797 Haywood Rd. Suite 201
Asheville, NC 28806
Address

FOR COMMUNITY USE ONLY:

Community Approval

☒ Approved ☐ Disapproved

Steve Holden
Community Official's Name

Community Official's Signature

Bldg Inspector
Title

4-12-12

FEMA, MT

16.0 APPENDIX C - MITIGATION WORK PLAN DATA AND ANALYSES

16.1 Channel Morphology (Rosgen Analysis)

16.1.1 Existing Conditions

16.1.1.1 Existing Conditions Survey

The project area was flown by the NC Floodplain Mapping Program (FMP) during 2003 to obtain a 1-foot accuracy aerial topographic survey using LIDAR technology. Detailed channel morphology was surveyed with a total station by Baker under the direction of Will Kent, PLS. Along with providing detailed topography, this survey included four detailed transect cross-sections (and multiple others from field survey data cut from the CAD surface model for FEMA modeling) on Silver Creek, six cross-sections on UT1, two cross-sections on UT2, and four cross-sections on UT3. Longitudinal profiles were also conducted for all reaches. Baker also collected substrate samples to characterize stream sediments. These data and other existing conditions for the designated project reaches are described below in Tables 16.1 through 16.3, summarizing the representative geomorphic conditions currently present at the Silver Creek mitigation site. The table also provides regional curve data for comparison based on the drainage area of each reach. A discussion of the assessment conducted to determine channel stability and channel-forming discharge for project streams is included in Section 16.2. Photo logs depicting the existing conditions at the Silver Creek project site are provided, by reach in Section 2.7.

Baker assessed the stream and valley types present and considered their evolutionary stage and likely endpoint in order to develop a basis for the proposed restoration efforts. The project contains both colluvial and alluvial valleys with gently to moderately-sloping streams present. The depth of gravel deposits discovered in soil pits, as well as morphologic soil indicators observed in the bank support the conclusion that channel incision and/or floodplain aggradation has resulted in an incised stream condition. Based on our knowledge that mining in the stream and floodplain was very widespread, we believe that floodplain accretion during and after mining activities could be a factor that still affects the stream position in the landscape. Many of the stream in the immediate project area have also been altered by past activities, including aerial photographic evidence of straightening, bridge crossings, buffer removal among other likely impacts such as mining which are evidence by current conditions, such as the presence of spoil piles and abandoned roadbeds on the floodplain.

16.1.1.2 Channel Classification

Of the project streams, Silver Creek, UT2 and UT3 are broken out into reaches (each stream is comprised of two reaches based on the design approach presented in this plan). All of the streams on the site are degraded due to past channelization, agricultural uses, and historical gold mining in the streams and on the floodplains. Most stream segments contain gravel substrate; however, bank erosion in many areas is also contributing significant amounts of sand and fines into the systems. A combination of Priority I and Priority II Restoration, and Level II Enhancement approaches is proposed for each stream in the project area. Several considerations were addressed in determining the most appropriate design approach including, but not limited to avoidance of hydraulic trespass, enhancement of adjacent wetland areas, the degree to which pattern adjustments would require off-line channel creation, and the elevation the project streams would need to be at to tie in with receiving waters while maintaining adequate measures to protect aquatic passage.

Table 16.1 Representative Existing Conditions Geomorphic Data for Silver Creek

Stream Channel Classification Level II
Upper Silver Creek Mitigation Plan-EEP Project#94645

Parameter	Silver Creek						
	Reach 2						Reach 1
	XS7	XS1	XS2	XS6	XS3	XS4	XS5
Existing Reach Length	2,643						
Drainage Area (Sq.mi.)	2.7-3.3 (Values below shown are for average 3.0)						
NC Mtn. & Pied. Regional Curve (W_{bkf}) (ft)	29.6 (Mtn.) & 19.1 (Pied.)						
NC Mtn. & Pied. Regional Curve (D_{bkf}) (ft)	1.5 (Mtn.) & 2.1 (Pied.)						
NC Mtn. & Pied. Regional Curve (A_{bkf}) (sq ft)	46.1 (Mtn.) & 45.2 (Pied.)						
Bankfull Discharge, Q_{bkf} (cfs)[1]	347 (Mtn.) & 177 (Pied.) USGS 2-YR[5]=(ROI) 286, (RRE) 292						
Feature Type	Riffle	Riffle	Pool[2]	Pool[2]	Riffle	Riffle	Pool[2]
Rosgen Stream Type	E[3]	E[3]	-	-	E	E	-
Bankfull Width (W_{bkf}) (ft)	19.8	18.9	19.4	20.2	21.2	18.5	23
Bankfull Mean Depth, (d_{bkf}) (ft)	2.0	2.9	2.4	2.3	2.5	2.5	2.7
Width to Depth Ratio (W_{bkf}/d_{bkf})	10.1	6.4	8	8.8	8.3	7.4	8.6
Cross-Sectional Area, A_{bkf} (sq ft)	38.8[6]	55.2	47.4	46.2	53.7	46.3	61.2
Bankfull Max Depth (d_{mbkf}) (ft)	2.9	3.9	4.0	3.9	3.6	3.3	4.1
Floodprone Width (W_{fpa}) (ft)	160	453	453	397	456	443	426
Entrenchment Ratio ((W_{fpa}/W_{bkf})) (ft)	8.1	24	23.3	19.6	21.5	23.9	18.5
Bank Height Ratio	1.9	1.5	1.3	1.5	1.3	1.1	1.6
Longitudinal Sta. of Cross Section Along Existing Thalweg (ft)	~2,400-2,500	1,791	1,745	~1,600-1,700	1,320	1,154	~200
Bankfull Mean Velocity, V_{bkf}= (Q_{bkf}/A_{bkf}) (ft/s)	3-4	4.2	4.9	5	4.3	5	3.8
Channel Materials (Particle Size Index – d50) – Based on Pebble Count Sample[4]							
d_{16} / d_{35} / d_{50} / d_{84} / d_{95} (mm)	1.0 / 8.4 / 17.4 / 42.9 / 57.4						
Valley Slope	0.006						
Water Surface Slope (S)	0.004						
Channel Sinuosity (K)	1.4						

[1] Bankfull discharge calculated using HEC-RAS by best-fitting flow to physical indicators of bankfull (comparable to using average of Manning's equation for multiple cross sections).

[2] Pool cross section, bankfull characteristics are for pool comparison and pool habitat and design assessment only.

[3] High bank height ratios should be noted. Values in excess of 1.5 have little chance for self-recovery. Even for bank height ratios of 1.1-1.5, access to an active floodplain during flooding events is reduced. The major restoration drivers for this project are severe erosion due to on-going channel plan form adjustments, poor floodplain access, and the goal of restoring wetland functions.

[4] Bulk and subpavement samples also taken and used in sediment transport analyses.

[5] ROI=region of influence method, RRE=regional regression equation method.

[6] Field indicators of bankfull stage at XS7 were less reliable than other measured cross-sections, due to instability of the channel at the cross-section location.

Table 16.2 Representative Existing Conditions Geomorphic Data for UT1 and UT2 to Silver Creek

Stream Channel Classification Level II
Upper Silver Creek Mitigation Plan-EEP Project#94645

Parameter	UT1						UT2 (Reaches 1&2)	
	XS 1	XS2	XS3	XS4	XS5	XS6	XS1	XS2
Existing Reach Length	478						187	
Drainage Area (sq.mi.)	0.28						0.05	
NC Mtn. & Pied. Regional Curve (W_{bkf}) (ft)	12.6 (Mtn.) & 6.9 (Pied.)						6.0	
NC Mtn. & Pied. Regional Curve (D_{bkf}) (ft)	0.7 (Mtn.) & 1.0 (Pied.)						0.4	
NC Mtn. & Pied. Regional Curve (A_{bkf}) (sq ft)	9.4 (Mtn.) & 9.0 (Pied.)						2.6	
Bankfull Discharge, Q_{bkf} (cfs) [1]	62 (Mtn.) & 21 (Pied.) USGS 2-YR[6]=(ROI) 44, (RRE) 58						18 (Mtn.) & 5 (Pied.), USGS 2-YR[6]=(ROI) 7, (RRE) 14	
Feature Type	Riffle	Pool[2]	Riffle	Riffle	Riffle	Pool[2]	Riffle	Riffle
Rosgen Stream Type	E[3]	-	Gc	Gc	Bc	-	B[5]	B[5]
Bankfull Width (W_{bkf}) (ft)	6.0	6.9	9.3	7.3	6.1	8.8	3.1	3.4
Bankfull Mean Depth, (d_{bkf}) (ft)	1.5	1.5	0.97	1.27	1.48	1.04	0.9	0.84
Width to Depth Ratio (W_{bkf}/d_{bkf})	4.0	4.6	9.6	5.7	4.1	8.5	3.5	4.0
Cross-Sectional Area, A_{bkf} (sq ft)	9.1	10.3	9.1	9.3	9.0	9.2	2.8	2.9
Bankfull Max Depth (d_{mbkf}) (ft)	2.07	2.38	1.37	1.71	1.91	2.04	1.08	1.36
Floodprone Width (W_{fpa}) (ft)	60.5	88.7	10.9	9.8	10.9	19.6	5.1	6.5
Entrenchment Ratio ((W_{fpa}/W_{bkf})) (ft)	10.0	12.9	1.2	1.3	1.8	2.2	1.6	1.9
Bank Height Ratio	1.5	1.9	3.0	1.9	2.4	2.7	2.2	2.4
Longitudinal Sta. of Cross Section Along Existing Thalweg (ft)	54	165	307	200	467	492	70	135
Bankfull Mean Velocity, $V_{bkf}= (Q_{bkf}/A_{bkf})$ (ft/s)	4	3.7	4.2	4.1	4.2	4.2	3.4	3.3
Channel Materials (Particle Size Index – d50) – Average of 2 Pebble Count Samples for UT1[4], 1 PC Sample UT2[4]								
d_{16} / d_{35} / d_{50} / d_{84} / d_{95} (mm)	4.0 / 12.3 / 18.0 / 49.1 / 85.0						5.6 / 13.1 / 17.8 / 43.5 / 60.4	
Valley Slope	0.011						0.035	
Water Surface Slope (S)	0.016						0.037	
Channel Sinuosity (K)	1.41						1.06	

[1] Bankfull discharge calculated using HEC-RAS by best-fitting flow to physical indicators of bankfull (comparable to using average of Manning's equation for multiple cross sections).
[2] Pool cross section, bankfull characteristics are for pool comparison and pool habitat and design assessment only.
[3] High bank height ratios should be noted, values in excess of 1.5 have little or no chance for self-recovery, modeling has shown that floodplain access is limited to 5-25 year return interval or greater (or 4-20% chance of floodplain activation in a given year); a major restoration driver is severe erosion due to channel plan form coupled with poor floodplain access.
[4] Bulk and subpavement samples also taken and used in sediment transport analyses.
[5] Both reaches of UT2 have been channelized.
[6] ROI=region of influence method, RRE=regional regression equation method.

Table 16.3 Representative Existing Conditions Geomorphic Data for UT3 to Silver Creek

Stream Channel Classification Level II

Upper Silver Creek Mitigation Plan-EEP Project#94645

Parameter	UT3			
	Reach 1		Reach 2	
	XS3	XS2	XS4	XS 1
Existing Reach Length	1,162			
Drainage Area (Sq.mi.)	0.17			
NC Mtn. & Pied. Regional Curve (W_{bkf}) (ft)	9.8 (Mtn.) & 5.1 (Pied.)			
NC Mtn. & Pied. Regional Curve (D_{bkf}) (ft)	0.6 (Mtn.) & 0.9 (Pied.)			
NC Mtn. & Pied. Regional Curve (A_{bkf}) (sq ft)	6.7 (Mtn.) & 6.4 (Pied.)			
Bankfull Discharge, Q_{bkf} (cfs) [1]	43 (Mtn.) & 14 (Pied.) USGS 2-YR[6]=(ROI) 22, (RRE) 34			
Feature Type	Pool[2]	Riffle	Riffle	Pool[2]
Rosgen Stream Type	-	E[3]	E[3]	-
Bankfull Width (W_{bkf}) (ft)	5.1	5.3	4.1	3.7
Bankfull Mean Depth, (d_{bkf}) (ft)	1.18	1.05	1.45	1.57
Cross-Sectional Area, A_{bkf} (sq ft)	6	5.6	5.9	5.8
Bankfull Max Depth (d_{mbkf}) (ft)	1.83	1.77	2.03	1.70
Width to Depth Ratio (W_{bkf}/d_{bkf})	4.3	5	2.8	2.3
Floodprone Width (W_{fpa}) (ft)	23	48	28	8
Entrenchment Ratio ((W_{fpa}/W_{bkf})) (ft)	4.5	9.1	6.9	2.1
Bank Height Ratio	1.4	1.1	1.3	2.4
Longitudinal Sta. of Cross Section Along Existing Thalweg (ft)	95	233	566	1,004
Bankfull Mean Velocity, V_{bkf}= (Q_{bkf}/A_{bkf}) (ft/s)	4.3	4.6	4.3	4.4
Channel Materials (Particle Size Index – d50) – Average of 2 Pebble Count Samples[4]				
d_{16} / d_{35} / d_{50} / d_{84} / d_{95} (mm)	2.4 / 11.7 / 16.5 / 36.2 / 53.7			
Valley Slope	0.012			
Average Water Surface Slope (S)	0.015			
Average Channel Sinuosity (K)	1.21			

[1] Bankfull discharge calculated using HEC-RAS by best-fitting flow to physical indicators of bankfull (comparable to using average of Manning's equation for multiple cross sections).

[2] Pool cross section, Bankfull characteristics are for pool comparison and pool habitat and design assessment only.

[3] High bank height ratios should be noted, values in excess of 1.5 have little or no chance for self-recovery, even for bank height ratios of 1.1-1.5, hydraulic modeling has shown that floodplain access is limited to10 return interval or greater (or 10-20% chance of floodplain activation in a given year); a major restoration driver is severe erosion due to channel plan form coupled with poor floodplain access.

[4] Bulk and subpavement samples also taken and used in sediment transport analyses.

16.1.1.3 Valley Classification

In addition to determining stream types present at the Upper Silver Creek project site, valley types were also considered. The tributaries to Silver Creek within the project area are located in a Type III valley setting until they come onto the floodplain of the main stem channel. Type III valleys are primarily depositional in nature with moderately steep valley floors with slopes greater than 2% (Rosgen 1996). At the project site, the debris-colluvial landforms that typify

Type III valleys with vegetated riparian zones as well as stable, vegetated spoil piles that remain from historic mining activities.

Silver Creek is located in a Type X valley setting. Type X valleys are typically characterized as very wide with very gentle elevation relief and are mostly constructed of alluvial materials. While the valley may be considered narrow as compared to a more typical Type X valley, the floodplain of Silver Creek confirms the deposition of alluvium over time. An E-type channel, Silver Creek is a moderately entrenched, meandering channel with a riffle/pool bedform. This stream type is common to alluvial valley types with well-developed floodplains.

16.1.1.4 Project Reach Existing Conditions Characterization

Many cross-sections were surveyed across the project area as described in Section 16.1.1.2. Bankfull elevations were determined by field identification of bankfull indicators, and were later validated using multiple methods. The methods used are both analytical and empirical. Analytical modeling was conducted using HECRAS (Bruner, 2005) to calculate water surface profiles (with hydrologic flow data from regional curves and USGS region of influence and regional regression equation methods). Empirical data is based on prior project information, local data and regional reference reach database records and internal reference reach surveys from past projects. Because the location of this project is on the fringes of the boundary between the Blue Ridge and Piedmont physiogeographic regions, both the Mountain and Piedmont Regional Curves for NC were consulted to compare to project area and upstream reference reach findings (Harman et al., 2000 and Harman et al., 1999).

The incised condition of Silver Creek mainstem has resulted in the incision of its tributaries beyond what is typical of a tributary on the floodplain of its master stream. If prior grade control existed, channelization and other anthropogenic impacts have eliminated grade control yielding vertical and horizontal channel instability. The project tributaries themselves were modified through channelization or have been otherwise impacted by prior roads, land uses and disruptive activities (notably mining).

The following paragraphs briefly summarize the existing conditions of each stream and provide an introduction of the proposed restoration approach that is further described and supported in Section 16.1.3.1.

Channel conditions in Silver Creek - Reach 1, facing upstream.

Silver Creek (Reaches 1 and 2)

Since Reaches 1 and 2 are similar in character and only differ in approach, they are described here together. Reach 1 will be restored with a Priority II approach involving a new pattern, dimension and profile. This reach is approximately 840 linear feet and starts at the conservation easement boundary just downstream of the NC-64 culvert on the mainstem of Silver Creek. The Priority II approach involves excavation of the existing floodplain; the primary purpose of this approach is to provide a stable and gradual transition into a Priority I approach.

For this reach, stability hinges on constructing a floodplain activated by the bankfull flow, and a design that ensures adequate sediment transport continuity while avoiding upstream hydrologic impacts. Other typical stability considerations based on geomorphic and vegetative design are also addressed as depicted on the plan sheets in Appendix D.

Silver Creek passes under Highway 64 through a 3-barrel box culvert; each barrel is approximately 8x8 feet. Silver Creek has a regulatory floodplain that is described in Section 15.5 of this report. Restrictions and regulations apply to all impacts to the existing, effective modeled plan form, profile and floodway (encroachment) characteristics of the stream. The valley slope for Silver Creek is approximately 0.006 and does not change to a notable degree within the project area; the existing channel slope is 0.004. The sinuosity of the existing channel is approximately 1.4. While existing vegetation has reduced the rate of stream evolution, outside meander bank scour and fallen trees and debris from flood events have resulted in bank failures. The slightly incised channel is laterally unstable in both bends and straight sections (except for mitigating factors such as vegetation and cohesive banks), and is a significant in-stream sediment source contributing to water quality degradation. Moderate to severe erosion is present in all meander bends and in some straight sections.

Four cross-section transects were surveyed on the mainstem over the project reach and are very consistent with one-another and representative of the overall character of the mainstem project area (recall that reaches 1 and 2 do not differ markedly in character). Additional cross-sections were developed using the CAD topographic surface model that uses field survey data and breaklines to produce a reliable topographic model. These cross-sections are justifyably given equal weight to the transects. They were employed in hydraulic modeling, and some were included in Table 16.1 presented in Section 16.1.1.2. The following summary of the reaches is based on consideration of all existing conditions survey data collected.

Reach 1 has bank height ratios ranging from 1.1 to 1.9, and therefore are too low to result in a severe entrenchment ratio that would classify the channel as a “G.” Instead, the channel classifies as a moderately incised “E”, with severe bank erosion owing to planform instability. HECRAS modeling data indicates that floodplain activation does not occur until the 5 or 10-year event over the majority of the main stem within the project area (bankfull flow is contained within the channel). As such, the mainstem has a 10-20% chance of flooding in any given year, compared to typical stable reference reaches that would have a 50 to 75% annual chance of flooding. Width-depth ratios range from 5.0 to 8.3. No nick points or other concerns with vertical stability were noted. The primary concerns in this reach are lateral stability, channel bank erosion, and impaired hydrologic function of the channel with reference to floodplain activation and support of adjacent floodplain wetland hydrology.

The pattern characteristics of this reach have created a channel that is dominated by pool and run habitat, and is lacking in riffle habitat. Pattern and profile improvement will lead to a more diverse bedform while restored channel dimensions and the establishment of stable well-vegetated banks will aid in the enhancement of in-stream habitat. Sediment analysis is provided in Section 16.3.

Reach 2 of Silver Creek begins a few hundred feet below the confluence of UT3 at Station 8+52 and continues to the end of the project downstream of UT1. As previously discussed, this reach is similar in character to Reach 1. A Priority I Restoration approach will be applied to Reach 2 of Silver

Channel conditions in Silver Creek-Reach 2, facing downstream.

Creek. Unstable plan form is evident from widespread erosion – pool to pool spacing, radius of curvature and floodplain connectivity will all be addressed to improve overall channel stability.

Reach 2 has a higher typical bank height ratio than Reach 1; however, cross-sections taken in this reach still indicate that the channel is an E-type stream. Reach 2 has a lower typical width-depth ratio reflecting the increased channel depth. The connectivity of bankfull flows to the existing floodplain is comparable to Reach 1. The key components of the restoration approach proposed is the improved activation of the floodplain and support of adjacent floodplain wetland hydrology by both through flooding and by raising the groundwater table around the vicinity of Silver Creek.

<u>UT 1</u>

UT1, facing upstream.

UT1 enters the project area through a culvert below Goldmine Road. It is the furthest downstream tributary within the project reach. It appears the alignment of UT1 may have been altered in the past to accommodate an old road previously located just upslope of the tributary that eventually crossed Silver Creek near proposed station 24+00 (see Figure 2.6). Upstream of Goldmine Road, UT1 meanders through a horse pasture. The valley slope for UT1 is approximately 0.011 and does not change notably within the project area. At 0.016, the channel slope is steeper than the valley because the valley slope was measured at the top of bank – the channel becomes more incised over the project length. The sinuosity of the existing channel is approximately 1.4. Deeply incised channel conditions on UT1 have caused excessive bank erosion. The tributary is a significant in-stream sediment source contributing to water quality degradation. Moderate to severe erosion is present throughout.

Six cross-sections were surveyed on UT1 within the project area. They were employed in hydraulic modeling and have been included in Table 16.2 presented in Section 16.1.1.2. The following summary of the reach is based on consideration of existing conditions survey data collected.

The bank height ratio for this channel ranged from 1.5 to 3; as such, some cross-sections were classified as “G”-type streams while others were classified as incised “E”-type streams. HECRAS modeling data indicates that floodplain activation does not occur until the 10 to 25-year event over the majority of the main stem within the project area (bankfull flow is contained within the channel). As such, the mainstem has a 4-10% chance of flooding in any given year, compared to typical stable reference reaches that would have a 50 to 75% annual chance of flooding. Width-depth ratios range from 4.1 to 9.6 for the riffle cross-sections evaluated. As observed in the other project tributaries, the degree of incision, compounded by the lack of grade control has resulted in both vertical and lateral instability. To remedy the incised channel condition, a Priority I Restoration approach will be utilized to improve the pattern, profile, and dimension of this tributary.

According to HECRAS, a 10-25year event is required to get floodplain activation at the top end of the project. The bankfull indicator in the upper right graphic shown below is fairly consistent with regional curve (Q_{bkf}=21 cfs). For the highest flow, the USGS 25-Year flow is Q_{25}=133 cfs.

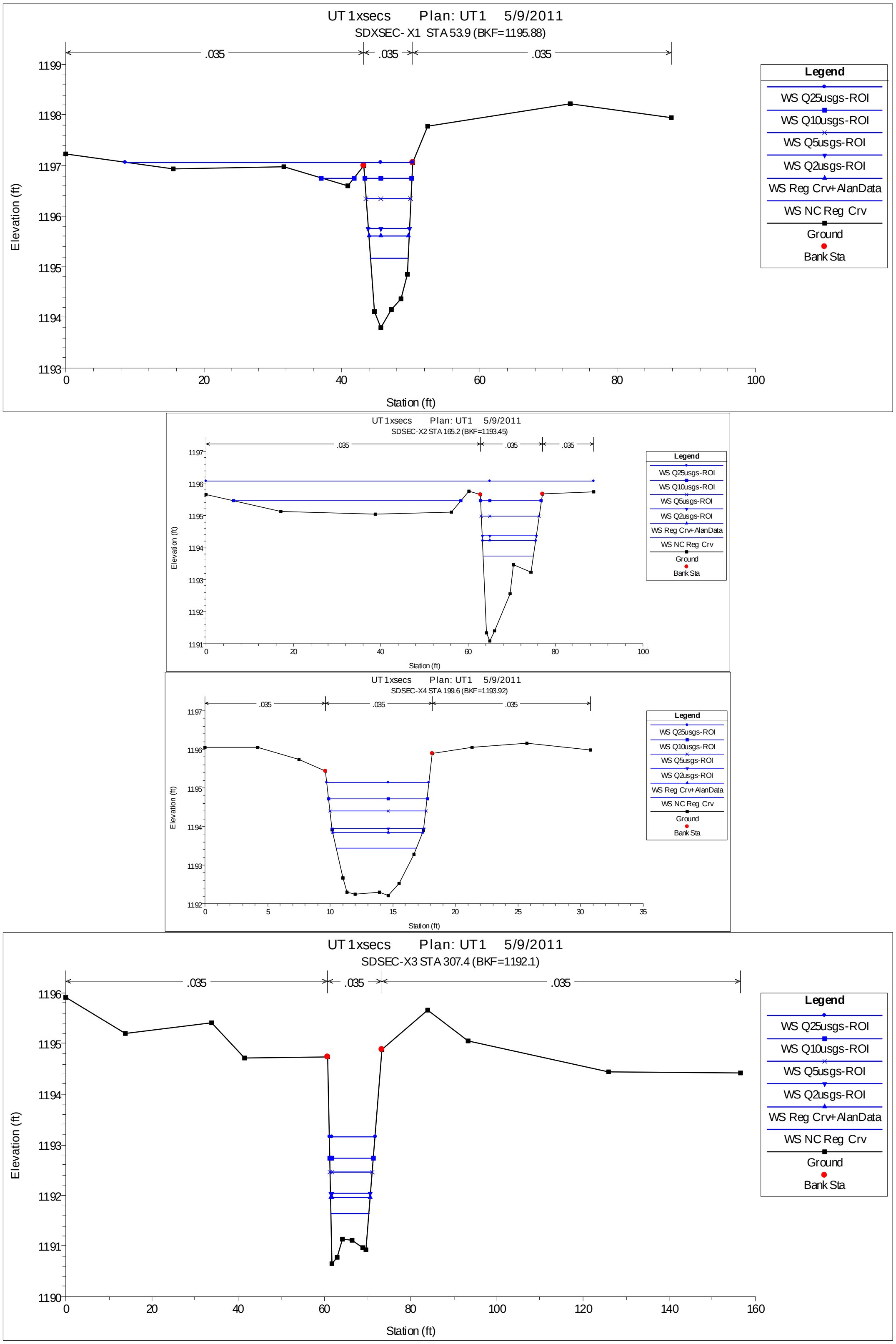


Figure 16.1. HECRAS Plots for UT1 Cross-Sections

UT2 (Reaches 1 and 2)

Unnamed Tributary 2 was channelized in the past decades and is presently a straight “ditch” with a nick point in the form of a head cut that has propagated to the upstream project limits. Since its existing conditions are uniform, the description is not broken out by reach. The average valley slope for UT2 is approximately 0.035 and decreases somewhat adjacent to the mainstem where the tributary drops onto the floodplain of Silver Creek. The average existing channel slope is 0.037, however, this includes the head cut which accounts for much of this gradient. The sinuosity of the existing channel is approximately 1.06. The re-alignment of UT2 has led to a straighter, shorter channel with an increased channel slope and streamflow velocity, and a high degree of incision as dredged material was also side-cast immediately adjacent building a levy on the dredged channel. In addition to channelizing UT2 to Silver Creek, modifications included culvert installation at a trail crossing in the upper extent of the project reach that has further disturbed the existing channel. Above the headcut that marks the beginning of the project reach, the channel appears aggraded, perhaps affected by downstream manipulations and corresponding disturbance to a stable channel slope, or perhaps reflecting prior sediment impacts from mining (an activity that is evident from large and numerous spoil piles in the area).

UT2 facing downstream.

Two cross-sections were surveyed on UT2 within the project area. They have been included in Table 16.2 presented in Section 16.1.1.2. The following summary of the reach is based on consideration of the existing conditions survey data collected.

The bank height ratio for this channel ranged from 2.2 to 2.4. While the channel types out as a “B”-type stream, its character is more that of a “G”-type channel. The likely reason for typing as a B-stream is that the upper bank of the excavated channel has sloughed into the channel at the flood-prone area width causing the entrenchment ratio to appear moderate rather than having the degree of entrenchment that actually exists. HECRAS modeling was not performed, due to obvious lack of floodplain connectivity and need to address erosion concerns and lack of habitat. Width-depth ratios range from 4.1 to 9.6 for the riffle cross-sections evaluated. As observed in the other project tributaries, the degree of incision, compounded by the lack of grade control has resulted in both vertical and lateral instability. To remedy the incised channel condition, a Priority I Restoration approach will be utilized to improve the pattern, profile, and dimension of this tributary. Reach 1 will be a steeper step-pool “B”-type channel, while Reach 2 will follow a flatter meandering approach.

UT3 (Reaches 1 and 2)

UT3 appears to be a meandering stream from the aerial photo, but when compared to the expected pattern for a stream of this size, it is apparent that the channel was previously modified. UT3 enters the project area through a culvert under Gold Mine Road. Upstream of Gold Mine Road, there is evidence that this tributary was manipulated in the past to allow for mining activities. Within the project area, it appears that this stream was channelized along the slope that is on the left bank. Presently the tributary receives stormwater runoff from the pavement and storage buildings at the Brackett Brothers Lumber business that is partially located within the UT3 subwatershed. Other significant land uses within the subwatershed include livestock pasture and forest lands. The existing valley slope of UT3 over the project area is approximately 1.2%. Atypically, the water surface slope is greater than the fall of the valley as measured on the floodplain, due to increasing degree of incision in the lower half of the reach. The existing conditions profile shows a break point where the tributary hits the floodplain of the mainstem and the valley profile flattens while the stream profile remains constant as the stream becomes further entrenched in the valley. This has impacted floodplain wetland hydrology and also resulted in stream erosion, habitat homogeneity and impairment to stream and floodplain functions.

Reach 1 begins at the easement line, which is approximately at the culvert opening, and continues downstream to station 3+37 which is located on the invert of a log J-hook vane that begins the offline reach, or Reach 2. Two cross-sections (pool and riffle) were taken within Reach 1. The riffle cross-section indicates an entrenchment ratio of 9.1 for this section of the Reach. The high entrenchment ratio observed in this segment of UT3 supports visual observations that the reach suffers from aggradation. The first aggraded area is located just downstream of the culvert and is the accumulated sand and silt coming from the watershed and depositing when it reaches this reach that supports lower velocity flow. Another area in the reach experiencing aggradation begins at station 1+96; it is caused by a debris jam. The sediment wedge above the debris continues upstream to station 1+33. Below these aggraded locations, the channel has a U shape and has a Rosgen “E”-type stream classification. Based on an earlier field visit with staff from the EEP, it was determined that only profile and dimension improvements would be made in Reach 1. To accomplish this, a Level I Enhancement approach will be used to stabilize the reach.

In contrast to conditions observed in Reach 1, Reach 2 of UT3 becomes increasingly incised as it approaches the confluence with Silver Creek, impairing the hydrology of adjacent wetlands. Reach 2 continues downstream past station 3+37 to the planned confluence with the mainstem of Silver Creek at station 4+66 on the mainstem, or station 13+32 of UT3. Two cross-sections (pool and riffle) were also taken in Reach 2. Although the riffle cross-section has a high entrenchment ratio similar to that observed in Reach 1, the width-depth ratio observed in Reach 2 is much lower than that observed upstream. At the confluence of UT3 and Silver Creek, UT3 has incised as a result of the down-cutting of the mainstem of Silver Creek. Channelization near the farm crossing has also affected pattern in this reach. The design approach proposed for this part of UT3 will consist of using a Priority I Restoration approach from the transition into Reach 2 to the confluence with Silver Creek. Pattern improvements, combined with profile and dimension adjustments will allow UT3 to dissipate overbank flows out onto the floodplain, improving hydrologic and ecological relationships between UT3 and adjacent wetlands. As is the case with the other project tributaries, a series of grade control structures will be installed on UT3 near its confluence with the mainstem to discourage further headcutting; some bank grading is proposed near the confluence as well to ensure continued connectivity with the floodplain.

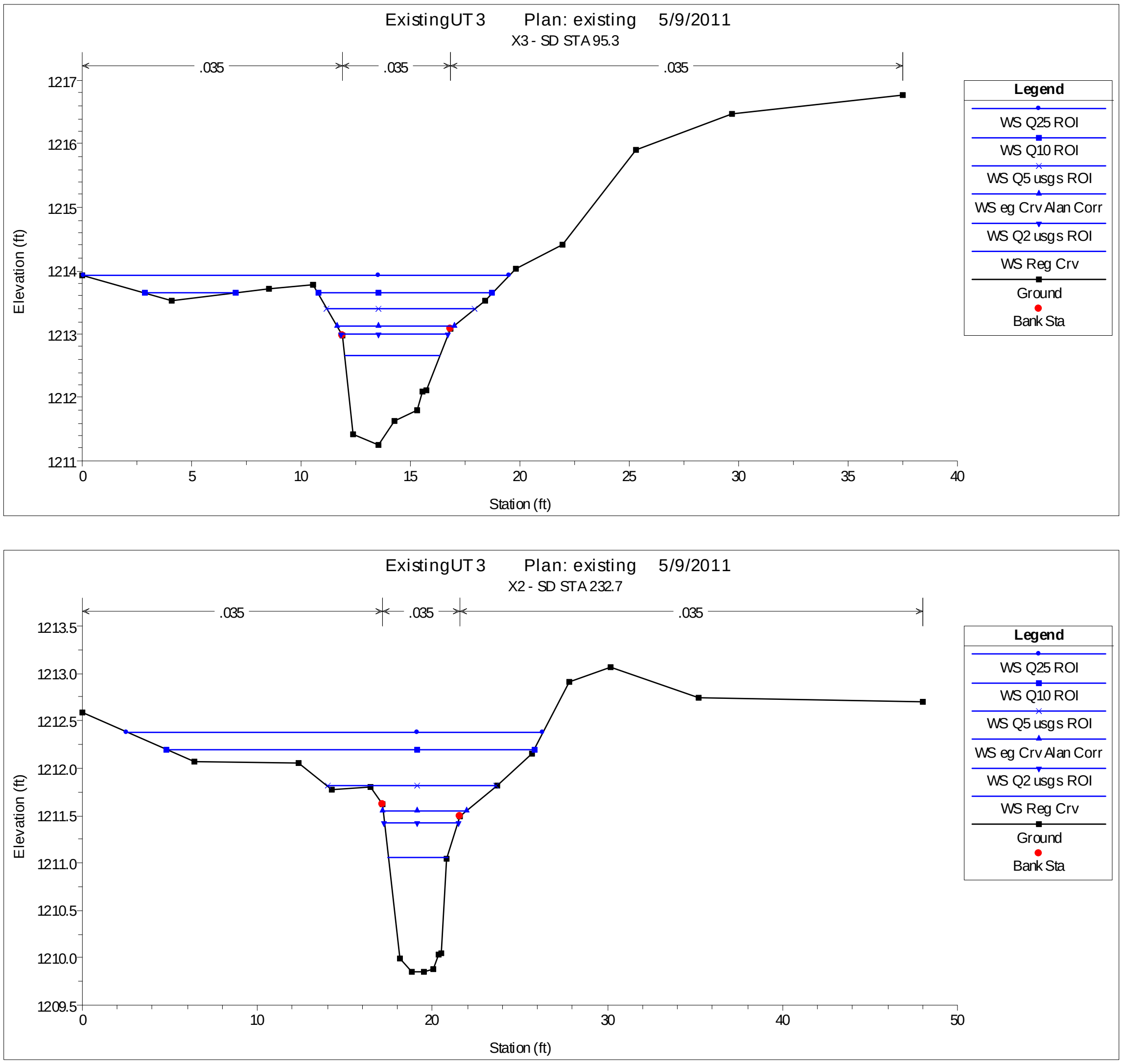


Figure 16.2. HECRAS Plots for UT3 Cross-Sections

HECRAS shows that a 10-year event is required to get floodplain activation of the smaller floodplain. Restoration will activate the larger floodplain at an elevation of approximately 1,213 feet above sea level.

16.1.2 Channel Evolution and Stability Assessment

Channel stability is defined here as the stream's ability to transport incoming flows and sediment loads supplied by the watershed without undergoing significant changes over a geologically short time-scale. A generalized relationship of stream stability was proposed by Lane (1955); it states that the product of sediment load and sediment size is in balance with the product of stream slope and discharge, or stream power. A change in any one of these variables induces physical adjustment of one or more of the other variables to compensate and maintain the proportionality.

Longitudinally, the water and sediment flows delivered to each subsequent section are the result of the watershed and upstream or backwater (downstream) conditions. Water and sediment pass through the channel, which is defined by its shape, material, and vegetative condition. Flow and sediment are either stored or passed through each section along the reach. The resulting physical changes are a balancing act between gravity, friction, sediment and water being delivered into the system (Leopold et al., 1964).

Observed stream response to induced instability, as described by Simon's (1989) Channel Evolution Model, involves extensive modifications to channel form resulting in profile, cross-sectional, and plan form changes, which often take decades or longer to achieve resolution. The Simon (1989) Channel Evolution Model characterizes typical evolution in six stages:

I. Pre-modified
II. Channelized
III. Degradation
IV. Degradation and widening
V. Aggradation and widening
VI. Quasi-equilibrium.

The channel evolution process is initiated once a stable, well-vegetated stream that interacts frequently with its floodplain is disturbed. Channelization, dredging, changing land use, removal of streamside vegetation, upstream or downstream channel modifications, and/or change in other hydrological variables result in adjustments in channel morphology to compensate for the new condition(s). Disturbance commonly results in an increase in stream power that can cause degradation, often referred to as channel incision (Lane, 1955). Incision eventually leads to over-steepening of the banks and, when critical bank heights are exceeded, the banks begin to fail and mass wasting of soil and rock leads to channel widening. Incision and widening continue moving upstream in the form of a head-cut. Eventually the mass wasting slows, and the stream begins to aggrade. A new, low-flow channel begins to form in the sediment deposits. By the end of the evolutionary process, a stable stream with dimension, pattern, and profile similar to those of undisturbed channels forms in the deposited alluvium. The new channel is at a lower elevation than its original form, with a new floodplain constructed of alluvial material (FISRWG, 1998).

Channels within the project area are perennial in nature and have experienced prior channelization or other kinds of watershed disturbance. Channel stability was assessed with the following methods: qualitative and quantitative site observations, comprehensive site-specific hydraulic modeling using detailed topographic data collected for the project, and sediment analyses. Conclusions reached from these methods were used to define site stability and determine appropriate restoration approaches for each project reach.

The project area consists of channels that are primarily in intermediate phases of the channel evolutionary process, with some sections of the reaches experiencing widening or aggradation. As a result of vegetation and cohesive soils, the channel evolutionary process has slowed considerably and resulted in impaired stream and floodplain functions that will take decades or longer to self-adjust. As a result, these streams are prime candidates for restoration and enhancement.

A synopsis of each project reach and the point of evolution in which it is currently in, based on the Simon Channel Evolution Model, is provided later in this section in Table 16.4. Stream restoration techniques act to minimize the erosion and geomorphic disturbance required to achieve a new stable state naturally. Restoration activities proposed at the Silver Creek Site will recreate channel types that are appropriate to the valley types and slopes present through the restoration of stable channel dimension, pattern and profile. This resets the evolutionary cycle; the structures and measures installed, in conjunction with a protective riparian buffer, should ensure the continued stability of the restored streams, barring major disturbance in the unprotected areas of the greater watershed.

For the mainstem of Silver Creek, the most probable evolutionary scenario is for it to change from its present E-type channel (somewhat incised) to an F-type channel. The stream appears vertically stable and has a low slope, which suggests that significant down-cutting is not likely under the current hydrologic regime. However, since there is significant lateral instability, the prevailing evolutionary mechanism (as has already occurred in some of the downstream meander cut-offs in Reach 2) is widening from meander bend erosion and floodplain formation from point bar accretion. However, as demonstrated in the cut-offs, fallen trees are likely to force channel evulsion, rather than a gradual transformation. This type of rapid change does not support biological recovery and introduces significant downstream impacts. Furthermore, the large floodplain will never again be active, resulting in the loss of wetlands, and reduction of floodplain ecological and hydrologic benefits. Given these conditions, Silver Creek was determined to be in the early stages of Simon Evolutionary Model Stage V (Simon, 1989) since it lacks access to its floodplain. Further widening is inevitable without some stream modification.

UT1has been altered in the past during road construction and other land-disturbances. Although it does not appear to have been altered in the recent past, its riparian buffer is minimal, consisting of sparse woody vegetation, brush, and scattered clusters of exotic, invasive vegetation. The lack of a more mature buffer is likely due to periodic mowing associated with agricultural use of the property in recent decades. The incised nature of UT1 and unstable bank conditions are characteristic of a stream in Stage IV of the Simon Evolutionary Model (1989). During the course of the project design period, significant mid-channel bars and bank erosion have developed or increased in severity. These bars, in conjunction with severely eroding banks, provides evidence of the widening that is also occurring on UT1 in the absence of access to its floodplain.

The most recent channelization of a stream within the project site likely occurred on UT2. Located on the right bank of Silver Creek in a forested area, UT2 presently exists as a channelized “ditch” that was excavated between the property boundary and Silver Creek. Characteristic of Stage III in the Simon Channel Evolution Model, a headcut has propagated up the channelized reach of UT2 from its confluence with the mainstem. It will next transition into Stage IV, further degradation and widening. A berm of soil, most likely wasted during the channelization of UT2, is present in the floodplain along the left bank of the tributary. The restoration approach for this tributary will consist of creating a more stable plunge-pool channel in the area of the relict channel, that will transition into a slightly meandering channel before the tie-in to Silver Creek and the existing “ditch” will be filled.

UT3 has two distinct reaches, Reach 1, which begins at the culvert outfall on Gold Mine Road and continues for 343 linear feet, and Reach 2 which begins at the end of the first reach and ends at the confluence with Silver Creek. Reach 1 is a fairly stable channel that has not incised owing to the presence of a downstream culvert that has arrested headcut propagation up from the mainstem of Silver Creek. This Reach is undisturbed or has not been disturbed for many years and exhibits Stage I of the Simon Channel Evolution Model. Reach 2 has not been disturbed in recent decades, but was previously subjected to land use conversion in the watershed, mainstem downcutting and headcut propagation up the tributary, buffer removal, and other potential disturbance. It is in a downcutting and widening phase (Stage IV). The restoration approach for Reach 2 of this tributary will reconnect the channel with its floodplain thereby enhancing adjacent wetland hydrology and resetting the evolutionary cycle.

Table 16.4 summarizes existing channel morphology in the project area. Data was taken from surveyed cross-sections from each project stream. Table 16.5 summarizes research findings by Rosgen (2001) concerning bank height ratios as an indicator of channel stability.

Table 16.4 Channel Morphology Features and Stability Indicators for Riffles on Silver Creek and Unnamed Tributaries to Silver Creek

Upper Silver Creek Mitigation Plan-EEP Project #94645

Parameter	Silver Creek and Tributaries									
	Silver Creek Reaches 1-2		UT1 Reach 1		UT2 Reaches 1-2		UT3 Reach 1		UT3 Reach 2	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Stream Type	E		E/Gc/Bc		B		E		E/Bc	
Riparian Vegetation	Good buffer for approximately two-thirds of its length; left bank and right bank on upper third of project reach is minimal with scattered trees and brush. Many trees falling in from banks.		Buffer predominantly consists of scattered trees and brush on both banks, typically only or two rows deep.		Although the canopy is not particularly dense along UT2, this tributary is located in a forested area. Surrounding trees provide shading for UT2. Most trees are offset a ways from the top of bank (presumably due to disturbance)		Buffer width and canopy density is variable on UT3, but is generally only one or two rows of trees deep. Most trees along UT3 are not mature.		Buffer width and canopy density is variable on UT3, but is generally only one or two rows of trees deep. Most trees along UT3 are not mature.	
Channel Dimension										
Bankfull Area (sq. ft.)	46	78	9	9.3	2.8	2.9	5.6		5.8	5.9
Width/Depth Ratio	5.0	8.8	4.0	9.6	3.5	4.0	5		2.3	2.8
Channel Pattern										
Meander Width Ratio	2.3	5.4	2.7	8.0	N/A		8.9	11.7	3.3	13.9
Sinuosity	1.4		1.41		1.06		1.21			
Vertical Stability										
Bank Height Ratio (BHR)	1.1	1.9	1.5	3.0	2.2	2.4	1.1		1.3	2.4
Entrenchment Ratio (ER)	20	24	1.2	10.0	1.6	1.9	9.1		2.1	6.9
Channel Type, Evolution Scenario (present stage or ongoing transition highlighted)	**E-F**-E or **E-Gc**-F-E		**E-Gc**-F-E, or E-**Bc**-Gc-F-E		Channelized **B-G**-F-B, or **B-F**-B		**E-Bc**-Gc-F-E		**E-Bc**-Gc-F-E	
Existing Evolution Stage (I-II-	Degradation, some Widening		Degradation, Widening		Degradation		Degradation, some Widening		Degradation, some Widening	

III…)[2]					

[1] N/A: Meander Width Ratio not measured because channel has been straightened.
[2] Simon Channel Evolution Model.

Table 16.5 Rosgen Channel Stability Assessment
Upper Silver Creek Mitigation Plan-EEP Project #94645

Stability Rating	Bank Height Ratio (BHR)
Stable (low risk of degradation)	1.0-1.05
Moderately unstable	1.06-1.3
Unstable (high risk of degradation)	1.3-1.5
Highly unstable	>1.5

Notes: Rosgen, D. L. (2001) A stream channel stability assessment methodology. Proceedings of the Federal Interagency Sediment Conference. Reno, NV. March, 2001.

16.1.3 Proposed Morphological Conditions

The primary objective of the restoration design is to construct a stream with a stable dimension, pattern, and profile that has access to its floodplain at bankfull flows while enhancing riparian and aquatic habitat. The philosophy applied by Baker to the Upper Silver Creek project consisted of creating more stable B, Bc, C, or E-type channels with the potential to adjust naturally, resulting in long-term B, Bc and E-type channels. The proposed morphology and design parameters for each of the reaches are detailed later in Section 16.1 in Tables 16.8-16.11.

The design rationale and design parameters for all of the design reaches are presented below.

Dimension

Throughout the entire proposed design, the channel dimensions were adjusted to reduce velocities and near-bank shear stress. The selected design parameters eliminate the current incised condition and restore access to the floodplain, increasing the entrenchment ratio. Channels are given as high a width-depth (W/D) ratio as practicable, with consideration of sediment transport continuity and also incoming loading rates from upstream. Higher sediment loads lend themselves to rapid self-adjustment in the form of bank deposition and W/D ratio reduction. This is preferable to building a narrow channel to start with, since a higher W/D ratio is helpful for maintaining early stability prior to vegetation establishment. Bank height ratios (BHR) of approximately 1.0 will be implemented to ensure that floodplain access is adequate and conservative towards increased flooding. In some areas, valley slope dictates that a choice be made of whether the constructed BHR will be <1, or whether levies will be built on the stream. In such cases, a BHR of <1 will be constructed and natural levy formation will be allowed to occur rather than constructed levy building. The low bank height ratio will improve hydrologic connectivity of the channel base flow to adjacent wetlands. The low valley slope in these areas may have been the original impetus for hydric soil formation that has resulted in a condition that will support wetlands. Typical cross-sections are shown on the plan sheets in Appendix D.

Pattern

The existing pattern of these project streams is representative of historical stream channelization and relocation. Although Silver Creek and unnamed tributaries 1 and 3 do not lack sinuosity to the same degree as UT2, all project streams contain reaches where pattern adjustments are proposed to create a stable pattern based on the valley slope, hydrology and sediment supply present in the Silver Creek watershed. The proposed channels have been designed to dissipate energy both vertically and through meandering. The riffle-pool morphology proposed on Silver Creek is common for streams with slopes less than 2% while the design approach proposed for steeper channels like UT2 will rely more on step-pool morphology. The design proposed for UT1 and UT3 consists of a combination of the riffle-pool and step-pool approaches with the step-pool approach being implemented near the confluence of the tributaries with Silver Creek. Changes to the channel alignment in the restoration reaches are meant to modify the sinuosity of these channels to a value of approximately 1.5, typical of natural streams of this channel type. Higher meander width ratios are present where the valley widens and are intended to allow for lateral dissipation of energy and provide a floodplain sufficient for future natural channel development. The new channel alignment locations combined with changes in dimension and profile also attempt to allow for overbank flow to improve the hydrology and plant communities of adjacent wetlands.

The pattern at overly sinuous sections in Reaches 1 and 2 of Silver Creek will be decreased whereas slight increases in sinuosity will be added elsewhere in the Reaches to achieve an overall sinuosity of 1.5. The sinuosity of project reaches on the unnamed tributaries will range from 1.0 to 1.3. Plan views of the main channel and unnamed tributaries are shown on the attached plan sheets.

While radius of curvature is not a primary feature of step-pool channels, some pattern was used in areas where the floodplain width increased and the floodplain topography flattened. Aside from reaches that are confined, the radius of curvature ratio falls into the range of approximately 1.8 to 2.8. The range of meander width ratios varies across the project site, but the general range of meander width ratios for the project streams is 3.5 to 8, with UT2 having the narrowest range at 3.6 to 5.

Profile/Bedform

The channel profile of the existing mainstem of Silver Creek is lacking in overall bedform diversity. The profile of the existing tributaries lack vertical grade control and overall bedform diversity. With the exception of proposed off-line channel segments, initial construction on project reaches will consist of restoring connectivity between channels and the floodplain. Based on the project stream, this will be followed by development of a riffle-pool or step-pool system mimicking those characteristic of the reference reaches. Grade control structures placed according to the pool-to-pool spacing range, as well as the natural tendency of the stream, dictate where pools will be located in sections of the stream with lower sinuosity. The average channel slope proposed for project streams varies, with the lowest channel slope of less than 1% being present on Silver Creek and the steepest average channel slope, approximately 3.7% being located on UT2.

Riffles throughout the design reaches will typically be 1.1 to 2 times the average slope of the channel while there is no slope from the head to tail of the pools. The proposed maximum pool depth will be approximately 3.0 feet on the mainstem of Silver Creek with pool-to-pool spacing ranging from 104-182 lf. Pool-to-pool spacing on UT1 is expected to range from 38 to 115 lf with a maximum pool depth of approximately 1.25 feet. The proposed maximum pool depth on UT2 will be 0.6 feet with the step-pool morphology resulting in pool spacing of 9 to 30 lf. Lastly, the maximum pool depth on UT3 is expected to range from 1.2 to 1.4, with pool spacing ranging from 18 to 42 lf. Design efforts were made to maximize diversity while designing a channel with adequate sediment transport capacity within the profile constraints.

16.1.3.1 Proposed Design Conditions by Project Reach

The Upper Silver Creek project site is an appropriate candidate for restoration given the level of impacts to wetland hydrology and vegetation for wetland complexes on site, and given the prevalence of bank and channel erosion that appears to only resolve after channel avulsion or other catastrophic self-adjustment. If implemented, project restoration and enhancement objectives will help to reestablish wetland and stream functions and forgo the undesirable effects that are the result of natural stabilization. The Silver Creek project supports the river basin restoration plan priorities and goals by reducing sediment and nutrient loading, streambank erosion, reversing channel modifications and losses of wetlands and riparian buffers.

Baker will directly address these concerns through the restoration or enhancement of riparian buffers, stabilizing streambanks and channel morphology through natural channel design concepts, and restoring or enhancing the functionality of wetlands within the project area. The accompanying plans submitted with this report depict the proposed restoration measures (Appendix D). The application of these measures is described below according to reach.

Silver Creek (Reaches 1 and 2)

A Rosgen Priority Level II Restoration approach will be used at the beginning of the project on Silver Creek to avoid any hydrologic trespass concerns related to the presence of a large, box culvert and state highway that marks the upper limits of the project area. This approach will consist of leaving the channel at its present elevation and grading and new channel and floodplain to create a bankfull channel with connectivity to a foodplain.

Anticipated benefits are the reduction or of erosion, an increase in the frequency of floodplain activation, reduced in-stream velocities, and potential mitigation of downstream flooding. In addition, hydrologic connectivity will be improved between Silver Creek and nearby wetlands located beyond the left bank, benefitting floodplain and in-stream ecological processes, and allowing for improvements to habitat quality and diversity. Reforestation of the riparian zone with additional woody vegetation will be done to improve overbank flow infiltration, shading and rootmass density along the stream corridor.

This approach coupled with a profile modification will allow the project to transition to a Priority I Restoration approach in Reach 2, which covers the lower two-thirds of the project on the mainstem. A Priority I Restoration approach will be used to achieve the same benefits listed for Reach 1, with the primary goal of increasing floodplain activation both in the field and in the adjacent forested area. To accomplish this, the channel will be raised to take advantage of the existing floodplain. An added benefit in this reach is the presence of a maturing bottomland forest within the conservation easement on the right bank of Silver Creek. As the project area ends, the restoration approach will involve transitioning back to the existing channel elevation.

UT1

A culvert outfall on the eastern side of Gold Mine Road marks the beginning of the project reach on UT1. A Priority I approach, which will involve constructing some offline channel segments, is proposed to improve floodplain connectivity and bank stability. This approach also involves changes to the channel profile to reduce headcutting present near the beginning and end of the project reach. The proposed approach will include some floodplain excavation at the upper and lower ends of the reach to ensure ample floodplain activation throughout the project area. While some subreaches of UT1possess a slope more common to B-type channels, an evaluation of the surrounding valley and stream types suggest streams in this area are more commonly E-type channels, with meandering planforms. Unnamed Tributary 1 presently possesses some sinuosity; however, given the degree of incision present, this sinuosity currently causes bank instability.

The approach proposed for UT1 will follow a more meandering planform, with grade control structures proposed near the end of the reach to promote a stable, yet diverse bedform for UT1 as it converges with the elevation proposed for Silver Creek. While in-stream structures and riffle (step) - pool morphology will increase the vertical stability of UT1, the meandering planform will also call for changes in channel dimension to address bank incision present. By providing greater access to the surrounding floodplain and improving the density and diversity of vegetation present in the riparian zone, it is anticipated that bank stability will also be restored.

UT2 (Reaches 1 and 2)

Unnamed tributary 2 appears to have experienced the most recent efforts to channelize streams within the project area. Currently, UT2 looks more like a flowing ditch than an actual channel. To return UT2 to a more natural state, a Priority I Restoration approach is proposed throughout the project reach. As a B-type channel, UT2 also has the steepest slope of the project streams, though much of this steepness is located in Reach 1. Consequently, Reach 1 of UT2 will initially be constructed as a step-pool type channel. A step-pool approach will promote greater bedform stability and diversity while changes in pattern and dimension, that were lost during previous disturbance to the channel, will be re-established.

Part of the reason for two design reaches is the relocation of the mainstem that results in a flatter section to connect UT2 to the proposed channel by running it across the flatter floodplain of Silver Creek. Reach 2 begins where the floodplain of UT2 and Silver Creek become one in the same; here, the plunge-pool approach will transition into a meandering channel with riffle/pool features. More emphasis will be placed on improving pattern in this reach to restore lateral stability. As with UT1, some floodplain excavation will be required as the tributary converges with Silver Creek to provide adequate floodplain access. Grade control structures will also be placed near the confluence as a precautionary measure against headcut propagation upstream from the mainstem of Silver Creek.

UT3 (Reaches 1 and 2)

As previously noted, pattern adjustments are not proposed for UT3-Reach 1. To address aggraded segments as well as concerns for the long-term stability of the reach, which receives stormflow from upstream via a culvert under Gold Mine Road, an Enhancement II approach is proposed. Profile and dimension improvements will consist of grading work where necessary to restore adequate dimension and bedform while a series of grade control structures will be installed to allow for vertical energy dissipation of streamflow exiting the culvert under Gold Mine Road.

Reach 1 will transition into Reach 2 via a Priority I Restoration approach that will be used beyond station 3+37 to address reduced pattern from previous channelization efforts, incised channel conditions, and headcutting that has occurred. Pattern adjustments were made with consideration to valley constraints as well as opportunities to improve the hydrology of adjacent wetlands. The restoration approach will consist of a meandering riffle-pool system and like the other tributaries, will involve the installation of grade control structures and some floodplain excavation where UT3 meets Silver Creek. The grade control structures will be installed to discourage future headcutting while the excavation work will allow for continued floodplain activation for the length of the channel.

Where abandoned, old stream channels will be backfilled using fill material generated by the grading of a new channel and floodplain benches or otherwise graded to make them continuous with other local surface features. Any excess fill material generated during construction will be stabilized on-site in locations that are more than 75 feet away from any surface water.

Exotic invasive removal and re-planting with native vegetation will be conducted on all project reaches to restore or enhance existing buffer widths with woody and herbaceous vegetation native to the ecoregion.

16.1.4 Reference Reach Data Indicators

Reference reach surveys are valuable tools. Their morphology dimension, pattern, and profile can be used as a template for design of a stable stream in a similar valley type with similar bed material. In order to extract the morphological relationships observed in a stable system, dimensionless ratios are developed from the surveyed reference reach. These ratios can be applied to a stream design to allow the designer to ‘mimic’ the natural, stable form of the target channel type.

While reference reaches can be used as an aid in designing channel dimension, pattern, and profile, there are limitations. The pattern for most reference reach quality streams is controlled by large trees and other woody vegetation. Therefore, the pattern is not “free to form” based on fluvial processes, but instead is formed by the vegetation. Some parameters, such as radius of curvature, are particularly affected by vegetation control, often resulting in very tight bends. Therefore, pattern ratios observed in reference reaches are often adjusted in the design criteria to create more conservative designs that are less likely to erode after construction, before the permanent vegetation is established.

Baker evaluated upstream and local (subwatershed) conditions, obtained reference quality geomorphic data (from prior reference reach surveys and from design and monitoring projects) for watersheds of comparable size to the project drainage areas, and assessed in-house design ratios for this component of the design process. A focus on reference reach data from smaller drainages was used to help temper the lack of small drainage area data points on regional curves. Baker evaluated the weight that should be attributed to reference reach data in the design based on its applicability and quality measured in terms of degree of stability and analogy to the design reach. The best reference data is from adjacent stable stream reaches, or reaches in the same watershed. Convergence of reference data with other design data and methods lent confidence to the design. The locations of streams used as reference, or design-aid, information for Silver Creek and its tributaries are provided in Figure 16.3.

Reference reach ratios for pattern, dimension and profile were collected in the immediate project vicinity. The immediate upstream reaches of Silver Creek, and UT3 to Silver Creek (above Gold Mine Road) were both observed and surveyed. On UT3 (above Gold Mine Road), a full reference reach survey (greater than 20 times the bankfull width, including cross-sections and profile) was conducted. Upstream of the project area on Silver Creek, visual observation of 2,000 linear feet of stream was conducted to identify and measure prevailing features and conditions; spot measurements of dimension and slope on multiple stable riffles and pools were conducted (no areas were identified for a full reference survey). In addition, survey information within the project area on Silver Creek and its tributaries (UT1, UT2, and UT3) were used to help develop and verify geomorphic trends. Stable cross-sections from within the project reaches were also used, where applicable, to validate design choices.

UT3 Reference Reach Survey Cross Section.

Reference, design and monitoring survey data were analyzed from a number of projects that Baker has completed in the vicinity and from the NCDOT reference reach database. Among these reference and completed project reaches are UT2 to Bailey Fork (prior Baker design), South Fork Hoppers Creek (prior Baker design), UT3 to Silver Creek (prior Baker design on another site), Morgan Creek (NCDOT, 2002 (Doll, 1999)), UT to Spencer Creek (Baker reference reach), and Spencer Creek (NCDOT, 2002 (Clinton, 1998)). Data for Morgan Creek, UT to Spencer Creek, and Spencer Creek are provided in Table 16.6.

Finally, guiding ratios from in-house design ratios that have been developed from multiple successful restoration projects completed by Baker at similar E and B-type streams were compared against reference reach data. These ratios are provided in Table 16.7. These design ratios differ from reference reach ratios in that they consider factors that allow for recovery with developing vegetation.

Silver Creek has a valley slope of 0.6%. It is an alluvial channel with sand and gravel constituents in its sediment load. Dimension observations within the project area and in the upstream reach yielded important information related to the target bottom width and cross-sectional area for design. In-house ratios for C/E-type streams guided pattern layout while reference ratios from Morgan Creek and Spencer Creek, as well as survey data from prior projects in the vicinity were considered in the final selection of the preferred range of geomorphic ratios for design layout.

Tributaries to Silver Creek have valley slopes varying from 1.1% to 3.5% and transition from their valleys onto the floodplain of the mainstem within the project area. The reference information used for the design on UT3 to Silver Creek came from a prior Baker design on another site, UT3 above the project and data from stable cross-sections on the tributaries within the project area. These data were most influential in the design approach and development of appropriate geomorphic ratios. Other data used in selecting geomorphic ratios included design ratios used in a previous Baker project on UT2 to Bailey Fork as well as Baker’s design ratios for both E and B-type channels which were employed based on the reach slopes present at the current project site. High slope reaches off-site in the watershed were observed to have considerable sinuosity, which along with the existing stream sinuosity of tributaries within the project area, was used to justify the use of E-type pattern ratios even when the design proposed for some reaches utilizes a step-pool morphology. Design ratios used in a previous Baker project on UT2 to Bailey Fork were reviewed and considered in final selection of the design criteria for the Silver Creek tributaries. Reference reach data is included in the design tables for the project tributaries (Tables 16.8 through 16.11).

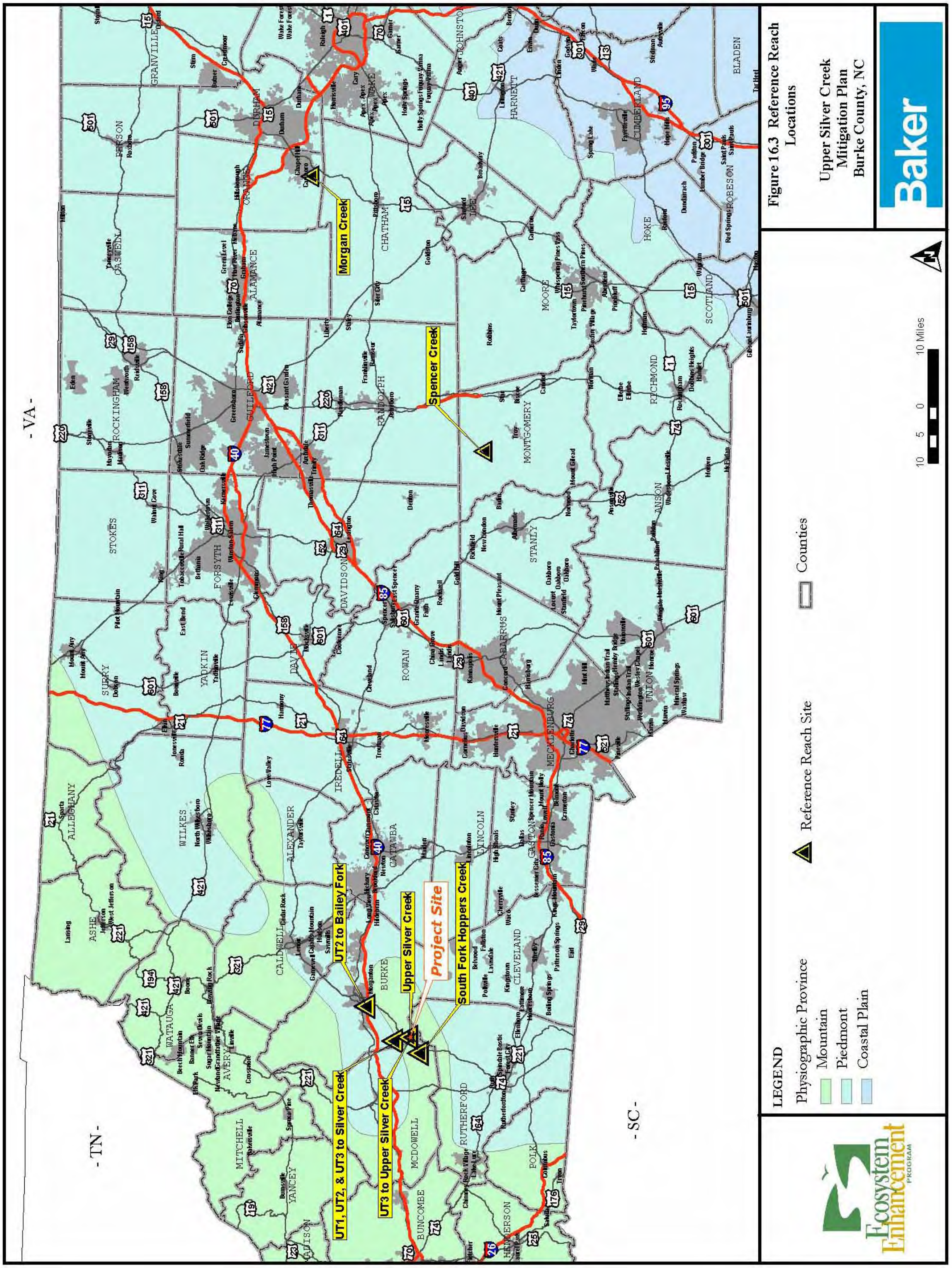


Figure 16.3 Reference Reach Locations

Upper Silver Creek Mitigation Plan
Burke County, NC

Table 16.6 Reference Reach Geomorphic Parameters

Upper Silver Creek Mitigation Plan-EEP Project #94645

	Reference Reaches for Silver Creek Mainstem					Reference Reaches for Silver Creek Tributaries				
	Morgan Creek			UT3 to Silver Creek – Upstream of Gold Mine Road		UT to Spencer Creek		Spencer Creek Downstream		
	Min	Max	n*	Min	Max	Min	Max	Min	Max	n*
1. Stream Type	C4			E/Bc		E5		E4		
2. Drainage Area – square miles	8.4			0.12		0.014		1.0		
3. Bankfull Width (w_{bkf}) – feet	33.2	33.5	2	6.3	7.9	7		10.7		11.2
4. Bankfull Mean Depth (d_{bkf}) – feet	2.3	2.4	2	0.7	0.9	1.1		1.6		1.8
5. Width/Depth Ratio (w/d ratio)	14.1	14.7	2	7.3	11.7	6.4		5.7		
6. Cross-sectional Area (A_{bkf}) – SF	75.1	79.8	2	5.5	6.5	7.7		17.8		
7. Bankfull Mean Velocity (v_{bkf}) - fps	7.0			2.1	3.4	3.2		4.9	5.4	
8. Bankfull Discharge (Q_{bkf}) – cfs	524			18		25		97		
9. Bankfull Max Depth (d_{mbkf}) - feet	2.8	2.9	2	1.2	1.4	2.0		2.1		1
10. d_{mbkf} / d_{bkf} ratio	1.2	1.2	2	1.2	1.3	1.8		1.3		1
11. Low Bank Height to d_{mbkf} Ratio	1.0		2	1.0		1.0		1.0		1
12. Floodprone Area Width (w_{fpa}) – feet	77.5	86.8	2	15	19	81+		60.0		1
13. Entrenchment Ratio (ER)	2.3	2.6	2	1.9	3	11.6		5.5		1
14. Meander length (L_m) – feet	Not Available			45	75	37.7	42.5	46.0	48.0	2
15. Ratio of meander length to bankfull width (L_m/w_{bkf})	Not Available			6.4	10.5	5.4	6.1	4.1	4.4	2
16. Radius of curvature (R_c) – feet	Not Available			Not Available		5.8	15.8	10.9	14.6	5
17. Ratio of radius of curvature to bankfull width (R_c / w_{bkf})	Not Available			Not Available		0.8	2.3	1.3	1.4	5
18. Belt width (w_{blt}) – feet	Not Available			Not Available		11.4	26.7	38.3	40.8	2
19. Meander Width Ratio (w_{blt}/W_{bkf})	Not Available			Not Available		1.6	3.8	3.4	3.6	2
20. Sinuosity (K) Stream Length/ Valley Distance	Not Available			1.05		2.45		2.3		
21. Valley Slope – feet per foot	Not Available			0.0188		0.0081		0.0109		
22. Channel Slope ($s_{channel}$) – feet per foot	0.0070			0.0197		0.0033		0.0047		
23. Pool Slope (s_{pool}) – feet per foot	0.0001		1	0	0.004	0.0013	0.0014	0.0007		2
24. Ratio of Pool Slope to Average Slope (s_{pool} / $s_{channel}$)	0.01		1	0	0.18	0.40	0.42	0.2		2
25. Maximum Pool Depth (d_{pool}) – feet	4.1		1	1.8	1.8	2.5		3.3		1
26. Ratio of Pool Depth to Average Bankfull Depth (d_{pool}/d_{bkf})	1.8		1	2.2	2.2	2.3		2.1		1
27. Pool Width (w_{pool}) – feet	25.9		1	6	6	6.5		17.5		1
28. Ratio of Pool Width to Bankfull Width (w_{pool} / w_{bkf})	0.8		1	0.8	0.8	0.9		1.6		1
29. Pool Area (A_{pool}) – square feet	88.9		1	Not Available		8.8		24.5		1
30. Ratio of Pool Area to Bankfull Area (A_{pool}/A_{bkf})	1.2		1	Not Available		1.1		1.4		1
31. Pool-to-Pool Spacing – feet	46.0	277.0	2	39.9	62.3	19	41.7	71.0		5
32. Ratio of Pool-to-Pool Spacing to Bankfull Width ($p\text{-}p/w_{bkf}$)	4.4	8.3	2	5.6	8.8	2.7	6.0	6.6		5
33. Riffle Slope $^{(4(}$ (s_{riffle}) – feet per foot	0.014	0.024	2	0.013	0.054	0.014		0.013		2
34. Ratio of Riffle Slope to Average Slope	2.0	3.4	2	0.67	2.84	4.2		1.4		2

Table 16.6 Reference Reach Geomorphic Parameters
Upper Silver Creek Mitigation Plan-EEP Project #94645

	Reference Reaches for Silver Creek Mainstem					**Reference Reaches for Silver Creek Tributaries**				
	Morgan Creek			**UT3 to Silver Creek – Upstream of Gold Mine Road**		**UT to Spencer Creek**		**Spencer Creek Downstream**		
	Min	**Max**	**n***	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**n***
(s_{riffle}/ s_{bkf})										
Particle Size Distribution of Riffle Material										
Material (d_{50})	Very Fine Gravel			Not Available		Coarse Sand		Medium Gravel		
d_{16} – mm	Not Available			Not Available		<0.062		<0.062		
d_{35} – mm	1.2			Not Available		0.062		3		
d_{50} – mm	3			Not Available		1.0		8.8		
d_{84} – mm	77			Not Available		16.0		42		
d_{95} – mm	800			Not Available		22.3		90		

* n – This column represents the number of data points used where a range or mean is specified.

Table 16.7 Design Ratios and Guidelines for Restoration of Silver Creek and its Tributaries
Upper Silver Creek Mitigation Plan-EEP Project #94645

	Baker Geomorphic Design Ratios: UT2		**Baker C/E Geomorphic Design Ratios:** Silver Creek and UT1, UT2, and UT3	
Parameter	MIN	MAX	MIN	MAX
Stream Type (Rosgen)	B		C/E	
Bankfull Mean Velocity, Vbkf (ft/s)	4.0	6.0	3.5	5.0
Width to Depth Ratio, W/D (ft/ft)	12.0	18.0	10.0	12.0
Riffle Max Depth Ratio, Dmax/Dbkf	1.2	1.4	1.2	1.4
Bank Height Ratio, Dtob/Dmax (ft/ft)	1.0	1.1	1.0	1.1
Meander Length Ratio, Lm/Wbkf	N/A	N/A	7.0	12.0
Rc Ratio, Rc/Wbkf	N/A	N/A	1.8	3.0
Meander Width Ratio, Wblt/Wbkf	N/A	N/A	3.5	8.0
Sinuosity, K	1.1	1.2	1.2	1.6
Riffle Slope Ratio, Srif/Schan	1.1	1.8	1.5	2.0
Pool Slope Ratio, Spool/Schan	0	0.4	0	0.2
Pool Max Depth Ratio, Dmaxpool/Dbkf	2.0	3.5	2.0	3.5
Pool Width Ratio, Wpool/Wbkf	1.1	1.5	1.3	1.7
Pool-Pool Spacing, Lps/Wbkf	1.5	5.0	4.0	7.0

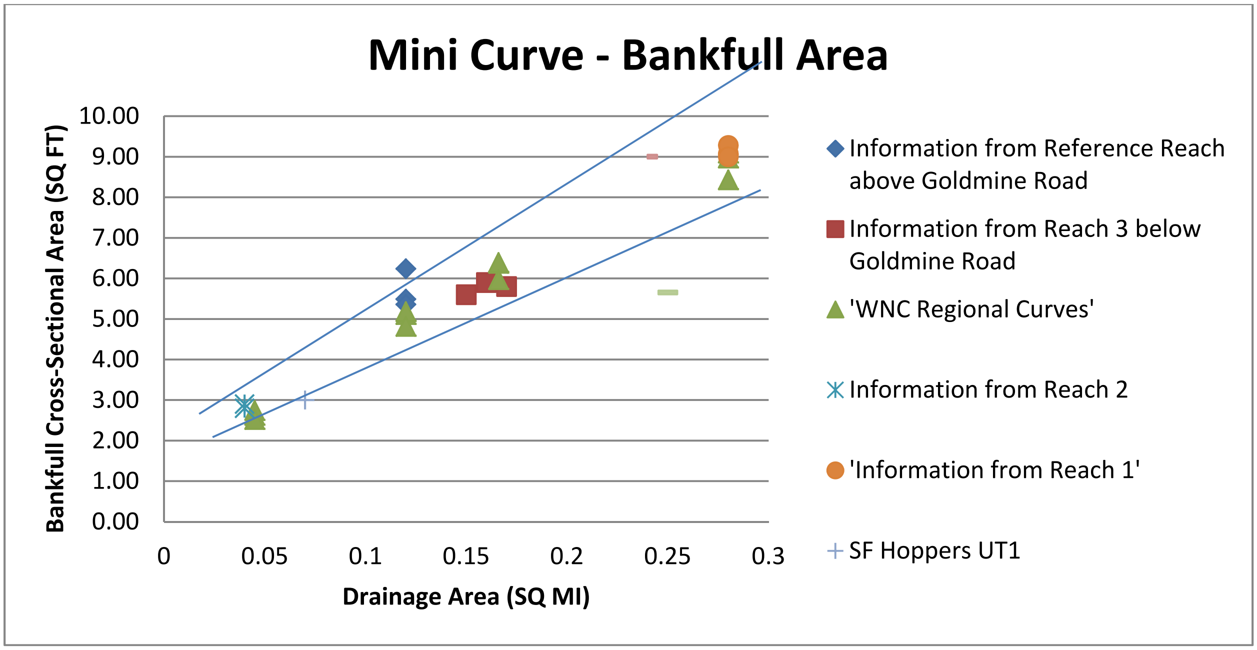


Figure 16.4 Project Area and Vicinity Mini Curve for Bankfull Area

Table 16.8 Geomorphic Table – Silver Creek Mainstem
Upper Silver Creek Mitigation Plan-EEP Project #94645

Parameter	Regional Curve	Existing Conditions		Design		Baker C/E Geomorphic Design Ratios		Reference Reach (Morgan Creek)	
	NC Mtn. / NC Pied. (Rural)	Min	Max	Min	Max	Min	Max	Min	Max
Reach Parameters									
Drainage Area (square miles)	3.0	2.73	3.35	2.73	3.35			8.4	
Impervious cover estimate		<5%		<5%					
Rosgen Stream Classification Type		E		C		C/E		C4	
Rosgen Valley Classification Type		VIII		VIII					
Assumed Manning's "n" roughness coeff.		0.04	0.05	0.037					
Bankfull Mean Velocity (v_{bkf}) (ft/s)		2.8	4.9	4.2		3.5	5.0	7.0	
Bankfull Discharge (Q_{bkf}) (ft^3/s)	232 / 196	180	240	230				524	
Valley Length (ft)		2223		2024					
Channel Thalweg length (ft)		3179		3068					
Sinuosity (K) Stream Length/ Valley Distance		1.43		1.5		1.2	1.6		
Avg Valley Slope – feet per foot		0.006		0.006		0.005	0.015		
Avg Water Surface Slope (ft/ft)		0.004		0.004				0.0070	
Bankfull slope (ft/ft)				0.003	0.008				
Average Channel Slope ($s_{channel}$) – (ft/ft)		0.004		0.004					
Avg Channel Slope Reach 1				0.003					
Avg Channel Slope Reach 2				0.004					
Bankfull Floodplain Area (acres)		2.1		5.2					
Biological or Other									
Stability Indicators									
Bank Height Ratio (dlow / d_{mbkf})		1.07	1.49	1.0	1.0	1.0	1.1	1.0	1.0
Floodprone Area Width (w_{fpa}) (ft)		397	453	397	453			77.5	86.8
Entrenchment Ratio (ER)		19.6	24.0	15.3	17.4			2.3	2.6
Riparian Vegetation Quality (Desc)		Thin buffer, mostly pasture – larger buffer on right floodplain		Hardwood forest					
Evolution Scenario (I-II-III…)		**E-G**-F-E, **E-C-Gc**-F-C-E		C-E	C-E				
Existing Evolution Stage		Degradation/Widening		Stable					
Proportion over wide (%)									
BEHI VL%/L%/M%/H%/VH%/E%									
Channel Stability or Habitat Metric									
Dimension									
Riffle Feature Characteristics									
Bankfull Width (w_{bkf}) (ft)	29 / 19	18.53	21.2	26				33.2	33.5
Bankfull Mean Depth (d_{bkf}) (ft)	1.6 / 2.1	2.29	2.93	2.20				2.3	2.4
Width/Depth Ratio (W/D ratio)		7.4	8.8	12.2		10	12	14.1	14.7
Cross-sectional Area (A_{bkf}) (ft^2)	46 / 45	46.3	55.2	56				75.1	79.8
Bankfull Max Depth (d_{mbkf}) (ft)		3.32	3.87	3.0				2.8	2.9
d_{mbkf} / d_{bkf} ratio		1.3	1.5	1.4		1.2	1.4	1.2	1.2
Low Bank Height (D_{low}) (ft)		3.3	3.9	3				1.0	1.0

Table 16.8 Geomorphic Table – Silver Creek Mainstem
Upper Silver Creek Mitigation Plan-EEP Project #94645

Parameter	Regional Curve	Existing Conditions		Design		Baker C/E Geomorphic Design Ratios		Reference Reach (Morgan Creek)	
	NC Mtn. / NC Pied. (Rural)	Min	Max	Min	Max	Min	Max	Min	Max
Pool Feature Characteristics									
Maximum Pool Depth (d_{pool}) (ft)		3.97	4.08	5.5	7.7			4.1	4.1
Pool Depth to Average Bankfull Depth (d_{pool}/d_{bkf})		1.55	1.59	2.5	3.5	2.0	3.5	1.8	1.8
Pool Width (w_{pool}) (ft)		19.44	23.0	33.8	41.6			25.9	25.9
Pool Width to Bankfull Width (w_{pool} / w_{bkf})		0.99	1.17	1.3	1.6	1.3	1.7	0.8	0.8
Pool Area (A_{pool}) (ft^2)				84.3				88.9	88.9
Pool Area to Bankfull Area (A_{pool}/A_{bkf})				1.5				1.2	1.2
Pattern									
Meander length (L_m) (ft)		59	139	182	312			Not Available	
Meander length to bankfull width (L_m/w_{bkf})		3.0	7.1	7	12	7	12	Not Available	
Radius of curvature (R_c) (ft)		19	62	47	73			Not Available	
Radius of curvature to bankfull width (R_c / w_{bkf})		1.0	3.1	1.8	2.8	1.8	3	Not Available	
Riffle Angle to Fall of Valley (degrees)				35	70	30	75	Not Available	
Belt width (w_{blt}) (ft)		45	106	104	208			Not Available	
Meander Width Ratio (w_{blt}/W_{bkf})		2.3	5.4	4	8	3.5	8	Not Available	
Pool-to-Pool Spacing (L_{ps}) (ft)		40	162	104	182			46.0	277.0
Pool Spacing to Bankfull Width (L_{ps}/w_{bkf})		2.0	8.2	4	7	4	7	4.4	8.3
Pool Length (ft)		15	135	78	137				
Profile									
Riffle Feature Characteristics									
Riffle Slope (s_{riffle}) (feet per foot)		0.001	0.108	0.005	0.008			0.014	0.024
Riffle Slope to Avg Slope (s_{riffle}/ $s_{channel}$)		0.266	26.1	1.2	2	1.5	2	2.0	3.4
Pool Feature Characteristics									
Pool Slope (s_{pool}) (feet per foot)				0.000	0.001			0.0001	
Pool Slope to Avg Slope (s_{pool} / s_{chan})				0	0.2	0	0.2	0.014	
Substrate and Transport Parameters									
Particle Size Distribution of Pebble Count		Coarse Sand-Coarse Gravel		Sand-Cobble				Very Fine Gravel	
d_{16} – mm (Pebble Ct / Subpavement)		1.0/0.9						Not Available	
d_{35} – mm (Pebble Ct / Subpavement)		8.4/5.8						1.2	
d_{50} – mm (Pebble Ct / Subpavement)		17/13						3	
d_{84} – mm (Pebble Ct / Subpavement)		43/32						77	
d_{95} – mm (Pebble Ct / Subpavement)		57/41						800	
Reach Shear Stress (lb/ft^2)		0.35	1.13	0.5					
Stream Power (W/m^2)		34-40		29-35					

Table 16.9 Geomorphic Table – UT1 to Silver Creek
Upper Silver Creek Mitigation Plan-EEP Project #94645

Parameter	Regional Curve	Existing Conditions		Design		Baker C/E Geomorphic Design Ratios		Reference Reach (UT3 Upstream of Gold Mine Road)	
	NC Mtn. / NC Pied. (Rural)	Min	Max	Min	Max	Min	Max	Min	Max
Reach Parameters									
Drainage Area (square miles)	0.28	0.28	0.28	0.28	0.28			0.12	
Impervious cover estimate		<5%		<5%				<5%	
Rosgen Stream Classification Type		E, Gc, Bc		E (high W/D)		C/E		E/Bc	
Rosgen Valley Classification Type		III		III				III	
Assumed Manning's "n" roughness coeff.		0.035	0.04	0.037				0.04	
Bankfull Mean Velocity (v_{bkf}) (ft/s)		3.4	4.6	3.7		3.5	5.0	2.1	3.4
Bankfull Discharge (Q_{bkf}) (ft^3/s)	38 / 36	31	41	33.5				18	
Valley Length (ft)		371.41		373				128.5	
Channel Thalweg length (ft)		524.07		504				134.5	
Sinuosity (K) Stream Length/ Valley Distance		1.41		1.35		1.2	1.6	1.05	
Avg Valley Slope – feet per foot		0.011		0.017		0.005	0.015	0.0198	
Avg Water Surface Slope (Channel) (ft/ft)		0.016		0.015				0.0197	
Bankfull slope (ft/ft)				0.011					
Average Channel Slope ($s_{channel}$) – ft per ft		0.0079		0.015				0.0189	
Channel Slope Reach 1		0.008		0.011					
Channel Slope Tie-in		0.008		0.026					
Bankfull Floodplain Area (acres)									
Biological or Other									
Stability Indicators									
Bank Height Ratio (dlow / d_{mbkf})		1.5	3.0	1.0	1.0	1.0	1.1		
Floodprone Area Width (w_{fpa}) (ft)		10.9	60.5	10.9	60.5			15	19
Entrenchment Ratio (ER)		1.2	10	1.1	6.4			1.9	3
Riparian Vegetation Quality (Desc)		Thin buffer, mostly pasture		Hardwood forest				Hardwood forest	
Evolution Scenario (I-II-III…)		**E-Gc**-F-E, or E-**Bc**-Gc-F-E		E-E (W/D reduction)				Stable E	
Existing Evolution Stage		Degradation, Widening		Stable					
Proportion over wide (%)									
BEHI VL%/L%/M%/H%/VH%/E%									
Channel Stability or Habitat Metric									
Dimension									
Riffle Feature Characteristics									
Bankfull Width (w_{bkf}) (ft)	11.9 / 6.9	6.05	9.3	9.5				6.3	7.9
Bankfull Mean Depth (d_{bkf}) (ft)	0.7 / 1.0	0.97	1.5	0.95				0.7	0.9
Width/Depth Ratio (W/D ratio)		4	9.6	10		10	12	7.3	11.7
Cross-sectional Area (A_{bkf}) (ft^2)	9.1 / 9.0	9	9.07	9.0				5.5	6.5
Bankfull Max Depth (d_{mbkf}) (ft)		1.37	2.07	1.2	1.2			1.0	1.35
d_{mbkf} / d_{bkf} ratio				1.3	1.3	1.2	1.4	1.3	1.5
Low Bank Height (D_{low}) (ft)									

Table 16.9 Geomorphic Table – UT1 to Silver Creek
Upper Silver Creek Mitigation Plan-EEP Project #94645

Parameter	Regional Curve	Existing Conditions		Design		Baker C/E Geomorphic Design Ratios		Reference Reach (UT3 Upstream of Gold Mine Road)	
	NC Mtn. / NC Pied. (Rural)	Min	Max	Min	Max	Min	Max	Min	Max
Pool Feature Characteristics									
Maximum Pool Depth (d_{pool}) (ft)		2	2.4	1.9	3.3			1.8	1.8
Pool Depth to Average Bankfull Depth (d_{pool}/d_{bkf})		1.5	1.8	2	3.5	2.0	3.5	2.2	2.2
Pool Width (w_{pool}) (ft)		6.9	8.8	12.3	16.1			6	6
Pool Width to Bankfull Width (w_{pool} / w_{bkf})		1	1.2	1.3	1.7	1.3	1.7	0.8	0.8
Pool Area (A_{pool}) (ft^2)		9.2	10.3	14	14			6.9	6.9
Pool Area to Bankfull Area (A_{pool}/A_{bkf})		1	1.1	1.6	1.6			1.2	1.2
Pattern									
Meander length (L_m) (ft)		92	138	67	114			45	75
Meander length to bankfull width (L_m/w_{bkf})		12	18	7	12	7	12	6.4	10.5
Radius of curvature (R_c) (ft)		9	21	17	27				
Radius of curvature to bankfull width (R_c / w_{bkf})		1.2	2.7	1.8	2.8	1.8	3		
Riffle Angle to Fall of Valley (degrees)		0	75	35	70	30	75		
Belt width (w_{blt}) (ft)		30	60	33	76				
Meander Width Ratio (w_{blt}/W_{bkf})		3.9	7.8	3.5	8.0	3.5	8		
Pool-to-Pool Spacing (L_{ps}) (ft)		15	50	38	66.5			39.9	62.3
Pool Spacing to Bankfull Width (L_{ps}/w_{bkf})		2	6.5	4	7	4	7	5.6	8.8
Pool Length (ft)								17.4	26.0
Profile									
Riffle Feature Characteristics									
Riffle Slope (s_{riffle}) (feet per foot)		0.018	0.039	0.0165	0.022			0.013	0.054
Riffle Slope to Avg Slope (s_{riffle}/ $s_{channel\text{-}Reach\ 1}$)		2.2	4.9	1.5	2	1.5	2	0.67	2.8
Pool Feature Characteristics									
Pool Slope (s_{pool}) (feet per foot)				0.000	0.002			0	0.00345
Pool Slope to Avg Slope (s_{pool} / $s_{channel\text{-}Reach\ 1}$)				0	0.2	0	0.2	0	0.18
Substrate and Transport Parameters									
Particle Size Distribution of Pebble Count		Small Gravel – Small Cobble		Gravel-Cobble					
d_{16} – mm (Pebble Ct / Subpavement)		4.0/2.2							
d_{35} – mm (Pebble Ct / Subpavement)		12/15							
d_{50} – mm (Pebble Ct / Subpavement)		18/21							
d_{84} – mm (Pebble Ct / Subpavement)		49/90							
d_{95} – mm (Pebble Ct / Subpavement)		85/115							
Reach Shear Stress (lb/ft^2)		0.1	1.0	0.5-0.6				0.2	0.6
Stream Power (W/m^2)		32		30				6.5	28.5

Table 16.10 Geomorphic Table – UT2 to Silver Creek
Upper Silver Creek Mitigation Plan-EEP Project #94645

Parameter	Regional Curve	Existing Conditions		Design		Baker C/E Geomorphic Design Ratios[2]		Baker B Geomorphic Design Ratios		Reference Reach (UT3 Upstream of Project)	
	NC Mtn. / NC Pied. (Rural)	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Reach Parameters											
Drainage Area (square miles)		0.05	0.05	0.05	0.05	0.12				0.12	
Impervious cover estimate		<5%		<5%						<5%	
Rosgen Stream Classification Type		G/B[1]		Cb (Reach 1), C (Reach 2)		C/E		B		E/Bc	
Rosgen Valley Classification Type		VIII		VIII						III	
Assumed Manning's "n" roughness coeff.				0.037						0.04	
Bankfull Mean Velocity (v_{bkf}) (ft/s)		3.2	3.9	3.5		3.5	5.0	4.0	6.0	2.1	3.4
Bankfull Discharge (Q_{bkf}) (ft^3/s)	9.5 / 9.5	9	11	10						18	
Valley Length (ft)		194		248						128.54	
Channel Thalweg length (ft)		209		333						134.48	
Sinuosity (K) Stream Length/ Valley Distance		1.08		1.34		1.2	1.6	1.1	1.2	1.05	
Valley Slope – feet per foot		0.0387		0.025		0.005	0.015	0.02	0.03	0.0198	
Water Surface Slope (Channel) (ft/ft)		0.01	0.17	0.021						0.0197	
Bankfull slope (ft/ft)		0.024 (T.O.B. slope)		0.020							
Avg Channel Slope ($s_{channel}$) – feet per foot		0.036		0.020						0.0189	
Channel Slope Reach 1				0.031							
Channel Slope Reach 2				0.007							
Channel Slope Tie-in				0.026							
Bankfull Floodplain Area (acres)											
Biological or Other											
Stability Indicators											
Bank Height Ratio (dlow / d_{mbkf})		2.2	2.4	1.0	1.0	1.0	1.1	1.0	1.1		
Floodprone Area Width (w_{fpa}) (ft)		5.1	6.4	60	120					15	19
Entrenchment Ratio (ER)		1.6	1.9	10	20					1.9	3
Riparian Vegetation Quality (Desc)		Hardwood forest		Hardwood forest						Hardwood forest	
Evolution Scenario (I-II-III…)		Cb-**G**-F-C / **B**-**G**-Fb-B[1]		Cb-Eb, C-E (W/D reduction)						Stable E	
Existing Evolution Stage		Degradation		Stable							
Proportion over wide (%)											
BEHI VL%/L%/M%/H%/VH%/E%											
Channel Stability or Habitat Metric											
Dimension											
Riffle Feature Characteristics											
Bankfull Width (w_{bkf}) (ft)	6.0 / 3.1	3.1	3.4	6.0						6.3	7.9
Bankfull Mean Depth (d_{bkf}) (ft)	0.4 / 0.6	0.84	0.9	0.50						0.7	0.9
Width/Depth Ratio (W/D ratio)		3.5	4	12.0		10	12	12	18	7.3	11.7
Cross-sectional Area (A_{bkf}) (ft^2)	2.6 / 2.6	2.8	2.85	3.0						5.5	6.5
Bankfull Max Depth (d_{mbkf}) (ft)		1.08	1.36	0.63						1.0	1.35
d_{mbkf} / d_{bkf} ratio		1.2	1.6	1.3		1.2	1.4	1.2	1.4	1.3	1.5
Low Bank Height (D_{low}) (ft)											
Pool Feature Characteristics											

Table 16.10 Geomorphic Table – UT2 to Silver Creek
Upper Silver Creek Mitigation Plan-EEP Project #94645

Parameter	Regional Curve	Existing Conditions		Design		Baker C/E Geomorphic Design Ratios[2]		Baker B Geomorphic Design Ratios		Reference Reach (UT3 Upstream of Project)	
	NC Mtn. / NC Pied. (Rural)	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Maximum Pool Depth (d_{pool}) (ft)		Not available		1.4	1.4					1.8	1.8
Pool Depth to Average Bankfull Depth (d_{pool}/d_{bkf})		Not available		2.8	2.8	2.0	3.5	2.0	3.5	2.3	2.3
Pool Width (w_{pool}) (ft)		Not available		7.5	9					6	6
Pool Width to Bankfull Width (w_{pool} / w_{bkf})		Not available		1.1	1.5	1.3	1.7	1.1	1.5	0.8	0.8
Pool Area (A_{pool}) (ft^2)		Not available		5.6	6.7					6.9	6.9
Pool Area to Bankfull Area (A_{pool}/A_{bkf})		Not available		1.9	2.2					1.2	1.2
Pattern											
Meander length (L_m) (ft)		No pattern - channelized		42	72					45	75
Meander length to bankfull width (L_m/w_{bkf})		No pattern - channelized		7	12	7	12			6.4	10.5
Radius of curvature (R_c) (ft)		No pattern - channelized		12	18						
Radius of curvature to bankfull width (R_c / w_{bkf})		No pattern - channelized		2	3	1.8	3				
Riffle Angle to Fall of Valley (degrees)		No pattern - channelized		35	70	30	75				
Belt width (w_{blt}) (ft)		No pattern - channelized		22	30						
Meander Width Ratio (w_{blt}/W_{bkf})		No pattern - channelized		3.6	5.0	3.5	8				
Pool-to-Pool Spacing (L_{ps}) (ft)		9.5	51	9	30					39.9	62.3
Pool Spacing to Bankfull Width (L_{ps}/w_{bkf})		2.8	16.2	1.5	5	4	7	1.5	5	5.6	8.8
Pool Length (ft)		5.2	12.7							17.41	26.03
Profile											
Riffle Feature Characteristics											
Riffle Slope (s_{riffle}) (feet per foot)		0.014	0.057	0.014	0.033					0.013	0.054
Riffle Slope to Average Slope (s_{riffle}/ $s_{channel}$)		0.4	1.6	0.7[2]	1.6[2]	1.5	2	1.1	1.8	0.67	2.8
Pool Feature Characteristics											
Pool Slope (s_{pool}) (feet per foot)				0.00000	0.00734					0	0.00345
Pool Slope to Average Slope (s_{pool} / $s_{channel}$)				0	0.2	0	0.2	0	0.4	0	0.18
Substrate and Transport Parameters											
Particle Size Distribution of Pebble Count		Small-Coarse Gravel		Gravel-Cobble							
d_{16} – mm (Pebble Ct / Subpavement)		5.6/0.56									
d_{35} – mm (Pebble Ct / Subpavement)		13/2.7									
d_{50} – mm (Pebble Ct / Subpavement)		18/9.1									
d_{84} – mm (Pebble Ct / Subpavement)		43/35									
d_{95} – mm (Pebble Ct / Subpavement)		60/72									
Reach Shear Stress (lb/ft^2)		Not available		0.3						0.2	0.6
Stream Power (W/m^2)		45-51		33						6.5	28.5

[1] The evolution scenario is more likely a Cb starting point; however, the slope of the stream is such that a B-type stream with a lower entrenchment ratio could have been present before mining and other disturbance. The cross-sections classify in a strict sense as B-type channels, however the entrenchment ratio is within 0.2 units of the acceptable variation for classification as a G. The low width/depth ratio suggests that it is more appropriately classified as a G.

[2] The reported riffle slope to average slope ratio is outside of the design range based on the variable channel slope for the tributary between reaches 1 and 2. The slight variation between reaches in terms of other design variables did not warrant an entire separate design table for each reach.

Table 16.11Geomorphic Table – UT3 to Silver Creek

Upper Silver Creek Mitigation Plan-EEP Project #94645

Parameter	Regional Curve	Existing Conditions		Design		Baker C/E Geomorphic Design Ratios		Reference Reach (UT3 Upstream of Project)	
	NC Mtn. / NC Pied. (Rural)	Min	Max	Min	Max	Min	Max	Min	Max
Reach Parameters									
Drainage Area (square miles)	0.17	0.14	0.17	0.14	0.17			0.12	0.12
Impervious cover estimate		<5%		<5%				<5%	
Rosgen Stream Classification Type		E		E		C/E		E/Bc	
Rosgen Valley Classification Type		III		III				III	
Assumed Manning's "n" roughness coeff.		0.035	0.04	0.037				0.04	
Bankfull Mean Velocity (v_{bkf}) (ft/s)		3.9	4.9	3.3		3.5	5.0	2.1	3.4
Bankfull Discharge (Q_{bkf}) (ft^3/s)	26 / 24	20	25	21.7				18	
Valley Length (ft)		1002.1		1019				128.54	
Channel Thalweg length (ft)		1209.79		1332				134.48	
Sinuosity (K) Stream Length/ Valley Distance		1.21		1.31		1.2	1.6	1.05	
Valley Slope – feet per foot		0.0124		0.017		0.005	0.015	0.0198	
Water Surface Slope (Channel) (ft/ft)		0.015		0.013				0.0197	
Bankfull slope (ft/ft)		0.012		0.013					
Avg Channel Slope ($s_{channel}$) – feet per foot		0.0103		0.013				0.0189	
Channel Slope Reach 1				0.0135					
Channel Slope Reach 2				0.011					
Channel Slope Tie-in				0.020					
Bankfull Floodplain Area (acres)		0.2							
Biological or Other									
Stability Indicators									
Bank Height Ratio (dlow / d_{mbkf})		1.0	2.4	1.0	1.0	1.0	1.1		
Floodprone Area Width (w_{fpa}) (ft)		7.7	48					15	19
Entrenchment Ratio (ER)		2.1	9.1					1.9	3
Riparian Vegetation Quality (Desc)		Thin buffer, mostly pasture		Hardwood forest				Hardwood forest	
Evolution Scenario (I-II-III…)		**E**-**G**-F-C-E		E-E (W/D reduction)				Stable E	
Existing Evolution Stage		Degradation		Stable					
Proportion over wide (%)									
BEHI VL%/L%/M%/H%/VH%/E%									
Channel Stability or Habitat Metric									
Dimension									
Riffle Feature Characteristics									
Bankfull Width (w_{bkf}) (ft)	9.8 / 5.5	3.7	5.27	8.0				6.3	7.9
Bankfull Mean Depth (d_{bkf}) (ft)	0.6 / 0.8	1.05	1.57	0.82				0.7	0.9
Width/Depth Ratio (W/D ratio)		2.4	5	8.9		10	12	7.3	11.7
Cross-sectional Area (A_{bkf}) (ft^2)	6.4 / 6.3	5.56	5.93	6				5.5	6.5
Bankfull Max Depth (d_{mbkf}) (ft)		1.7	2.03	0.98	1.1			1.0	1.35
d_{mbkf} / d_{bkf} ratio		1.1	1.7	1.2	1.3	1.2	1.4	1.3	1.5
Low Bank Height (D_{low}) (ft)									

Table 16.11Geomorphic Table – UT3 to Silver Creek
Upper Silver Creek Mitigation Plan-EEP Project #94645

Parameter	Regional Curve	Existing Conditions		Design		Baker C/E Geomorphic Design Ratios		Reference Reach (UT3 Upstream of Project)	
	NC Mtn. / NC Pied. (Rural)	Min	Max	Min	Max	Min	Max	Min	Max
Pool Feature Characteristics									
Maximum Pool Depth (d_{pool}) (ft)		1.8	1.8	1.6	2.8			1.8	1.8
Pool Depth to Average Bankfull Depth (d_{pool}/d_{bkf})		1.3	1.3	2	3.5	2.0	3.5	2.2	2.2
Pool Width (w_{pool}) (ft)		5.09	5.09	9.1	11.9			6	6
Pool Width to Bankfull Width (w_{pool} / w_{bkf})		1.2	1.2	1.3	1.7	1.3	1.7	0.8	0.8
Pool Area (A_{pool}) (ft^2)		6.0	6.0	10.1	10.1			6.9	6.9
Pool Area to Bankfull Area (A_{pool}/A_{bkf})		1.04	1.04	1.7	1.7			1.2	1.2
Pattern									
Meander length (L_m) (ft)		49	72	49	84			45	75
Meander length to bankfull width (L_m/w_{bkf})		10.9	12.8	7	12	7	12	6.4	10.5
Radius of curvature (R_c) (ft)		11	30	13	21				
Radius of curvature to bankfull width (R_c / w_{bkf})		2.5	6.7	1.8	3	1.8	3		
Riffle Angle to Fall of Valley (degrees)		0	90	35	70	30	75		
Belt width (w_{blt}) (ft)		44	94	25	56				
Meander Width Ratio (w_{blt}/W_{bkf})		9.8	21.0	3.5	8.0	3.5	8		
Pool-to-Pool Spacing (L_{ps}) (ft)		40	140	18	42			39.9	62.3
Pool Spacing to Bankfull Width (L_{ps}/w_{bkf})		8.9	31.2	2.5	6	4	7	5.6	8.8
Pool Length (ft)		25	65	20	40			17.4	26.0
Profile									
Riffle Feature Characteristics									
Riffle Slope (s_{riffle}) (feet per foot)		0.00517	0.0305	0.016	0.022			0.013	0.054
Riffle Slope to Average Slope (s_{riffle}/ $s_{channel}$)		0.50	2.97	1.2	1.7	1.5	2	0.67	2.8
Pool Feature Characteristics									
Pool Slope (s_{pool}) (feet per foot)				0.000	0.000			0	0.00345
Pool Slope to Average Slope (s_{pool} / $s_{channel}$)				0	0.2	0	0.2	0	0.18
Substrate and Transport Parameters									
Particle Size Distribution of Pebble Count		Small-Medium Gravel		Gravel-Cobble					
d_{16} – mm (Pebble Ct / Subpavement)		2.5/1.6							
d_{35} – mm (Pebble Ct / Subpavement)		12/10							
d_{50} – mm (Pebble Ct / Subpavement)		16/25							
d_{84} – mm (Pebble Ct / Subpavement)		36/45							
d_{95} – mm (Pebble Ct / Subpavement)		54/57							
Reach Shear Stress (lb/ft^2)		0.55	0.8	0.6				0.2	0.6
Stream Power (W/m^2)		25-45		37				6.5	28.5

16.2 Bankfull Verification and HEC-RAS Modeling and Analysis

Baker engaged physical, analytical, and empirical methods to verify the bankfull stage and discharge of the project reaches of Silver Creek and its tributaries. These methods were each given weight, with physical field measurements having a slightly higher weight due to their site-specific nature. Subsequent methods were used to interpret and sometimes adjust field observations.

The following steps were taken to verify the bankfull stage and discharge of the project reaches:

1. Identified and surveyed cross-sections representative of reach-wide conditions. Estimated bankfull elevation from field observations.
2. Compared field bankfull elevations (and resultant bankfull dimensions) to regional curves and to each other to assess consistency.
3. Built and ran a HEC-RAS existing conditions model with estimated flows
4. Finally, considered all results (physical observation, HEC-RAS, and regional curves) and determined dimensions and flow that best correspond to bankfull.

16.2.1 Physical Field Measurement

Physical bankfull indicators surveyed during the existing conditions analysis were typically depositional bars, defined breaks in slope at a consistent elevation relative to the water surface, or transitions in bank vegetation (including scour lines).

Upon completion of the field survey, the data from the representative cross sections were plotted and processed to check for consistency and correlation with region-specific empirical equations and regional reference data. These data were analyzed to estimate the most likely bankfull stages for each of the representative cross sections surveyed. Once bankfull stage was estimated using these methods, HEC-RAS hydraulic models were used to assess whether a particular flow rate (USGS regression flows and regional curve flows (2-Year, 5-Year, 10-Year) were used to bracket an initial estimate) would produce the bankfull stage at successive cross sections. The HEC-RAS output was then used in conjunction with the regional curve data and physical indicators to determine the most probable bankfull elevation at each surveyed cross section, as well as other sections that were extracted from the surface model created from survey data.

16.2.2 Regional Curve Equations

Publicly available and in-house bankfull regional curves are available for a range of stream types and physiographic provinces. The Upper Silver Creek mitigation site lies near the South Mountains along the border of the Blue Ridge physiographic province of western North Carolina. The North Carolina Mountain and Piedmont and Regional Curves (Harman et al., 2000, and Harman et al., 1999) were referenced for comparison to other more site-specific means of estimating bankfull discharge.

Silver Creek and its tributaries are in a small headwater system; therefore, the contributing watershed areas to the streams in this project are poorly represented on the regional curves. For this reason, it was felt to be important to assess local reference areas for stable dimensions and to consider that variability of design dimensions from the regional curve would not be unreasonable. Rainfall distribution charts indicated that this area receives higher rainfall rates than average for the Piedmont; rainfall distribution in the Blue Ridge is highly variable.

Bankfull predictions from the regional curve are provided in Tables 16.8 to 16.11. In general, design dimensions were comparable or slightly greater than the regional curve values with respect to bankfull area. According to the NC Mountain Regional Curves, the bankfull width, depth, and area for a drainage area of 2.7 to 3.3 square miles (corresponding to the mainstem of Silver Creek at the upstream and downstream project limits) is 27.6-29.8 feet width (Piedmont - Rural: 18.3-20.0 feet), 1.5-1.6 feet depth (Piedmont - Rural: 2.1-2.2 feet), 42.8-49.2 square feet area (Piedmont - Rural: 42.4-48.8 square feet), respectively. By comparison, hydraulic modeling and site-specific measurements of stable cross-sections in the existing project reach and immediately upstream led to a design cross section of 26 feet width, 2.2 feet depth, and 56 square feet area for the typical mainstem riffle section. The design typical has side slopes of 2.5:1; if these were to steepen to an effective slope of 1.5:1, as is possible given typical restoration recovery trends (and with consideration of cross-sectional area being taken up by vegetation), the new cross-section area would be 47.5 square feet, with corresponding decreases in the bankfull width and depth.

16.2.1 Role of Hydraulic Modeling Using HEC-RAS 4.1 in Design Discharge Selection

Extensive and detailed topographic data were collected during the existing conditions survey. This information was used to create a three dimensional topographic surface (surface model) of the stream channel and floodplain. Stream channel and flood plain cross-sections were extracted from this surface model at key locations in the project reach, such as slope breaks in the channel profile and significant changes in channel and floodplain dimensions. These cross sections, along with the stream pattern, were imported into HEC-RAS 4.1 to create a detailed hydraulic model of the channel and floodplain. This “design” hydraulic model is more detailed than the FEMA model used to assess project impacts in order to assess stage-discharge relationships at multiple field-collected cross sections and in order to assess these relationships at lower flows with the most detailed information available.

The design model was used to assess stream stage and the degree of connectivity to the floodplain that segments of stream exhibited at different modeled flow rates (mainly those flow rates thought to be reasonable estimates of the bankfull flow based on regional curve and USGS regression flow data). Longitudinal (see Figure 16.5) channel data were scrutinized against water surface profiles to assess consistence of the physical bankfull indicators (slope breaks, benches, etc.), and to assess the floodplain activating flows throughout the project reach. Figure 16.5 shows that the top of bank is consistently well above the bankfull and 2-Year flow estimates. Further analysis, such as that demonstrated by the cross-section views in Figures 16.6 and 16.7 reveal that the floodplain is typically not activated until a flow magnitude equal to the 5 to 10-Year event. The annual percent chance of floodplain activation is therefore 10-20%, versus the desired target 50-70% for a floodplain at the 1.5 to 2-Year return interval stage.

Cross section 82,150 shown in Figure 16.6 is an example of the stage-discharge analysis that was conducted at multiple cross sections throughout the reach. USGS and NC regional curve flows and other bankfull estimates were run through the model to produce water surface profiles that helped identify reliable physical indicators of bankfull and help size the proposed restoration channel. 82,150 corresponds with detailed cross-section Baker “X4” on Silver Creek perpendicular to design station 11+79.

As a result of the hydraulic analysis, Baker selected a bankfull discharge estimate of 180-240 cfs for Silver Creek mainstem; this was narrowed down to a value of approximately 230 cfs for design.

“Mini” hydraulic models were built for the project tributaries. These models included 2 to 4 cross-sections (typically detailed field cross sections cut along a tape in the field, but supplemented with cross sections from CAD as necessary) and were used in similar fashion to the mainstem hydraulic model. Less confidence was placed on these models which are of reduced detail. These models were used to help assess whether field-identified indicators should be deemed reliable. An example of the model analysis is provided in Figure 16.7 below. This figure depicts cross section two (X2) on UT1, showing the depth of the regional curve bankfull through 25-Year flows at this section. Flows that corresponds with potential bankfull indicators, such as the small side-channel bar on the right side of the channel in the figure, are noted to assess their consistency with other noted physical indicators of bankfull in upstream and downstream cross-sections. Factors that may affect consistency, such as roughness or multi-dimensional flow were considered; where possible, sensitivity analyses were conducted.

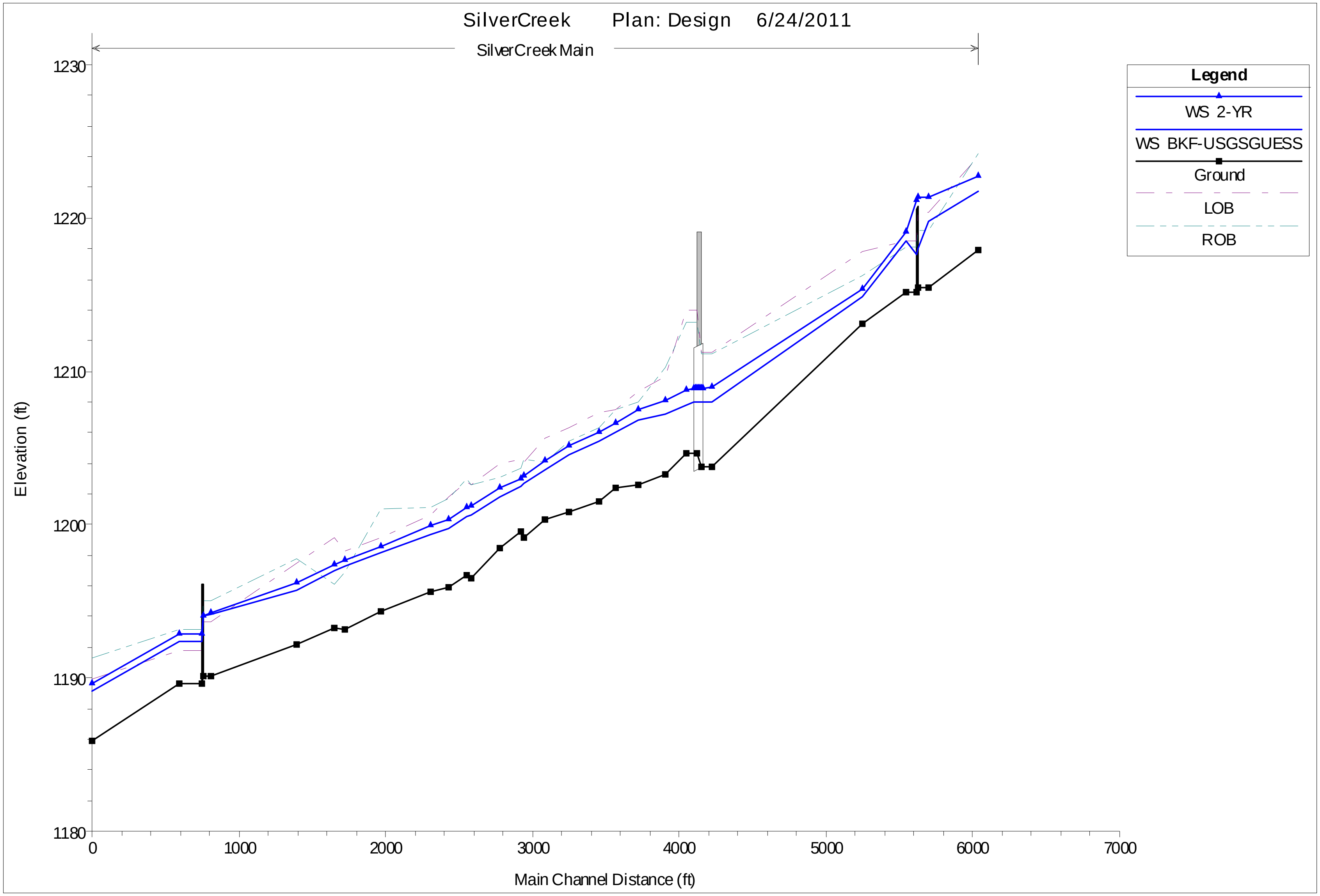


Figure 16.5 Existing Bed Profile, Left and Right Top of Bank, and Water Surface Profiles for the Bankfull Estimate ("WS BKF-USGSGUESS") and 2-Year ("WS 2-YR") Flows; (LOB=Left Top of Bank, ROB=Right Top of Bank)

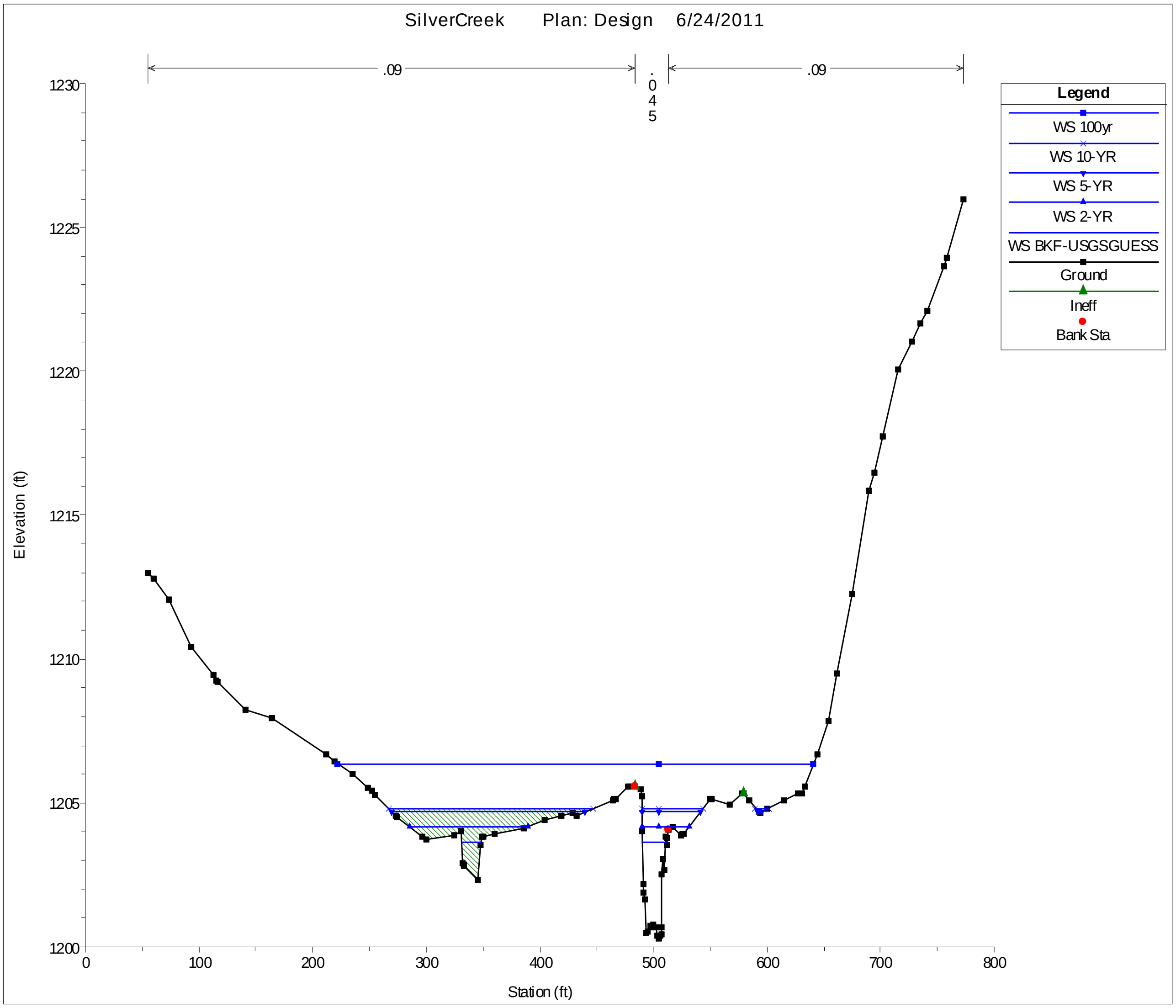


Figure 16.6 Silver Creek HEC-RAS Depth-Discharge Relationship at River Station 82,150 (Existing Channel Perpendicular to Design Station 11+79)

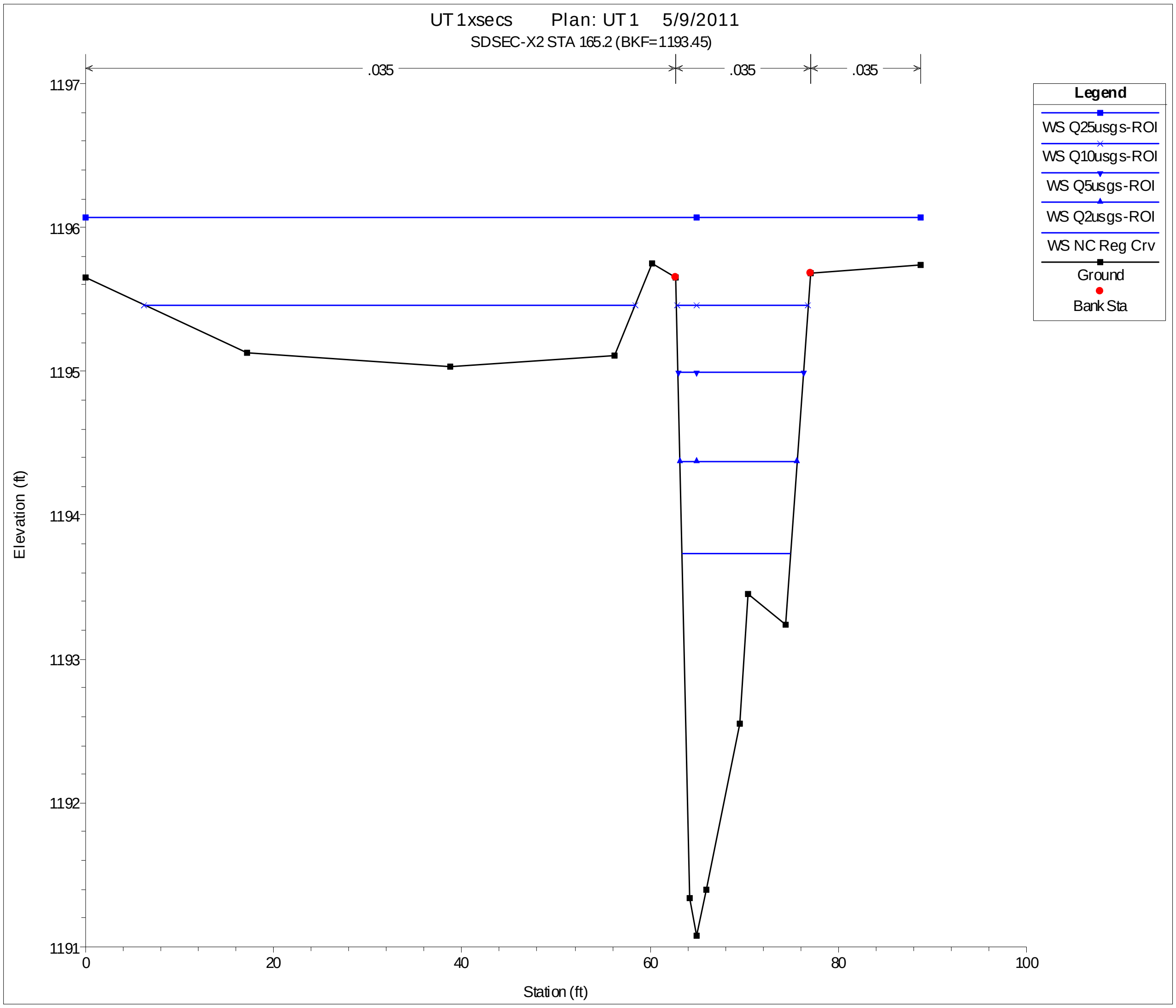


Figure 16.7 UT1 HEC-RAS Modeled Cross-Section 2

16.2.2 Conclusions for Channel Forming Discharge

The insight gained from the HEC-RAS model, the field identified bankfull indicators, and the Manning's discharge estimation method (see table below) indicate that the discharge values on the mainstem of Silver Creek and its tributaries correspond well with the regional curve.

Table 16.12 provides a discharge analyses based on the regional curve flows for the drainage area being considered, the Manning's equation discharges calculated from the representative cross-sections for each reach (based on the bankfull calls identified in the field and adjusted based on detailed analysis), and the design discharge calculated based on the proposed design cross-sections for each stream within the Upper Silver Creek mitigation project.

Table 16.12 Design Discharge Summary for Silver Creek and Tributaries by Reach
Upper Silver Creek Mitigation Plan-EEP Project #94645

Stream	Reach	Downstream Drainage Area (mi^2)	Q, Mountain Regional Curve^2 (cfs)	Q, 1-D Manning's Formula^1 (cfs)	Q, 1-D Hydraulic Modeling^3 (cfs) – "n"=0.045-0.048	Design Q* (cfs)

Silver Creek	1&2	2.7-3.3 (use avg of 3.0)	232 (Piedmont R.C., 196)	230	180-240	230
UT1	1	0.28	38	34	22-44	34
UT2[4]	1&2	0.05	9.5	11	N/A	11
UT3	1&2	0.19	26	20	14-22	20

[1] Q 1-D and Design Q is based on Manning's Equation for the specified or design riffle cross-section and an assumed n-value of n=0.037.
[2] Piedmont Regional Curve - Rural (R.C.) flows for tributaries have negligible difference compared to Mountain Curve.
[3] A range of flows is provided to account for variability (including model limitations) and reliability of indicators as well as to account for potential changes within the project reaches due to addition of drainage area.
[4] No hydraulic model built for UT2.

16.3 Sediment Transport Modeling and Analysis

16.3.1 Sediment Transport Analysis

The factors that influence sediment transport are critical to the initiation and course of stream evolution. In the dynamic equilibrium that is achieved for stable channels, sediment transport is such that the inflowing and outgoing sediment loads are balanced. As discussed in the channel stability assessment, Lane (1955) describes a generalized relationship of stream stability wherein the product of sediment load and sediment size is proportional to the product of stream slope and discharge. Whereas sediment size, stream slope, and stream discharge are readily measured or calculated, sediment load is much more difficult to accurately quantify because of the numerous and complex processes controlling sediment delivery and movement within the stream system. Sediment transport is typically assessed by computing channel competency, capacity, or both. In this case, we have addressed sediment competency by conducting shear stress analyses and looking at empirical data related to particle size mobility. Sediment transport competency is a measure of force per unit area (lb/ ft^2) that refers to the stream's ability to move a given grain size. Quantitative assessments include shear stress, tractive force, and critical dimensionless shear stress. Since these assessments help determine a size class that is mobile under certain flow conditions, they are most important in gravel bed studies in which the bed material ranges in size from sand to cobble (of which only a fraction are mobile during bankfull conditions).

Sediment transport capacity refers to the stream's ability to move a mass of sediment past a cross section per unit of time, expressed in lbs/second or tons/year. Capacity analyses are most critical in systems that have excessive sediment loads, often exhibiting excessive channel filling and aggradation, uniform or plane beds, and/or braided channel configurations. Our assessments of Silver Creek system did not indicate excessive sediment loads for any of the project reaches; therefore, only basic assessments of sediment capacity were conducted as described in Sections 16.3.2 and 16.3.3.

16.3.2 Methodology

To conduct the sediment competency analyses, subpavement and pebble count sediment samples were taken on each stream; typically one pebble count was conducted per reach. The sediment samples were weighed to generate cumulative frequency plots. Project reaches have median particle sizes in the range of small to large gravel. This sampling is a snapshot of the sediment characteristics in the existing channel, affected by both systematic and local instability, as well as other impacts such as channelization. As such, interpretation of the data should consist of gross observations. Ultimately, the existing conditions sediment data will be one of the pieces of information that will help guide design decisions.

As described earlier, small HEC-RAS models were created for each reach to assess the cross-sections collected. The existing conditions shear stresses were estimated to compare to those of the design sections. In general, the design uses higher width-to-depth ratios as a conservative approach to natural channel design. This has multiple effects, one of which is the reduction of shear stress in the design channel due to the increased surface area and decreased depth.

For each stream reach, a worksheet that compares multiple methods (all based on empirical data) was used to assess the critical particle size that is of sufficient size (mass) to resist movement when subjected to the critical (e.g. bankfull) shear stress. The methods include a dimensionless method based on Shields Diagram (Julien, 1995), a critical shear stress graph from Lane (1953), an Isbesh Curve method that selects requisite stone size based on velocity, a permissible tractive force graph from Raudkivi (1967), and a critical shear stress curve from Figure 2.6 of EPA WARSSS v1.0. The result is a bracketing of the probably particle size that would mobilize at bankfull.

The goal of a capacity analysis is to have sediment transport equilibrium; evidence to the contrary would suggest possible aggradation or degradation of the bed or banks. Moderate sand and gravel loads have been observed during site evaluations, particularly on the main stem of Silver Creek. It is expected that these sand and gravel loads will persist as the watershed contains a network of unpaved roads, some agriculture, and eroding stream banks and localized instability in a number of locations higher in the watershed. The design approach to achieve sediment transport equilibrium is to build a channel that should achieve sediment continuity for most events but may be depositional during larger loading events, particularly for finer sediments on the banks and adjacent floodplain. Vegetation establishment will influence the location of deposition based on the localized roughness and velocity reductions on channel margins. Large material will deposit in riffles as part of the natural armoring process. Smaller materials will deposit on the banks due to the lower shear stress zones in these regions. The designed bank 2.5:1 side slopes are expected to narrow over time, as has been witnessed on similar past projects, to form a more efficient channel adapted to the incoming sediment load conditions. Existing channel side slopes are commonly 1:1 or steeper, especially where vegetated. This constitutes a conservative design approach that allows for natural adjustment and promotes recovery.

16.3.3 Sediment Transport Analysis Discussion

The sediment samples were used to determine the dimensionless critical shear stress and corresponding slope and depth required to move the largest particle size. Based on this method, the Silver Creek mainstem bankfull design channel will be competent to move between the D84 (32 mm) and the D100 (44 mm) of the subpavement sample. The D84 of the pavement, or armoring layer is approximately equal to the D100 of the subpavement, suggesting that the armor layer will be less mobile or immobile under bankfull events and smaller (which is desirable). A second check on particle size mobility is based on calculated bankfull shear stress, which is 0.5 lb/sq ft for the design channel. Using multiple empirical data sets it can be determined that shear stresses of this magnitude will typically move particles that range in size from 30 mm to 40 mm in size. A more conservative method, the Colorado data from EPA WARSSS (Rosgen, 2006), also predicts that particles as large as 150 mm may become mobile. The D100 of the pebble count sample was approximately 64 mm, which may be a more reasonable ceiling value for competency of the design channel under bankfull. Finally, there is a Rosgen rock sizing calculation (intended for use in designing structures) that recommends a minimum rock size of 800 mm, or about 2.5 feet be used for the mainstem to prevent movement of boulders in stream structures. These various analyses were used in the selection of appropriately sized riffle and structure material.

In alluvial systems, sediment transport capacity is the other criteria that must be met to avoid channel instability. For this project, stream power was analyzed as it is an accepted surrogate for capacity. The unit stream power (ω, where $\omega = \gamma_{water}$*flow*slope/width) of the existing bankfull channel is estimated to be between 34 and 40 W/m^2 (W = watts) in areas where the existing bank height ratios are close to 1.0 (downstream main stem reach). These areas appear to be actively transporting the incoming sediment load, without active degradation or aggradation. Under proposed design conditions, the stream power of the design channel for Silver Creek would be between 29 to 35 W/m_2. If the side slope of the channel narrows from 2.5:1 to 2:1 (as is expected to occur over time with vegetation growth and sediment deposition), this would constitute a reduction in bankfull channel width from 25.4 feet to 22.4

feet. It would also result in an increase in stream power from the reported range above to a range of 32 to 40 W/m2. Since existing cross-sections with stream power ranging from 34 to 40 W/m^2 appear to be effectively moving the stream's sediment load, it is expected that the post-restoration channel cross-section with stream power in the range of 32 to 40 W/m^2 will also provide sufficient transport capacity. By reducing bank height ratios along the stream as part of the restoration, stability will be improved at flows higher than bankfull by reducing stream power and bed shear stresses during these higher flow events.

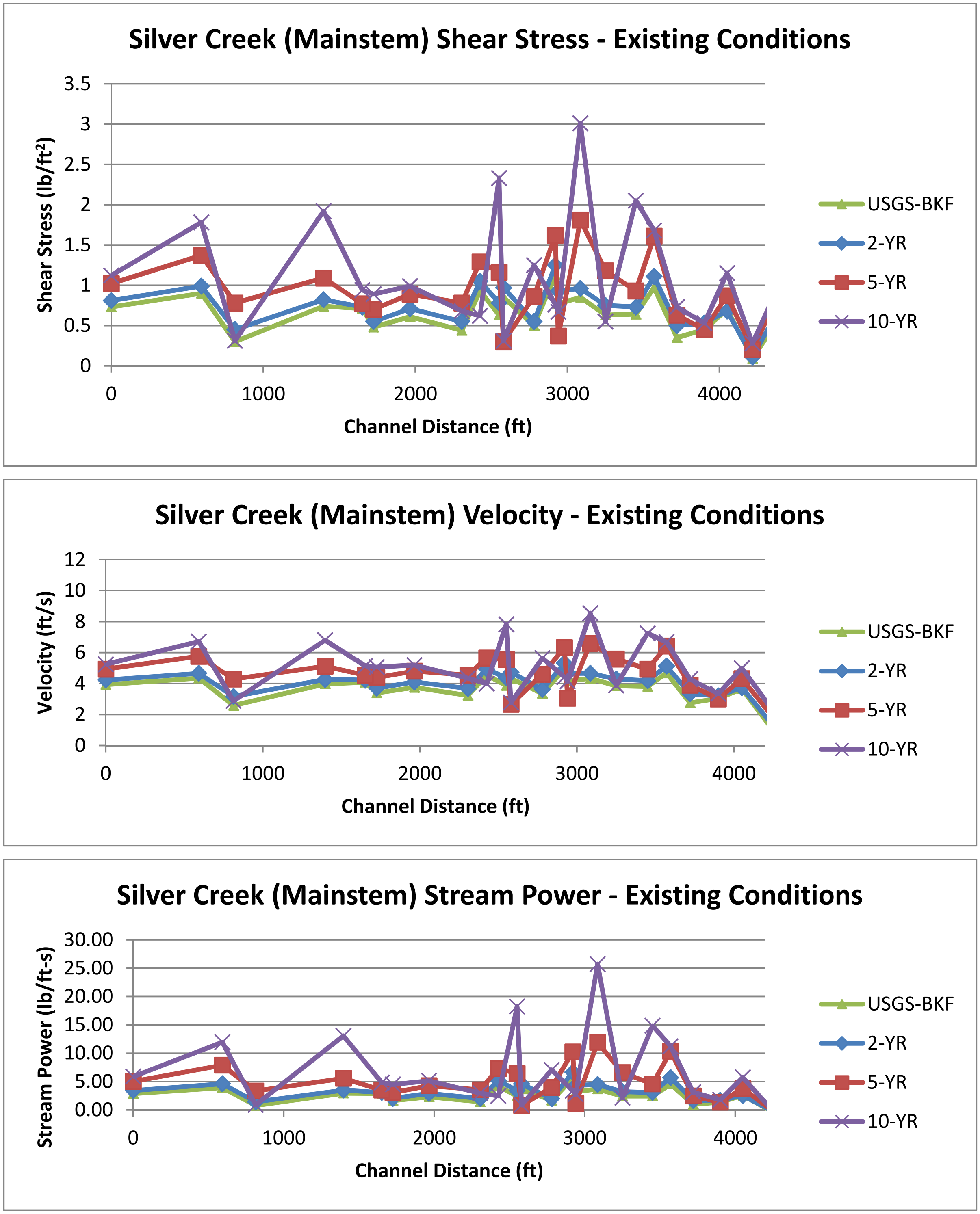
For UT1, the design bankfull channel dimensions and slope is competent to move the subpavement D50 (21 mm) but not the D84 (90 mm). Similarly, the D84 of the pebble count sample is not competent. Since the design for UT1 is intended to have less mobile riffles consistent with a hybrid step-pool design, having a greater percentage of the sediment be non-mobile is not of concern. An upstream pond in the watershed limits sediment input, so highly mobile particles would result in an evacuation of sediment from the reach and subsequent risk of down-cutting. The design shear stress is 0.5-0.6 lb/sq ft; shear stresses of this magnitude, based on multiple bedload capacity data sets, may typically move particles that range in size from 30 mm to 40 mm in size and may move particles as large as 150 mm according to Colorado data from EPA WARSSS (Rosgen, 2006). The D100 of the pebble count sample was approximately 85 mm and for the subpavement sample, 115 mm; this range may be a more reasonable ceiling value for immobile particle design. Rosgen rock sizing calculations recommend a minimum rock size of 800 mm, or about 2.5 feet be used to prevent movement of boulders in stream structures. In terms of transport capacity, the reach is expected to be supply limited and is therefore being designed to be more immobile. Unit stream power for existing and proposed are nearly identical (32 W/m^2 average for existing versus 30 W/m^2 for proposed). However, due to an upstream pond, the UT is not expected to have an incoming sediment load that will cause significant bank slope adjustment. Under these supply limiting conditions, aggradation is not a concern and the concern of degradation will be met by designing low-mobility grade control features.

For UT2, the design bankfull depth and slope is capable of moving particles in the size range of the D50 particle of the subpavement sample (9.1 mm) but not the D84 (35 mm) and may be capable of moving the D50 of the pebble count sample (18 mm), but not the D84 (43 mm). The design shear stress is 0.3 lb/sq ft; shear stresses of this magnitude, based on multiple bedload capacity data sets, may typically move particles that range in size from 15 mm to 25 mm in size and may move particles as large as 80 mm according to Colorado data from EPA WARSSS (Rosgen, 2006). The D100 of the pebble count sample was approximately 85 mm and for the subpavement sample, 115 mm; this range supports the Colorado curve data and may be a more reasonable ceiling value for immobile particle design. Since the design for UT2 is intended to have less mobile riffles consistent with a step-pool design, the proposed mix of riffle material will include 50% or more particles greater than 80 mm in order to reduce particle mobility. Rosgen rock sizing calculations suggest that a minimum rock size of 700 mm, or about 2.3 feet be used to prevent movement of boulders in stream structures; it is Baker's experience that for a stream of this size even with a moderate gradient that 1x2x2' boulders are sufficient for structure stability. The discrepancy is, in part, related to multiple boulders making up any one structure acting as a unit based on their tight configuration and interlocking characteristics. In terms of transport capacity, the reach is expected to have an abundance of fine sediment based on observations of upstream deposition. Existing transport capacities are affected by the channel size (due to incision or dredging), but also due to the uneven gradient (current conditions have one large drop, or headcut, that has migrated to the head of the design reach). The gradient below this drop is 80% of the average water surface slope reported in the design table, the proposed design conditions will more adequately distribute gradient throughout the reach, however, there will also be an increase in stream sinuosity that reduces stream power. The existing stream power below the gradient is approximately 45-51 W/m^2 compared to a proposed stream power for the stream of 33 W/m^2. Strategies to maintain transport capacity are to maintain gradient, allow banks to narrow over time, and to use multi-directional velocities to scour and cleanse pools during high frequency events. As with other designs for this project, a conservative approach that allows for natural recovery and adjustment has been prescribed. A potential adjustment scenario could be that a 1-foot reduction in stream top width due to depositional narrowing would result in a 10 unit increase in stream power, bringing the reach in-line with existing transport capacity. Also, it was noted that areas upstream that were observed to have deposition problems are also areas that have slopes much lower than the proposed design reach.

For UT3, the design bankfull depth and slope is capable of moving D50 size particles (25 mm) of the subpavement sample but probably not the D84 (45 mm). For the pebble count sample, it can move the D50 (16 mm), but it is uncertain whether it can move the D84 (36 mm). The design shear stress is approximately 0.6 lb/sq ft; shear stresses of this magnitude, based on multiple bedload capacity data sets, may typically move particles that range in size from 30 mm to 45 mm in size and may move particles as large as 150 mm according to Colorado data from EPA WARSSS (Rosgen, 2006). The D100 of the pebble count sample was in the range of 65 to 90 mm; this range is less than the Colorado curve prediction and may be a more reasonable ceiling value for immobile particle design. UT3 has a very stable upstream watershed and it is anticipated that a design channel that is comparable to the upstream reference reach will meet capacity and competency criteria. The riffles will be designed with a higher percentage of immobile particles than in the existing channel to protect the project during the early recovery stages. Approximately 50% or more of the proposed mix of riffle material will consist of particles greater than 50 mm in order to reduce particle mobility. Rosgen rock sizing calculations suggest that a minimum rock size of 820 mm, or about 2.7 feet be used to prevent movement of boulders in stream structures; as described in the previous paragraph, 1x2x2' boulders will be sufficient for structure stability. In terms of transport capacity, the upstream supply is expected to be low to moderate based on its stable forested watershed and stable in-stream character. The existing stream power is approximately 25-30 W/m^2 in the upper reach, with the lower reach in the range of 30-45 W/m2. The proposed stream power for the upper reach will remain the same with few modifications being proposed; for the lower reach, stream power was calculated at 37 W/m2. Strategies for the lower reach include encouragement of high frequency storm flows into braided offline channels to increase hydrology in the adjacent wetland. As such, transport capacity is not a significant concern. Never-the-less, upstream supply rates are expected to be low enough so as not to cause significant sedimentation in the project area.

16.3.4 Data Outputs and Graphics

An example of the HEC-RAS output used to assess sediment transport is provided below (Figure 16.8). HEC-RAS can output shear stress, velocity and stream power as standard calculations done within each program run. For the mainstem of Silver Creek, existing conditions were plotted to assess the range and average values for these parameters. The figures below provide these results. Results were used in the analysis described in the previous section.


Silver Creek (Mainstem) Shear Stress - Existing Conditions

Silver Creek (Mainstem) Velocity - Existing Conditions

Silver Creek (Mainstem) Stream Power - Existing Conditions

Figure 16.8 HEC-RAS Assessment of Sediment Transport on Silver Creek

16.4 EXISTING VEGETATION COMMUNITIES AND DISTURBANCE HISTORY

Habitat within and adjacent to the proposed project area consists of fallow agricultural fields, pocket wetlands, mixed hardwood forests and successional deciduous forests as described by Schafale and Weakley (1990) and North Carolina's Gap Data Tool (2005). Trees common to this site and the greater

Piedmont and lower-elevation Mountain valleys include sweetgum (*Liquidambar styraciflua)*, red maple (*Acer rubrum*), sycamore (*Plantanus occidentalis)*, tulip poplar (*Liriodendron tulipifera)*, hemlock (*Tsuga spp.*) and white pine (*Pinus strobus*). Other maples and oaks are present as well. Riparian areas ranged from relatively undisturbed in recent years to very disturbed. Periodic mowing has restricted the growth of trees in most of the project area, including the wetlands. The forested area on the eastern side of Silver Creek is the least disturbed area, although evidence of relic spoil piles, berms, and old roadbeds are present. A general description of each community follows:

16.4.1 Piedmont/Mountain Mixed Bottomland Hardwood Forest

This ecological community is located in the bottomland portion of the project area, primarily along Silver Creek. Dominant canopy species include river birch (*Betula nigra*), sycamore (*Platanus occidentalis*), sweetgum (*Liquidambar styraciflua*), tulip poplar (*Liriodendron tulipifera*), sugarberry (*Celtis laevigata*), black walnut (*Juglans nigra*), green ash (*Fraxinus pennsylvanica*), shagbark hickory (Carya ovata), red maple (Acer rubrum), white ash (*Fraxinus americana*) and Carolina silverbell (*Halesia tetraptera (carolina)*). Understory trees include box elder (*Acer negundo*), southern sugar maple (*Acer floridanum*), red maple (*Acer rubrum*), pawpaw (*Asimina triloba*), and ironwood (*Carpinus caroliniana*). Shrubs may include spicebush (*Lindera benzoin*), painted buckeye (*Aesculus sylvatica*), redtwig doghobble (*Leucothoe recurva*), beaked hazel (*Corylus cornuta*), and silky dogwood (*Cornus amomum*). The herb layer is generally diverse and includes, but is not limited to, dimpled troutlily (Erythroniumum bilicatum ssp. Umbilicatum), star chickweed (Stellaria pubera), wreath goldenrod (Solidago caesia), broad looseflower sedge (Carex laxiflora), Christmas fern (Polystichum acrostichoides), smallspike false nettle (Boehmeria cylindrical), eastern bottlebrush grass (Elymus hystrix), jumpseed (Polygonum(Tovara) virginianum), wingstem (Verbesina alternifolia), jewelweed (Impatiens capensis), violet (Viola spp.), and jack-in-the-pulpit, (Arisaema triphyllum). The large number of tulip poplar and sweetgum indicates prior clear-cutting in the project area.

16.4.2 Successional Deciduous Forest

This ecological community is primarily located along UT1, UT3 and the western upland fringe of the project area. Other portions of the project area in which traces of successional deciduous vegetation can be found include portions of the project area that are periodically mowed for hay production. Sweetgum, tulip poplars and maples are the dominant regenerating deciduous trees located in these areas.

16.4.3 Piedmont Dry-Mesic Oak and Hardwoods Forest

This ecological community is primarily located in the project area downstream of UT1 along the upland fringes of the riparian zone along Silver Creek. The dominant canopy species of the dry mesic oak forest area includes white oak (*Quercus alba*), northern red oak (*Quercus rubra*), black oak (*Quercus velutina*), mockernut hickory (*Carya alba* (*tomentosa*)), red hickory (*Carya ovalis*), and pignut hickory (*Caryus glabra*). Yellow poplar (*Liriodendron tulipifera*) is also common. Understory species included red maple (*Acer rubrum*), flowering dogwood (*Cornus florida),* sourwood *(Oxydendrum arborem),* American holly *(Ilex opaca),* black tupelo *(Nyssa sylvatica)* rhododendron (*Rhododendron* spp.), and mountain laurel (*Kalmia latifolia*). Shrubs include downy arrowwood (*Viburnum rafinesquianum),*deerberry *(Vaccinium stamineum),*Blue Ridge blueberry *(Vaccinium pallidum (vacillans)),* and strawberry bush *(Evonymus americana).* Muscadine grapevines *(Vitis rotundifolia)* and poison ivy *(Toxicodendron (Rhus) radicans)*often are present. Herbs are fairly sparse, with *Hexastylis spp.,* striped prince’s pine *(Chimaphila maculata),* nakedflower ticktrefoil *(Desmodium nudiflorum),* and rattlesnakeweed common.

16.5 Project Site Wetlands

16.5.1 Jurisdictional Wetlands

The proposed project area was reviewed for the presence of wetlands and waters of the United States in accordance with the provisions of Executive Order 11990, the Clean Water Act, and subsequent federal regulations. Wetlands have been identified by the USACE as “those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas” (33 CFR 328.3(b) and 40 CFR 230.3 (t)). The areas in the project boundaries that displayed one or more wetland characteristics were reviewed to determine the presence of wetlands. The wetland characteristics included:

1. Prevalence of hydrophytic vegetation.
2. Permanent or periodic inundation or saturation.
3. Hydric soils.

On June 5, 2007, the USACE and US Environmental Protection Agency (USEPA) issued joint guidance for their field offices for Clean Water Act jurisdictional determinations in response to the Supreme Court’s decision in the consolidated cases of Rapanos v. United States and Carabell v. United States (USEPA and USACE, 2007). Based on this guidance, the agencies will assert jurisdiction over the following waters:

- Traditional navigable waters (TNWs)
- Wetlands adjacent to TNWs
- Non-navigable tributaries of TNWs that are considered relatively permanent waters (RPWs). Such tributaries flow year-round or exhibit continuous flow for at least 3 months.
- Wetlands that directly abut RPWs.

The agencies will decide jurisdiction over the following waters based on a standardized analysis to determine whether they have a significant nexus with a traditional navigable water:

- Non-navigable tributaries that are not relatively permanent waters (non-RPWs)
- Wetlands adjacent to non-RPWs
- Wetlands that are adjacent to but do not directly abut an RPW.

The significant nexus analysis is fact-specific and assesses the flow characteristics of a tributary and the functions performed by all its adjacent wetlands to determine if they significantly affect the physical, chemical, and biological integrity of downstream TNWs. A significant nexus exists when a tributary, in combination with its adjacent wetlands, has more than a speculative or insubstantial effect on the physical, chemical, or biological integrity of a TNW.

The USACE and USEPA will apply the significant nexus standard within the limits of jurisdiction specified by the Supreme Court decision in the case of Solid Waste Agency of Northern Cook County (SWANCC) v. US Army Corps of Engineers. Under the SWANCC decision, the USACE and USEPA cannot regulate isolated wetlands and waters that lack links to interstate commerce sufficient to serve as a basis for jurisdiction under the Clean Water Act. Though isolated wetlands and waters are not regulated by the USACE, within the state of North Carolina isolated wetlands and waters are considered “waters of the state” and are regulated by the NCDWQ under the isolated wetlands rules (15A NCAC 2H .1300).

Following an in-office review of the National Wetland Inventory (NWI) map, NRCS soil survey, and USGS quadrangle map, a field survey of the project area was conducted to delineate wetlands and waters of the U. S. The project area was examined utilizing the jurisdictional definition detailed in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory, 1987). Supplementary information to further support wetland determinations was found in the *National List of Plant Species that Occur in Wetlands: Southeast (Region 2)* (Reed, 1988).

Based on the findings on the wetland delineation, six pockets of cleared bottomland hardwood forest wetlands totaling 3.32 acres are present in the open fields west of Silver Creek.

These wetlands have formed as a result of groundwater seepage, hillslope run-off, depressional topography, overbank flow, and poor drainage. Existing wetlands will be incorporated into the design as wetland enhancement areas. Through the proposed stream and wetland restoration practices, many of these areas will experience more natural regimes of baseflow and flood hydrology once the project is completed. In addition, the exclusion of mowing activities from the area will provide for re-establishment of appropriate vegetation communities. Since most of the existing wetlands are dominated by herbaceous wetland species, the areas will be planted with native woody vegetation that is tolerant of flooded conditions.

16.5.2 Wetland Impacts

Existing Impacts from Prior Activities

Existing wetlands and potential wetland restoration and enhancement areas are primarily located in the bottomland west of Silver Creek. Wetland creation is also being proposed on the left (western) floodplain where an existing ditch drains surface water to the creek. The buried hydric and non-hydric soils suggest that much of this area may have once been wetland, however soils were not consistent enough and/or were buried too deep to propose restoration. Existing and proposed wetlands consist of riparian groundwater seep wetlands (located in pockets and at toe-of-slop areas along the western portion of the site) and depressional riparian wetlands (located in the floodplain of Silver Creek and its tributaries).

Many of the wetlands and proposed wetland restoration areas are hydrologically impaired. Wetlands on this site are often perched above the prevailing stream base flow elevation, but may still be affected by stream flow connectivity (endosaturation). Based upon current bank height ratios for the streams, stream base flow in the mainstem and tributaries is 1-2’ lower than historic conditions prior to channel incision and floodplain aggradation, which impacts regional saturation and therefore hydraulic gradients and hydroperiods. Many of these wetlands should also be driven in part by hydrology from overbank flooding (episaturation); however, the frequency of overbank flooding has been significantly decreased by this same incised channel condition. Restoring streams to their historic vertical position on the landscape will significantly contribute to the success of wetland enhancement, creation, and restoration efforts.

Drainage ditches running through the sites are also impacting hydrologic conditions. Such ditches exist adjacent to all existing wetlands on the left (west) floodplain between UT1 and UT3. There is a large ditch running north-northeast through the area with a series of minor ditches draining to it. The ditch networks were likely dug to capture various sources of seepage in this portion of the project area in order to increase land available for agricultural use. Other portions of the project area are drained by Silver Creek due to its incised condition, exerting a drainage effect on the adjacent fields.

Soil investigations indicated that pre-disturbance wetland areas were larger and that a wetland complex existed along much of the western floodplain. Drainage as discussed, fill from roadway construction and also for the purpose of enhancing agricultural fields, and unnatural floodplain deposition from extensive mining in the watershed have all contributed to impairment of that wetland system. Slope run-off, groundwater seepage, and natural drainage patterns were diverted to ditches and swales that are still present. Soil investigations verify the prevalence of buried hydric soils, as well as buried non-hydric soils. Wetland hydrology is present in gage #3, but soils have been altered to where the area is not a jurisdictional wetland. Hydric soils are present below gage #6, however loose and sandy fill, as well as a lowered stream and modified topography have altered the hydrology to where restoration is required to reestablish hydrology to the wetland soils.

Based on Corps of Engineers guidance from site visits, wetland restoration and enhancement activities may remove up to one foot of overburden to restore jurisdictional soil and hydrologic conditions. In areas where anthropogenic activities has resulted in a thicker layer of overburden, creation credit is available.

Proposed Impacts

Both temporary and permanent impacts are required to meet mitigation goals; these are described and addressed here and in the permit. Efforts were taken during the design process to minimize impacts to existing jurisdictional streams and wetlands. To this end, alternatives were considered and implemented where possible.

Temporary and permanent wetland impacts associated with the restoration activities are very minimal and are required for overall project success in terms of restoring stability to Silver Creek, UT1 and UT3 and for enhancement of wetland hydrology in existing, proposed and creation wetlands. Proposed temporary impacts to wetlands are necessary to conduct minor grading to remove fill in existing wetlands, to conduct activities associated with soil tillage and loosening, removal of exotic, invasive vegetation, re-establishment of wetland vegetation native to the region and minor adjustments to drainage patterns. The proposed stream and wetland restoration measures will not negatively impact the hydrology, vegetation, and soils of the existing wetlands. These impacts have been established using proposed grading contours that intersect existing jurisdictional wetlands and are equal to approximately 2.1 acres. These activities are prescribed to improve wetland hydrology, reestablish topographic diversity, native vegetation, and hydric soil connectivity in existing impaired wetlands. Proposed permanent impacts to streams are necessary to establish stable dimension, pattern and profile by conducting stream restoration activities. These activities also support hydrologic enhancement goals associated with wetland mitigation efforts.

The entire existing conditions stream length of the project streams within the project area, 4,470 linear feet, is to be considered as permanently impacted by construction associated with the restoration project. The result will be increased stream length, with geomorphically stable conditions and as-built conditions that support a trajectory for ecosystem recovery. In addition, a jurisdictional manmade ditch will be permenantly impacted (it will be modified as a broad swale and will serve as wetland creation component, C1). This impact is 917 linear feet of 4'-wide ditch and is considered necessary since it is restoring a jurisdictional feature of a comparable nature with enhanced functional value.

Permanent impacts are proposed to small portions of three of the existing wetlands (JDW1, JDW5 and JDW6) totaling 0.06 acres (the combined impact to JDW1 and JDW5 is less than 0.005 acres). The wetland impacts are as follows: A portion (<0.005 acres) of wetland area JDW1 (JDW1b) will be removed by the new alignment of UT3. A portion of JDW 5 (<0.005 acres) will be removed by the new alignment of the mainstem (this portion of JDW 5 is a manmade ditch that is helping to drain the wetland). In addition, wetland JDW6 will be transected by the proposed mainstem stream alignment resulting in an impact of 0.06 acres, equal to the footprint of the proposed stream displacing existing wetland and including the remaining isolated portion of wetland on the right point bar. All of these impacts were necessary for meeting stream and wetland goals and design criteria.

Multiple options were reviewed and impacts were ultimately minimized by selecting the least invasive options to existing jurisdictional wetlands while still meeting the intent of the project to restore wetland hydrology and restore stream stability. For the jurisdictional ditch (an unnatural feature meeting jurisdictional requirements for streams), this feature is going to be reshaped and converted to a created wetland. Plugging the ditch is deemed an essential activity to restoring hydrology to adjacent wetlands, and reshaping the ditch to a broad wet swale is consistent to a natural condition for the size of the catchment area draining to the ditch.

See Table 16.13 for a summary of wetland impacts and Sheet 1 of the Plan Set for additional information.

16.13 Summary of Proposed Wetland Impacts
Upper Silver Creek Mitigation Plan-EEP Project#94645

Wetland Name	Impact Condition Permanent (P) / Temporary (T)	Type of Impact	Type of Wetland	Area of Impact (Acres)
Wetland 1	P; T	Wetland Enhancement - Minor Grading & Priority 1 Restoration – Channel excavation & fill	Bottomland Hardwood Forest	P = <0.005 T = 1.43
Wetland 2	T	Wetland Enhancement - Minor Grading	Bottomland Hardwood Forest	T = 0.51
Wetland 3	T	Wetland Enhancement - Minor Grading	Bottomland Hardwood Forest	T = 0.03
Wetland 4	T	Wetland Enhancement - Minor Grading	Bottomland Hardwood Forest	T = 0.24
Wetland 5	P; T	Wetland Enhancement - Minor Grading & Priority 1 Restoration – Channel excavation & fill	Bottomland Hardwood Forest	P = <0.005 T = 0.81
Wetland 6	P; T	Wetland Enhancement - Minor Grading & Priority 1 Restoration – Channel excavation & fill	Bottomland Hardwood Forest	P = 0.06 T = 0.25
			Total Wetland Impacts	P = 0.07 T = 3.27

16.5.3 Jurisdictional Wetland Findings

Following an in-office review of the National Wetland Inventory (NWI) map, NRCS soil survey, and USGS quadrangle map, Baker personnel delineated jurisdictional wetlands and waters on-site based on the USACE 1987 Wetland Delineation Manual (USACE, 1987) and indicators specified in the Interim Regional Supplement of the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (USACE, 2010). Wetland delineation surveys were conducted September 2010 and January 2011. Jurisdictional wetlands were flagged in the field and located using a total station.

The original plant community located in these wetlands was most likely typical of other bottomland forested wetlands in the region; however, past agricultural land use practices have altered the composition of the plant community currently present. Wetland boundaries were delineated and have been accepted by the USACE in a jurisdictional determination dated April 7, 2011. In total, there are 3.32 acres of existing wetlands on the project property (these are shown in Figures 2.4 and 2.5)

16.5.4 Hydrological Characterization

The presence of buried or surface hydric soils over much of the project site is evidence that the site historically supported a wetland ecosystem. Like other rural areas in the state, drainage patterns on-site were historically altered to maximize the availability of arable land or land to support livestock. Man-made drainage ditches were added to further drain wetland complexes on-site. Evidence of these swales and ditches still exist today and exert varying degrees of influence on several jurisdictional wetlands present.

Eight automated groundwater wells were installed in the project area to evaluate current hydrologic conditions on-site – These wells are shown in the project planset on the following sheets as well as in Appendix E, Location of Wells and Groundwater Data by Well:

- Well 1 (Reference wetland): Located in existing wetland JDW6, Sheet 12.
- Well 2 (Reference wetland): Located in existing wetland JDW5, Sheet 12.

- Well 3: Located near fringe of JDW4, Sheet 12.
- Well 4: Located between ditch and Silver Creek, Sheet 12.
- Well 5: Located in existing wetland JDW2, near main ditchline, Sheet 11.
- Well 6: Located in raised, hydric soil-mapped area near JDW1, Sheet 11.
- Well 7: Located in non-wetland area on right floodplain, Sheet 12.
- Well 8 (Reference wetland): Located in JDW1, Sheet 11.

The wells provide a basis for comparing pre-and post-restoration hydrology on-site. Water table data were collected and analyzed for one year, from November 2010 through October 2011; results for all wells are provided in Figure 16.9. Hydroperiods observed on-site during the 2011 growing season are provided in Table 16.13. More detailed data broken out by well is provided in Appendix E. With the exception of Well 7, the wells were installed in existing field areas targeted for wetland restoration, enhancement, or creation. Wells were installed across a range of elevations and locations to evaluate the range of hydrologic conditions on-site. The wells were installed to a depth of 44 inches below ground surface, and the automated loggers (RDS Ecotone^{TM} CP & WM Series units) were programmed to record water table levels every 1.5 hours.

Well locations exhibited similar trends in water table depth throughout the monitoring period that reflect seasonal changes in rainfall as well the interaction between wetlands, streams and man-made drainage ways on-site. Average water table levels were at their lowest in mid to late summer when rainfall was approximately 10" below average and evapotranspiration rates were high. A couple of months prior during March-April 2011, water tables were at their highest as the result of period consistent with historic average rainfall during that time. Water table levels spiked in response to significant rainfall events or smaller, cumulative events that took place over a couple of days. Where the groundwater hydrology is influenced more by surface runoff, seepage, and confining soils, the water level did not decrease as quickly as those levels observed in monitoring wells that were located in closer proximity to perennial or intermittent surface water features. Floodplain lenses of sand and gravel, as well as other floodplain depositional patterns appear to influence hydrology in the adjacent wetlands.

Of the eight wells, Wells 6, 4 and 7 appear to be the most strongly influenced by flow in Silver Creek. Well 1 also appears to be influenced, though not to the same degree. Well 7, located in close proximity to Silver Creek, experienced dramatic spikes in water levels, likely a result of the lack of hydric soils in this area on the opposite eastern floodplain. Wells 4 and 6 also had higher water level variations which are attributed to the drainage effect from Silver Creek and other tributaries/ditches; however these areas did show a greater retention of water than the non-hydric soils around Well 7. Well 1, located in JDW6, has a very strong hydrology which is supported by recharge (it is a topographic low point with sizable contributing drainage area) and lesser disturbed hydric soils except for around its margins.

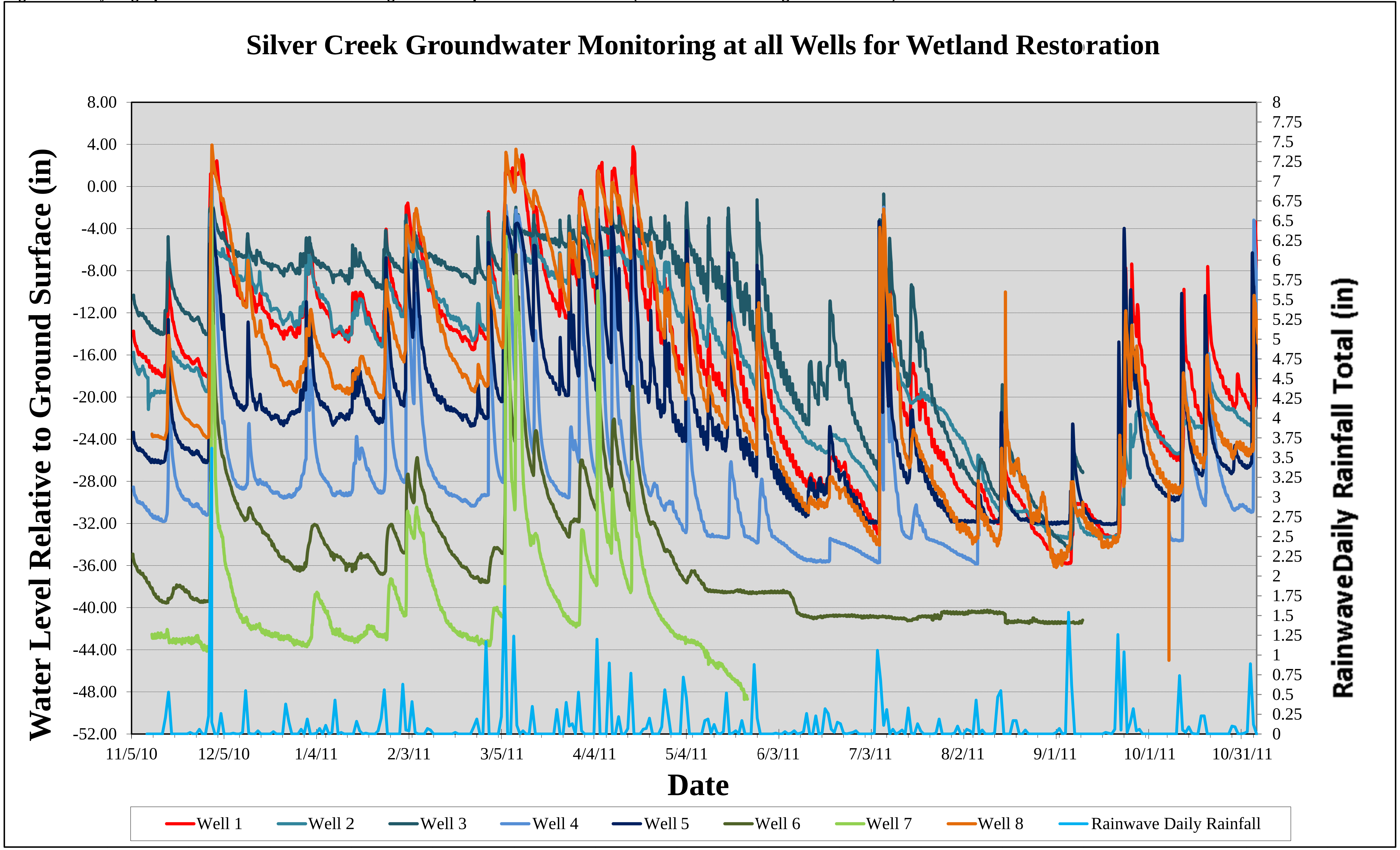
Wells 2, 3, 5, and 8 appear to be influenced by a combination of slope run-off, groundwater seepage, and a higher water table (poorer draining soils). Wells 2 and 5 also seem to be influenced by nearby swales/ditches as the rate of decline in water levels recorded produced a slightly sharper curve than Well 3. Well 5, located in existing wetland JDW2, achieved only marginal hydrology 7-12% during the monitoring period which is thought to be a result of low rainfall and the effect of the adjacent swale which contributes in draining the adjacent wetland. Well 2 has a strong hydrology, but the associated wetland, JDW5, is affected by peripheral and cross-cutting ditches which prevent it from being even stronger, or prevent the wetland from being larger (having expanded margins such as are being proposed for restoration credit). Well 3, which is not even located in a jurisdictional wetland, maintained a very high water level and the most gradual rate of water level receedence. A combination of manipulated soils and mowing have resulted in this area, which displays such strong hydrology, not being considered jurisdictional and attests to the disturbed nature of the site. Well 8, located in a depressional area within Wetland JDW1, reflects high recharge and retention likely dictated by topography and supported by soils.

Table 16.14 Hydroperiods Observed During the Growing Season (# Days)

Upper Silver Creek Mitigation Plan-EEP Project#94645

# Days/Month Where Groundwater Depth (in.) ≤ 12 inches									
		Well 1	Well 2	Well 3	Well 4	Well 5	Well 6	Well 7	Well 8
	Mar-11	31	31	31	11	18	3	4	29
Growing Season	Apr-11	26	30	30	6	12	0	---	27
	May-11	8	12	30	0	5	0	---	3
	Jun-11	0	0	1	0	0	0	---	0
	Jul-11	4	0	9	3	3	0	---	5
	Aug-11	0	0	0	---	0	0	---	1
	Sep-11	3	0	---	---	3	---	---	1
	Oct-11	3	0	---	---	2	---	---	0
	Nov-11	17	16	---	---	12	---	---	16
	Total # Days	92	89	101	20	55	3	4	82

Figure 16.9 Hydrographs of the Groundwater Monitoring Wells Compared to Local Rainfall (November 2010 through October 2011)



16.5.5 Climatic Conditions

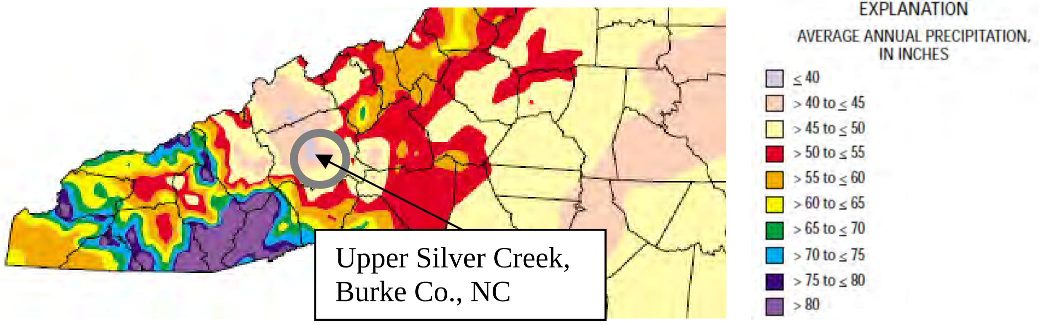
Growing Season

The average growing season (defined as the period in which air temperatures are maintained above 28° Fahrenheit at a frequency of 5 years in 10) for the project locale is 208 days, beginning on April 3 and ending October 29 (NRCS Burke County WETS Table , Morganton, NC: NC5838, 2002). Data was retrieved from http://www.wcc.nrcs.usda.gov/climate/wetlands.html for this station for the period of record from 1971-2000.

Rainfall

The Town of Morganton, located approximately twelve miles northeast of the project site, experiences an average annual rainfall of 50 inches (NRCS Burke County WETS Table , Morganton, NC: NC5838, 2002) although Figure 16.10 below indicates that typical annual rainfall at the project site may be even greater. Of this, about 30 inches, or 60 percent, usually falls in April through October during the growing season (NRCS Burke County Soil Survey, 2000). In much of the southeastern US, average rainfall exceeds average evapotranspiration losses and these areas experience a moisture excess during most years. Excess water leaves a site by groundwater flow, runoff, channelized surface flow, or deep seepage. Annual losses due to deep seepage, or percolation of water to confined aquifer systems, are usually small and are not considered a significant loss pathway for excess water. Although groundwater flow can be significant in some systems, most excess water is lost via surface and shallow subsurface flow. Monthly precipitation amounts have been recorded on-site by the landowner since April 2011; these data have been compared with Rainwave^{TM} precipitation data for the site. Rainfall data has been plotted against well data in Figure 16.9. Although the winter of 2010-2011 was drier than normal, the spring of 2011 brought average rainfall amounts at the site before rainfall started to trail off below average once more through the summer months. Climate data reviewed in the WETS database were recorded by the nearest sampling station in the Town of Morganton (Station 315838).

Figure 16.10. Average Annual Precipitation for Western North Carolina



(source: http://pubs.usgs.gov/wri/wri994283/report.html, accessed 1/9/12)

16.5.6 Soil Characterization

The NRCS Burke County Soil Survey (2000) indicates that the floodplain areas of the site are mapped primarily as a Fluvaquents-Udifluvents complex, while the Arkaqua loam series is more prevalent around UT3 and scattered segments of the project area. While a majority of soils around UT2 are mapped as the Fluvaquents-Udifluvents complex, the upper limits are mapped as the Unison series. Figure 2.3 depicts soil mapping. The Fluvaquents-Udifluvents complex consists of a mix of somewhat poorly drained to moderately or well drained soils commonly found on floodplains that have been disturbed by wasting or fill activities. Although it is not generally considered to be a hydric soil, site visits are recommended by the NRCS to determine whether this complex includes hydric inclusions. Arkaqua loam consists of somewhat poorly drained soils commonly found on nearly level floodplains along creeks and rivers in the Appalachian, Blue Ridge, and Great Smoky Mountains. The Arkaqua series is considered a Hydric "B"soil type, indicating that in some areas of these mapped soils, inclusions of hydric soils can be found. The Unison loam series consists of well drained, moderately permeable soils found on terraces and alluvial fans. The Unison series is not considered a hydric soil by the NRCS. The fact that there are existing jurisdictional wetlands that have been delineated within the mapped areas of Fluvaquents-Udifluvents soils indicates that the project site is located in an area of this complex where hydric inclusions are common.

In addition to soil evaluations performed by Baker wetland scientists, hydric soil evaluations were performed by licensed soil scientists with ECS Carolinas LLP. During November 2010, field investigations were conducted including hand auger borings and backhoe pits on 50-foot intervals. Hydric soil determinations were based upon *Field Indicators of Hydric Soils in the United States - A Guide for Identifying and Delineating Hydric Soils* Version 7.0, (USDA, 2010). While investigations indicated considerable spatial variation in soil profile characteristics across the site, areas proposed for restoration were found to exhibit one or more hydric soil indicator(s). Field indicators used for onsite hydric investigations were F1: “Loamy Mucky Mineral”, F3: “Depleted Matrix”, F8: “Redox Depressions”, and F12: “Iron Manganese Masses”, with F3 and F8 being most common (USDA, 2010). The above soil properties indicate that these soils were formed under reducing conditions and that portions of the site once functioned as a wetland system. The results indicate the presence of hydric indicators at depths typically ranging from 10 – 28 inches across much of the non-jurisdictional field areas (floodplain) where wetland restoration or creation is proposed. In these and in other areas, buried A horizons were discovered indicative of prior disturbance. The report, figures, and additional data developed by ECS Carolinas LLP are included in Appendix F. The findings of soil investigations are consistent with land disturbance from gold mining in the area, extreme flooding and channel/floodplain impacts due to watershed alterations (deforestation, mining, buffer removal, etc.), and erosional processes of natural and/or anthropogenic nature that moved soils from upslope of the project into the valley floor where the project is located. According to the landowner, during the most recent clearing of the bottomland forest to create pasture, stumpage and other material were burned and disposed of by burying the remnant material on-site. Both soil investigations and visual observation of vegetation and landform indicate that fill has been brought in over time to prepare fields for use as pastureland. In addition, at the upstream end of the project, it is likely that upland soils placed on the field came from adjacent road construction activities on US64. - This practice was common prior to regulations protecting streams and wetlands, as it provided landowners and farmers with an inexpensive way to convert wet fields into dry fields.

16.5.7 Plant Community Characterization

Historic aerials indicate that much of the project area has been consistently maintained in its present state for the past many decades. The proposed restoration area is comprised of mowed fields. Vegetation within these open fields is primarily comprised of Fescues (*Festuca* spp.) and other common pasture grasses. Multiflora rose (*Rosa multiflora*), Japanese honeysuckle (*Lonicera japonica*) and privet (*Ligustrum sp.*) are all invasive exotic species, which can be found in isolated pockets within the project area not mowed frequently. Native herbaceous wetland species including rushes (*Juncus* sp.), Smartweeds (*Polygonum* sp.), sedges (*Carex* sp.) observed in many of the jurisdictional and proposed restoration areas. Periodic mowing has kept much of the project area in low growing herbaceous cover. In wooded riparian areas within the project areas, the canopy is dominated by sycamore (*Platinus occidentalus*), sweetgum (*Liquidambar styraciflua*), yellow poplar (*Liriodendron tulipifera*), and river birch (Betula nigra), and understory species included ironwood (*Carpinus caroliniana*), holly (Ilex spp.), dogwood (Cornus florida, Cornus spp.) pine (Pinus spp.) and maples (*Acer spp*).

16.6 Reference Wetlands

16.6.1 Hydrological Characterization

The reference wetland sites for the project are located on-site within the existing wetland pockets that have been delineated as part of the project (see Jurisdictional Wetlands section). Table 16.14 provides a summary of the reference wetlands selected.

Table 16.15 Reference Wetlands

Upper Silver Creek Mitigation Plan-EEP Project #94645

Reference Wetland	Location	Corresponding Well Gage	Purpose
1	Wetland JDW1	Well 8	Serves as a reference wetland for depressional wetlands and those wetlands influenced by adjacent streams or ditches.
2	Wetland JDW6	Well 1	Serves as a reference wetland for wetlands moderately to strongly influenced by adjacent streams or ditches.
3	Wetland JDW5	Well 2	Serves as a reference wetland for wetlands strongly influenced by hillslope run-off.

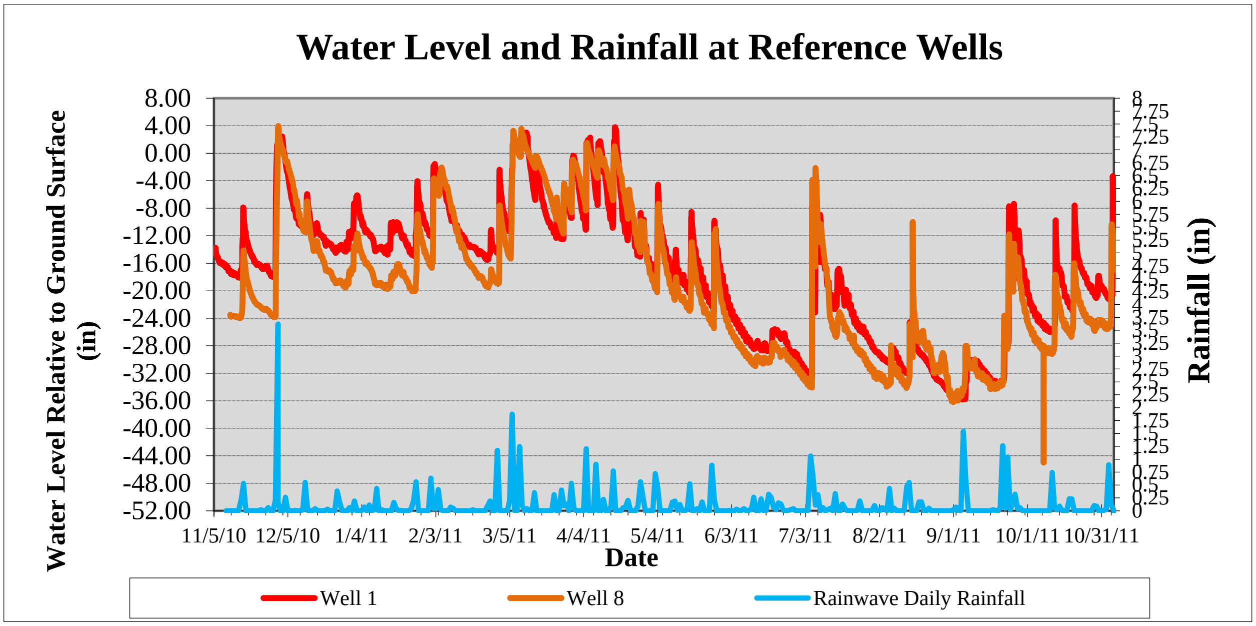
Reference wetland JDW1 has not been mowed as frequently as the other reference wetlands, presumably due to its wetness. However, is still consists primarily of herbaceous hydrophytic vegetation. Reference wetlands JDW5 and JDW6 have been mowed more frequently and like other wetlands on-site, consist of herbaceous hydrophytic vegetation interspersed with pasture grasses. Both wetlands are proposed as an on-site hydrologic reference; neither will be used to infer appropriate vegetation communities for restoration and creation areas. The hydrology of the reference sites will be compared with the restoration sites during dry years when the hydrology of the restoration sites may not meet defined success criteria to determine if the dry conditions are climatic in nature.

Hydrology of the reference sites is driven primarily by both groundwater discharge and surface runoff.

16.6.2 Gage Data Summary

Applicable automated recording wells listed in Section 16.5.1 were installed in each of the reference wetlands in November 2010. As depicted in Figure 16.9, during the monitoring period from November 2010 through October 2011, reference wells 1 and 8 had higher water levels compared to other gages installed and are representative of least manipulated conditions on the site. Recordings from these wells are plotted versus rainfall in Figure 16.11. Both wells are strongly driven by precipitation and corresponding ponding and recharge. While not all restored and enhanced wetlands will have the same recharge characteristics, the target of most of the proposed activities is to create more ponding, increase drainage area contribution to wetlands, and to couple this with removal of overburden and enhancement of the contribution of stream baseflow, stormflow, and overbank flooding to wetland hydrology.

Figure 16.11. Water Table Depths Recorded in the Reference Areas



16.6.3 Soil Characterization

The soils located in the vicinity of the reference wetlands are mapped as the Fluvaquents-Udifluvents complex. Given the nature of this soil complex, it can be a somewhat poorly drained to moderately or a well-drained soil; the NRCS Soil Survey for Burke County recommends an on-site investigation to determine whether the area mapped as the Fluvaquents-Udifluvents complex is hydric.

Soils of the existing wetland areas were examined by ECS Carolinas LLP as part of their investigation of the extent of hydric soils in the project area. In their summation of findings, it was noted that the hydric system of the site was "very complex." Soils within the boundaries of the existing wetland pockets and other areas mapped as having hydric soils were described as having low-chroma soil matrix values, redoximorphic features, and iron/manganese masses.

16.6.4 Proposed Wetland Restoration, Creation and Enhancement

The areas proposed for restoration, creation and enhancement are predominantly presently in use as pasture on the left (western) floodplain. As previously discussed, these areas have been continuously mowed and are drained by adjacent ditches and swales and are further impaired by the incised conditions of Silver Creek and its tributaries.

Wetlands located on the floodplain fringe at toe-of-slope locations transition rather seamlessly into floodplain wetlands. Existing hydrology is impacted by stream hydrology to the extent that endosaturated conditions in the adjacent soil profiles may affect drawdown rates in wetland features. The incised stream conditions are also assessed to be a factor in hydrologic impairment, despite the fact that some of these wetlands seem to have at least partially perched water tables. Landscape shape, which tends to be concave with marked depressions in the reference wetlands, is also impacted in some of the riparian wetland areas by prior filling.

An on-site hydric soils investigation by ECS Carolinas LLP concluded that there were many areas of the floodplain which had buried hydric soils indicative of prior wetlands. The complexity of the site in terms of soil profiles, as well as prior manipulation were noted and reduced confidence in the exact boundaries between hydric and non-hydric soils in some areas more than in others.

Aerial photography and soils investigations, which yielded various areas of buried hydric and non-hydric or mixed soils, confirm suspected anthropogenic impacts (wetland filling and grading from roadway construction and pasture creation/enhancement activities). Vegetative signatures observed on aerial photography coincide with surveyed contour information as well as soil profile data to support the conclusion that existing wetlands have been buried by such activities. Based on soils information, it also seems likely that prior widespread mining in the watershed resulted in significant alteration of natural soils and floodplain conditions. Since such impacts predate aerial photography and present landowner knowledge, the extent of impact can only be surmised from the soil profiles and from deductions from present stream geomorphology.

Soil investigation results indicated fills ranging from 0.5 to 3 feet. Fills were identified in areas with both hydric and non-hydric signatures. The minor fills are the primary target for wetland restoration proposed under this project. Priority II stream restoration (involving excavation of a new floodplain) as a wetland restoration approach is appropriate where floodplain fills have buried hydric soils, such as in portions of restoration wetland R2.

HEC-RAS hydraulic modeling analysis indicates that the vast majority of the mainstem channel is presently incised to a degree that limits floodplain activation to a frequency which yields a 10-20% likelihood of flooding in any given year (the 5 to 10-Year-Annual-Percent-Exceedence Flow is contained within the existing channel). On the tributaries, floodplain activation is at least as infrequent, if not more infrequent. Reconnecting Silver Creek and its tributaries to their floodplains by raising the bed (Priority I Restoration) or by cutting the floodplain (Priority II Restoration) will contribute to increased frequency of overbank flooding (episaturation) and in increased endosaturated conditions. This is the primary type of wetland restoration and enhancement activity, along with planting and minor grading. Other enhancement includes removing ditch networks and similar site alterations that are currently contributing to drain wetland areas.

Creation activities will be implemented where activities may involve excavation of more than 12" of overburden and/or where current soil conditions and soil complexity cannot convincingly support restoration credit. The creation area proposed is centered around a large man-made ditch and adjacent areas where ditch side-casting is evident.

Three types of wetland mitigation activities are being pursued at the indicated credit ratios:

- Restoration (1:1 credit ratio) – proposed for areas where vegetation alteration, minor filling (<12") and hydrologic alterations have resulted in non-jurisdictional areas that exhibit hydric soil signatures consistent with prior wetlands that have been disturbed by the activities noted.
- Enhancement (2:1 credit ratio, despite discussions that 1.5:1 could be sought, we are not submitting for a better ratio of credit because we are meeting our overall credit proposal) – proposed for existing jurisdictional wetlands in which two or more of the three components (hydric soil, wetland hydrology, wetland vegetation) have been altered and will be restored to a natural recovery condition. Typically, this will involve replanting mowed wetlands and restoring hydrology to wetlands impacted by stream down-cutting and/or stream alteration. In some cases, removal of minor fills (<6") in discreet smaller areas will be considered an enhancement to soil and hydrologic conditions.
- Enhancement (2:1 credit ratio) – proposed for existing jurisdictional wetlands that will be enhanced by restoring one of the three jurisdictional wetland components. Typically this will involve planting targeted hardwood ecosystem species to accelerate the successional process involved in bottomland hardwood forested wetland development.

- Creation (3:1 credit ratio, despite discussions that 2.5:1 could be sought, we are not submitting for a better ratio of credit because we are meeting our overall credit proposal) –proposed for areas where hydric soil signatures are present but are found at depths greater than a foot and where the specifics and timing of activities leading to burial of wetlands is unknown. In such cases, excavation of buried hydric soils will restore wetland attributes and result in near or full function of prior benefits. This ratio will only be sought where evidence suggests that restoration activities will restore a previous state that was anthropogenically altered – it will not be proposed for soils at depth with hydric signatures owing to natural conditions.

Tables ES.2 and 4.1 specify which existing and proposed wetlands are riparian versus non-riparian.

16.7 PROPOSED RIPARIAN AND WETLAND VEGETATION PLANTINGS

As has been the case with riparian areas, wetlands within the project site have been disturbed frequently enough to alter vegetation composition, particularly that of mid to upper level canopy cover.

Bare-root trees, live stakes, and permanent seeding will be planted within designated areas of the conservation easement including the wetland areas. In addition, transplanted trees as well as grass mats will be interspersed throughout the project to enhance vegetative reestablishment. Both of these will come from areas that are to be graded and smaller trees may be selectively harvested for reuse from abandoned stream channel buffers. A preferred 30-foot buffer measured from the top of banks (sometimes slightly less, and quite often substantially more) will be established along the restored stream reaches. Bare-root vegetation will be planted at a target density of 680 stems per acre, or an 8-foot by 8-foot grid. The proposed species to be planted are listed in Table 16.15. Planting of bare-root trees and live stakes will be conducted during the first dormant season following construction. If construction activities are completed in summer/fall of a given year, all vegetation will be installed prior to the start of the growing season of the following calendar year.

Species selection for re-vegetation of the site will generally follow those suggested by Schafale and Weakley (1990) and tolerances cited in the USACE Wetland Research Program (WRP) Technical Note VN-RS-4.1 (1997). Tree species selected for stream restoration areas will generally be weakly tolerant to tolerant of flooding. Weakly tolerant species are able to survive and grow in areas where the soil is saturated or flooded for relatively short periods of time. Moderately tolerant species are able to survive in soils that are saturated or flooded for several months during the growing season. Flood tolerant species are able to survive on sites in which the soil is saturated or flooded for extended periods during the growing season (WRP, 1997).

Observations will be made during construction regarding the relative wetness of areas to be planted. Planting zones will be determined based on these observations, and planted species will be matched according to their wetness tolerance and the anticipated wetness of the planting area.

Live stakes will be installed two to three feet apart using triangular spacing or at a density of 160 to 360 stakes per 1,000 square feet along the stream banks between the toe of the stream bank and bankfull elevation. Site variations may require slightly different spacing.

Permanent seed mixtures will be applied to all disturbed areas of the project site. Table 16.16 lists the species, mixtures, and application rates that will be used. A mixture is provided for floodplain wetland and floodplain non-wetland areas. Mixtures will also include temporary seeding (rye grain during cold season or browntop millet during warm season). The permanent seed mixture specified for floodplain areas will be applied to all disturbed areas outside the banks of the restored stream channel and is intended to provide rapid growth of herbaceous ground cover and biological habitat value. The species provided are deep-rooted and have been shown to proliferate along restored stream channels, providing long-term stability.

Temporary seeding will be applied to all disturbed areas of the site that are susceptible to erosion. These areas include constructed stream banks, access roads, side slopes, and spoil piles. If temporary seeding is applied from November through April, rye grain will be used and applied at a rate of 130 pounds per acre. If applied from May through October, temporary seeding will consist of browntop millet, applied at a rate of 45 pounds per acre.

Table 16.16 Proposed Bare-Root and Live Stake Species (may also include species to be seeded or installed as container plantings)
Upper Silver Creek Mitigation Plan-EEP Project #94645

Common Name	Scientific Name	% Planted by Species	Planting Density	Wetness Tolerance	Planting Location
Riparian Buffer Plantings: Wetland and Floodplain 408 Tree Stems/Acre & 272 Shrub Stems/Acre					
Trees Overstory (Plant 13’x13’)					
Shingle Oak	*Quercus imbricaria*	9	37 stems per acre	FAC-	Wetland & Floodplain
River Birch	*Betula nigra*	10	41 stems per acre	FACW	Wetland & Floodplain
Persimmon	*Diospyros virginiana*	10	41 stems per acre	FAC	Wetland & Floodplain
Sycamore	*Platanus occidentalis*	9	37 stems per acre	FACW-	Wetland & Floodplain
Black Willow	*Salix nigra*	10	41 stems per acre	OBL	Wetland & Floodplain
Southern Red Oak	*Quercus falcata*	5	20 stems per acre	FACU	Upland
Tulip Poplar	*Liriodendron tulipifera*	4	16 stems per acre	FACU	Upland
Trees Understory (Plant 10’x10’)					
Ironwood	*Carpinus caroliniana*	9	37 stems per acre	FAC	Wetland & Floodplain
Tag Alder	*Alnus serrulata*	9	37 stems per acre	FACW+ or OBL	Wetland & Floodplain
Highland Doghobble	*Leucothoe fontanesiana*	9	37 stems per acre	N/A	Wetland & Floodplain
Sourwood	*Oxydendrum arboreum*	4	16 stems per acre	FACU	Upland
Flowering Dogwood	*Cornus florida*	4	16 stems per acre	FACU	Upland
Redbud	*Cornus florida*	4	16 stems per acre	FACU	Upland
Witch Hazel	*Alnus serrulata*	4	16 stems per acre	FACU	Upland
Shrubs (Plant 10’x10’)					
Rivercane (giant cane)	*Arundinaria gigantea*	30	82 stems per acre	FACW	Wetland & Floodplain
Spicebush	*Lindera benzoin*	25	68 stems per acre	FACW	Wetland & Floodplain
Winterberry	*Ilex verticillata*	20	54 stems per acre	N/A	Wetland & Floodplain
Virginia Sweetspire	*Itea virginica*	25	68 stems per acre	FACW+	Wetland & Floodplain
Alternate Species					
Deerberry	*Vaccinium stamineum*	N/A		FACU	Upland
Eastern Sweetshrub, Sweetshrub	*Calycanthus floridus, Calycanthus spp.*	N/A		FACU	Upland

Table 16.16 Proposed Bare-Root and Live Stake Species (may also include species to be seeded or installed as container plantings)

Buttonbush	*Cephalanthus occidentalis*	N/A		OBL	Wetland & Floodplain
Silky Willow	*Salix sericea*	N/A		OBL	Wetland & Floodplain
Silky Dogwood	*Cornus amomum*	N/A		FACW+	Wetland & Floodplain

Note: Species selection may change due to refinement or availability at the time of planting. If species substitution is required, the planting Contractor will submit a revised planting list to Baker for approval prior to the procurement of plant stock.

Proposed Live Stake Species (Plant 3'x3' on center)

Common Name	Scientific Name	% Planted by Species	Planting Density	Wetness Tolerance	Planting Location
Ninebark	*Physocarpus opulifolius*	15	102 stems per acre	FAC-	Wetland & Floodplain
Elderberry	*Sambucus canadensis*	20	136 stems per acre	FACW-	Wetland & Floodplain
Buttonbush	*Cephalanthus occidentalis*	15	102 stems per acre	OBL	Wetland & Floodplain
Silky Willow	*Salix sericea*	25	170 stems per acre	OBL	Wetland & Floodplain
Silky Dogwood	*Cornus amomum*	25	170 stems per acre	FACW+	Wetland & Floodplain

Note: Species selection may change due to refinement or availability at the time of planting. If species substitution is required, the Planting Contractor will submit a revised planting list to Baker for approval prior to the procurement of plant stock.

Table 16.17 Proposed Permanent Seed Mixture
Upper Silver Creek Mitigation Plan-EEP-Project #94645

Common Name	Scientific Name	% Planted by Species	Density (lbs/ac)	Wetness Tolerance
Creeping Bentgrass	*Agrostis stolonifera*	10%	1.5	FACW
Big Bluestem	*Andropogon gerardii*	2%	0.3	N/A
Devil's Beggartick	*Bidens frondosa (or aristosa)*	3%	0.45	FACW
Northern Long Sedge	*Carex folliculata*	2%	0.3	N/A
Nodding Sedge	*Carex gynandra*	5%	0.75	N/A
Upright Sedge	*Carex stricta*	2%	0.3	OBL
Lance-leaved Tick Seed	*Coreopsis lanceolata*	3%	0.45	N/A
Virginia Wildrye	*Elymus virginicus*	15%	2.25	FAC
Soft Rush	*Juncus effusus*	2%	0.3	FACW+
Tioga Deer Tongue	*Panicum clandestinum*	10%	1.5	FACW
Switch Grass	*Panicum virgatum*	15%	2.25	FAC+
Pennsylvania Smartweed	*Polygonum pennsylvanicum*	5%	0.75	FACW
Broadleaf Arrowhead	*Sagittaria latifolia var. pubescens*	1%	0.15	OBL
Little Bluestem	*Schizachyrium scoparium*	5%	0.75	FACU
Roundleaf Goldenrod	*Solidago patula*	3%	0.45	OBL
Indian Grass	*Sorghastrum nutans*	10%	1.5	FACU
Eastern Gamma Grass	*Tripsacum dactyloides*	5%	0.75	FAC+
Joe Pye Weed	*Eupatorium fistulosum*	2%	0.3	N/A
	Total	100	15	

Note: Species selection may change due to refinement or availability at the time of planting. Soil amendment and mulching requirements, as well as temporary seeding specifications are provided in accompanying planset.

16.8 Site Construction

16.8.1 Site Grading, Structure Installation, and Other Project Related Construction

A construction sequence is provided below and can be found within the accompanying restoration plan set for the Upper Silver Creek project.

CONSTRUCTION SEQUENCE

1. Equipment and materials shall be mobilized to the top of the site.

2. Utility locations shown on the plans are approximate. The contractor shall have all underground utilities within the project limits located and marked prior to beginning construction. The contractor will be responsible for the repair of any utilities damaged during construction.

3. A construction entrance shall be incorporated into every access point that connects to a public road.

4. Temporary and permanent stream crossings shall be installed as shown in the plan set and removed as applicable when work has been completed.

5. In general, construction shall proceed upstream to downstream on each stream. All disturbed ground shall be seeded and mulched immediately after final grading and ground cover established within 7 days.

6. The engineer will stake the grading limits for floodplain excavation for reach 1 of the mainstem (Silver Creek). The engineer will stake the haul road and area to keep equipment out of. The contractor shall begin by clearing and grubbing and grading a new Priority II floodplain in reach 1 of the mainstem leaving the existing stream and banks intact as an erosion control measure. Prior to excavation, all applicable erosion control measures shall be installed in the vicinity of the grading and in the fill area. The contractor shall remove fill to designated areas outside of the 100-year floodplain limits (for this area, all fill to be removed to fill area #1 unless area #2 or 3 is approved by the engineer). All sod mats shall be harvested prior to excavation. All transplants shall be left in place until they can be relocated to their final location and installed at the appropriate finish grade. If possible, transplants shall be done in the dormant season.

7. The engineer will stake the channel and structure layout for Silver Creek Reach 1 and the last 150' of UT3 (Reach 2). Contractor will set up pump around from 0+00 to 6+00 and on UT3 from adjacent to UT3-2 station 12+00 to station 6+00 on the mainstem. The contractor will then construct the new channels, completing any remaining floodplain grading adjacent to existing channels, plugging those portions of the old Silver Creek channel as proposed and removing excess fill to disposal areas. Any grade differential in UT3-2 between the newly constructed part and the existing channel shall be stabilized with stone. The contractor shall stabilize (as necessary and at the direction of the engineer), the temporary Silver Creek tie-in at station 5+50 to protect against erosion during storm events.

8. The engineer will stake out, and Contractor shall conduct wetland grading in JDW1a. The contractor will conduct soil amendment and seeding.

9. The engineer will stake out the structures and grade for UT3-1. The contractor will construct channel and bank enhancement on this reach.

10. The engineer will stake out the proposed channel centerline for UT3-2. The contractor will construct this restoration portion of UT3 from top to bottom in the dry leaving flow in the existing channel. For this reason, no pump around will be required. The contractor shall stockpile excess soil from this and prior activities as necessary to complete channel plugging as shown on the plans (alternatively, the contractor may use cut material from wetland restoration activities at R3 and JDW2 to obtain soil for plugging). The contractor shall close out all activities on the south side of UT3, and in any other areas that would require creek crossing to access and then turn water into the new channel at the head of UT3-2. Plug abandoned channel segments as indicated on the plans.

11. The engineer will stake out grading on the left floodplain both sides of the floodplain drainage swale from mainstem station 6+00 to 10+75. The contractor shall complete clearing & grubbing and grading and remove excess to fill area #1. Fill area #1 shall be closed out after completion of all grading for this phase. Existing creek bank on mainstem to be left intact during this phase. The contractor shall conduct soil amendment and seeding and mulching as well as final grading of the drainage swale to proposed contours.

12. The engineer will stake out the mainstem from 6+00 to 10+75. The contractor shall construct components that can be done in the dry, then set up a pump around between these stations and complete the crossings of and tie-ins to the existing channel, backfilling the channel as indicated on the plans. Excess fill shall be taken to disposal area #2.

13. The engineer will stake out the floodplain and channel grading for the mainstem from 10+75 to 15+50 on both sides of the floodplain ditch. The contractor shall complete floodplain grading leaving existing banks of main channel intact. For floodplain and channel grading in this area, all excess fill

shall be taken to disposal area #2. All wetland soil amendment and seeding shall be completed to the break in the conservation easement. Then, construct channel segments on near side of creek that can be done in the dry. Once these are complete and stabilized, set up a pump around between these stations and complete remaining channel restoration, backfilling the channel as indicated on the plans and finally tying into the existing channel at 15+50. Stabilization of temporary tie-in shall be undertaken at direction of engineer. Once grading is complete on floodplain or in channel segments, stabilization measures shall be untaken immediately and ground cover established within 7 days.

14. The engineer will stake out grading for wetland restoration and enhancement activities in areas R6, JDW5 and JDW6 and for channel grading for Silver Creek stations 15+50 to 23+50. The contractor shall complete floodplain grading leaving existing banks of main channel intact. Excess fill shall be taken to disposal area #2. All wetland soil amendment and seeding shall be completed except for a 15’ strip along the proposed stream which shall be left for hauling.

Complete sections of channel that can be constructed in the dry (except for 20+50 to 21+50). Enough soil should be stockpiled between proposed and existing channel for use in plugging old channel. Then cross the mainstem at 21+00 and construct UT2. Engineer to layout UT2, contractor to set up pump around or diversion through old floodplain channels with approval and direction from engineer (need to use check dams in old floodplain channels to control flow). Then construct UT2 to its confluence with the existing mainstem without completing tie-in. Complete all seeding and mulching on UT2 upstream of confluence. Set up a pump around on the mainstem from 17+00 to 21+50 and complete all unfinished channel on UT2 and mainstem, backfilling old channels as indicated. Loosen and amend all soils where vehicles have been tracking and which were not previously completed in this segment. Setup pump around at 23+00 and complete temporary tie-in at station 23+75. Same notes as before apply to stabilization of tie-in. Complete all seeding and mulching to station 22+50. Remove staging area and construct hydrologic connection from UT1 to R6 as shown on Wetland Elements Sheet 2.

15. Engineer to layout and contractor to construct hydrologic connection shown from UT1 to Restoration Wetland “R6” on Wetland Elements (Sheet 2) – do not complete tie-in to UT1 until channel is dry. Engineer to layout and contractor to construct UT1 stations 0+00 to 3+25. Prior to construction, set up pump around from 0+00 to existing channel adjacent to 2+50 and complete UT1-to-R6 hydrologic connection tie-in. Plug existing channel just downstream of this tie-in and stabilize any loose soil. Move pump around outlet from vicinity of 2+50 up to hydrologic connection and allow UT1 to flow into R6. Prepare crew to handle (and notify engineer to oversee) overflow from R6 with a permanent solution that will accommodate any normal overflow resulting from out-of-bank flooding to this connection on UT1. This solution may involve minor grading and/or stone placement. Proceed with UT1 construction.

16. Engineer to layout UT1 from 3+25 to confluence and Silver Creek Mainstem stations 23+00 to end of project. Contractor to construct in the dry UT1 4+00 to confluence and Silver Creek 25+00 to 27+00 and 28+00 to 29+25, then set up pump around from 23+50 to end of project and complete all unfinished segments, backfilling old channel as specified in plans. Any excess fill may be located on the hill above the 100-year floodplain in a location approved by the engineer and must be immediately seeded and mulched and shall include silt fence on the downhill perimeter and additional erosion and sediment control as necessary. Loosen floodplain soils where compaction has occurred and conduct final seeding and mulching, removal of temporary crossing on UT1 and exit outside the wetland perimeter on the road side.

GENERAL CONSTRUCTION NOTES

1. Temporary sand bag coffer dams shall be installed upstream of each work area and flow in the work reach shall be diverted by pumping and piping around the work area. The length of each diversion shall be approximately 300 to 600 linear feet. Pumping will be done when work is required in a channel where the stream is flowing. Much of the mainstem and tributary work will be done

offline. Existing channel material should be stockpiled and incorporated in constructed offline reaches.

2. Clearing and grubbing required within the grading limits shall be performed so as to limit sediment migration off-site. When logs and roots must be removed from the banks prior to abandoning the channel (for use in new channel construction), bare areas must covered with mulch. Logs and root wads from trees larger than 8 inches in diameter shall be stockpiled for use as in-stream structures. Salvageable native vegetation will be flagged in the field and shall be harvested for transplanting or for cutting and live-staking materials. Brush material for toe wood structures should be stockpiled and kept wet. Special attention should be given to the removal of nonnative, exotic species when clearing and grubbing takes place. All non-native species shall be disposed of.

3. In general, riparian wetland grading in each segment shall be accomplished before stream restoration work is accomplished. The contractor may simultaneously be constructing new offline channel segments and using vegetation mats harvested from floodplain grading areas to apply to areas of the newly constructed channel. Graded areas should be amended as indicated and tilled to roughen the wetland area and create heterogeneous topography. The site should then be seeded and mulched to stabilize the site.

4. The new channel sections shall be stabilized with in-stream structures, erosion control matting, seed, and transplants before turning water into these sections. Compacted soil channel plugs shall be installed in areas where the new channel diverges from the original channel, and the original, abandoned channel sections will be backfilled to the extent indicated on the plans or approved by the engineer.

5. Dewatering of off-line sections shall be diverted through a sediment filter before being discharged into the downstream reach.

6. Earthwork shall be staged such that no more channel will be disturbed than can be stabilized by the end of the work day or before flow is diverted into a new channel segment.

7. Disturbed areas within the first 25 feet of buffer adjacent to the channel will be seeded, mulched or otherwise stabilized with temporary ground cover until a more permanent ground cover is established across the buffer area disturbed during construction. If temporary groundcover is not applied at the end of the workday, straw wattles will be staked down at the top of the bank where erosion control matting ends to prevent sediment loading from upland portions of the buffer that have not stabilized.

8. The flow diversions and temporary stream crossings shall be removed when no longer needed and the banks in these areas re-graded as necessary, stabilized with seeding and matting.

9. Excess soil materials shall be stockpiled in designated staging and stockpile areas, with silt fence installed on the downslope side(s) of the base of the stockpiles and maintained when sediment has accumulated above one third of the height of the silt fence and/or the silt fence has failed. Excess soil shall be hauled outside the conservation easement before demobilization.

10. The flow diversions and temporary stream crossings shall be removed when no longer needed and the banks in these areas stabilized with seeding and matting.

11. Bank and floodplain vegetation, including brush materials and live stakes, are preferably installed during the dormant season, November to April.

12. Staging and stockpile areas, and silt fence shall be removed and the ground shall be repaired to its original conditions once planting is complete and once they are no longer needed. Construction entrances may also be removed or left in place in the landowner wishes to retain them.

16.8.2 In-stream Structures and other Construction Elements

A variety of in-stream and floodplain structures and design elements are proposed for the Silver Creek restoration site. Structures such as constructed riffles, rock/log vanes, and geolifts will be used to stabilize the newly-restored stream. This project will primarily utilize those structures that provide grade control and enhance pool habitat as “B” and “C/E” type streams make up the project site. Wood structures will alternate with boulder structures on this site because of the material observed in the existing system. A certain amount of wood will be generated through the construction of this project. Table 16.17 summarizes the use of in-stream structures at the site.

Table 16.18 Proposed In-Stream Structure Types and Locations
Upper Silver Creek Mitigation Plan-EEP-Project #94645

Structure Type	Location
Constructed Riffle	Through straight sections to provide grade control.
Log Vane and J-Hook	In meander bends to turn water. J-hook vanes are typically grade control features and are used to protect banks in meander bends and to help establish and maintain grade control for upstream and downstream riffle sections.
Log Drop	In alluvial and colluvial valleys, log drops replicate natural grade control and may occur in any part of the stream. For restoration projects, they are commonly used to create and maintain pools.
Boulder Step	In steep channels to control grade and maintain step-pool systems.
Cover Log	Located along outside bends or against one bank in straight reaches to increase pool diversity and provide cover for aquatic organisms.
Root Wad	Outside bank of meander bends to reduce bank shear stress and improve aquatic habitat.
Vegetated Geolift	To create new banks in areas where cutting a new channel is not an option. Outside of meander bends under particularly high stress or in areas where slight lateral migration is unacceptable and bank slopes are higher. This structure may also be used to stabilize higher stress bank segments that are constructed with fill rather than having cut banks.
Toe Wood	Toe of a stream bank is stabilized using a mass of woody material to create overhead bank cover and improve aquatic habitat.
Brush Layering	Used on upper half of banks above Juncus sod mats or in other areas to promote live growth to provide root mass and shade.
Channel Plug	Plug some or all of old channel segments.
Transplants	Located where specified, typically in proximity to the source of transplant material.
Juncus Sod Mats	Use to provide toe protection in outside meander bends and carrying through into next downstream riffle; treatment is intended to end where thalweg cross-over in riffle reduces near bank stress on treated bank.
Floodplain Debris	Located in abandoned channel segments and other areas where floodplain velocities are a concern due to lack of vegetation or preferential flow paths from old channel fragments.
Oxbow Wetland	Located in abandoned channels where avulsion risk is low or can be mitigated.

Constructed Riffle

A constructed riffle consists of the placement of coarse bed material in the stream at specific riffle locations along the profile. A buried log or rocks at the upstream and downstream end of riffles may be used to control the slope through the riffle in steeper sections. The purpose of this structure is to provide grade control and establish riffle habitat. Constructed riffles will be placed throughout all reaches. In the higher slope reaches, the constructed riffles and cross vanes will be intermixed to provide diversity of structure and in-stream habitat.

Reference Quality Riffle Upstream of Project Reach – Template for Constructed Riffles

Log Vane and J-Hook

A log vane and j-hook log vane are used to protect the stream bank. The length of a single vane structure can span one-half to two-thirds the bankfull channel width. Vanes are located either upstream or downstream along a meander bend and function to initiate or complete the redirecting of flow energies resulting in reduced near bank shear stress and alignment maintenance. Vanes are located just downstream of the point where the stream flow intercepts the bank at acute angles. These vanes may also be used outside of meanders on moderate to steep channel gradients for grade control, a primary concern in this restoration project. Logs and or boulders may be used to construct vanes.

Log Drop

Log drops consist of a log structure that can be used individually or placed in a series at opposing angles and slopes. Single log drops are used in step pool channels to dissipate energy and for grade control. A series of log drops are often used in long riffles to create small meanders. Habitat diversity is increased by the addition of the logs and the pools created downstream of the structures.

Boulder Step

Boulder step structures consist of boulders placed in the channel in a U-shape constructed similarly to a cross-vane. These structures provide grade control in steep channels, direct high velocity flows to the center of the channel, and promote diverse habitat through the creation of plunge pools immediately downstream of the structure.

Cover Log

A cover log is placed in the outside of a meander bend to provide habitat in the pool area. The log is buried into the outside bank of the meander bend; the opposite end extends through the deepest part of the pool and may be buried in the inside of the meander bend, in the bottom of the point bar. The placement of the cover log near the bottom of the bank slope on the outside of the bend encourages scour in the pool. This increased scour provides a deeper pool for bedform variability. In addition to improving pool habitat, cover logs are also placed to create cover for trout and other fish.

Root Wad

Rootwads are large intact root masses placed at the toe of the stream bank in high stress areas to absorb energy, increase flow roughness and provide a physical barrier to the erosion of vulnerable stream banks. In the process, they can help induce scour-pool formation and serve as habitat for organisms favoring wood or cover. In addition to stream bank protection, they provide structural support to the stream bank and habitat for fish and other aquatic animals. They also increase substrate surface area for aquatic insects and other benthic organisms. Root wads include the root mass or root ball of a tree plus a portion of the trunk which is driven or buried into the bank.

Vegetated Geolift

A vegetated geolift consists of a layer of biodegradable matting back filled with soil (creating a lift) that is stacked upon a stone toe base. A row of native, riparian, woody vegetation is laid on top of this first soil lift and a second lift is constructed on top of the woody material. This alternating of lift and woody material continues up to the desired elevation. The mesh that makes up the matting acts much like a traditional gabion, but is designed to break down over time and is more economical. Unlike gabions that are filled over with topsoil to create a bank, the geolift actually holds the soil in place between layers of matting that are set perpendicular to the bank slope making it more effective in supporting the slope while vegetation is established. Geolifts also work to retain moisture for live stakes or other vegetation and provide a substrate for the establishment of a root system.

Toe Wood

Toe wood will be placed at the toe of streambanks to provide bank stabilization and improve fish habitat. Toe wood is a term for a revetment structure consisting of woody material bundles together and buried in the bank so that part of the material extends into the channel and part is anchored in the bank. In addition to providing resting areas for fish, these structures are also a part of the bank stabilization process. The top of the crib-structure is backfilled using stone and ultimately, a soil base for which to replant riparian vegetation.

Brush Layering

Brush layering will be used on the upper half of banks, typically where sod mats have been used on the lower half. Live brush cuttings will be lain out per the detail and covered with soil and matting. This will help accelerate the establishment of root mass and shade, particularly in outside meander bends, enhancing stability and habitat quality.

Channel Plug

A compacted earth plug will be used. In cases where oxbow wetlands will be created from the old channel, additional effort will be undertaken to mitigate a higher risk of evulsion.

Transplants

Transplants will be identified before starting construction as viable candidates (species and size) for uprooting and relocation. Areas that must be cleared will maximize the harvesting of transplants; transplants will be taken from other areas as suitable to enhance the rapid development of tree growth along the new channel margins.

Riparian Sod Mats

Riparian sod mats consist of applying a mat of sod excavated from existing floodplain. Sod mats are to be used in most outside meander bends to ½ of bankfull to help reduce velocities (provides roughness) and to provide instant stream bank protection. Sod mats will be overlain with a typical bank treatment of CF700 matting.

Floodplain Debris

Woody debris from tree trunks, limbs and unusable root masses will be relocated in areas as specified to create "jams" that reduce floodplain velocities, typically in the vicinity of abandoned channels. . These debris jams will typically be partially buried as practicable in order to reduce the likelihood that they be displaced by high flows. This reduces velocities and mitigates risk of evulsion, particularly when portions of old channel segments are being left open for wetland habitat creation. Debris jams also create valuable habitat in and of themselves and trap allochthonous material. Where practicable, debris jams will be mixed with live cuttings to produce a mixture of dead and live material.

Oxbow Wetland

Multiple depression wetlands with connectivity to the main channel will be established in abandoned channel reaches where the risk of evulsion is low or can be effectively mitigated. These "oxbow" areas will be constructed to have an elevation comparable to the existing elevation of the abandoned channel and will be shaped to maximize wetland creation with careful attention to minimize risk associated with channel evulsion in these areas that will be preferential flow paths under full valley flood conditions. Existing oxbows are present within the project area and these were surveyed to assess how they were hydrologically connected to the mainstem and how this connectivity, their shape and their location on the floodplain impacts the size distribution of sediments deposited and whether they are jurisdictional wetland features. Where possible, wetlands will be allowed to fill at flows less than bankfull by creating backflow paths at the downstream connection to the main stream at half bankfull or below. The stage at which these are accessed is expected to change over time as the channel deposits sediment on banks. These areas should also be well-connected to the base-flow water table.

17.0 APPENDIX D - PROJECT PLAN SHEETS

EEP PROJECT NO. 003270

Upper Silver Creek (Brackett Site)

STATE	BAKER PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
NC	120598	A	29

EEP PROJECT NO. 003270

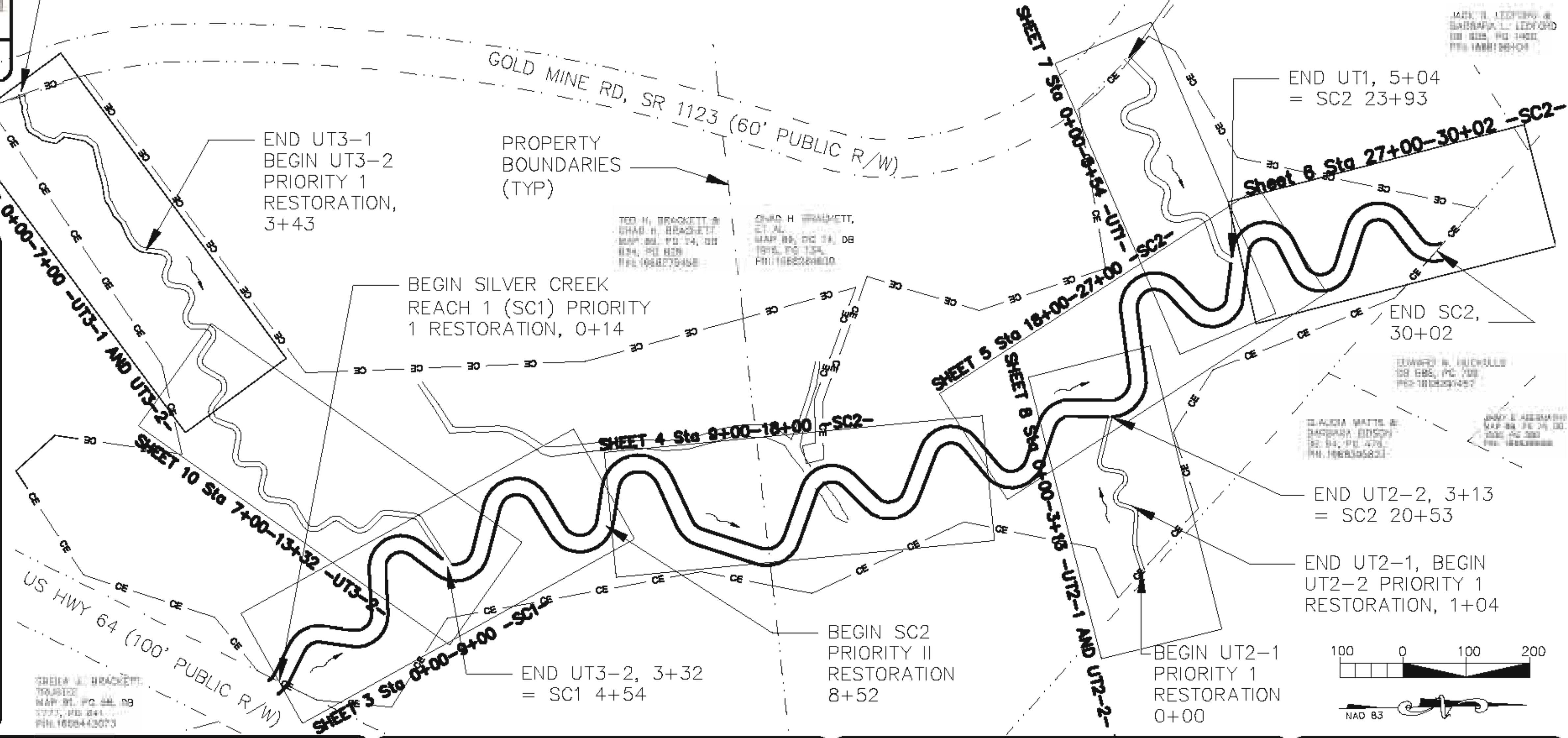
NC ECOSYSTEM ENHANCEMENT PROGRAM

Upper Silver Creek Stream and Wetland Restoration Project, Option C

Burke County, North Carolina

Type of Work: Stream and Wetland Restoration, Enhancement & Creation for Mitigation Credit Delivery

VICINITY MAP
NOT TO SCALE



INDEX OF SHEETS

DESIGN SUMMARY

STREAMS

Name:	Reach	Stations	Linear Ft	Type	Approach	SMU
SILVER CK	1 (SC1)	0+14 TO 8+52	838	Restoration	PII	838
SILVER CK	2 (SC2)	8+52 TO 30+02	2,150	Restoration	PI	2,150
UT1	1 (UT1-1)	0+07 TO 5+04	497	Restoration	PI	497
UT2	1 (UT2-1)	0+00 TO 1+04	104	Restoration	PI	104
UT2	2 (UT2-2)	1+04 TO 3+13	209	Restoration	PI	209
UT3	1 (UT3-1)	0+01 TO 3+43	342	Enhancement II	N/A	137
UT3	2 (UT3-2)	3+43 TO 13+32	989	Restoration	PI	989
						TOTAL: 4,924

WETLANDS	Acres	Type	WMU
Wetland Restoration	5.30	Riparian	5.30
Wetland Enhancement	3.27	Riparian	1.63
Wetland Creation	0.99	Riparian	0.33
			TOTAL: 7.26

PREPARED FOR THE OFFICE OF:

Ecosystem Enhancement

NCDENR - ECOSYSTEM ENHANCEMENT PROGRAM
2728 CAPITAL BLVD., SUITE 1H 103
RALEIGH, NC 27604

NCEEP PROJECT MGR.: Paul Wiesner

NCEEP REVIEW COORDINATOR: Paul Wiesner

PREPARED IN THE OFFICE OF:

Baker

Michael Baker Engineering Inc.
NC Eng License F-1084
797 Haywood Road, Suite 201
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JACOB P. MCLEAN, PE
PROJECT ENGINEER

JACOB P. MCLEAN, PE
PROJECT MANAGER

SEPTEMBER 13, 2013
DATE

Revisions

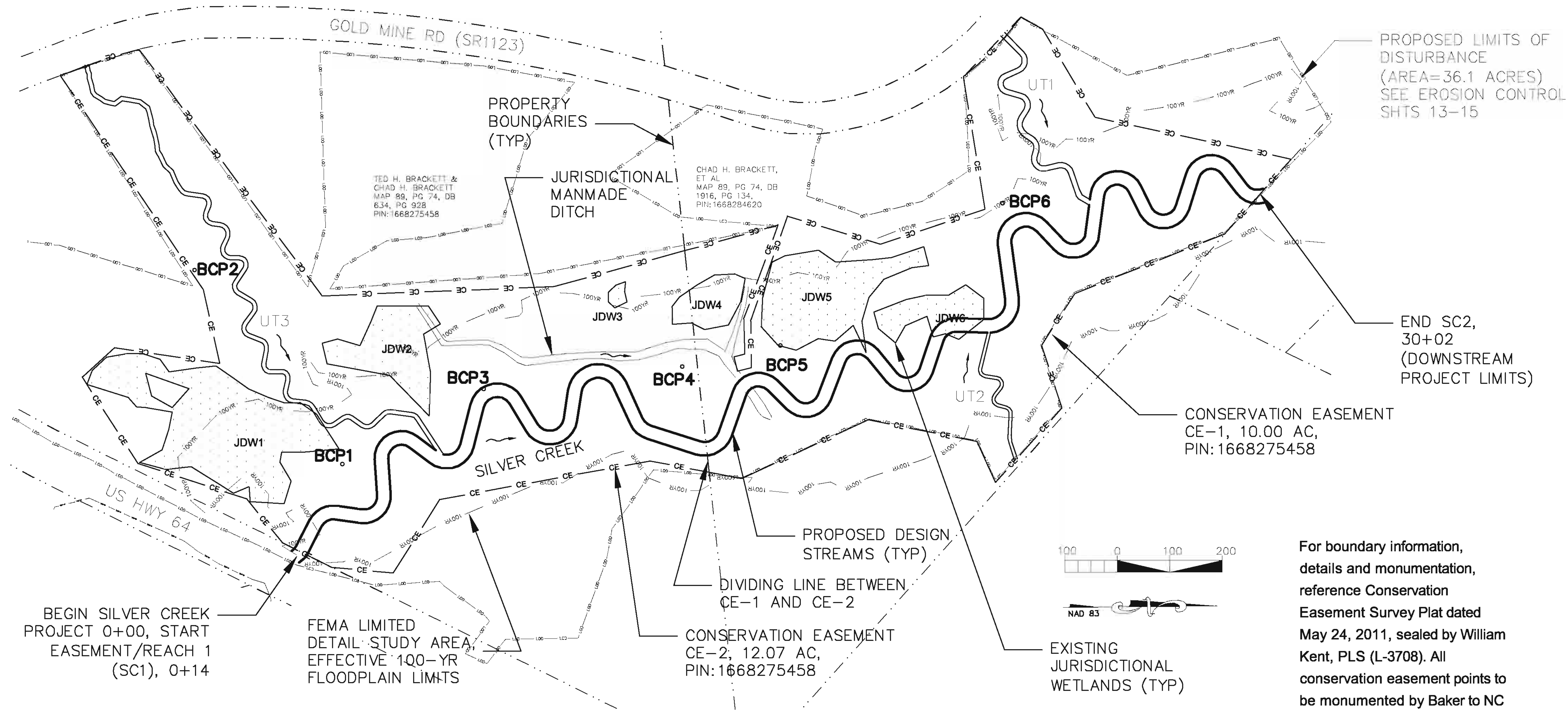
Date	Sheets
9/13/13	A, 1, 2, 27

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 033578 JACOB P. McLEAN

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SIGNATURE: *P.E.*



For boundary information, details and monumentation, reference Conservation Easement Survey Plat dated May 24, 2011, sealed by William Kent, PLS (L-3708). All conservation easement points to be monumented by Baker to NC EEP standards.

Information on wetlands mitigation and well locations provided on Sheets 11-12

CONSTRUCTION STAKEOUT

BAKER CONTROL POINTS (SHOWN ON ABOVE MAP)

Name	Easting	Northing	Elevation
BCP1	1162755.9480	687478.3620	1210.164
BCP2	1162386.1660	687196.7790	1217.796
BCP3	1162612.6370	687747.9320	1207.286
BCP4	1162570.9080	688126.4660	1204.389
BCP5	1162531.2120	688313.8050	1202.666
BCP6	1162258.5010	688737.6950	1202.570

PERMIT SUMMARY

Permit Type	Date Submitted	Date Approved
1. NCFMP (FEMA) No-Rise Certification	12/22/2011	4/12/2012
2. DLQ-DLR Land Disturbance	TBD	TBD
3. US ACOE Nationwide 27	TBD	TBD
4. DWQ Water Quality Certification	TBD	TBD
5. Local Floodplain Development Permit	TBD	TBD (No-Rise already approved)

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

033578
JACOB P. McLEAN

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Baker

UPPER SILVER CREEK STREAM AND WETLAND
RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC

PROJECT OVERVIEW

Prepared for:
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Revisions

Date	Sheets
9/13/13	A, 1, 2, 27

Project No. 120598

Date: 9/13/13

DESIGNED: JM
DRAWN: JM
CHECKED: DH

Sheet: 1 of 29

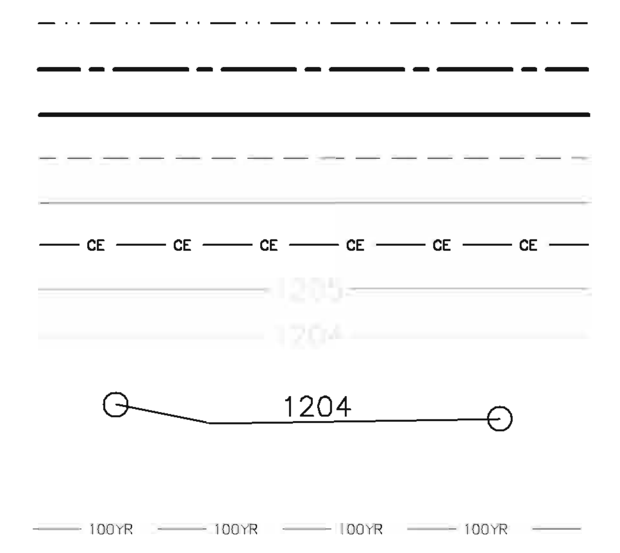
CONSTRUCTION SEQUENCE

1. Equipment and materials shall be mobilized to the top of the site.
2. Utility locations shown on the plans are approximate. The contractor shall have all underground utilities within the project limits located and marked prior to beginning construction. The contractor will be responsible for the repair of any utilities damaged during construction.
3. A construction entrance shall be incorporated into every access point that connects to a public road.
4. Temporary and permanent stream crossings shall be installed as shown in the plan set and removed as applicable when work has been completed.
5. In general, construction shall proceed upstream to downstream on each stream. All disturbed ground shall be seeded and mulched immediately after final grading and ground cover established within 7 days.
6. The engineer will stake the grading limits for floodplain excavation for reach 1 of the mainstem (Silver Creek). The engineer will stake the haul road and area to keep equipment out of. The contractor shall begin by clearing and grubbing and grading a new priority 2 floodplain in reach 1 of the mainstem leaving the existing stream and banks intact as an erosion control measure. Prior to excavation, all applicable erosion control measures shall be installed in the vicinity of the grading and in the fill area. The contractor shall remove fill to designated areas outside of the 100-year floodplain limits (for this area, all fill to be removed to fill area #1 unless area #2 or 3 is approved by the engineer). All sod mats shall be harvested prior to excavation. All transplants shall be left in place until they can be relocated to their final location and installed at the appropriate finish grade. If possible, transplants shall be done in the dormant season.
7. The engineer will stake the channel and structure layout for Silver Creek Reach 1 and the last 150' of UT3 (Reach 2). Contractor will set up pump around from 0+00 to 6+00 and on UT3 from adjacent to UT3-2 station 12+00 to station 6+00 on the mainstem. The contractor will then construct the new channels, completing any remaining floodplain grading adjacent to existing channels, plugging those portions of the old Silver Creek channel as proposed and removing excess fill to disposal areas. Any grade differential in UT3-2 between the newly constructed part and the existing channel shall be stabilized with stone. The contractor shall stabilize (as necessary and at the direction of the engineer), the temporary Silver Creek tie-in at station 5+50 to protect against erosion during storm events.
8. The engineer will stake out, and Contractor shall conduct wetland grading in JDW1a. The contractor will conduct soil amendment and seeding.
9. The engineer will stake out the structures and grade for UT3-1. The contractor will construct channel and bank enhancement on this reach.
10. The engineer will stake out the proposed channel centerline for UT3-2. The contractor will construct this restoration portion of UT3 from top to bottom in the dry leaving flow in the existing channel. For this reason, no pump around will be required. The contractor shall stockpile excess soil from this and prior activities as necessary to complete channel plugging as shown on the plans (alternatively, the contractor may use cut material from wetland restoration activities at R3 and JDW2 to obtain soil for plugging). The contractor shall close out all activities on the south side of UT3, and in any other areas that would require creek crossing to access and then turn water into the new channel at the head of UT3-2. Plug abandoned channel segments as indicated on the plans.
11. The engineer will stake out grading on the left floodplain both sides of the floodplain drainage swale from mainstem station 6+00 to 10+75. The contractor shall complete clearing & grubbing and grading and remove excess to fill area #1. Fill area #1 shall be closed out after completion of all grading for this phase. Existing creek bank on mainstem to be left intact during this phase. The contractor shall conduct soil amendment and seeding and mulching as well as final grading of the drainage swale to proposed contours.
12. The engineer will stake out the mainstem from 6+00 to 10+75. The contractor shall construct components that can be done in the dry, then set up a pump around between these stations and complete the crossings of and tie-ins to the existing channel, backfilling the channel as indicated on the plans. Excess fill shall be taken to disposal area #2.
13. The engineer will stake out the floodplain and channel grading for the mainstem from 10+75 to 15+50 on both sides of the floodplain ditch. The contractor shall complete floodplain grading leaving existing banks of main channel intact. For floodplain and channel grading in this area, all excess fill shall be taken to disposal area #2. All wetland soil amendment and seeding shall be completed to the break in the conservation easement. Then, construct channel segments on near side of creek that can be done in the dry. Once these are complete and stabilized, set up a pump around between these stations and complete remaining channel restoration, backfilling the channel as indicated on the plans and finally tying into the existing channel at 15+50. Stabilization of temporary tie-in shall be undertaken at direction of engineer. Once grading is complete on floodplain or in channel segments, stabilization measures shall be untaken immediately and ground cover established within 7 days.
14. The engineer will stake out grading for wetland restoration and enhancement activities in areas R6, JDW5 and JDW6 and for channel grading for Silver Creek stations 15+50 to 23+50. The contractor shall complete floodplain grading leaving existing banks of main channel intact. Excess fill shall be taken to disposal area #2. All wetland soil amendment and seeding shall be completed except for a 15' strip along the proposed stream which shall be left for hauling.
Complete sections of channel that can be constructed in the dry (except for 20+50 to 21+50). Enough soil should be stockpiled between proposed and existing channel for use in plugging old channel. Then cross the mainstem at 21+00 and construct UT2. Engineer to layout UT2, contractor to set up pump around or diversion through old floodplain channels with approval and direction from engineer (need to use check dams in old floodplain channels to control flow). Then contruct UT2 to its confluence with the existing mainstem without completing tie-in. Complete all seeding and mulching on UT2 upstream of confluence. Set up a pump around on the mainstem from 17+00 to 21+50 and complete all unfinished channel on UT2 and mainstem, backfilling old channels as indicated. Loosen and amend all soils where vehicles have been tracking and which were not previously completed in this segment. Setup pump around at 23+00 and complete temporary tie-in at station 23+75. Same notes as before apply to stabilization of tie-in. Complete all seeding and mulching to station 22+50. Remove staging area and construct hydrologic connection from UT1 to R6 as shown on Wetland Elements Sheet 2.
15. Engineer to layout and contractor to construct hydrologic connection shown from UT1 to Restoration Wetland "R6" on Wetland Elements (Sheet 2) - do not complete tie-in to UT1 until channel is dry. Engineer to layout and contractor to construct UT1 stations 0+00 to 3+25. Prior to construction, set up pump around from 0+00 to existing channel adjacent to 2+50 and complete UT1-to-R6 hydrologic connection tie-in. Plug existing channel just downstream of this tie-in and stabilize any loose soil. Move pump around outlet from vicinity of 2+50 up to hydrologic connection and allow UT1 to flow into R6. Prepare crew to handle (and notify engineer to oversee) overflow from R6 with a permanent solution that will accommodate any normal overflow resulting from out-of-bank flooding to this connection on UT1. This solution may involve minor grading and/or stone placement. Proceed with UT1 construction.
1. 16. Engineer to layout UT1 from 3+25 to confluence and Silver Creek Mainstem stations 23+00 to end of project. Contractor to construct in the dry UT1 4+00 to confluence and Silver Creek 25+00 to 27+00 and 28+00 to 29+25, then set up pump around from 23+50 to end of project and complete all unfinished segments, backfilling old channel as specified in plans. Any excess fill may be located on the hill above the 100-year floodplain in a location approved by the engineer and must be immediately seeded and mulched and shall include silt fence on the downhill perimeter and additional erosion and sediment control as necessary. Loosen floodplain soils where compaction has occurred and conduct final seeding and mulching, removal of temporary crossing on UT1 and exit outside the wetland perimeter on the road side.

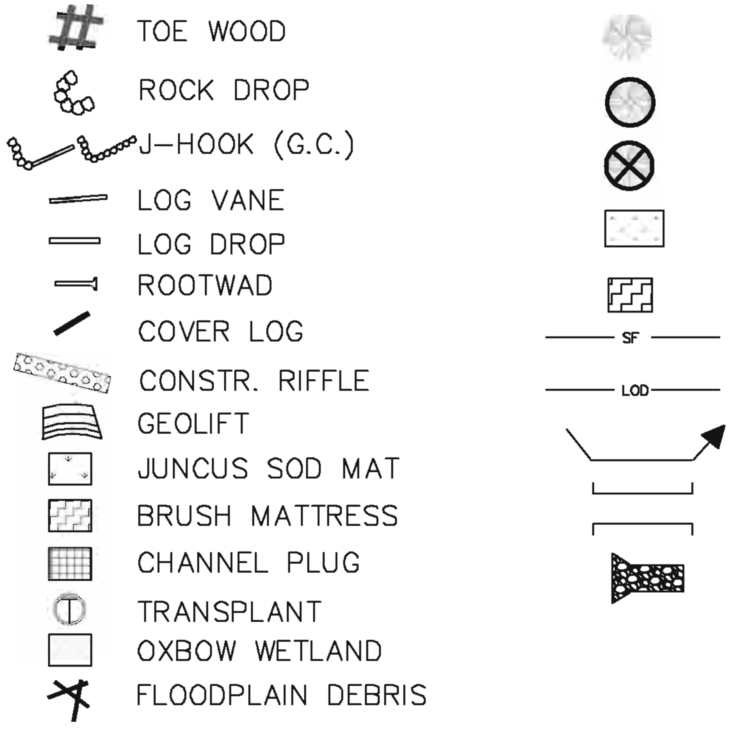
GENERAL CONSTRUCTION NOTES

1. Temporary sand bag coffer dams shall be installed upstream of each work area and flow in the work reach shall be diverted by pumping and piping around the work area. The length of each diversion shall be approximately 300 to 600 linear feet. Pumping will be done when work is required in a channel where the stream is flowing. Much of the mainstem and tributary work will be done offline. Existing channel material should be stockpiled and incorporated in constructed offline reaches.
2. Clearing and grubbing required within the grading limits shall be performed so as to limit sediment migration off-site. When logs and roots must be removed from the banks prior to abandoning the channel (for use in new channel construction), bare areas must covered with mulch. Logs and root wads from trees larger than 8 inches in diameter shall be stockpiled for use as in-stream structures. Salvageable native vegetation will be flagged in the field and shall be harvested for transplanting or for cutting and live-staking materials. Brush material for toe wood structures should be stockpiled and kept wet. Special attention should be given to the removal of nonnative, exotic species when clearing and grubbing takes place. All non-native species shall be disposed of.
3. High visibility safety fence shall be installed around the perimeter of wetlands, travel routes near wetlands and as directed by the engineer prior to beginning adjacent construction activities. Wetland mats shall be used to minimize impacts to wetland areas not involved in construction activities when working in wetland restoration, enhancement and creation areas or stream restoration and enhancement areas.
3. In general, riparian wetland grading in each segement shall be accomplished before stream restoration work is accomplished. The contractor may simulateneously be constructing new offline channel segments and using vegetation mats harvested from floodplain grading areas to apply to areas of the newly constructed channel. Graded areas should be amended as indicated and tilled to roughen the wetland area and create heterogeneous topography. The site should then be seeded and mulched to stabilize the site.
4. The new channel sections shall be stabilized with in-stream structures, erosion control matting, seed, and transplants before turning water into these sections. Compacted soil channel plugs shall be installed in areas where the new channel diverges from the original channel, and the original, abandoned channel sections will be backfilled to the extent indicated on the plans or approved by the engineer.
5. Dewatering of off-line sections shall be diverted through a sediment filter before being discharged into the downstream reach.
6. Earthwork shall be staged such that no more channel will be disturbed than can be stabilized by the end of the work day or before flow is diverted into a new channel segment.
7. Disturbed areas within the first 25 feet of buffer adjacent to the channel will be seeded, mulched or otherwise stabilized with temporary ground cover until a more permanent ground cover is established across the buffer area disturbed during construction. If temporary groundcover is not applied at the end of the workday, straw wattles will be staked down at the top of the bank where erosion control matting ends to prevent sediment loading from upland portions of the buffer that have not stabilized.
8. The flow diversions and temporary stream crossings shall be removed when no longer needed and the banks in these areas re-graded as necessary, stabilized with seeding and matting.
9. Excess soil materials shall be stockpiled in designated staging and stockpile areas, with silt fence installed on the downslope side(s) of the base of the stockpiles and maintained when sediment has accumulated above one third of the height of the silt fence and/or the silt fence has failed. Excess soil shall be hauled outside the conservation easement before demobilization.
10. The flow diversions and temporary stream crossings shall be removed when no longer needed and the banks in these areas stabilized with seeding and matting.
11. Bank and floodplain vegetation, including brush materials and live stakes, are preferably installed during the dormant season, November to April.
12. Staging and stockpile areas, and silt fence shall be removed and the ground shall be repaired to its original conditions once planting is complete and once they are no longer needed. Construction entrances may also be removed or left in place in the landowner wishes to retain them.

LEGEND



- PROPERTY LINES
- PROPOSED STREAM CENTERLINE
- PROPOSED TOP OF BANK
- EXISTING STREAM CENTER LINE
- EXISTING STREAM TOP OF BANK
- CONSERVATION EASEMENT
- EXISITING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED FLOODPLAIN/WETLAND GRADING CONTOUR AND TIE IN (DOES NOT APPLY WHERE CONTOURS CROSS CHANNEL)
- EFFECTIVE 100-YR FLOODPLAIN LIMITS



- TOE WOOD
- ROCK DROP
- J-HOOK (G.C.)
- LOG VANE
- LOG DROP
- ROOTWAD
- COVER LOG
- CONSTR. RIFFLE
- GEOLIFT
- JUNCUS SOD MAT
- BRUSH MATTRESS
- CHANNEL PLUG
- TRANSPLANT
- OXBOW WETLAND
- FLOODPLAIN DEBRIS
- EXISTING TREE
- EXISTING TREE TO REMAIN
- EXISITING TREE TO REMOVE
- JURISDICTIONAL WETLAND
- STAGING AREA
- SILT FENCE
- LIMITS OF DISTURBANCE
- PUMP AROUND
- TEMPORARY STREAM CROSSING
- CONSTRUCTION ENTRANCE

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UPPER SILVER CREEK STREAM AND WETLAND
RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC

CONSTRUCTION SEQUENCE AND LEGEND

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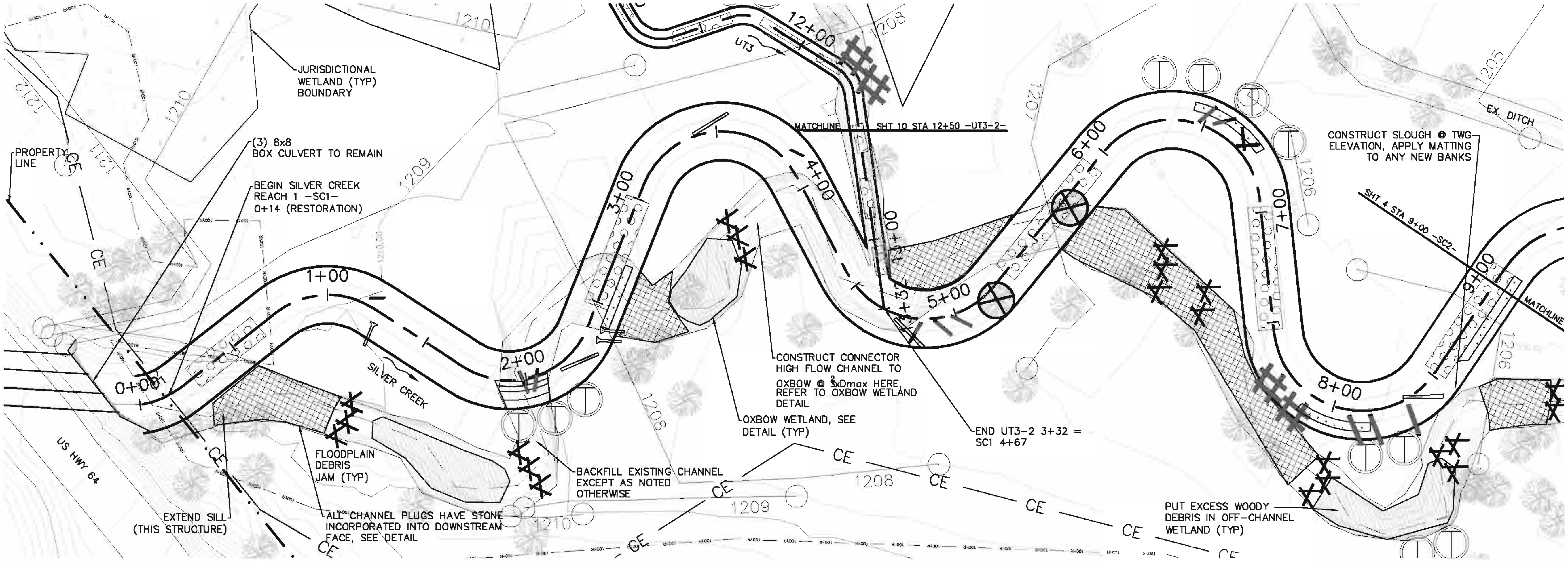
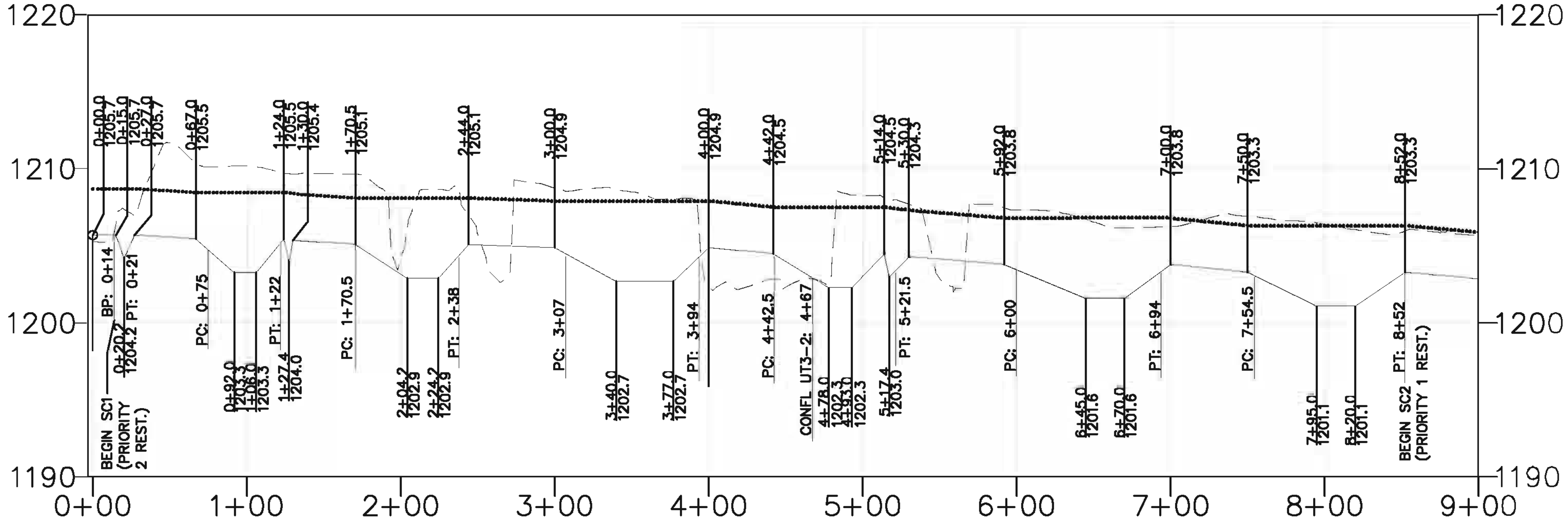
DESIGNED: JM
DRAWN: JM
CHECKED: DH
Sheet: 2 of 29



SEE WETLAND GRADING SHTS 11-12 AND E&SC SHTS 13-15



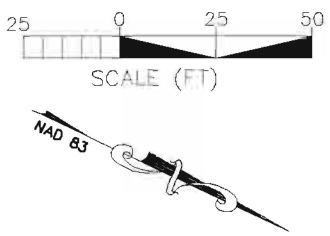
PROFILE SCALE
HORIZONTAL: 1"=100'
VERTICAL: 1"=10'

LEGEND OF PROFILES

- PROPOSED THALWEG
- PROPOSED TOB
- EXISTING GROUND

LEGEND OF PROPOSED PRACTICES

- TOE WOOD
- ROCK DROP
- GRADE CONTR J-HOOK
- LOG VANE
- LOG DROP
- ROOTWAD
- COVER LOG
- CONSTR. RIFFLE
- GEOLIFT
- JUNCUS SOD MAT
- BRUSH MATTRESS
- CHANNEL PLUG
- TRANSPLANTS
- OXBOW WETLAND
- FLOODPLAIN DEBRIS



PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

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UPPER SILVER CREEK STREAM AND WETLAND
RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC

SILVER CREEK MAINSTEM PLAN-PROFILE
STA. 0+00 TO STA. 9+00

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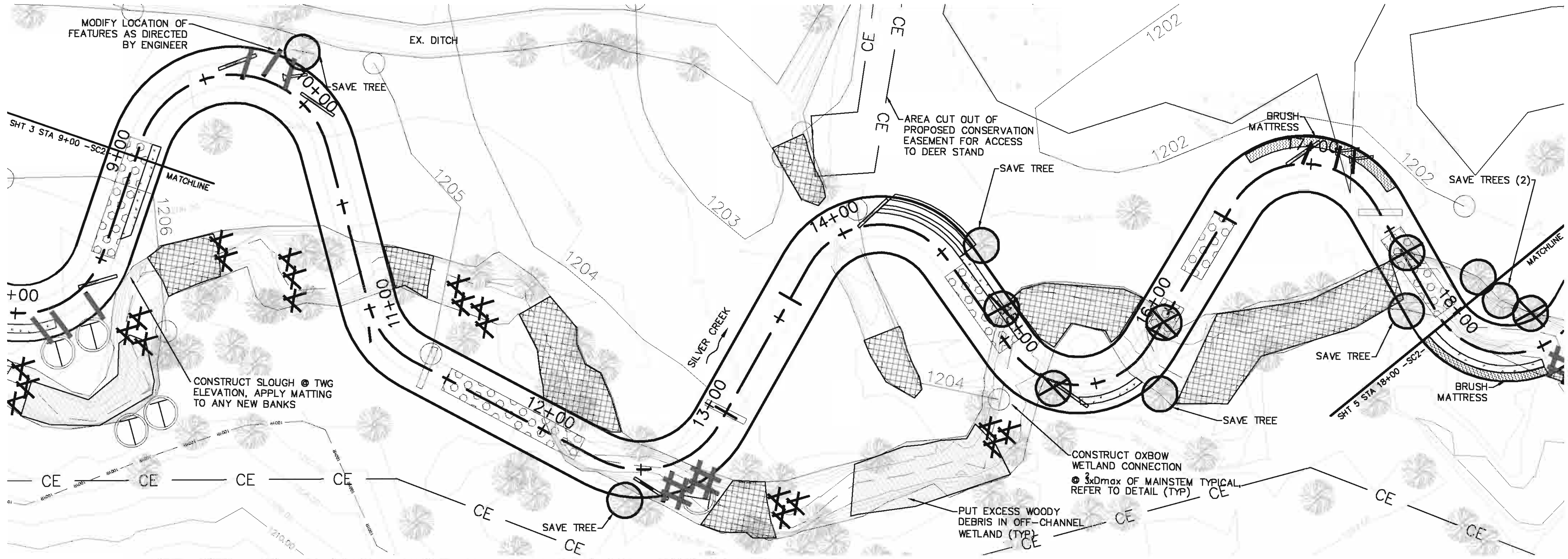
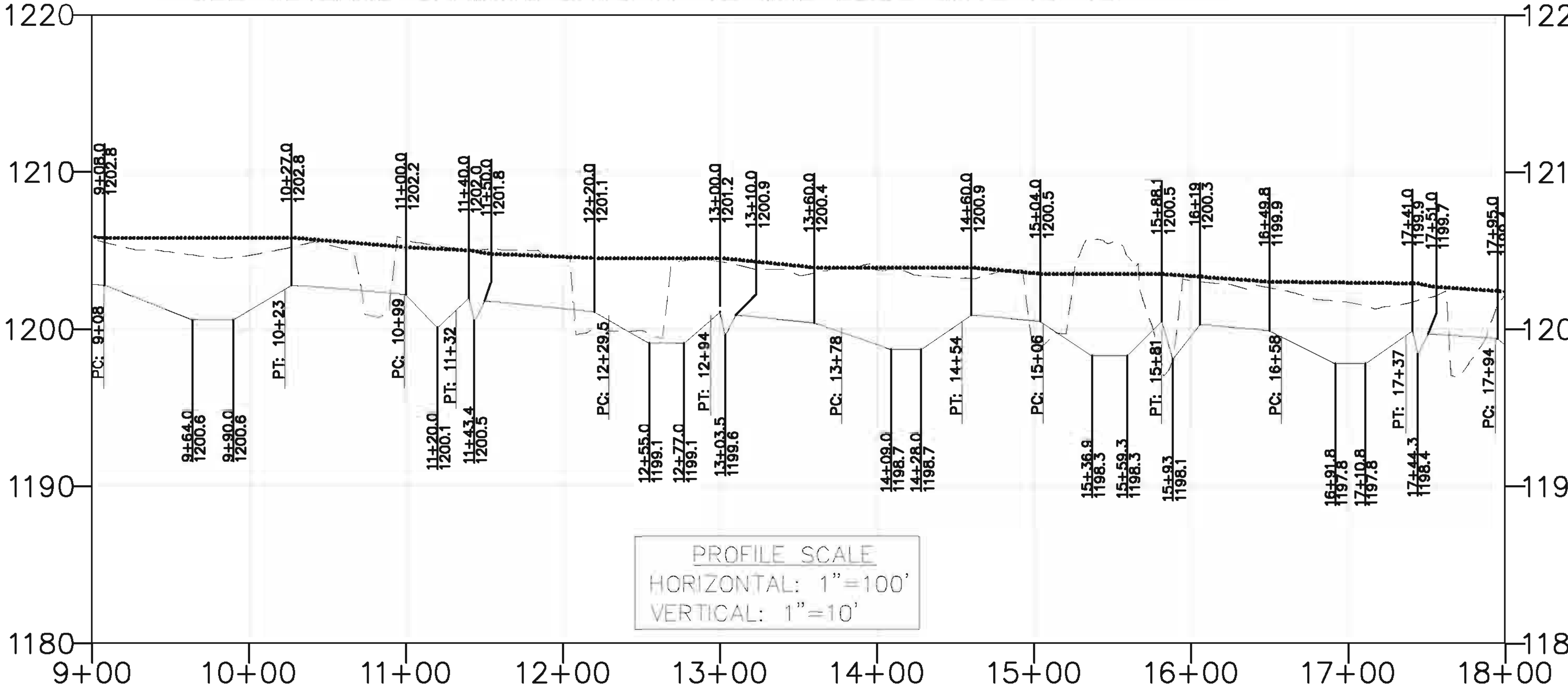
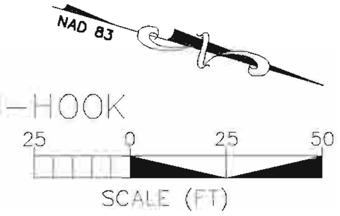


SEE WETLAND GRADING SHTS 11-12 AND E&SC SHTS 13-15



LEGEND OF PROPOSED PRACTICES

- TOE WOOD
- ROCK DROP
- GRADE CONTR J-HOOK
- LOG VANE
- LOG DROP
- ROOTWAD
- COVER LOG
- CONSTR. RIFFLE
- GEOLIFT
- JUNCUS SOD MAT
- BRUSH MATTRESS
- CHANNEL PLUG
- TRANSPLANTS
- OXBOW WETLAND
- FLOODPLAIN DEBRIS



LEGEND OF PROFILES

- PROPOSED THALWEG
- PROPOSED TOB
- EXISTING GROUND

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

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UPPER SILVER CREEK STREAM AND WETLAND
RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC

SILVER CREEK MAINSTEM PLAN-PROFILE
STA. 9+00 TO STA. 18+00

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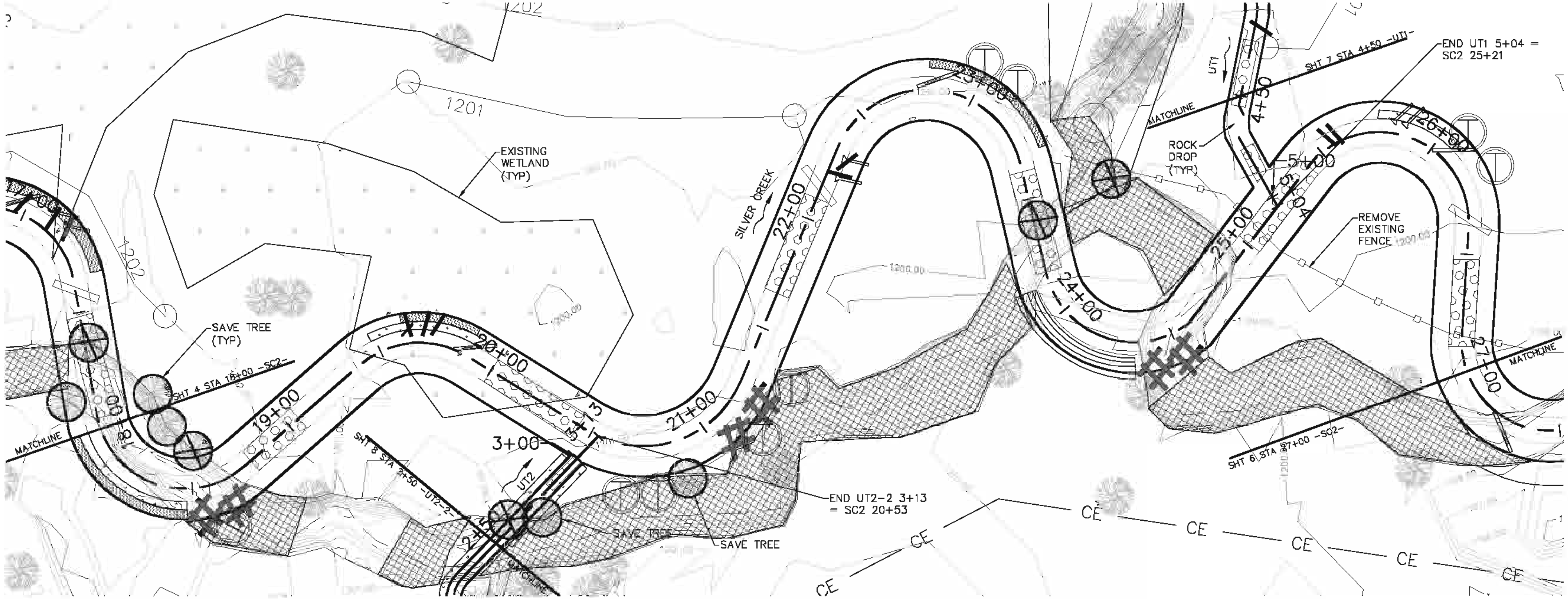
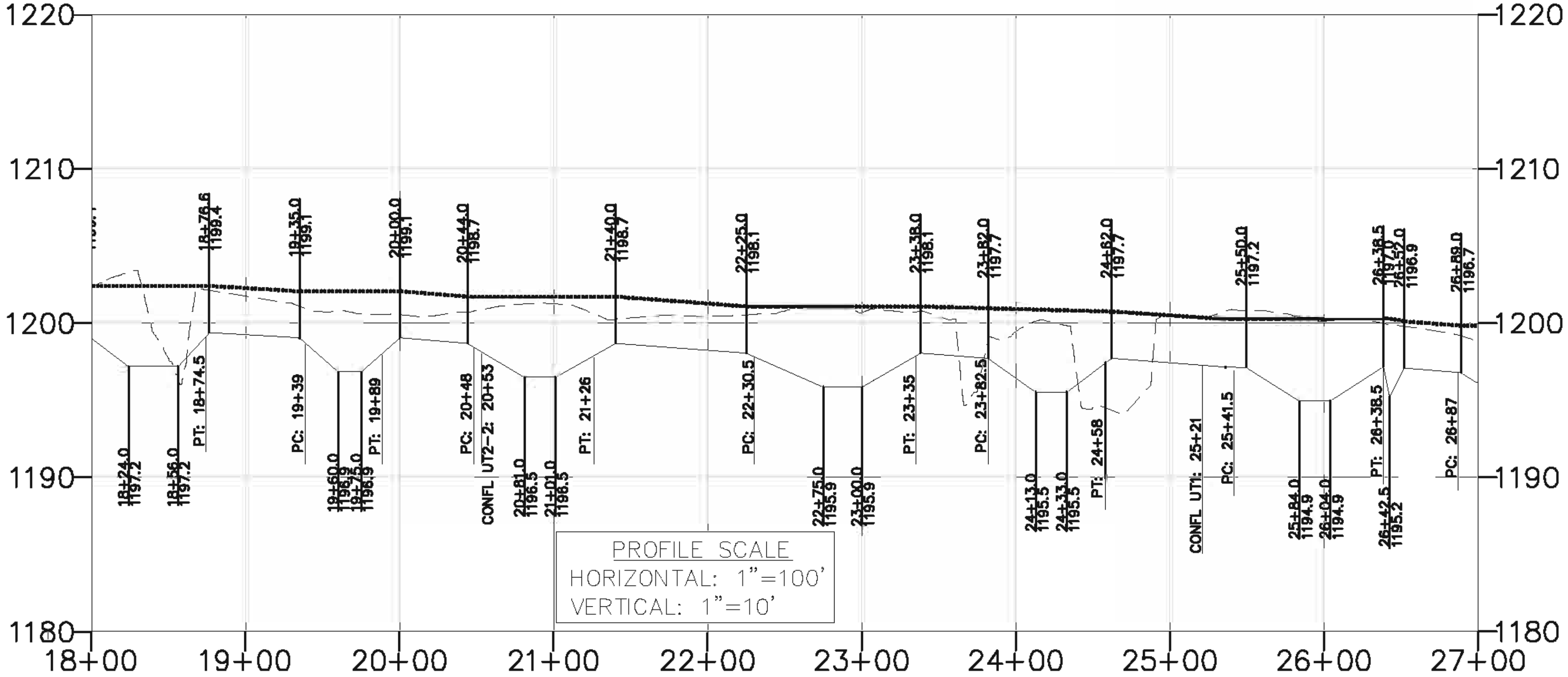


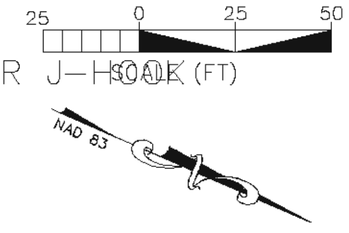
SEE WETLAND GRADING SHTS 11-12 AND E&SC SHTS 13-15



PROFILE SCALE
HORIZONTAL: 1"=100'
VERTICAL: 1"=10'

LEGEND OF PROPOSED PRACTICES

#	TOE WOOD
∞	ROCK DROP
∞	GRADE CONTR J-HOOK
/	LOG VANE
▭	LOG DROP
⊤	ROOTWAD
▬	COVER LOG
▭	CONSTR. RIFFLE
▭	GEOLIFT
▭	JUNCUS SOD MAT
▨	BRUSH MATTRESS
▦	CHANNEL PLUG
⊤	TRANSPLANTS
▨	OXBOW WETLAND
✗	FLOODPLAIN DEBRIS



LEGEND OF PROFILES

——— PROPOSED THALWEG
••••••• PROPOSED TOB
- - - - - EXISTING GROUND

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

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UPPER SILVER CREEK STREAM AND WETLAND
RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC
SILVER CREEK MAINSTEM PLAN-PROFILE
STA. 18+00 TO STA. 27+00

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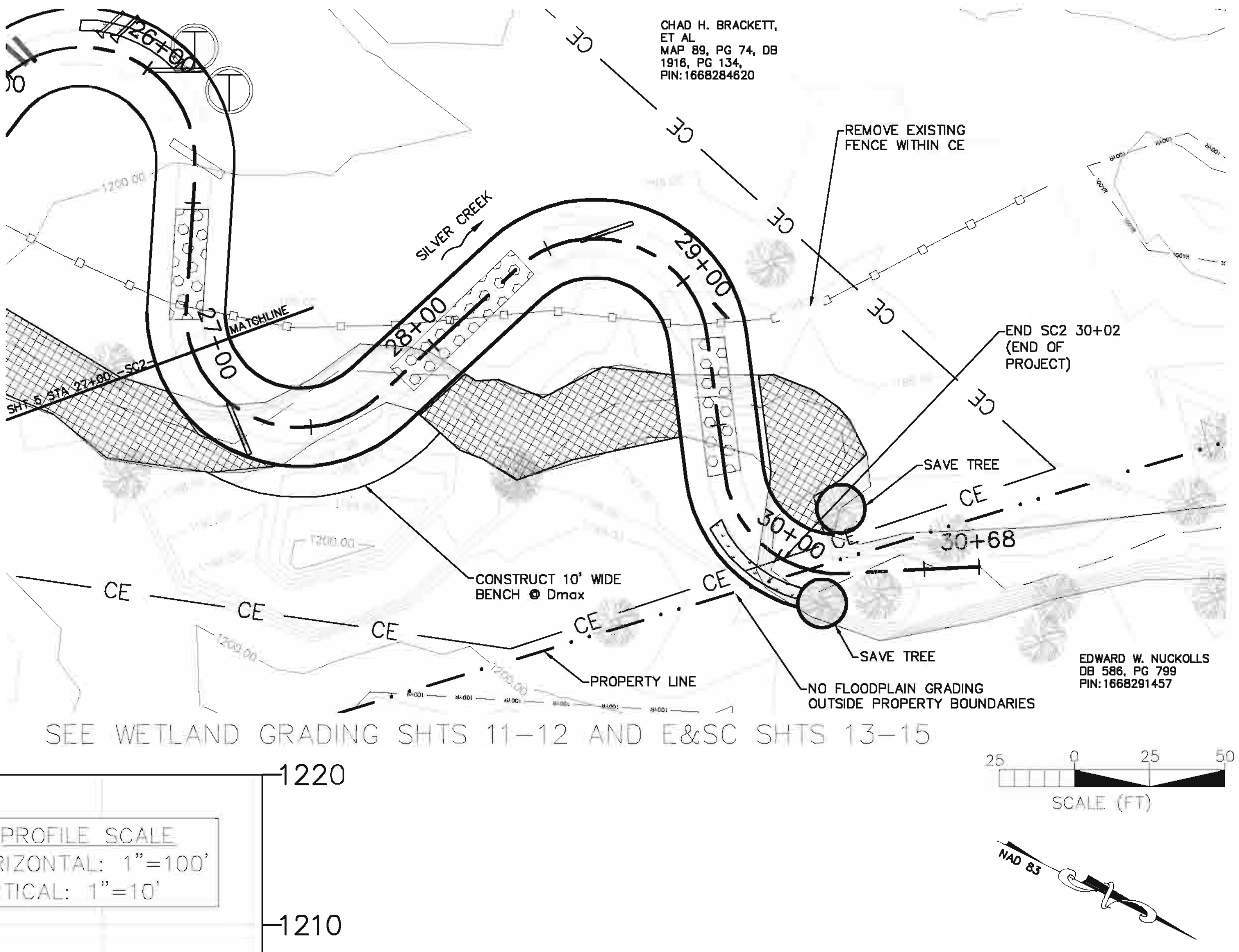

SEE WETLAND GRADING SHTS 11-12 AND E&SC SHTS 13-15

LEGEND OF PROPOSED PRACTICES

- # TOE WOOD
- ROCK DROP
- GRADE CONTR J-HOOK
- LOG VANE
- LOG DROP
- ROOTWAD
- COVER LOG
- CONSTR. RIFFLE
- GEOLIFT
- JUNCUS SOD MAT
- ▨ BRUSH MATTRESS
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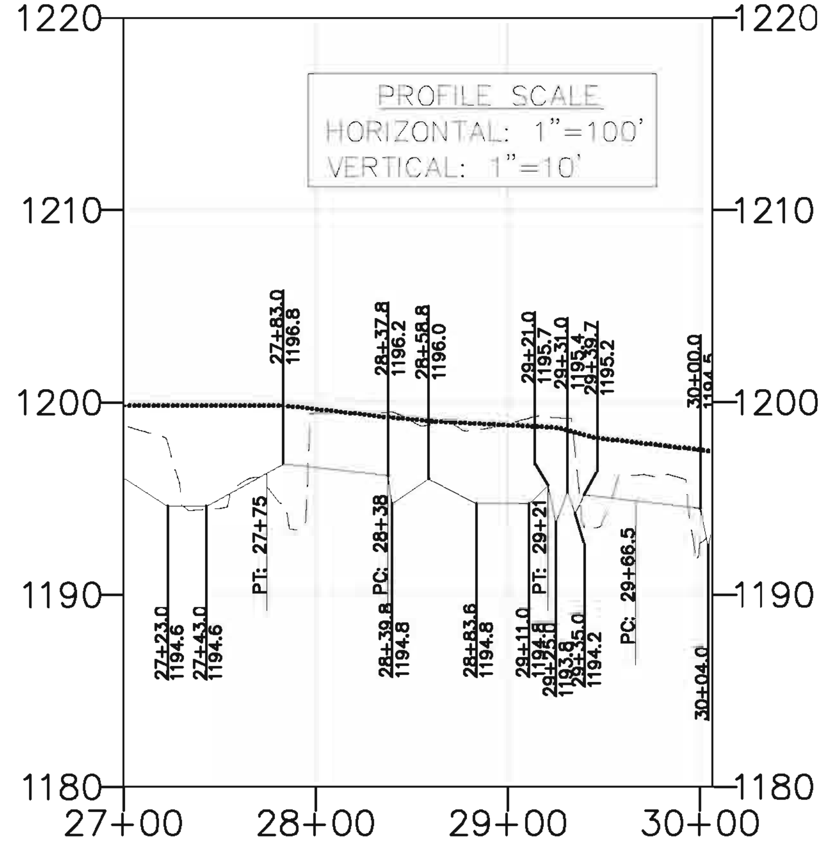

LEGEND OF PROFILES

- PROPOSED THALWEG
- PROPOSED TOB
- EXISTING GROUND

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 033578 JACOB P. McLEAN
PRELIMINARY PLANS
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UPPER SILVER CREEK STREAM AND WETLAND
RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC

SILVER CREEK MAINSTEM PLAN-PROFILE
STA. 27+00 TO STA. 30+02

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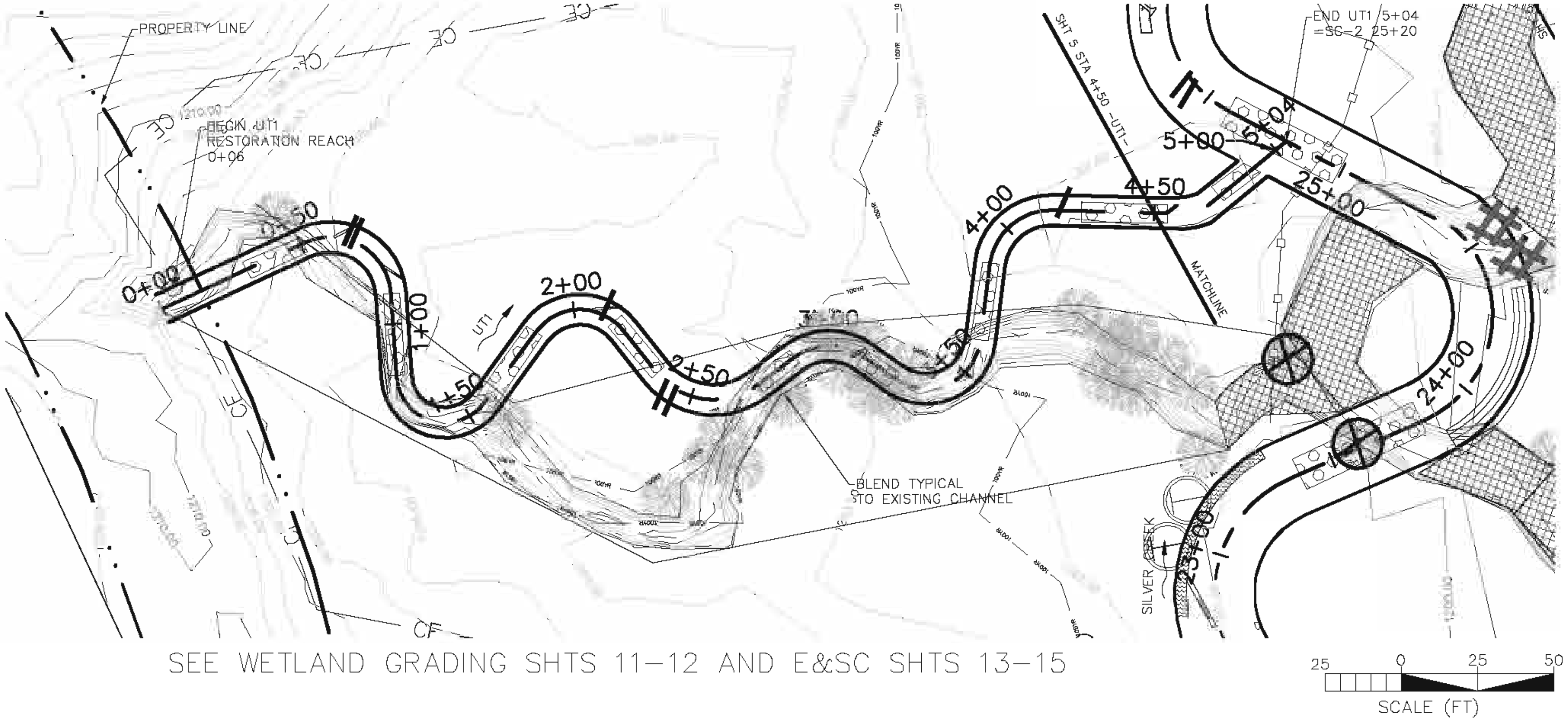
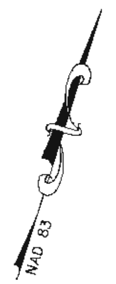


SEE WETLAND GRADING SHTS 11–12 AND E&SC SHTS 13–15



LEGEND OF PROPOSED PRACTICES

- TOE WOOD
- ROCK DROP
- GRADE CONTR J–HOOK
- LOG VANE
- LOG DROP
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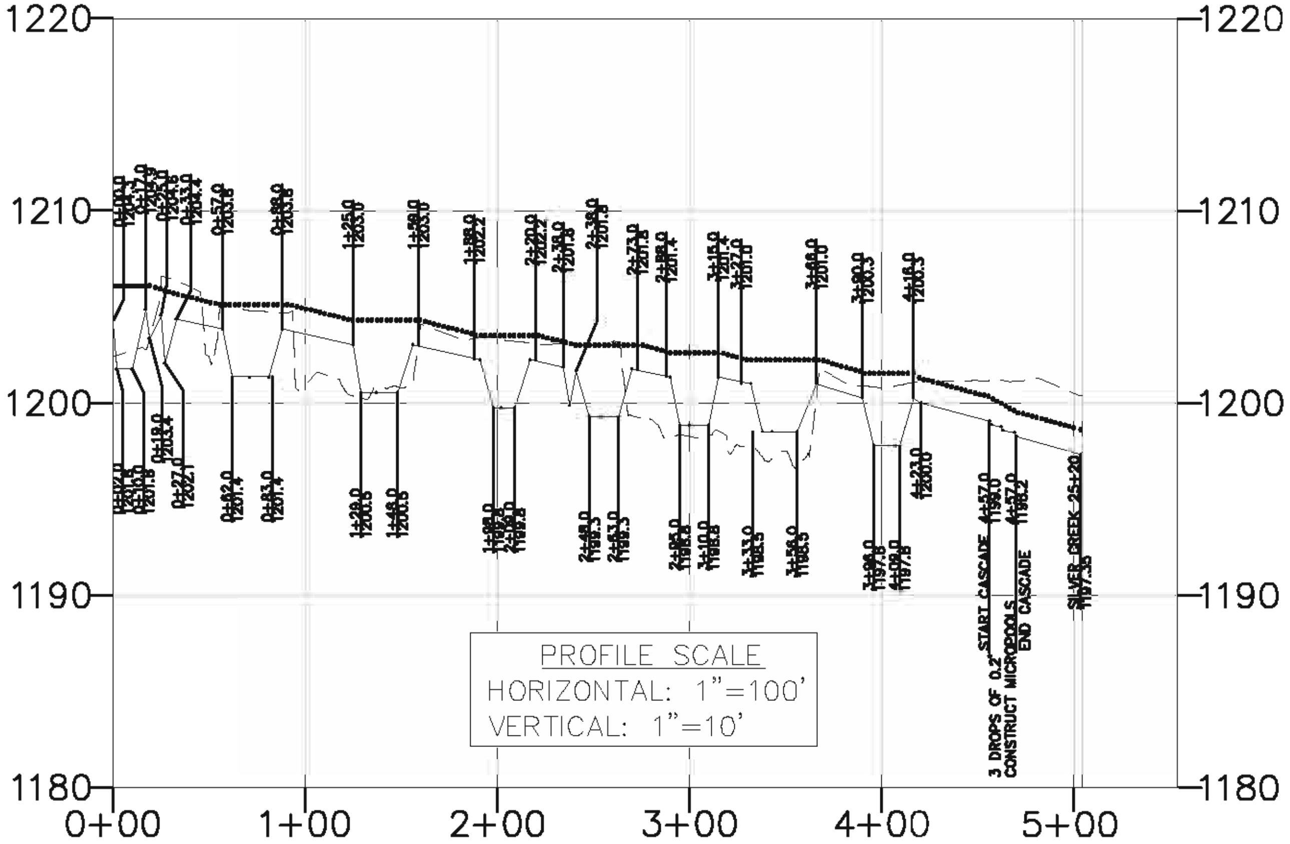

PROFILE SCALE
HORIZONTAL: 1"=100'
VERTICAL: 1"=10'

LEGEND OF PROFILES

- PROPOSED THALWEG
- PROPOSED TOB
- EXISTING GROUND

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

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UPPER SILVER CREEK STREAM AND WETLAND
RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC

UT1 PLAN-PROFILE
STA. 0+00 TO STA. 5+55

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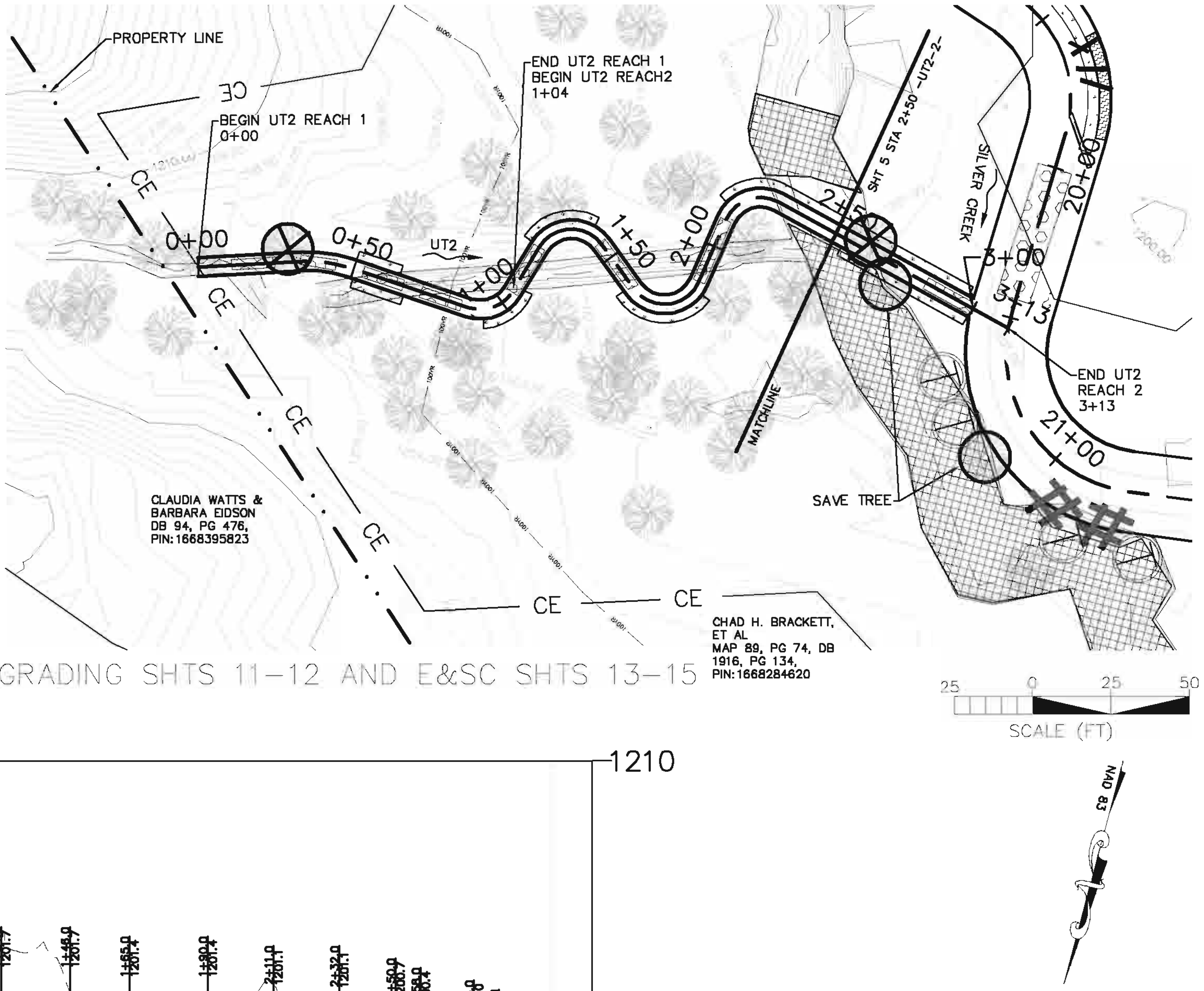

SEE WETLAND GRADING SHTS 11-12 AND E&SC SHTS 13-15

LEGEND OF PROPOSED PRACTICES

- TOE WOOD
- ROCK DROP
- GRADE CONTR J-HOOK
- LOG VANE
- LOG DROP
- ROOTWAD
- COVER LOG
- CONSTR. RIFFLE
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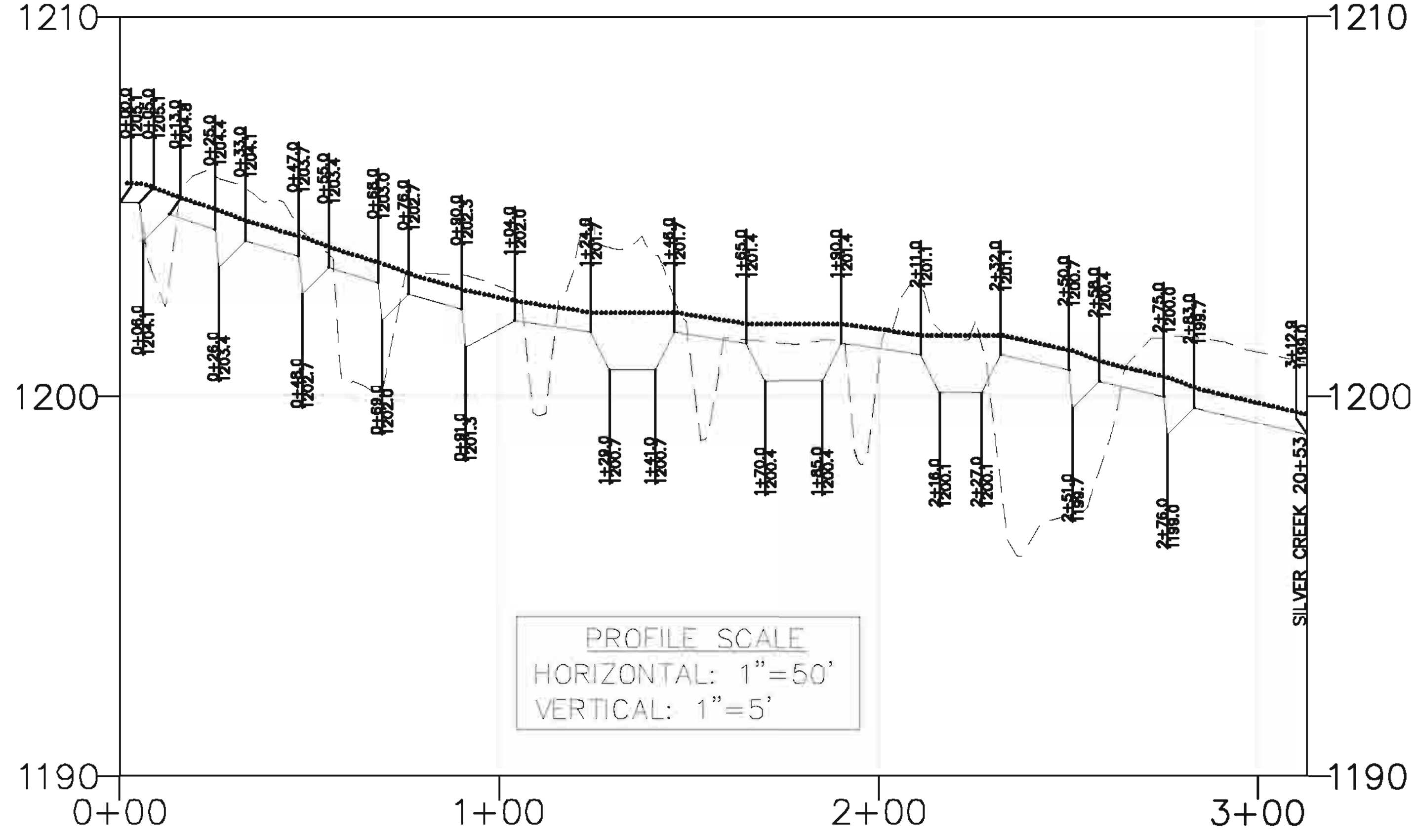
- FLOODPLAIN DEBRIS



LEGEND OF PROFILES

- PROPOSED THALWEG
- PROPOSED TOB
- EXISTING GROUND

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

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UPPER SILVER CREEK STREAM AND WETLAND RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC

UT2 PLAN-PROFILE
STA. 0+00 TO STA. 3+13

Prepared for:
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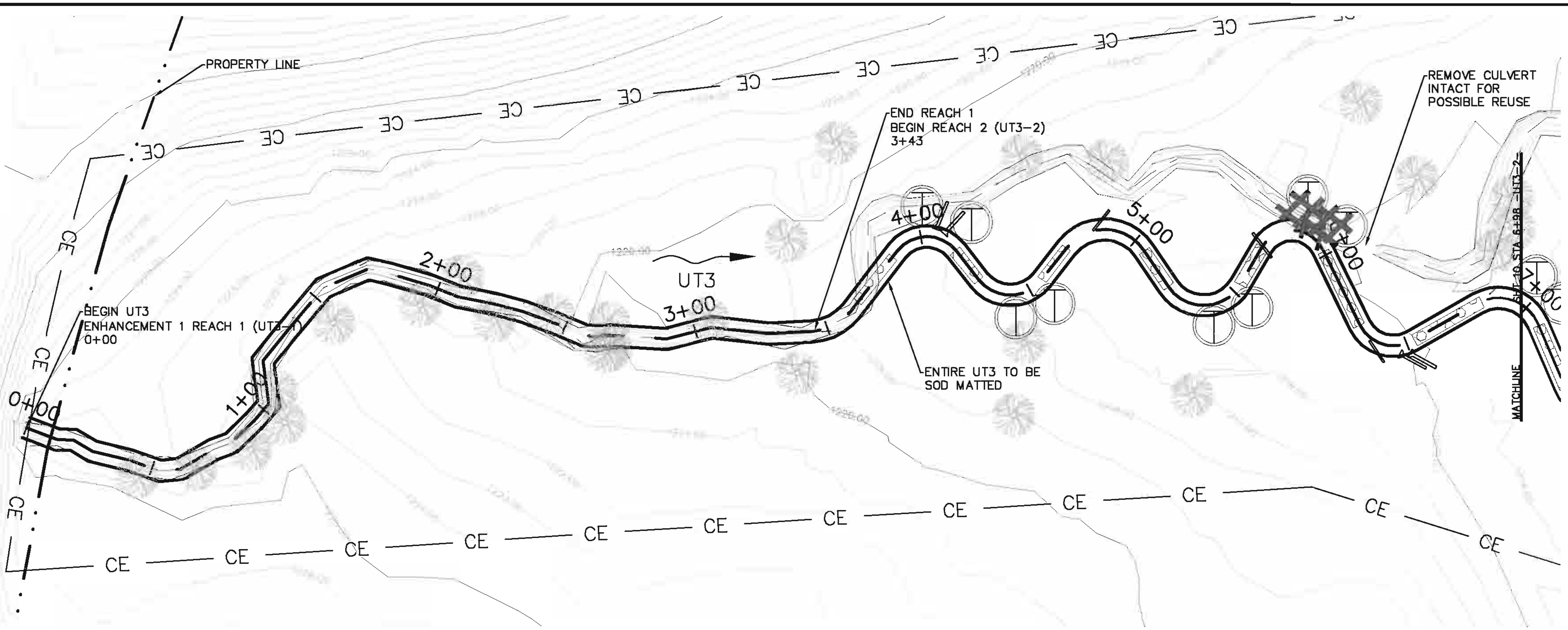
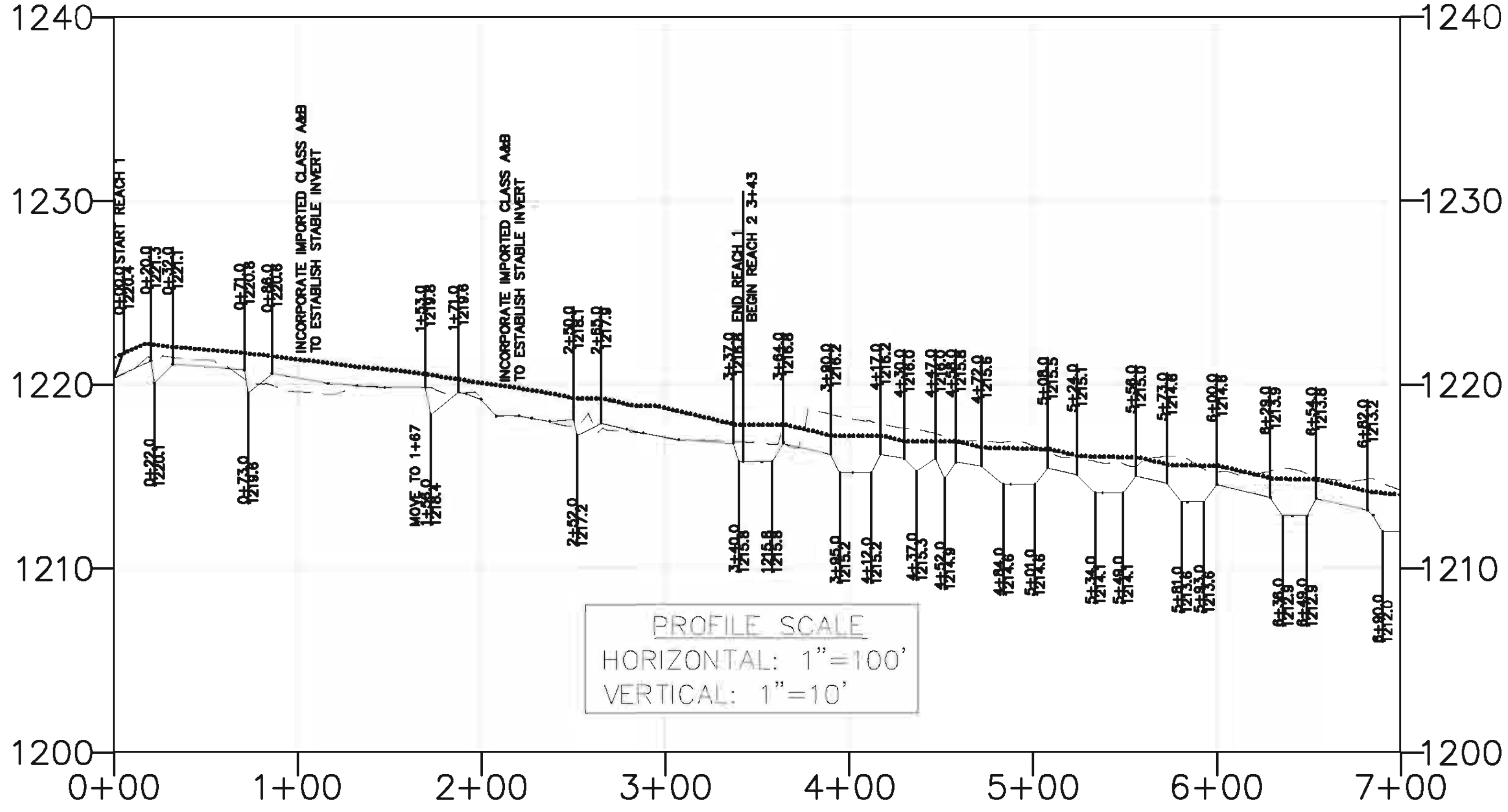
CHECKED: DH
Sheet: 8 of 29



SEE WETLAND GRADING SHTS 11-12 AND E&SC SHTS 13-15



LEGEND OF PROPOSED PRACTICES

- TOE WOOD
- ROCK DROP
- GRADE CONTR J-HOOK
- LOG VANE
- LOG DROP
- ROOTWAD
- COVER LOG
- CONSTR. RIFFLE
- GEOLIFT
- JUNCUS SOD MAT
- BRUSH MATTRESS
- CHANNEL PLUG
- TRANSPLANTS
- OXBOW WETLAND
- FLOODPLAIN DEBRIS

LEGEND OF PROFILES

- PROPOSED THALWEG
- PROPOSED TOB
- EXISTING GROUND

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SEAL 033578
JACOB P. McLEAN

Revisions Date	Sheets
9/13/13	A, 1, 2, 27

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UPPER SILVER CREEK STREAM AND WETLAND
RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC

UT3 PLAN-PROFILE
STA. 0+00 TO STA. 7+00

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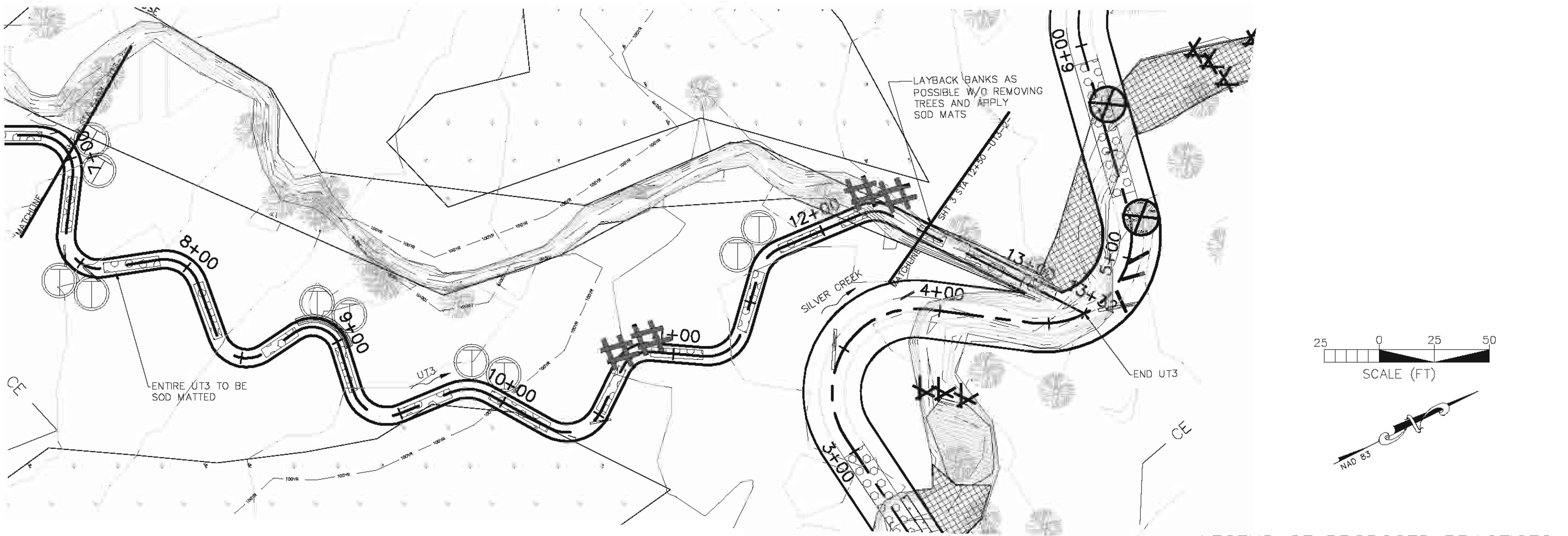
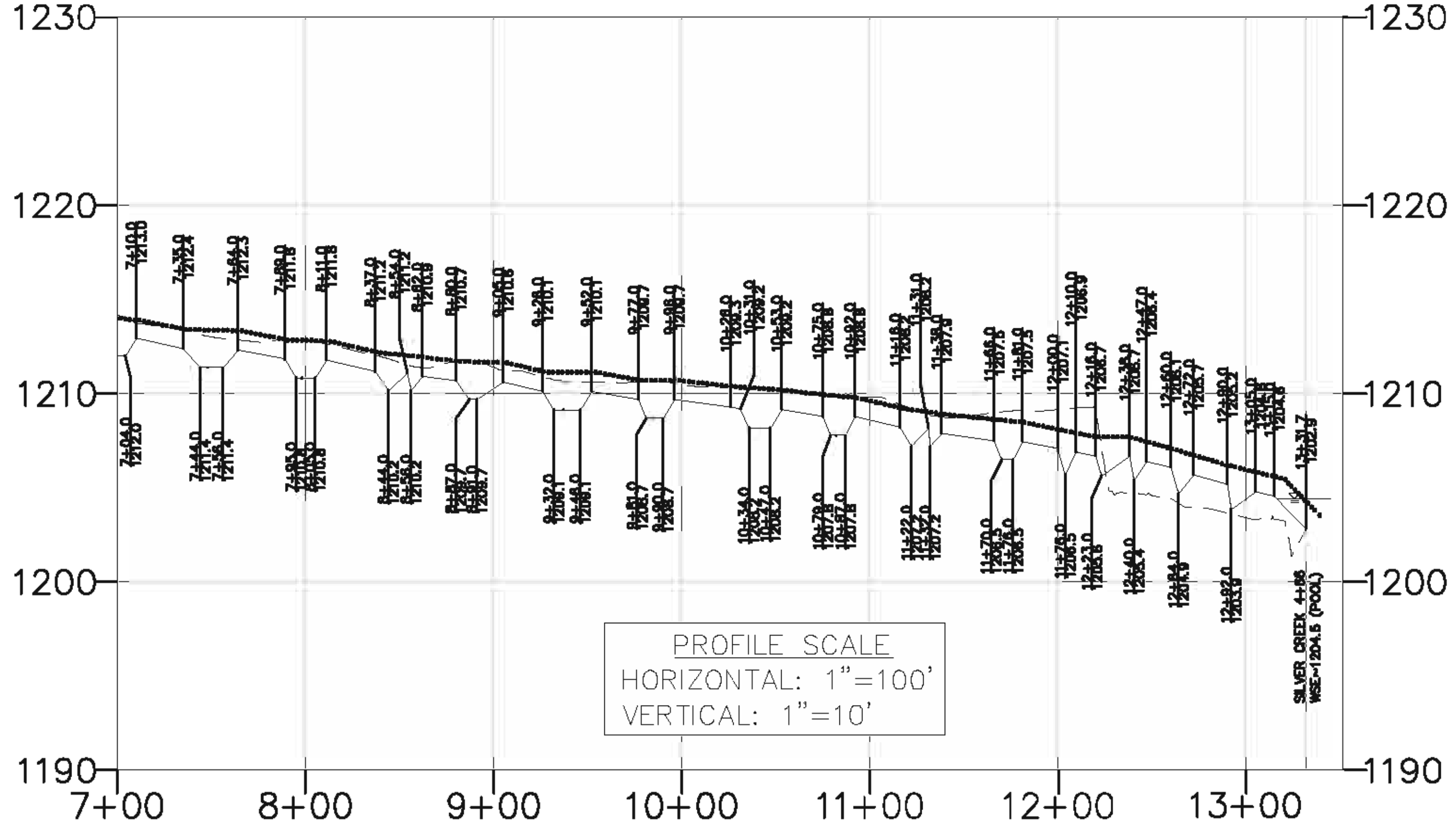


SEE WETLAND GRADING SHTS 11–12 AND E&SC SHTS 13–15



LEGEND OF PROPOSED PRACTICES

- \# TOE WOOD
- ROCK DROP
- GRADE CONTR J-HOOK
- LOG VANE
- LOG DROP
- ROOTWAD
- COVER LOG
- CONSTR. RIFFLE
- GEOLIFT
- JUNCUS SOD MAT
- BRUSH MATTRESS
- CHANNEL PLUG
- TRANSPLANTS
- OXBOW WETLAND
- FLOODPLAIN DEBRIS

LEGEND OF PROFILES

- ———— PROPOSED THALWEG
- ━━━━ PROPOSED TOB
- – – – – EXISTING GROUND

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SEAL 033578
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UPPER SILVER CREEK STREAM AND WETLAND
RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC

UT3 PLAN-PROFILE
STA. 7+00 TO STA. 13+32

Prepared for:
Ecosystem Enhancement Program
2728 Capitol Blvd., Suite 1H 103
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Revisions	
Date	Sheets
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Project No. 120598
Date: 9/13/13
DESIGNED: JM
DRAWN: JM
CHECKED: DH
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▨ WETLAND RESTORATION

⬚ WETLAND ENHANCEMENT TO EXISTING JURISDICTIONAL WETLANDS @ 2:1 CREDIT RATIO

▤ WETLAND CREATION

Ⓦ EXISTING MONITORING WELL

■ HYDRIC SOIL LOCATED

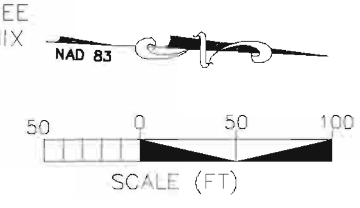
□ BURIED HYDRIC SOIL LOCATED

▲ BURIED SOILS LOCATED

Wetland Crediting

Wetland Name	Credit Type	Acreage	Ratio	WMU
JDW1a	Enhancement	0.53	2:1	0.26
JDW1b	Enhancement	0.9	2:1	0.45
JDW2	Enhancement	0.51	2:1	0.25
R1	Restoration	0.21	1:1	0.21
R2	Restoration	1.22	1:1	1.22
R3	Restoration	0.18	1:1	0.18
R4	See Sht 12	–	–	–
			Sheet Subtotal	2.57

NOTES:
1. ALL WETLANDS SHALL BE AMENDED WITH TOPSOIL OR ORGANIC MATTER
2. ALL WETLANDS TO BE PLANTED WITH WETLAND SEED MIX AND TREE SPECIES, ALL OTHER AREAS TO BE PLANTED WITH RIPARIAN SEED MIX AND TREE SPECIES. ALL AREAS TO BE PLANTED WITH TEMPORARY SEED.



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UPPER SILVER CREEK STREAM AND WETLAND RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC
WETLAND ELEMENTS (SHEET 1)
UPSTREAM PORTION

Prepared for:
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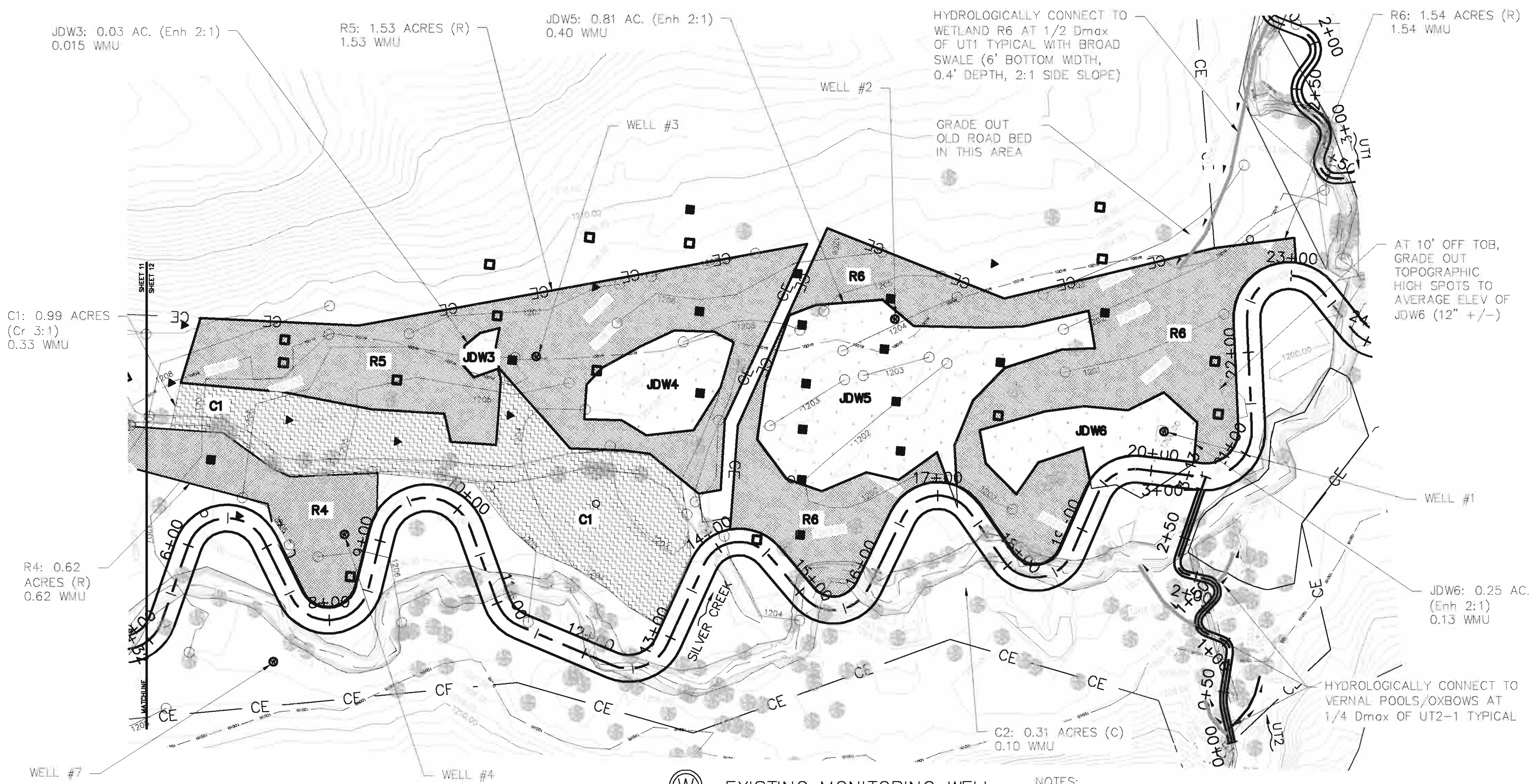

Wetland Crediting

Wetland Name	Credit Type	Acreage	Ratio	WMU
JDW3	Enhancement	0.03	2:1	0.02
JDW4	Enhancement	0.24	2:1	0.12
JDW5	Enhancement	0.81	2:1	0.40
JDW6	Enhancement	0.25	2:1	0.13
R4	Restoration	0.62	1:1	0.62
R5	Restoration	1.53	1:1	1.53
R6	Restoration	1.54	1:1	1.54
C1	Creation	0.99	3:1	0.33
			Sheet Subtotal	4.69
			Project Total	7.26

Ⓦ	EXISTING MONITORING WELL
■	HYDRIC SOIL LOCATED
□	BURIED HYDRIC SOIL LOCATED
▲	BURIED SOILS LOCATED
▨	WETLAND RESTORATION
▨	WETLAND CREATION
⬚	WETLAND ENHANCEMENT TO EXISTING JURISDICTIONAL WETLANDS @ 2:1 CREDIT RATIO

NOTES:
1. ALL WETLANDS SHALL BE AMENDED WITH TOPSOIL OR ORGANIC MATTER
2. ALL WETLANDS TO BE PLANTED WITH WETLAND SEED MIX AND TREE SPECIES, ALL OTHER AREAS TO BE PLANTED WITH RIPARIAN SEED MIX AND TREE SPECIES. ALL AREAS TO BE PLANTED WITH TEMPORARY SEED.

50 0 50 100
SCALE (FT)

NAD 83

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

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UPPER SILVER CREEK STREAM AND WETLAND RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC
WETLAND ELEMENTS (SHEET 2)
MIDDLE & DOWNSTREAM PORTION

Prepared for:
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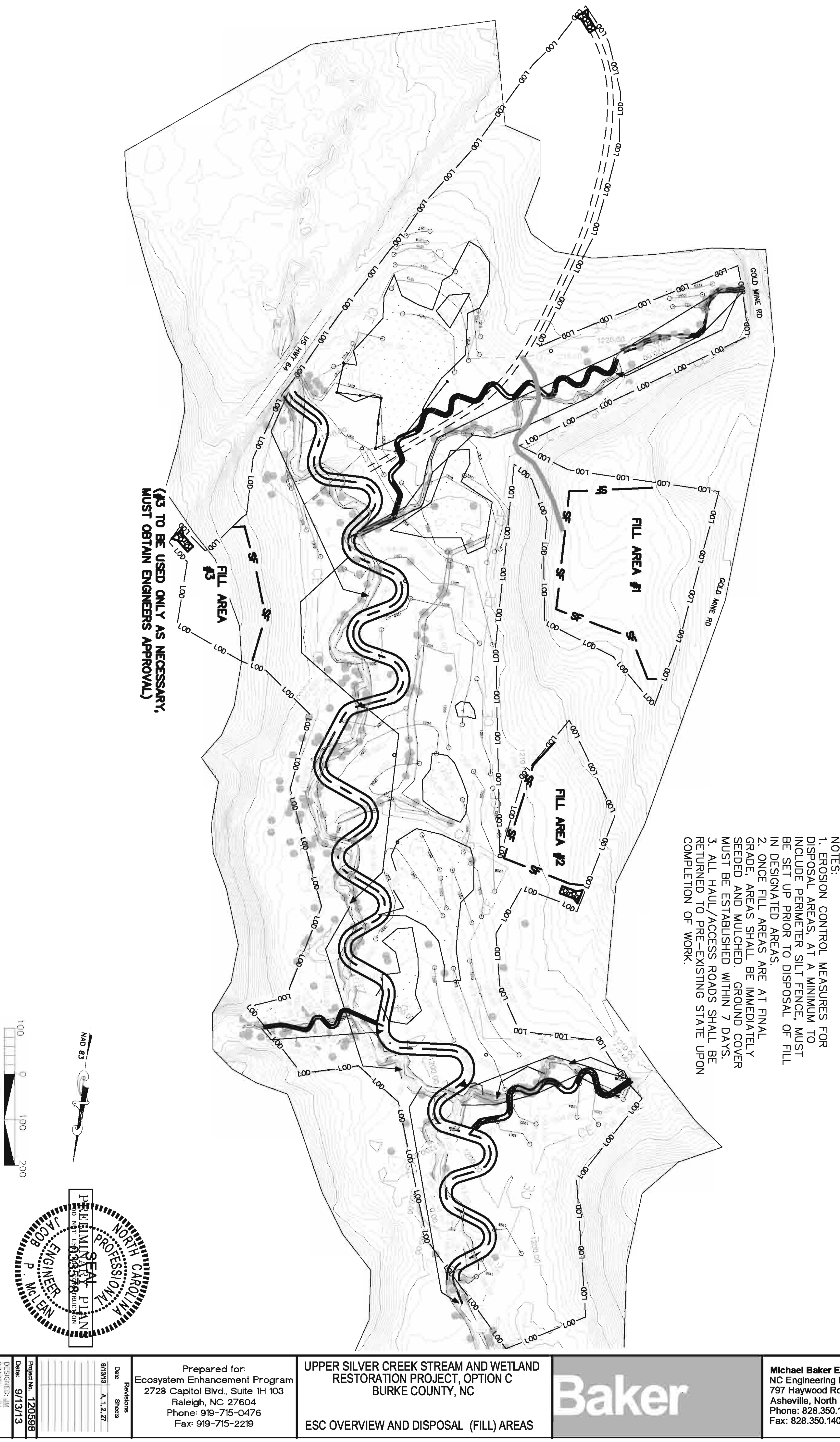

NOTES:
1. EROSION CONTROL MEASURES FOR DISPOSAL AREAS, AT A MINIMUM TO INCLUDE PERIMETER SILT FENCE, MUST BE SET UP PRIOR TO DISPOSAL OF FILL IN DESIGNATED AREAS.
2. ONCE FILL AREAS ARE AT FINAL GRADE, AREAS SHALL BE IMMEDIATELY SEEDED AND MULCHED. GROUND COVER MUST BE ESTABLISHED WITHIN 7 DAYS.
3. ALL HAUL/ACCESS ROADS SHALL BE RETURNED TO PRE-EXISTING STATE UPON COMPLETION OF WORK.

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UPPER SILVER CREEK STREAM AND WETLAND
RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC

ESC OVERVIEW AND DISPOSAL (FILL) AREAS

Prepared for:
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ACCESS ROAD FOR MAINSTEM CONSTRUCTION AND STAGING FOR MAINSTEM AND UT3 (SEE UT3 ESC SHEET FOR ROAD). DISCONTINUE ACCESS AFTER START OF UT1.

TEMPORARY HAUL ROAD TO EARTH DISPOSAL (FILL) AREA (FOLLOWS EXISTING DIRT ROAD)

BAKER TO INSTALL POSTS AND FLAGGING TO PREVENT DISTURBANCE IN WETLAND

CONSTRUCT IN DRY 6+00–10+50

TEMPORARILY CONNECT TO CONSTRUCT NEXT SEGMENT

LEGEND OF PROPOSED EROSION CONTROL PRACTICES

▨	STAGING AREA
— SF — SF —	SILT FENCE
— LOD — LOD —	LIMITS OF DISTURBANCE
— 100YR —	REGULATORY FLOODPLAIN LIMITS
↗	PUMP AROUND
○—○	PROPOSED GRADING CONTOUR
⊏ ⊐	TEMPORARY STREAM CROSSING
▨	CONSTRUCTION ENTRANCE

EROSION CONTROL INSPECTION & MAINTENANCE NOTES

1. CONTRACTOR SHALL ONLY CROSS STREAM AT DESIGNATED LOCATIONS
2. ALL BMPs SHALL BE INSTALLED PRIOR TO WORKING IN AN AREA, MAINTAINED THROUGHOUT THE PROJECT AND REMOVED ONCE NO LONGER IN USE, TYPICALLY PRIOR TO DEMOBILIZATION
3. ALL DISTURBED AREAS SHALL BE SEEDED WITH TEMPORARY AND PERMANENT SEED AND MULCHED AT THE END OF EACH DAY
4. MATTING SHALL BE APPLIED TO ALL DISTURBED BANKS EXCEPT UT3 WHICH SHALL BE SOD MATTED ONLY
5. STAGING AND STOCKPILING SHALL BE IN DESIGNATED AREAS; ADJACENT AREAS SHALL BE PROTECTED WITH SILT FENCE

NAD 83

50 0 50 100
SCALE (FT)

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RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC

UT3/UPSTR. MAINSTEM ESC & PLANTING

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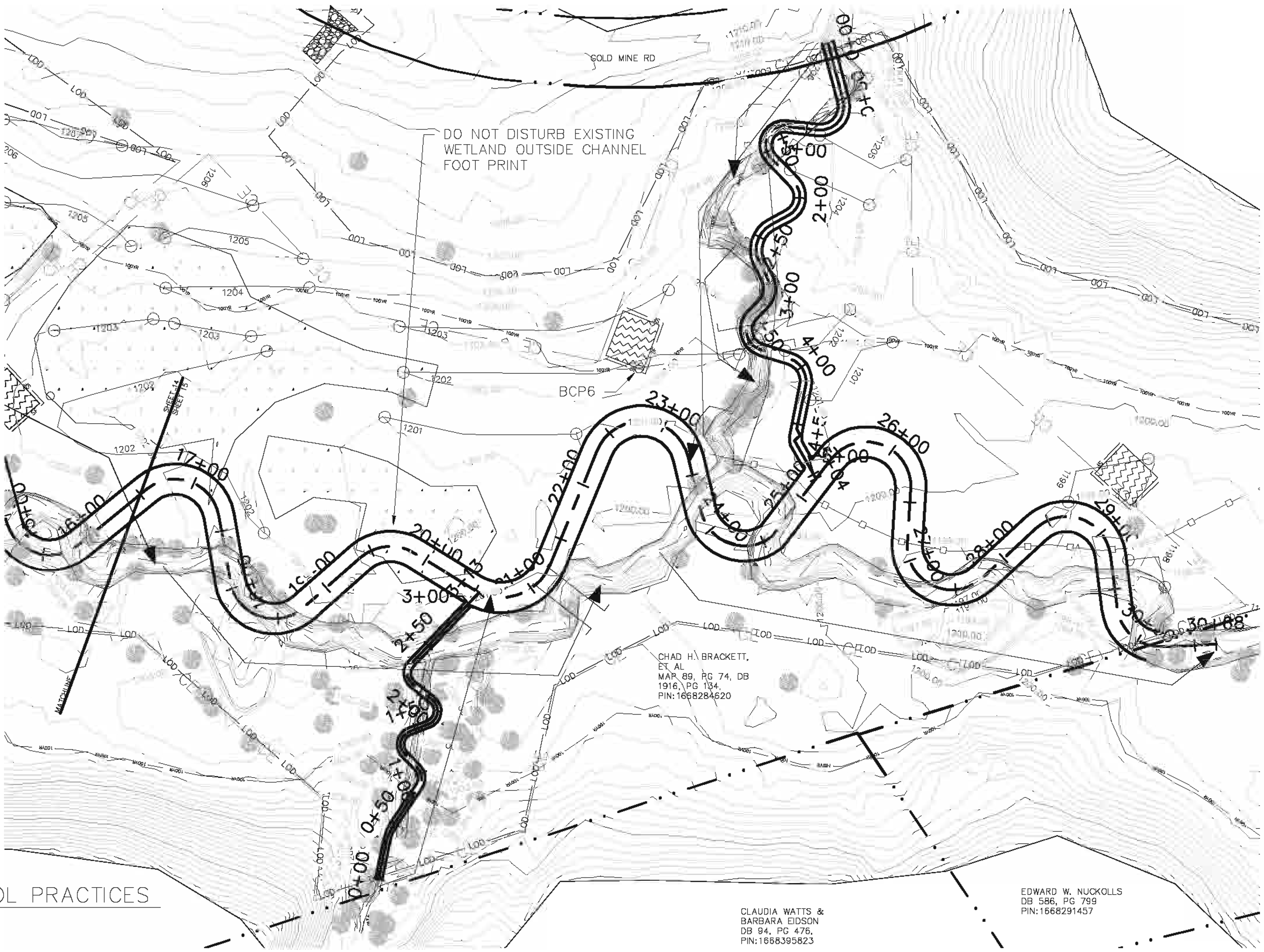
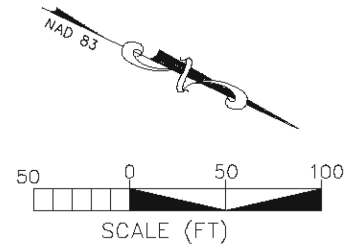


LEGEND OF PROPOSED EROSION CONTROL PRACTICES

▨	STAGING AREA
—SF—SF—	SILT FENCE
—LOD—LOD—	LIMITS OF DISTURBANCE
↗	PUMP AROUND
○——○	PROPOSED GRADING CONTOUR
⊏ ⊐	TEMPORARY STREAM CROSSING
▨	CONSTRUCTION ENTRANCE



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UPPER SILVER CREEK STREAM AND WETLAND
RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC

UT1/UT2/DWNSTR. MAINSTEM ESC & PLANTING

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DRY CONSTRUCTION
NO PUMP AROUND REQUIRED

LEGEND OF PROPOSED EROSION CONTROL PRACTICES

▨ STAGING AREA

— SF — SF — SILT FENCE

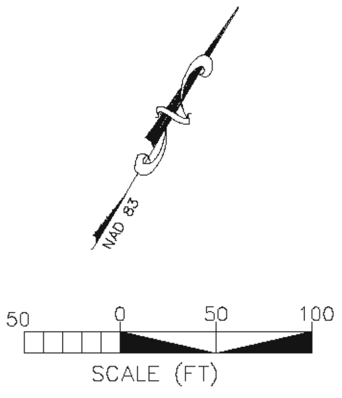
— LOD — LOD — LIMITS OF DISTURBANCE

PUMP AROUND

○——○ PROPOSED GRADING CONTOUR

TEMPORARY STREAM CROSSING

CONSTRUCTION ENTRANCE



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RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC

UT3 ESC & PLANTING

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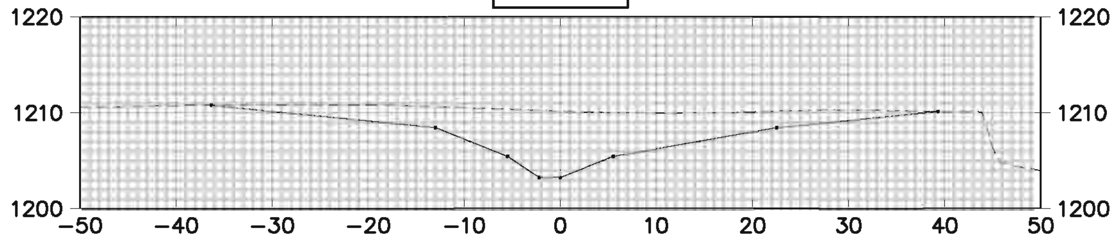

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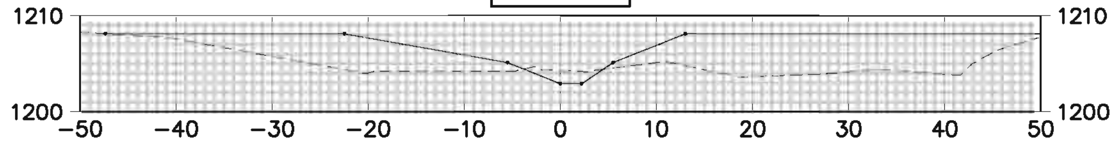

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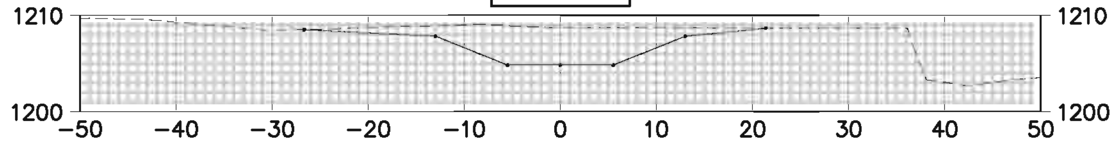

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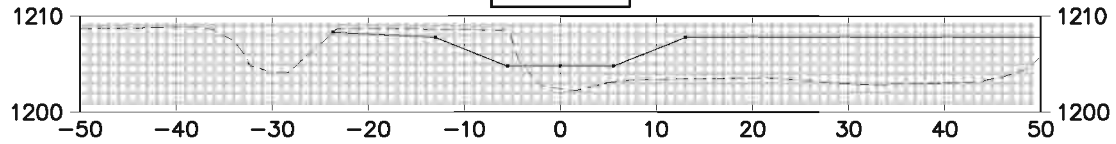

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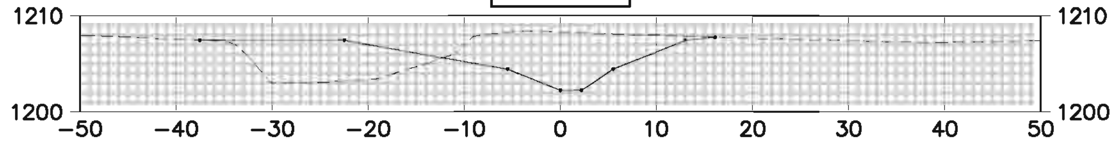

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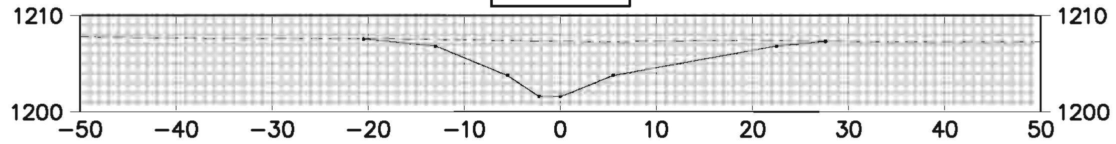

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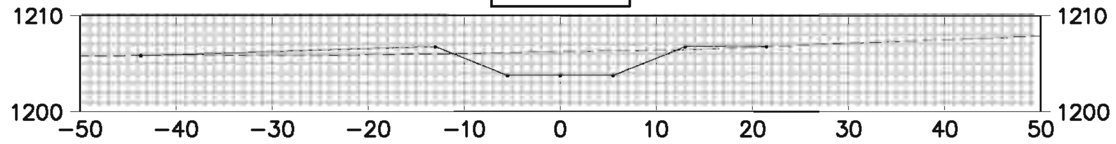

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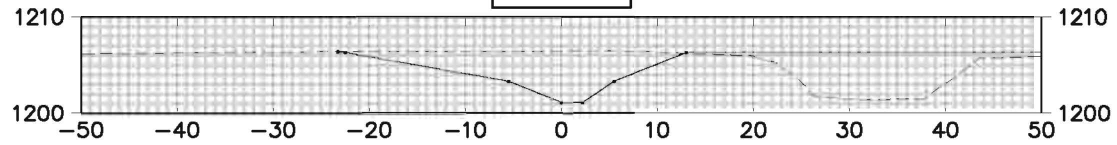

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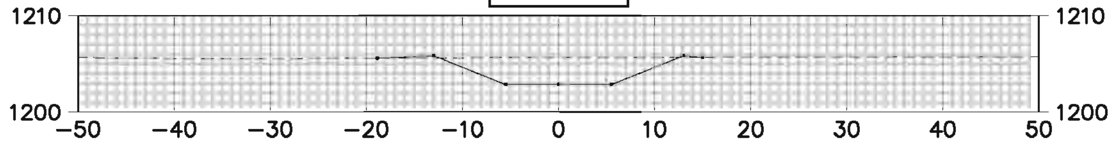

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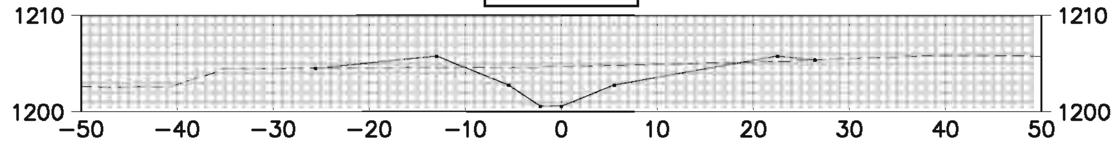

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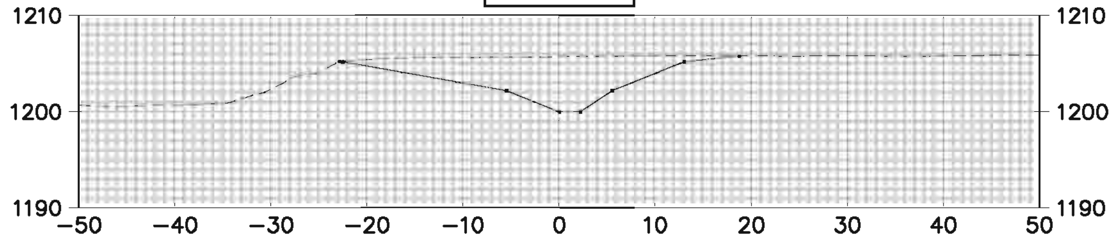

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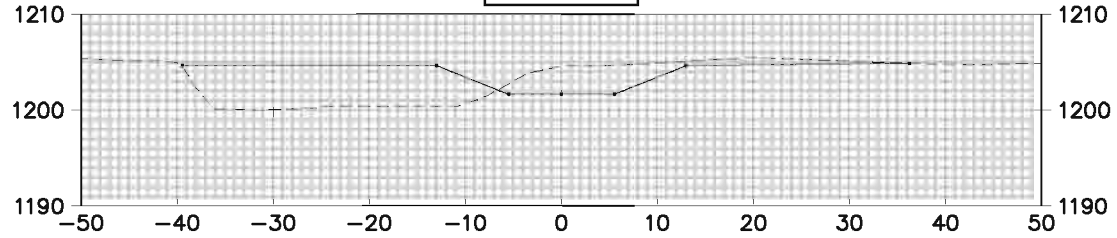

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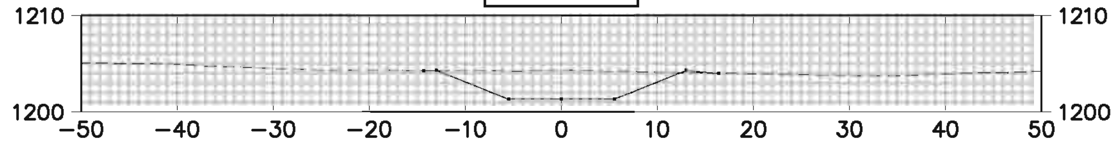

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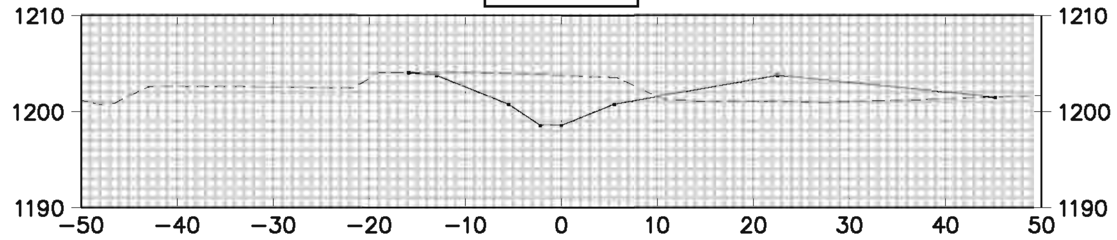
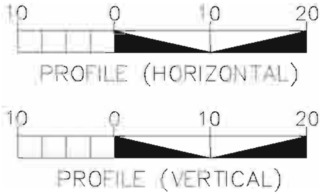


- - - - - - - - - - EXISTING GROUND
——————— PROPOSED GROUND

NOTE: SECTIONS ARE LOOKING DOWNSTREAM



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UPPER SILVER CREEK STREAM AND WETLAND
RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC

MAINSTEM SECTIONS (STA. 0+00 TO 14+00)

Prepared for:
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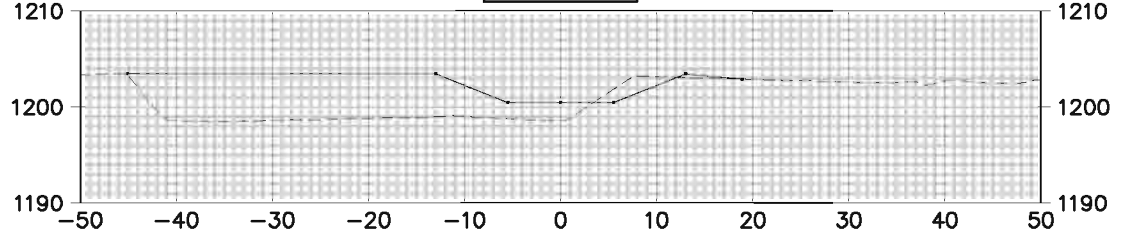
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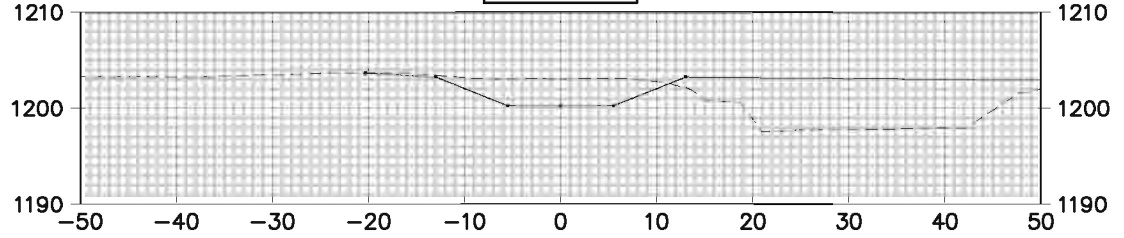
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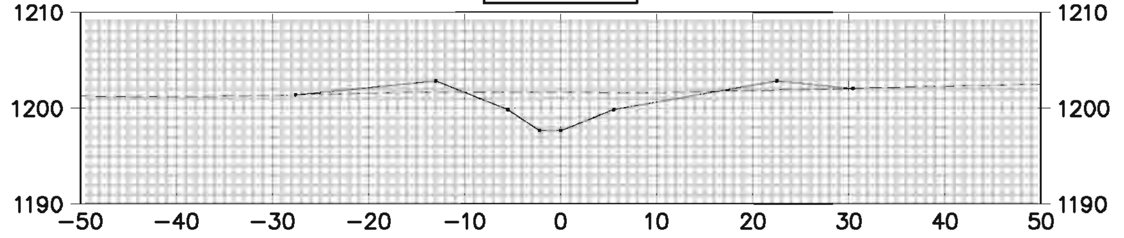
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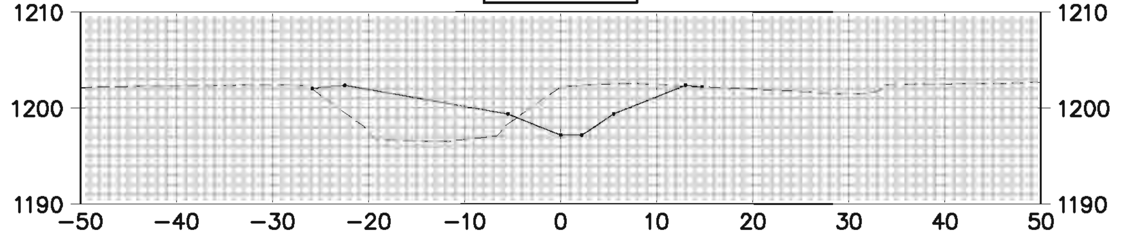
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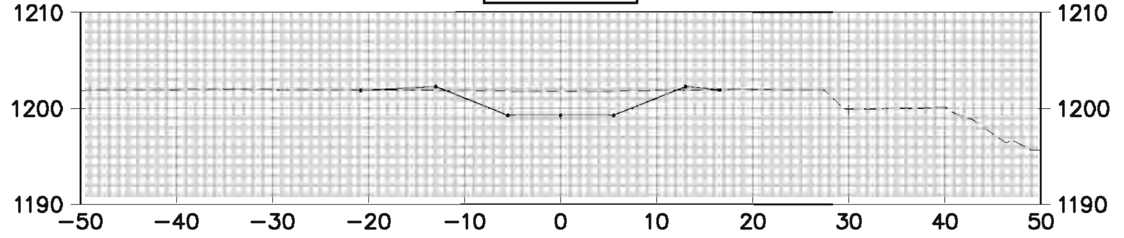
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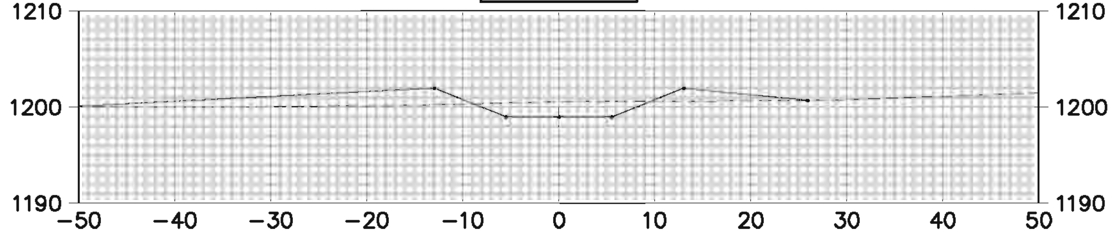
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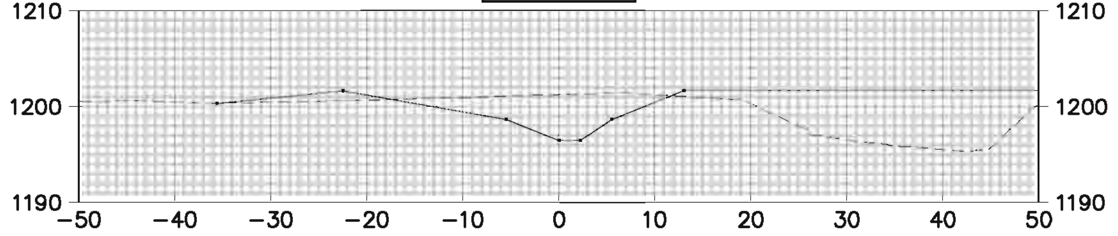
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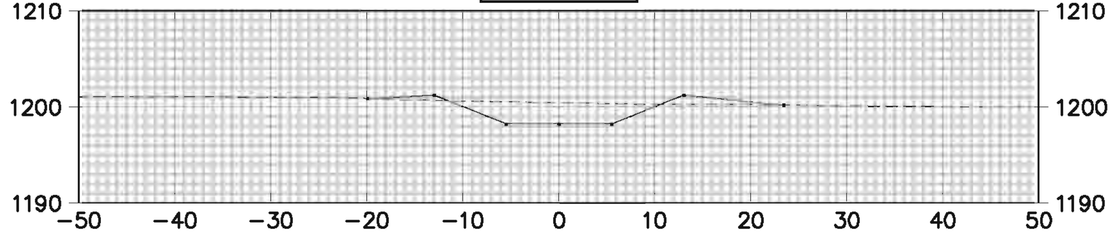
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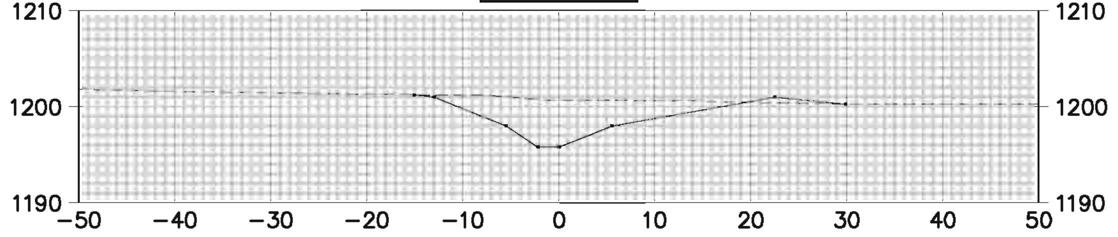
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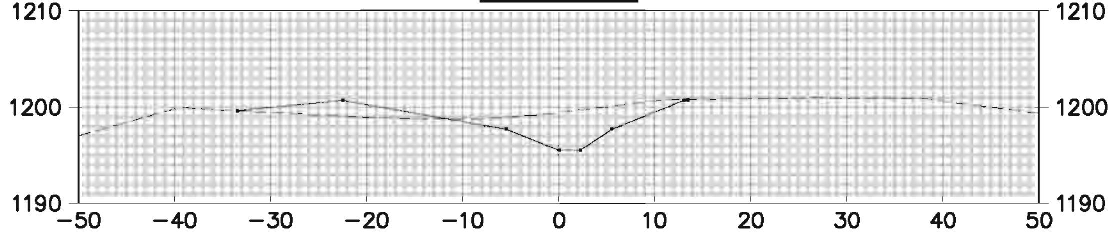
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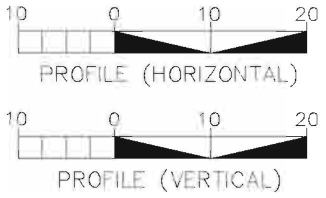

--------------- EXISTING GROUND
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PRELIMINARY PLANS
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UPPER SILVER CREEK STREAM AND WETLAND
RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC

MAINSTEM SECTIONS (STA. 15+00 TO 24+00)

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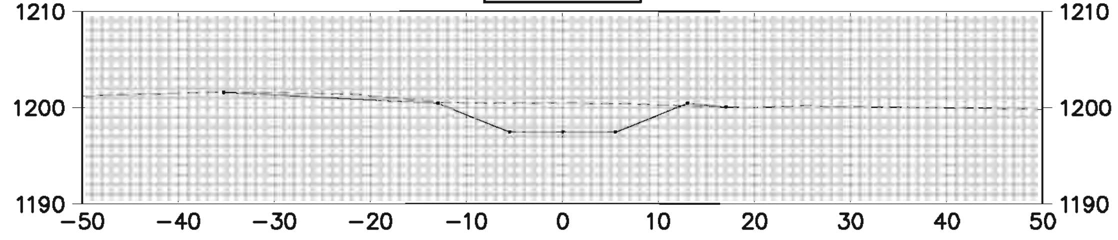
25+00.00



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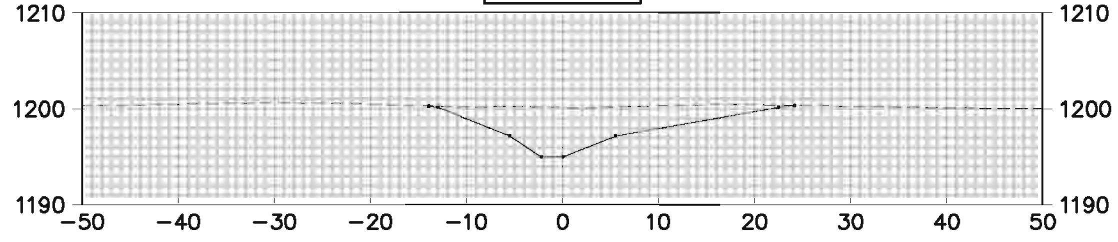

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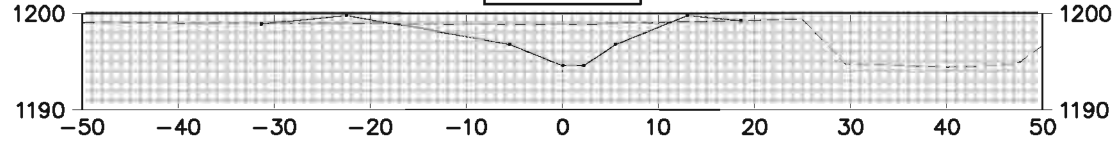

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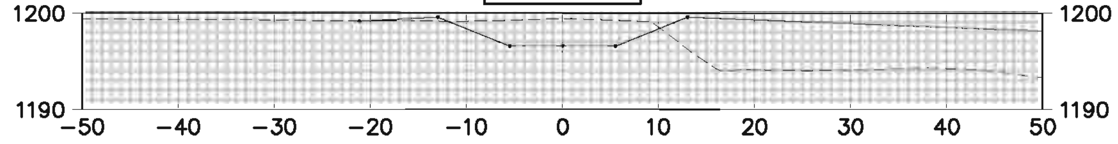

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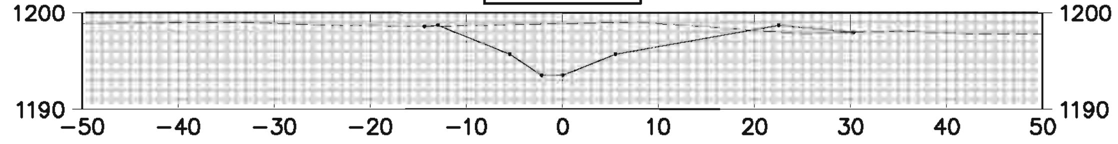

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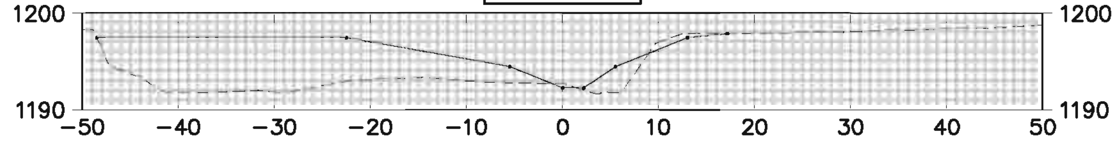
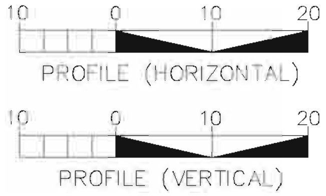


- - - - - - - - EXISTING GROUND
———————— PROPOSED GROUND

NOTE: SECTIONS ARE LOOKING DOWNSTREAM



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PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

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Baker

UPPER SILVER CREEK STREAM AND WETLAND
RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC

MAINSTEM SECTIONS (STA. 25+00 TO 30+00)

Prepared for:
Ecosystem Enhancement Program
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Revisions

Date	Sheets
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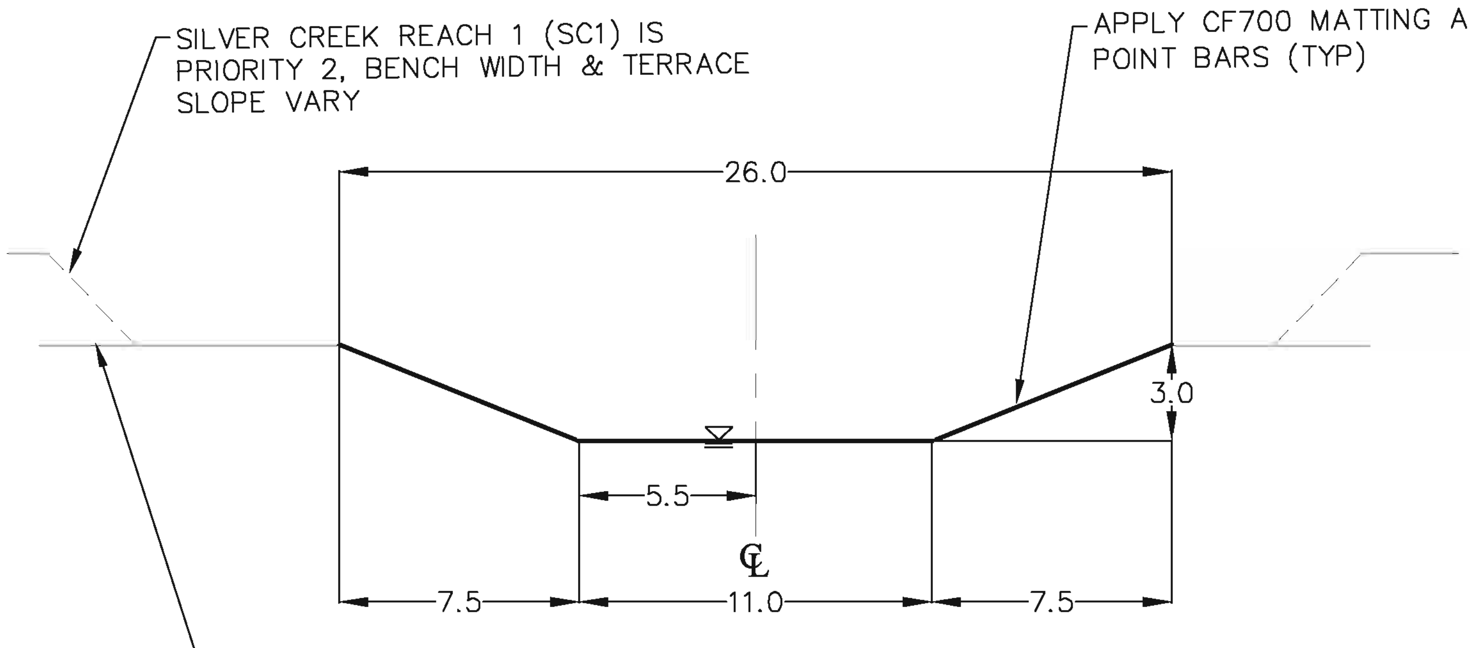
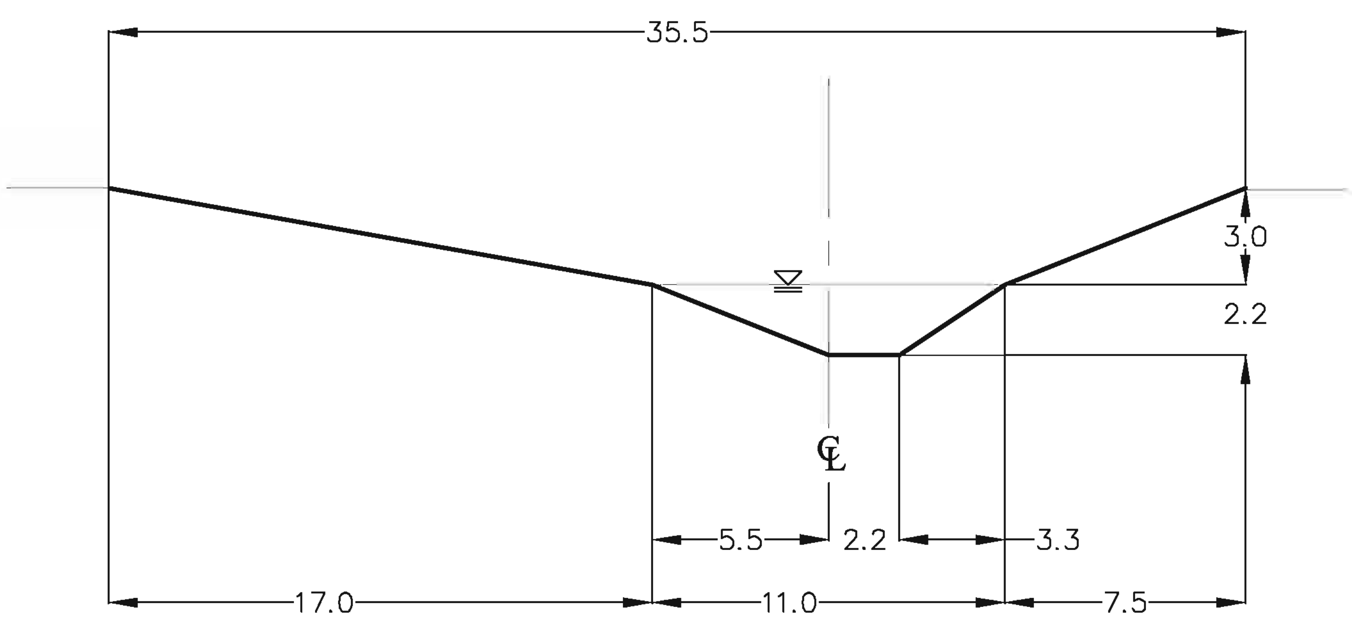
Sheet: 19 of 29



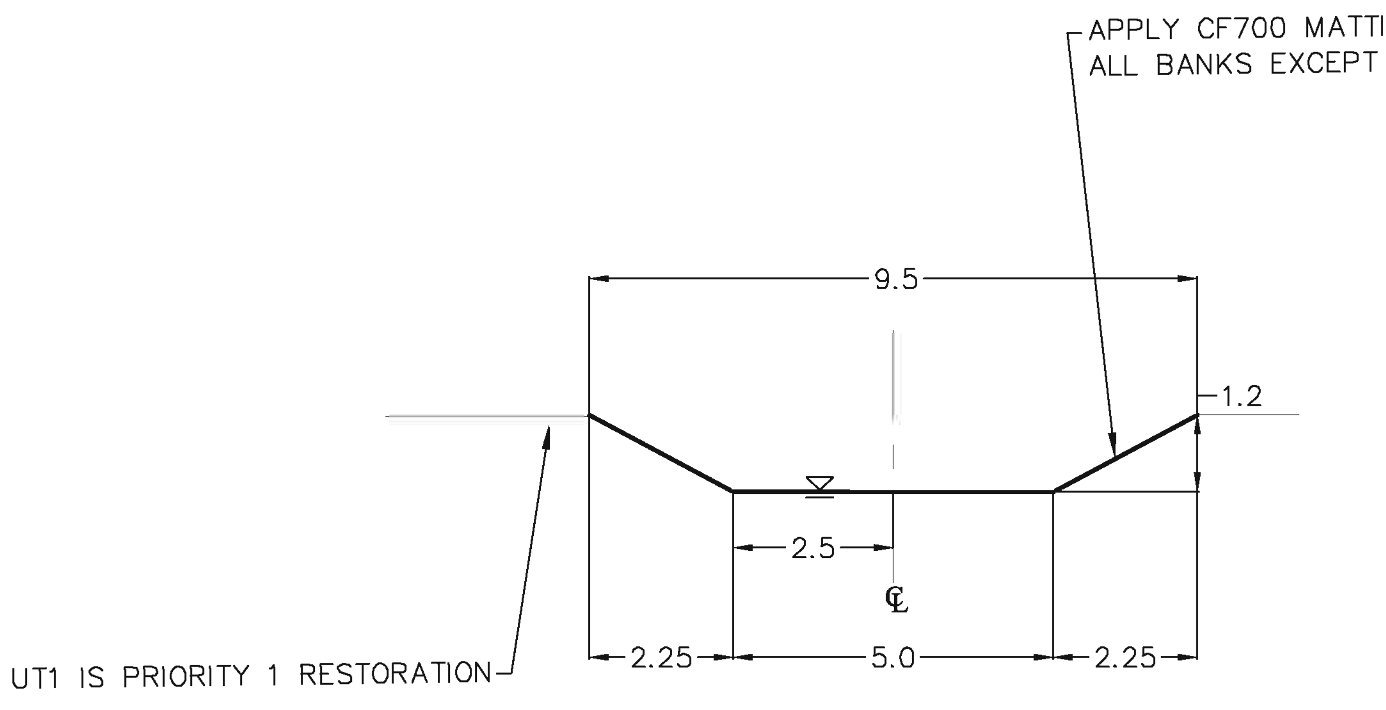
SILVER CREEK RIFFLE CROSS SECTION
NTS

CALL OUTS FOR RIFFLE APPLY TO POOL ALSO



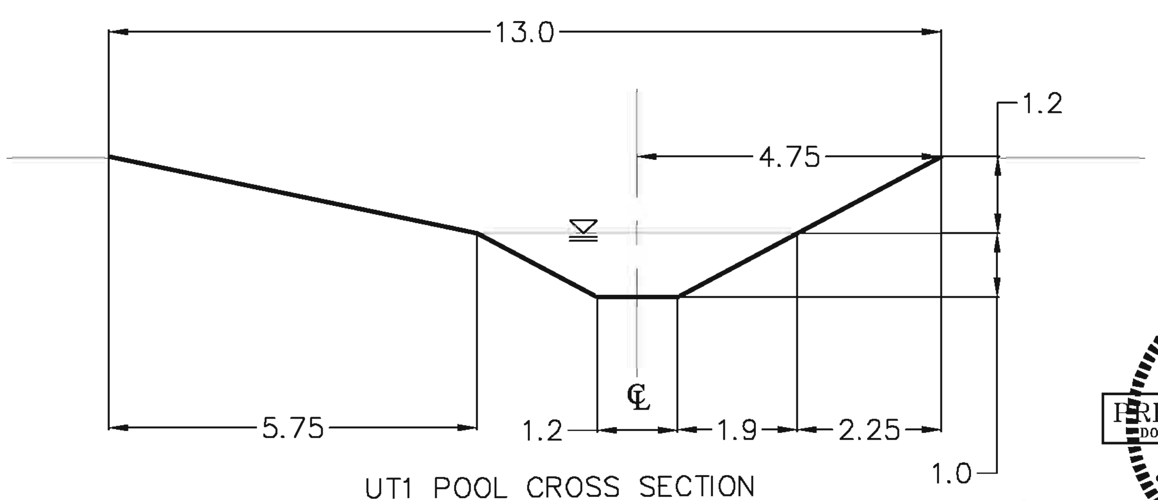
SILVER CREEK POOL CROSS SECTION
LEFT MEANDERING SHOWN, REVERSE FOR RIGHT MEANDERING
NTS

NOTE: SECTIONS ARE LOOKING DOWNSTREAM



UT1 RIFFLE CROSS SECTION
NTS

CALL OUTS FOR RIFFLE APPLY TO POOL ALSO



UT1 POOL CROSS SECTION
LEFT MEANDERING SHOWN, REVERSE FOR RIGHT MEANDERING
NTS

NOTE: SECTIONS ARE LOOKING DOWNSTREAM

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

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UPPER SILVER CREEK STREAM AND WETLAND
RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC

MAINSTEM & UT1 TYPICAL CHANNEL SECTIONS

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Proposed Live Stake Species (Plant 3'x3' on center)

Upper Silver Creek Stream and Wetland Restoration Project -NCEEP Project #003270

Common Name	Scientific Name	% Planted by Species	Planting Density	Wetness Tolerance	Planting Location
Ninebark	*Physocarpus opulifolius*	15	102 stems per acre	FAC-	Wetland & Floodplain
Elderberry	*Sambucus canadensis*	20	136 stems per acre	FACW-	Wetland & Floodplain
Buttonbush	*Cephalanthus occidentalis*	15	102 stems per acre	OBL	Wetland & Floodplain
Silky Willow	*Salix sericea*	25	170 stems per acre	OBL	Wetland & Floodplain
Silky Dogwood	*Cornus amomum*	25	170 stems per acre	FACW+	Wetland & Floodplain

Note: Species selection may change due to refinement or availability at the time of planting. If species substitution is required, the planting Contractor will submit a revised planting list to Baker for approval prior to the procurement of plant stock.

Proposed Bare-Root Species (may also include species to be seeded or installed as container plantings)

Upper Silver Creek Stream and Wetland Restoration Project -NCEEP Project #003270

Common Name	Scientific Name	% Planted by Species	Planting Density	Wetness Tolerance	Planting Location
Riparian Buffer Plantings: Wetland and Floodplain 408 Tree Stems/Acre & 272 Shrub Stems/Acre					
Trees Overstory (Plant 13'x13')					
Shingle Oak	*Quercus imbricaria*	9	37 stems per acre	FAC-	Wetland & Floodplain
River Birch	*Betula nigra*	10	41 stems per acre	FACW	Wetland & Floodplain
Persimmon	*Diospyros virginiana*	10	41 stems per acre	FAC	Wetland & Floodplain
Sycamore	*Platanus occidentalis*	9	37 stems per acre	FACW-	Wetland & Floodplain
Black Willow	*Salix nigra*	10	41 stems per acre	OBL	Wetland & Floodplain
Southern Red Oak	*Quercus falcata*	5	20 stems per acre	FACU	Upland
Tulip Poplar	*Liriodendron tulipifera*	4	16 stems per acre	FACU	Upland
Trees Understory (Plant 10'x10')					
Ironwood	*Carpinus caroliniana*	9	37 stems per acre	FAC	Wetland & Floodplain
Tag Alder	*Alnus serrulata*	9	37 stems per acre	FACW+ or OBL	Wetland & Floodplain
Highland Doghobble	*Leucothoe fontanesiana*	9	37 stems per acre	N/A	Wetland & Floodplain
Sourwood	*Oxydendrum arboreum*	4	16 stems per acre	FACU	Upland
Flowering Dogwood	*Cornus florida*	4	16 stems per acre	FACU	Upland
Redbud	*Cercis canadensis*	4	16 stems per acre	FACU	Upland
Witch Hazel	*Hamamelis virginiana*	4	16 stems per acre	FACU	Upland
Shrubs (Plant 10'x10')					
Rivercane (giant cane)	*Arundinaria gigantea*	30	82 stems per acre	FACW	Wetland & Floodplain
Spicebush	*Lindera benzoin*	25	68 stems per acre	FACW	Wetland & Floodplain
Virginia Sweetspire	*Itea virginica*	25	68 stems per acre	FACW+	Wetland & Floodplain
Winterberry	*Ilex verticillata*	20	54 stems per acre	N/A	Wetland & Floodplain
Alternate Species					
Deerberry	*Vaccinium stamineum*	N/A		FACU	Upland
Eastern Sweetshrub, Sweetshrub	*Calycanthus floridus, Calycanthus spp.*	N/A		FACU	Upland
Sweetpepperbush	*Clethra spp.*	N/A		N/A	Upland
American Hazelnut	*Corylus americana*	N/A		FACU	Upland
Blue Ridge Blueberry	*Vaccinium pallidum*	N/A		N/A	Upland

Note: Species selection may change due to refinement or availability at the time of planting. If species substitution is required, the planting Contractor will submit a revised planting list to Baker for approval prior to the procurement of plant stock.

Proposed Permanent Seed Mixture

Upper Silver Creek Stream and Wetland Restoration Project -NCEEP Project # 003270

Common Name	Scientific Name	% Planted by Species	Density (lbs/ac)	Wetness Tolerance
Creeping Bentgrass	*Agrostis stolonifera*	10%	1.5	FACW
Big Bluestem	*Andropogon gerardii*	2%	0.3	N/A
Devil's Beggartick	*Bidens frondosa (or aristosa)*	3%	0.45	FACW
Northern Long Sedge	*Carex folliculata*	2%	0.3	N/A
Nodding Sedge	*Carex gynandra*	5%	0.75	N/A
Upright Sedge	*Carex stricta*	2%	0.3	OBL
Lance-leaved Tick Seed	*Coreopsis lanceolata*	3%	0.45	N/A
Virginia Wildrye	*Elymus virginicus*	15%	2.25	FAC
Soft Rush	*Juncus effusus*	2%	0.3	FACW+
Tioga Deer Tongue	*Panicum clandestinum*	10%	1.5	FACW
Switch Grass	*Panicum virgatum*	15%	2.25	FAC+
Pennsylvania Smartweed	*Polygonum pensylvanicum*	5%	0.75	FACW
Broadleaf Arrowhead	*Sagittaria latifolia var. pubescens*	1%	0.15	OBL
Little Bluestem	*Schizachyrium scoparium*	5%	0.75	FACU
Roundleaf Goldenrod	*Solidago patula*	3%	0.45	OBL
Indian Grass	*Sorghastrum nutans*	10%	1.5	FACU
Eastern Gamma Grass	*Tripsacum dactyloides*	5%	0.75	FAC+
Joe Pye Weed	*Eupatorium fistulosum*	2%	0.3	N/A
	Total	100	15	

Note: Species selection may change due to refinement or availability at the time of planting.

Soil Amendment and Mulching Requirements:

Limestone: 75 lbs/1,000 sq ft or 1.5 tons/acre

Fertilizer: 5-10-10 at 40 lbs/1,000 sq ft or .75 ton/acre

Mulching: 1.5 tons/acre or (60) 50-lb. bales/acre

Proposed Temporary Seeding

Upper Silver Creek Stream and Wetland Restoration Project -NCEEP Project # 003270

Common Name	Scientific Name	Months to Use	Density (lbs/ac or lbs/sq ft)
Temporary Winter Seed Mix			
Winter Rye	*Secale cereale*	Nov.-April	130 lbs per acre or 3 lbs per 1000 sq ft
Temporary Summer Seed Mix			
Browntop Millet	*Pennisetum glaucum*	May -Oct.	45 lbs per acre or 1 lb per 1,000 sq ft

Note: Species selection may change due to refinement or availability at the time of planting.

Soil Amendment and Mulching Requirements:

Limestone: 75 lbs/1,000 sq ft or 1.5 tons/acre

Fertilizer: 5-10-10 at 40 lbs/1,000 sq ft or .75 ton/acre

Mulching: 1.5 tons/acre or (60) 50-lb. bales/acre

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

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Baker

UPPER SILVER CREEK STREAM AND WETLAND
RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC

PLANTING TABLES

Prepared for:
Ecosystem Enhancement Program
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Revisions

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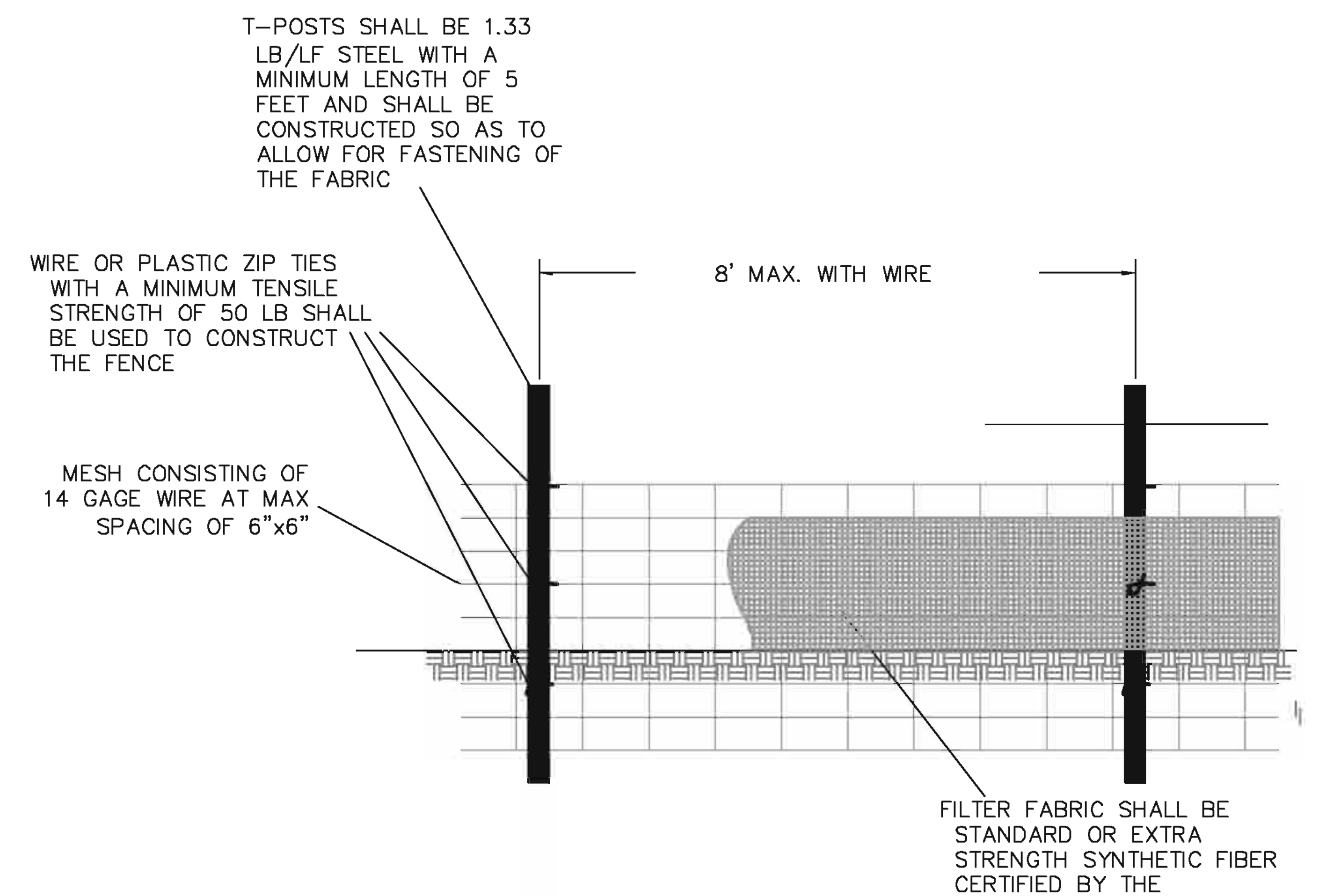
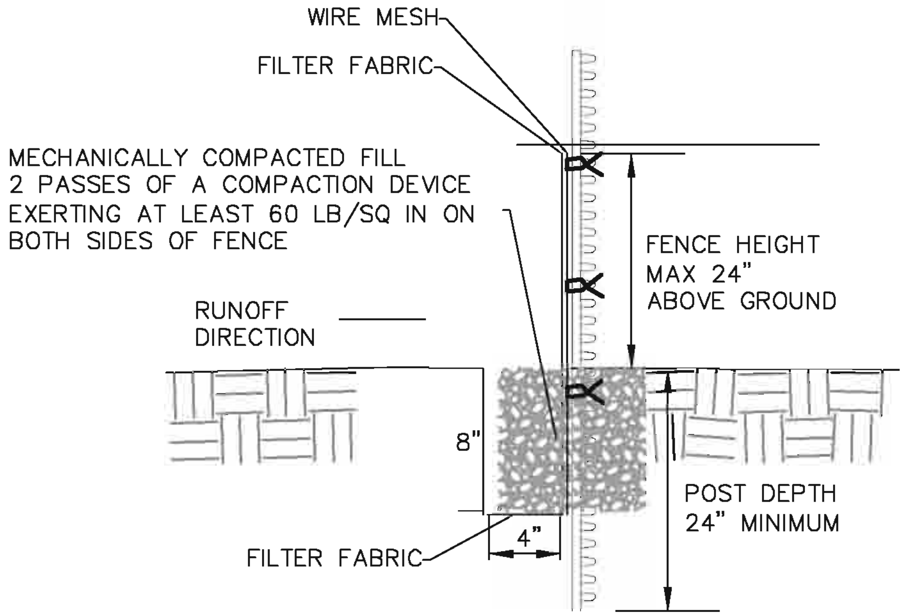


FILTER FABRIC SHALL BE STANDARD OR EXTRA STRENGTH SYNTHETIC FIBER CERTIFIED BY THE MANUFACTURER TO COMPLY WITH MATERIAL REQUIREMENTS IN ASTM STANDARDS D 6461, 4632, 4491, 4751, AND 4355.

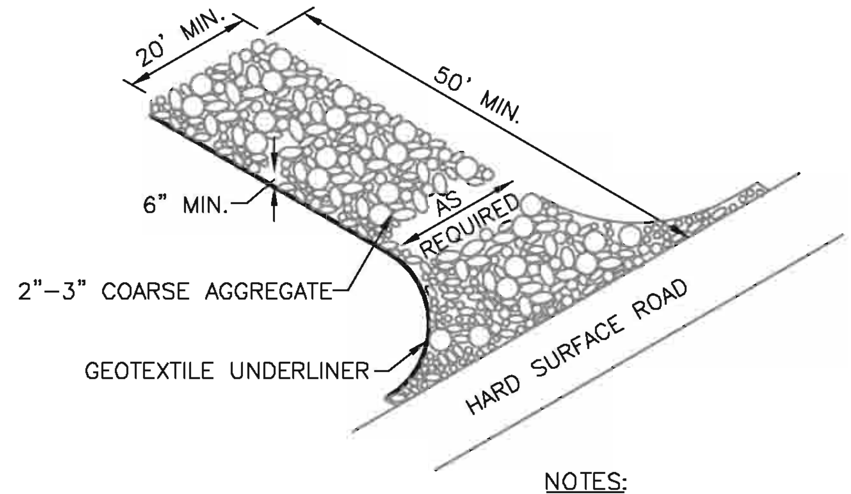


NOTES:

1) AVOID JOINTS, UNAVOIDABLE JOINTS MUST HAVE 4 FEET OF CLOTH OVERLAP AND SHOULD TIE INTO THE NEXT ADJACENT POST
2) PLACE ON CONTOUR EXCEPT ENDS WHICH SHOULD BE 1' ABOVE GRADE TO PREVENT CUT AROUND
3) WRAP APPROX. 6" OF FABRIC AROUND END POSTS AND SECURE WITH TIES
4) REMOVE ONCE AREA IS STABLE

SILT FENCE

NOT TO SCALE



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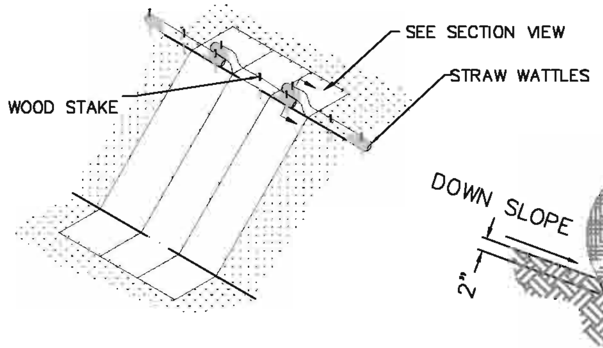
NOTES:

1) ENTRANCE OFF STATE MAINTAINED ROAD MUST BE MAINTAINED IN COMPLIANCE WITH STATE STORMWATER STANDARDS.
2) UPON COMPLETION, ALL PRIVATE ROADS SHALL BE RETURNED TO PRE-EXISTING CONDITION.
3) MUD TRACKED ONTO STATE ROADS SHALL BE REMOVED IMMEDIATELY.
4) STONE SHALL BE REPLACED IF IT IS FILLED WITH MUD

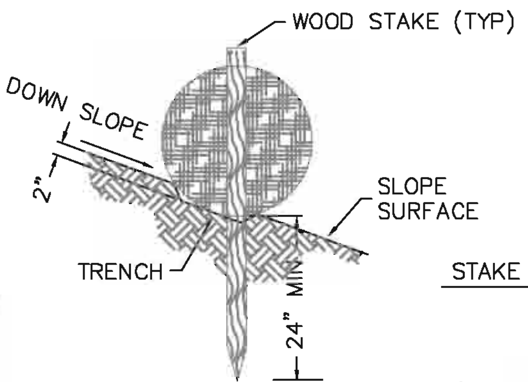
CONSTRUCTION ENTRANCE

NOT TO SCALE



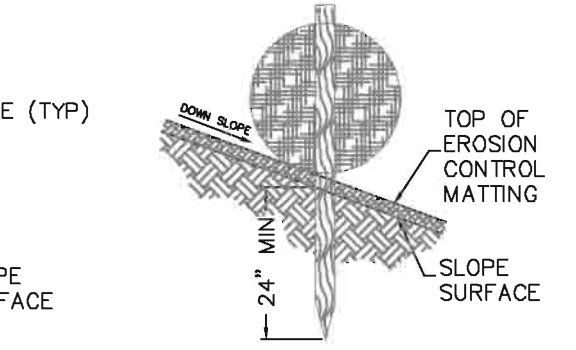
NOTES:

1. WATTLES SHALL BE INSTALLED ACCORING TO THE MANUFACTURERS SPECIFICATIONS.
2. WATTLES SHALL BE INSTALLED ADJACENT TO THE TOP OF THE STREAM BANKS FOLLOWING CHANNEL GRADING.
3. WATTLES SHALL BE INSTALLED ADJACENT TO THE TOP OF THE STREAM BANKS IN ANY OTHER LOCATIONS WHERE SOIL DISTURBANCE WILL OCCUR IN PROXIMITY OF THE STREAM CHANNEL.
4. WATTLES SHALL BE INSTALLED A MINIMUM OF 1' AND A MAXIMUM OF 4' FROM THE TOP OF THE STREAM BANK.



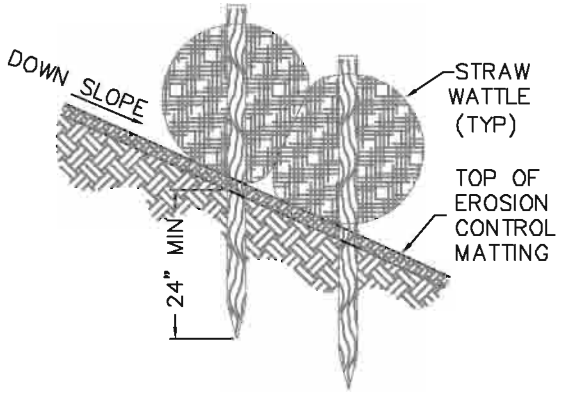
STAKE DETAIL ON BARE SOIL

NOT TO SCALE



STAKE DETAIL ON EROSION CONTROL MATTING

NOT TO SCALE



STAKE DETAIL SECTION VIEW

NOT TO SCALE

STRAW WATTLE

NOT TO SCALE

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Baker

UPPER SILVER CREEK STREAM AND WETLAND
RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC

DETAILS

Prepared for:
Ecosystem Enhancement Program
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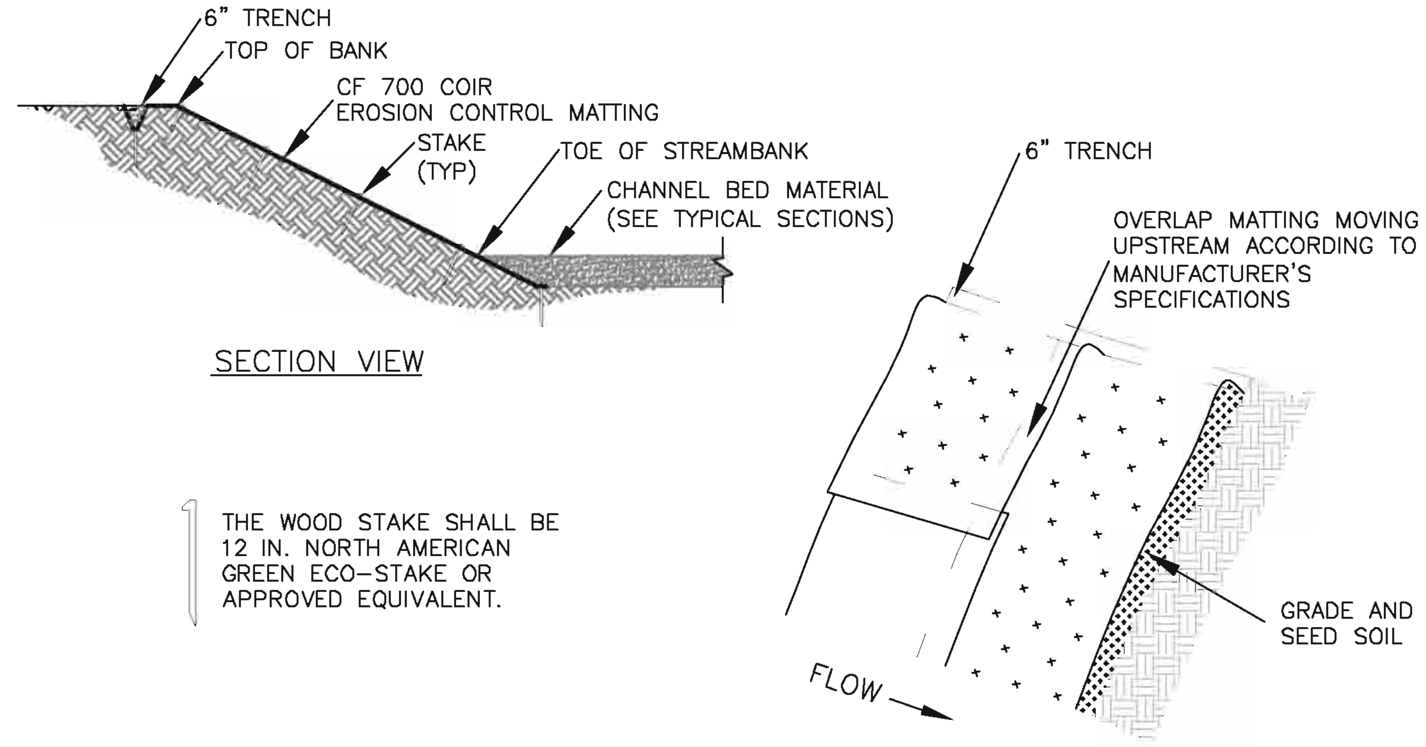
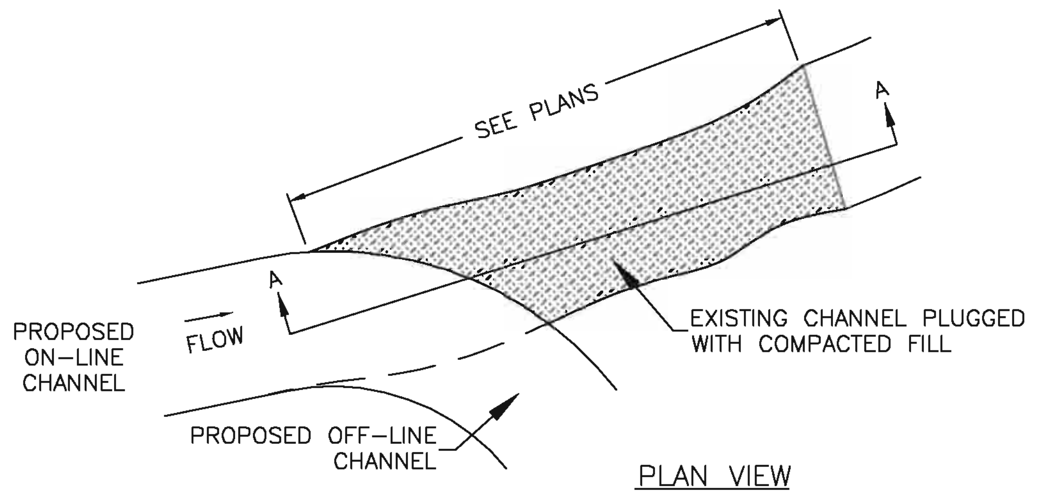
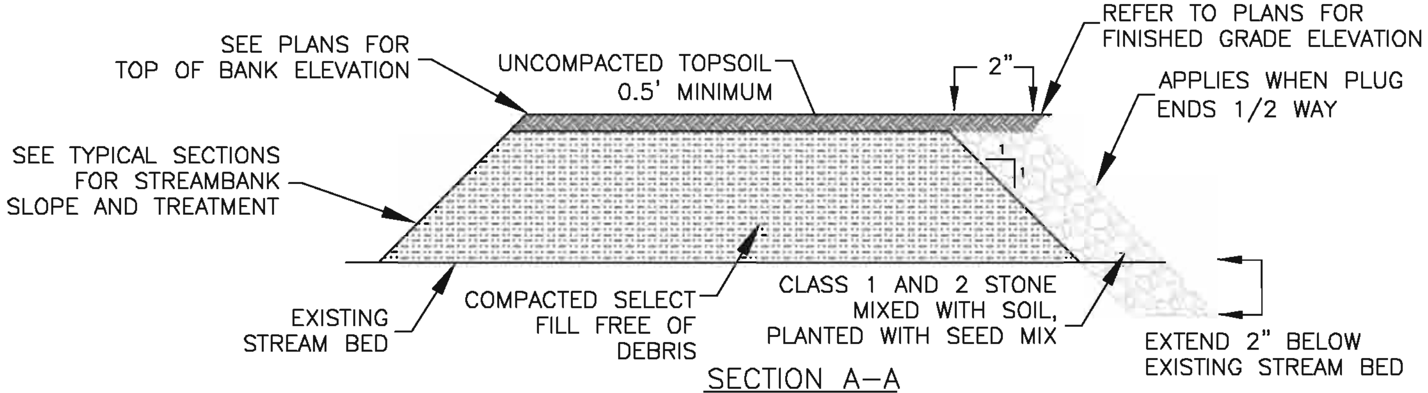


NOTES:
1) BANKS SHALL BE SEEDED AND MULCHED PRIOR TO INSTALLATION OF MATTING
2) MATTING SHALL BE PLACED ACCORDING TO MANUFACTURER'S SPECIFICATIONS
3) MATTING SHALL BE STAKED IN DIAMOND PATTERN
4) AT TOP OF BANK, MATTING SHALL BE PLACED IN 6" DEEP TRENCH, STAKED, BACKFILLED, AND COMPACTED

COIR MATTING

NOT TO SCALE

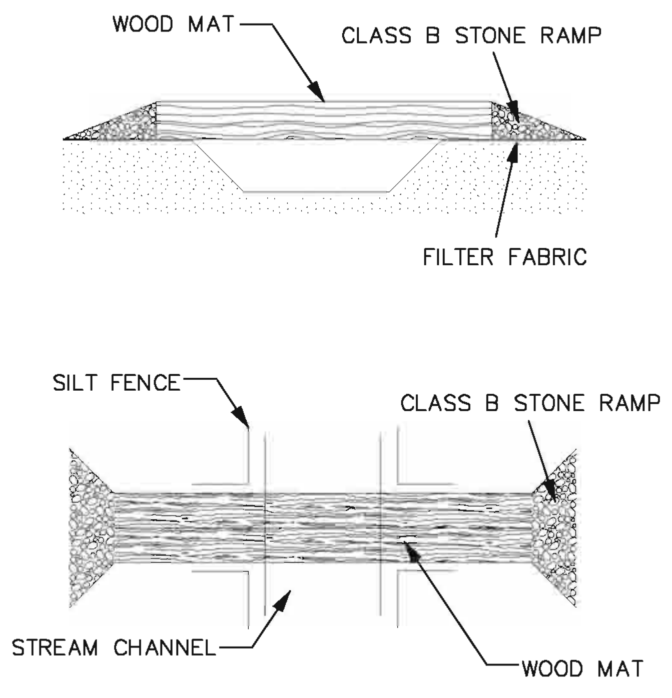




SECTION A–A

CHANNEL PLUG

NOT TO SCALE

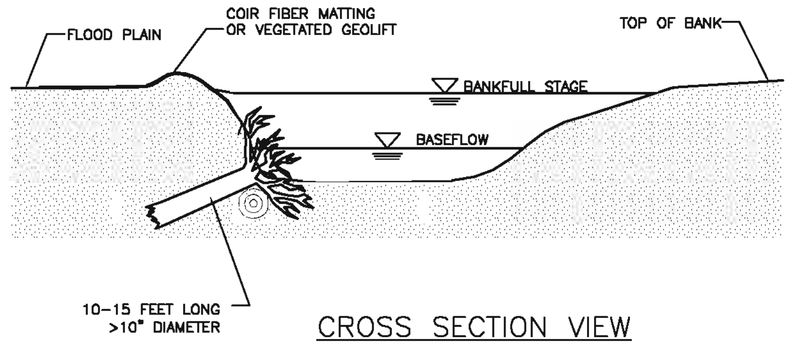


NOTES:

1. CONSTRUCT AT LOW FLOW JUST PRIOR TO BEGINNING WORK.
2. MINIMIZE CLEARING AND EXCAVATION OF STREAMBANKS. DO NOT EXCAVATE CHANNEL BOTTOM
3. LINE STREAMBANK AND ACCESS RAMP AREA WITH NON-WOVEN FILTER FABRIC.
4. CREATE STREAM CROSSING AT RIGHT ANGLE TO THE FLOW
5. PREVENT RUNOFF FROM HAUL ROAD INTO CHANNEL– USE SILT FENCE OR SEDIMENT BARRIER ON ALL FOUR CORNERS AS SHOWN.
6. THE WOOD MAT SHALL BE OF SUFFICIENT SIZE AND WIDTH TO SUPPORT THE LARGEST VEHICLE CROSSING
7. CONTRACTOR TO DETERMINE AN APPROPRIATE RAMP ANGLE ACCORDING TO EQUIPMENT USED (5:1 RECOMMENDED)
8. REMOVE UPON COMPLETION, RESTABILIZE DISTURBED AREA.

TEMPORARY STREAM CROSSING

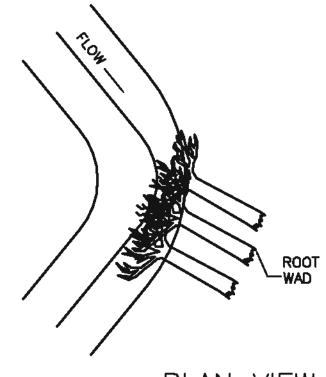
NOT TO SCALE



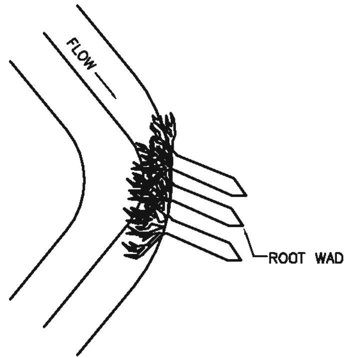
CROSS SECTION VIEW

NOTE:
DRIVE POINT METHOD (PREFERRED METHOD):
SHARPEN THE END OF THE LOG WITH A CHAINSAW BEFORE "DRIVING" IT INTO THE BANK. ORIENT ROOT WADS UPSTREAM SO THAT THE STREAM FLOW MEETS THE ROOT WAD AT A 90–DEGREE ANGLE, DEFLECTING THE WATER AWAY FROM THE BANK. A TRANSPLANT OR BOULDER SHOULD BE PLACED ON THE DOWNSTREAM SIDE OF THE ROOT WAD IF A BACK EDDY IS FORMED BY THE ROOT WAD. THE BOULDER SHALL BE APPROXIMATELY 4' X 3' X 2' OR THE MIN PROJECT SPECIFIC BOULDER SIZE SPECIFIED IN OTHER DETAILS

TRENCHING METHOD:
IF THE ROOT WAD CANNOT BE DRIVEN INTO THE BANK OR THE BANK NEEDS TO BE RECONSTRUCTED, THE TRENCHING METHOD SHOULD BE USED. THIS METHOD REQUIRES THAT A TRENCH BE EXCAVATED FOR THE LOG PORTION OF THE ROOT WAD. IN THIS CASE, A FOOTER LOG SHOULD BE INSTALLED UNDERNEATH THE ROOT WAD IN A TRENCH EXCAVATED PARALLEL TO THE BANK AND WELL BELOW THE STREAMBED. ONE–THIRD OF THE ROOT WAD SHOULD REMAIN BELOW NORMAL BASE FLOW CONDITIONS.



PLAN VIEW
TRENCHING METHOD



PLAN VIEW
DRIVE POINT METHOD

ROOTWAD

NOT TO SCALE

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UPPER SILVER CREEK STREAM AND WETLAND RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC

DETAILS

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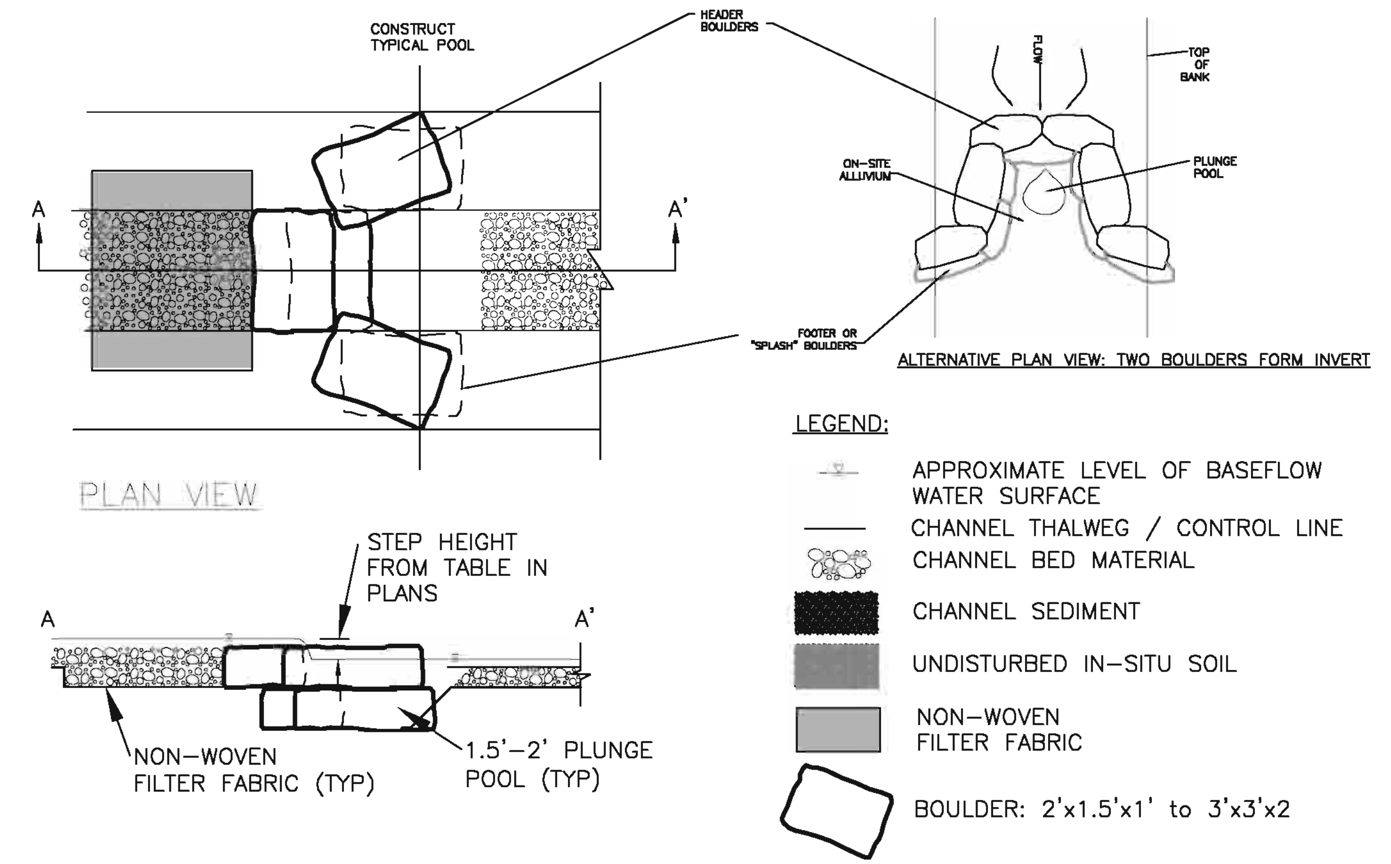
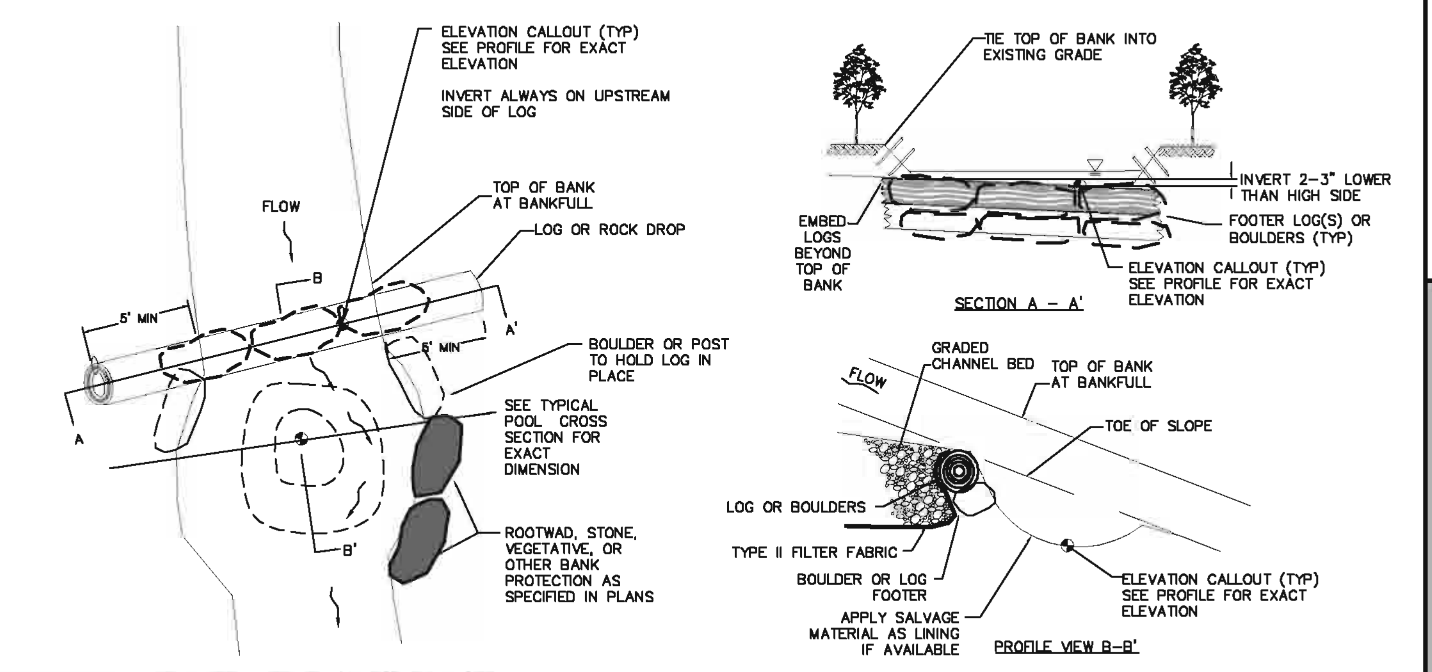


LEGEND:

- ▽ APPROXIMATE LEVEL OF BASEFLOW WATER SURFACE
- — CHANNEL THALWEG / CONTROL LINE
- ○ CHANNEL BED MATERIAL
- ■ CHANNEL SEDIMENT
- ▨ UNDISTURBED IN-SITU SOIL
- ▭ NON-WOVEN FILTER FABRIC
- ▢ BOULDER: 2'x1.5'x1' to 3'x3'x2

ROCK DROP 1
NOT TO SCALE

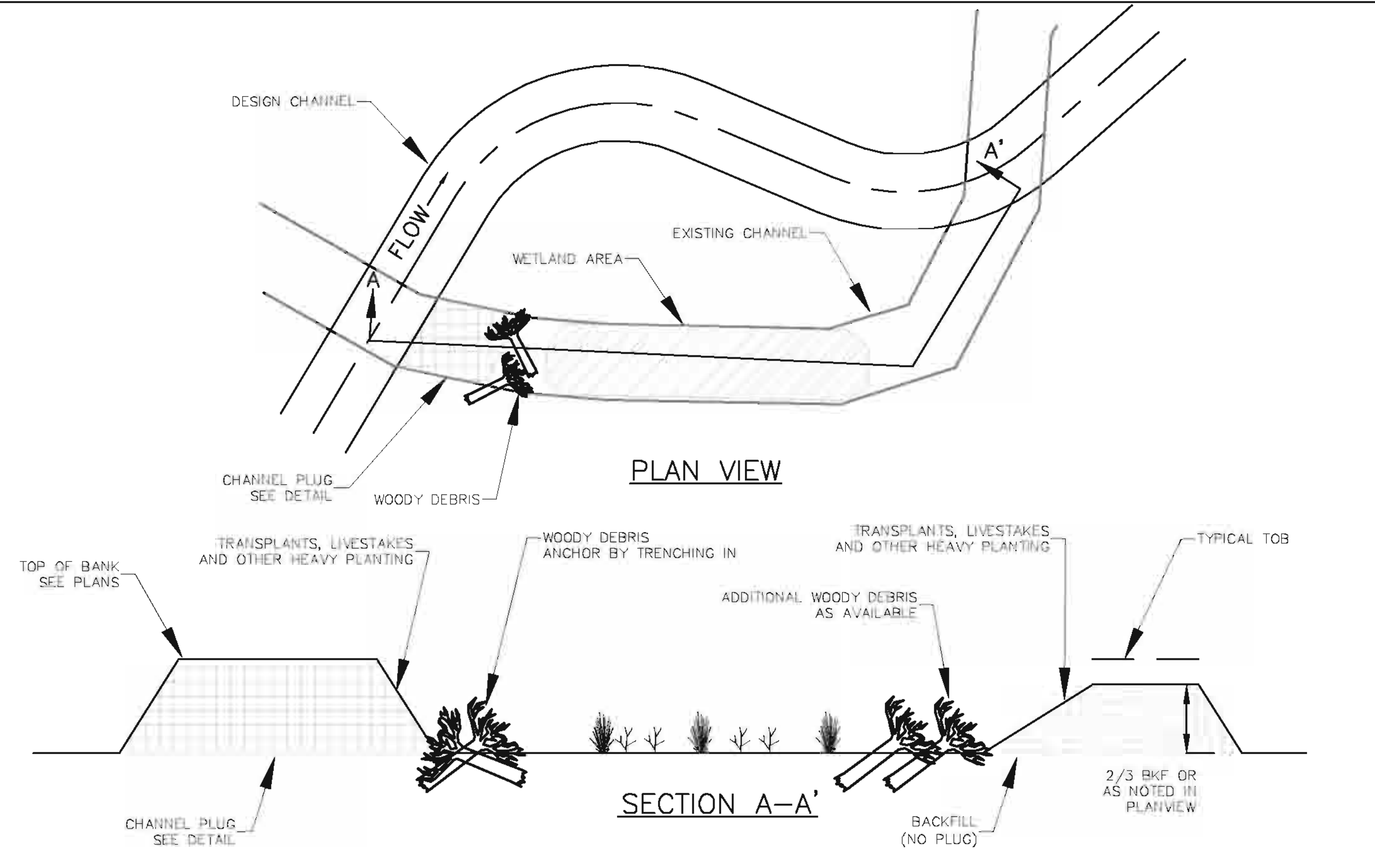


SILVER CREEK PROJECT SPECIFIC SPECS

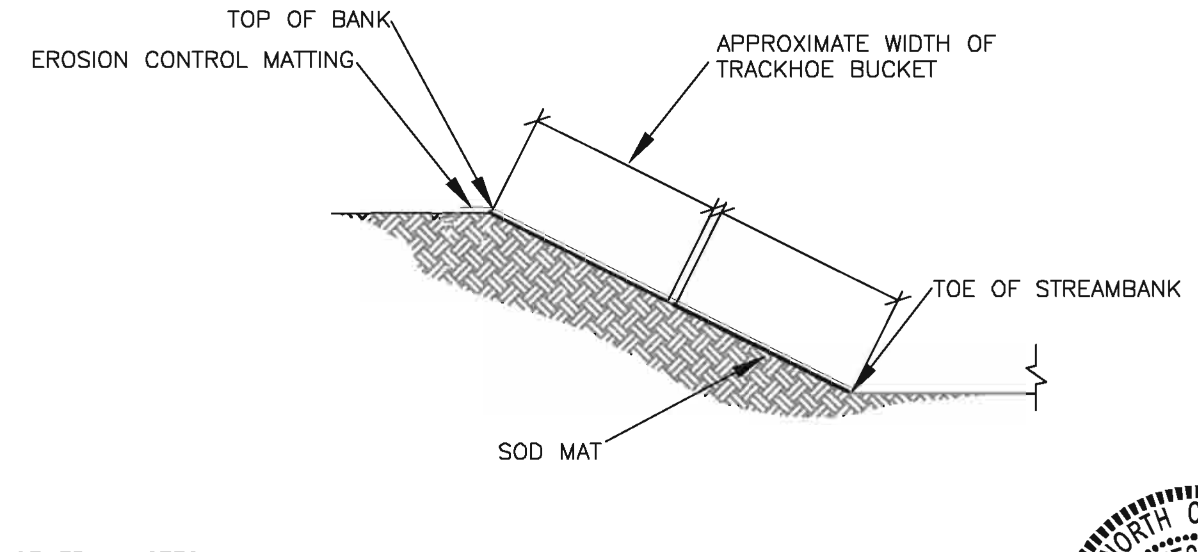
MINIMUM BOULDER SIZE MAINSTEM AND UT1 2.5x2x2 FT UT2 AND UT3 1x2x2 FT
MINIMUM LOG DIAMETER 10 IN
MINIMUM LOG EXTEND INTO BANKS 3 FT
AVERAGE CHANNEL BOTTOM WIDTH 5 FT
(LESS FOR SMALLER TRIBS, ~3 FT)
APPROXIMATE LOG LENGTHS 11+ FT

NOTES
1. LOGS SHALL BE AT LEAST 10 INCHES IN DIAMETER, RELATIVELY STRAIGHT, HARDWOOD, AND RECENTLY HARVESTED.
2. TOP OF LOG SHALL BE SET AT SAME ELEVATION AS THE STREAMBED.
3. FILTER FABRIC SHALL BE NAILED USING 3" 10d GALVANIZED COMMON NAIL AT TWO-FOOT SPACING ALONG THE LOG.
4. SEE LOG OR ROCK SEQUENCE DETAIL FOR MULTIPLE CONSECUTIVE DROPS
4. INVERT IS OFFCENTERED BECAUSE LOG OR STONES SLOPE TO PUSH WATER TO ONE SIDE OF THE CHANNEL, THAT SIDE IS THEN PROTECTED ON THE DOWNSTREAM OF THE STRUCTURE TO ABSORB THE ADDITIONAL FLOW

ROCK DROP 2
NOT TO SCALE



OWBOW WETLAND
NOT TO SCALE



GENERAL NOTES:
1. SEED FIRST WITH JUNCUS.
2. APPLY SOD MAT HARVESTED FROM ADJACENT AREAS OF DISTURBANCE.
3. APPLY COIR MATTING.
4. HALF OR FULL BANK HEIGHT AS DEPICTED.

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 033578 JACOB P. McLEAN
PRELIMINARY PLANS
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SOD MAT
NOT TO SCALE

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UPPER SILVER CREEK STREAM AND WETLAND
RESTORATION PROJECT, OPTION C
BURKE COUNTY, NC

DETAILS

Prepared for:
Ecosystem Enhancement Program
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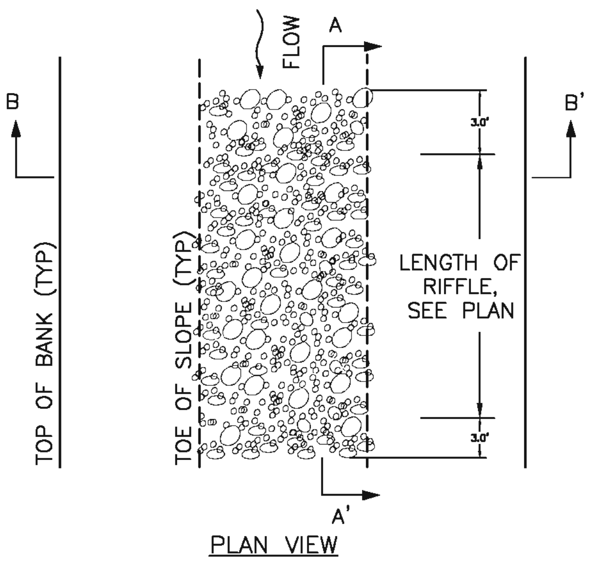
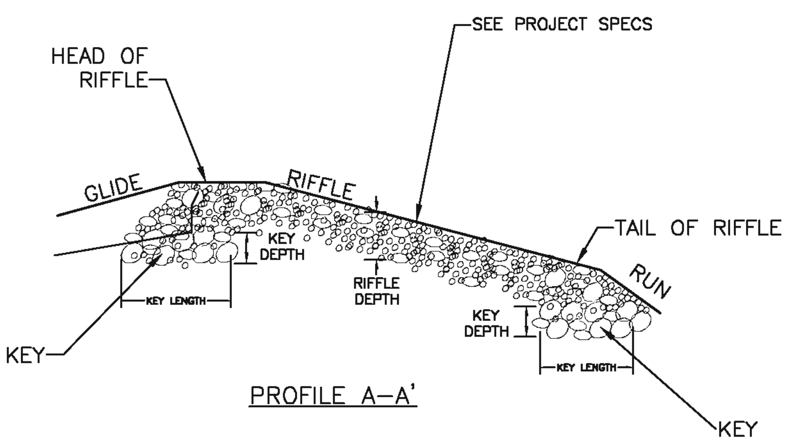


PLAN VIEW



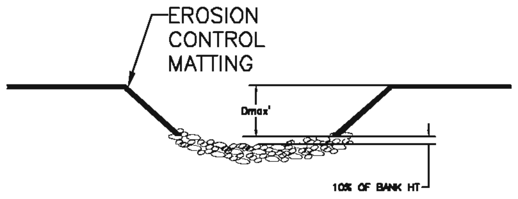
PROFILE A–A'

SILVER CREEK PROJECT SPECIFIC SPECS

KEY LENGTH 3 FT
KEY DEPTH 12 IN
RIFFLE DEPTH 12 IN

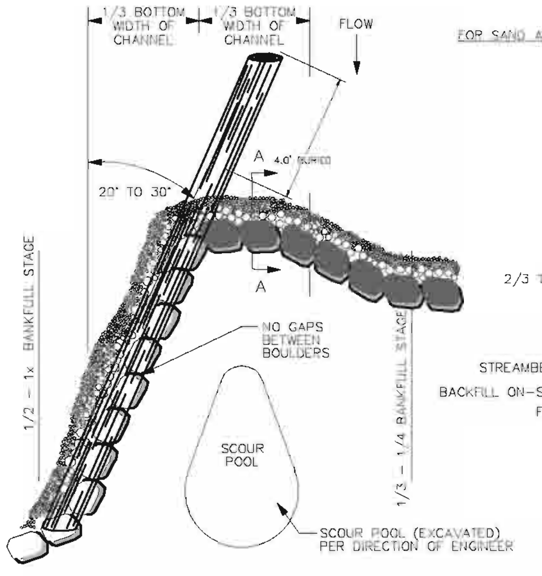
KEY COMPOSTION
50 % CLASS B
20 % 3" CRUSHER RUN (WASHED)

RIFFLE COMPOSTION
67 % CLASS A
33 % 3" CRUSHER RUN (WASHED)



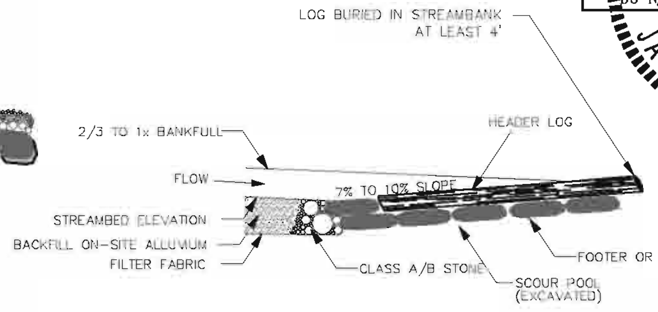
SECTION B–B'

CONSTRUCTED RIFFLE
NOT TO SCALE



PLAN VIEW

FOR SAND AND GRAVEL SYSTEMS



PROFILE VIEW

PRELIMINARY PLAN
DO NOT USE FOR CONSTRUCTION

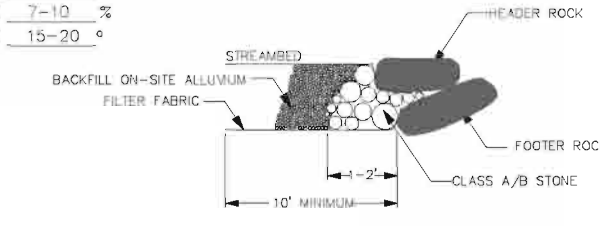
SEAL 038578
JACOB P. McLEAN

SILVER CREEK PROJECT SPECIFICS

VANE ARM LENGTH ~20 FT (DOESN'T INCLUDE BURIED PORTION)
INVERT WIDTH <= 2 FT
VANE ARM SLOPE 7-10 %
VANE ANGLE 15-20 °

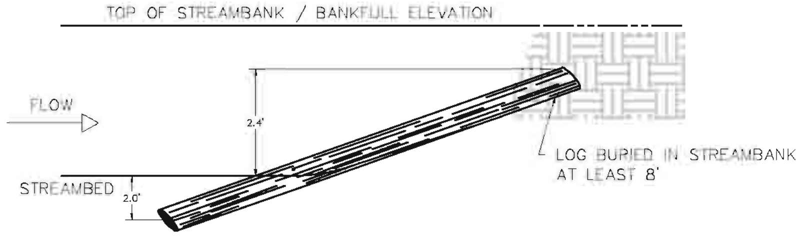
NOTES FOR ALL VANE STRUCTURES:

1. BOULDERS MUST BE AT LEAST 2.5' x 2' x 2'.
2. INSTALL FILTER FABRIC FOR DRAINAGE BEGINNING AT THE MIDDLE OF THE HEADER ROCKS AND EXTEND DOWNWARD TO THE DEPTH OF THE BOTTOM FOOTER ROCK, AND THEN UPSTREAM TO A MINIMUM OF TEN FEET.
3. DIG A TRENCH BELOW THE BED FOR FOOTER ROCKS AND PLACE FILL ON UPSTREAM SIDE OF VANE ARMS, BETWEEN THE ARMS AND STREAMBANK.
4. START AT BANK AND PLACE FOOTER ROCKS FIRST AND THEN HEADER (TOP) ROCK.
5. CONTINUE WITH STRUCTURE, FOLLOWING ANGLE AND SLOPE SPECIFICATIONS.
6. AN EXTRA BOULDER CAN BE PLACED IN SCOUR POOL FOR HABITAT IMPROVEMENT.
7. USE CLASS B STONE TO FILL GAPS ON UPSTREAM SIDE OF BOULDERS, AND CLASS A STONE TO FILL GAPS ON UPSTREAM SIDE OF CLASS B STONE.
8. AFTER ALL STONE HAS BEEN PLACED, FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH ON-SITE ALLUVIUM TO THE ELEVATION OF THE TOP OF THE HEADER ROCK.

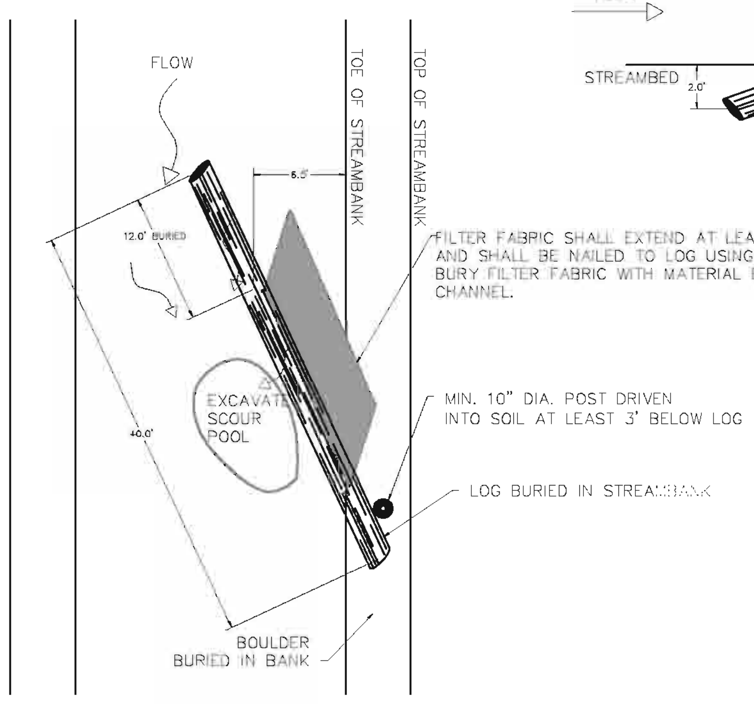


SECTION A – A

GRADE CONTROL J–HOOK
NOT TO SCALE



PROFILE VIEW



FILTER FABRIC SHALL EXTEND AT LEAST 6' UPSTREAM AND SHALL BE NAILED TO LOG USING ROOFING NAILS. BURY FILTER FABRIC WITH MATERIAL EXCAVATED FROM CHANNEL.

MIN. 10" DIA. POST DRIVEN INTO SOIL AT LEAST 3' BELOW LOG

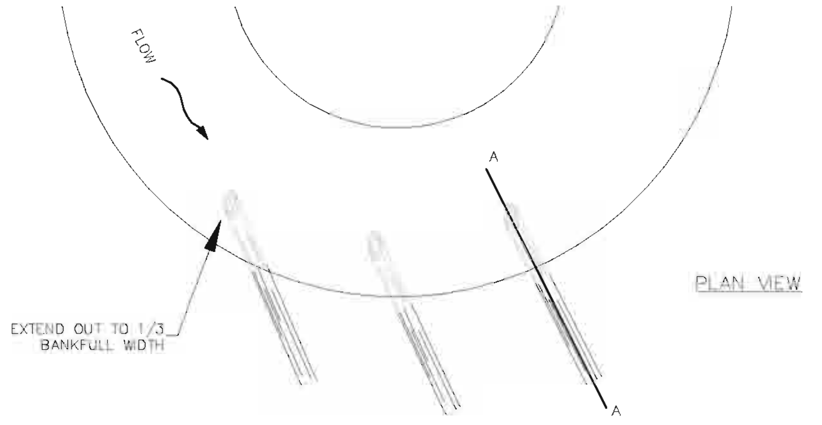
LOG BURIED IN STREAMBANK

PLAN VIEW

NOTES:
1. LOG SHALL BE A HARDWOOD SPECIES AT LEAST 18" DIAMETER, RELATIVELY STRAIGHT, AND RECENTLY HARVESTED.
2. MULTIPLE SMALLER LOGS (MIN. DIA. 10") MAY BE SUBSTITUTED FOR A SINGLE LOG IF JOINED WITH #4 REBAR BENT TO SECURE LOGS TOGETHER.
3. SOIL SHALL BE WELL COMPACTED AROUND BURIED PORTIONS OF LOG.

END VIEW
MULTIPLE LOGS OPTION

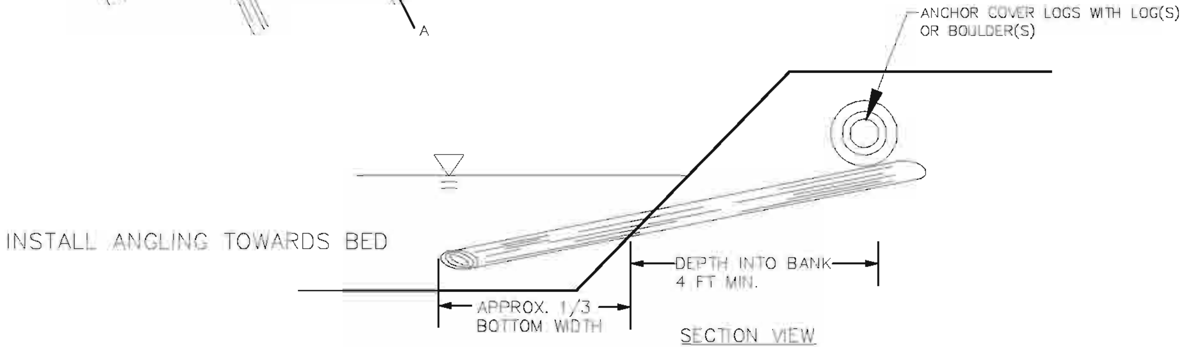
LOG VANE (SINGLE ARM)
NOT TO SCALE



PLAN VIEW

SILVER CREEK PROJECT SPECIFIC SPECS

APPROXIMATE LOG LENGTHS 5-10 FT
APPROXIMATE LOG DIAMETERS 6-12 IN
MOST LIKELY ANCHOR METHOD ___ LOG*
Y BOULDER
X ADJACENT STRUCT.
* NOT AVAIL. ON SITE



SECTION VIEW

NOTES
1. INSTALL BELOW THE LOW FLOW WATER SURFACE
2. WHEN APPLICABLE, USE ADJACENT STRUCTURE ELEMENTS (I.E. ROOTWAD OR VANE) TO ANCHOR COVER LOG

COVER LOG
NOT TO SCALE

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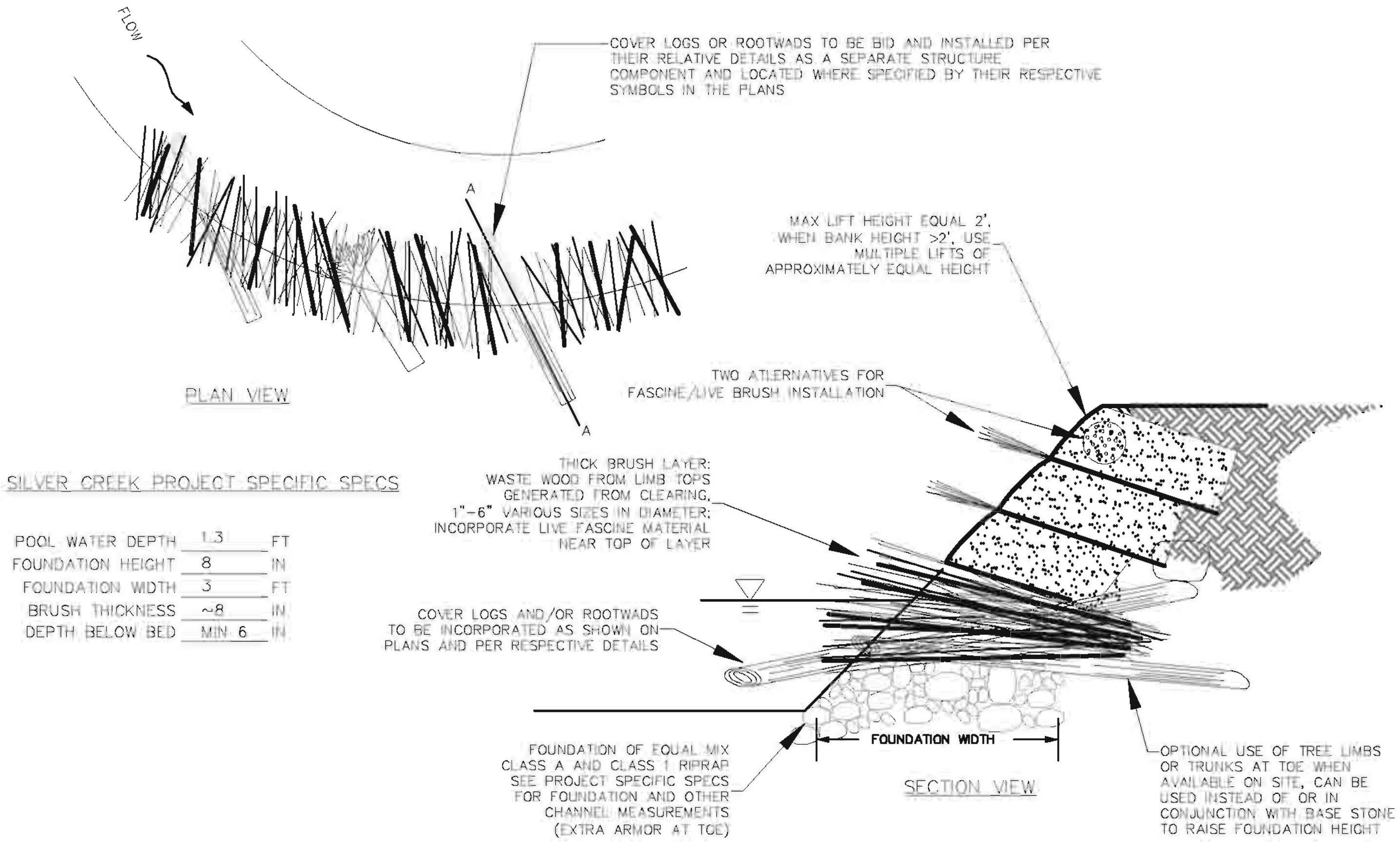
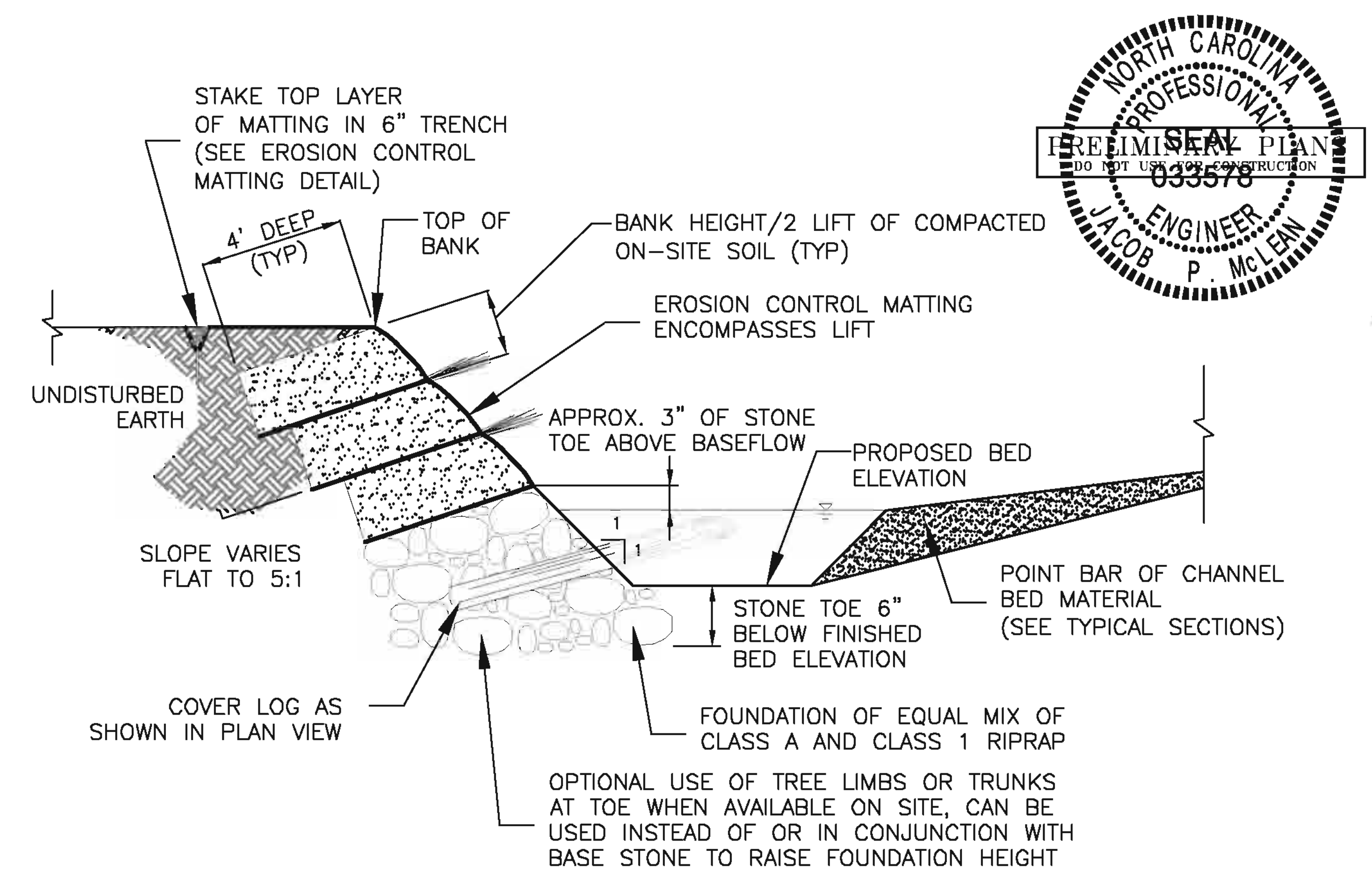


SILVER CREEK PROJECT SPECIFIC SPECS

POOL WATER DEPTH	1.3	FT
FOUNDATION HEIGHT	8	IN
FOUNDATION WIDTH	3	FT
BRUSH THICKNESS	~8	IN
DEPTH BELOW BED	MIN 6	IN

TOE WOOD

NOT TO SCALE



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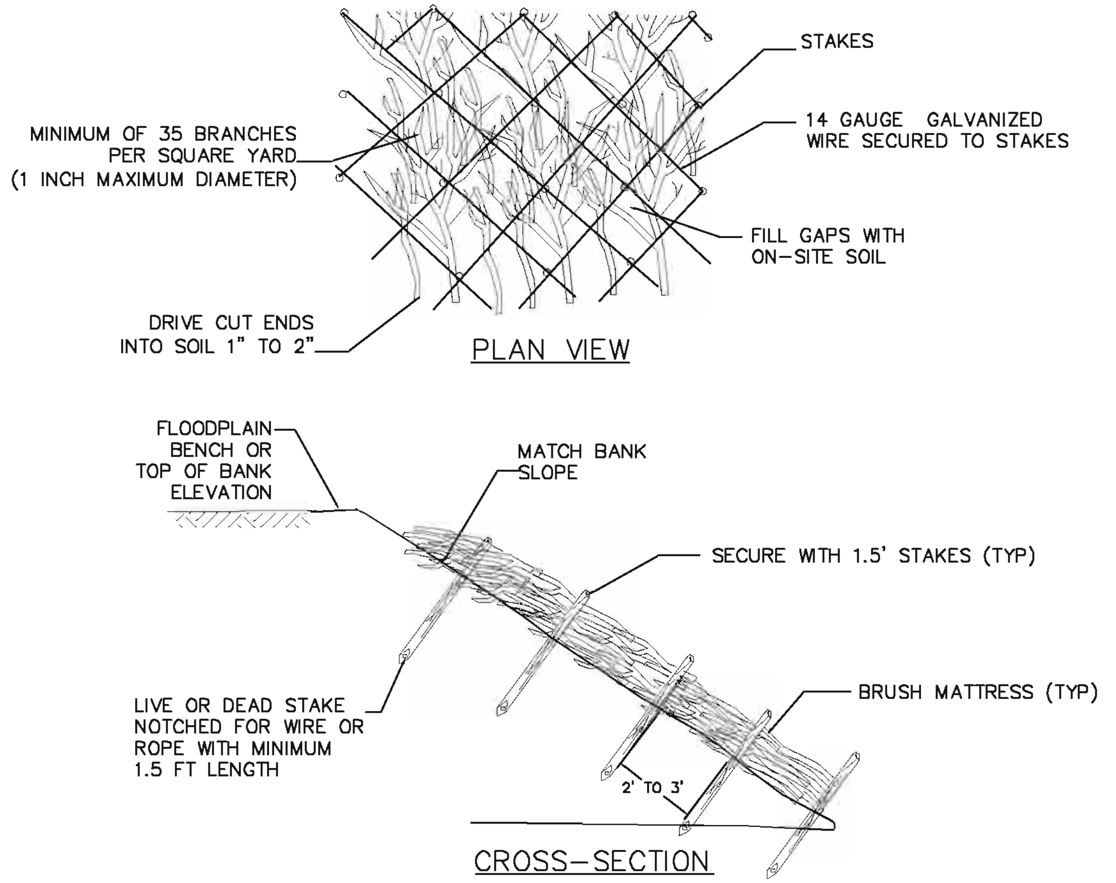
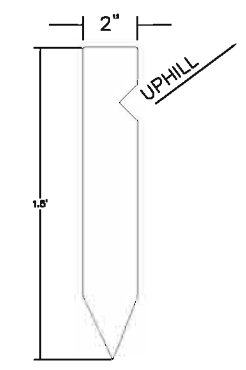
PRELIMINARY PLAN DO NOT USE FOR CONSTRUCTION

VEGETATED GEOLIFT

NOT TO SCALE



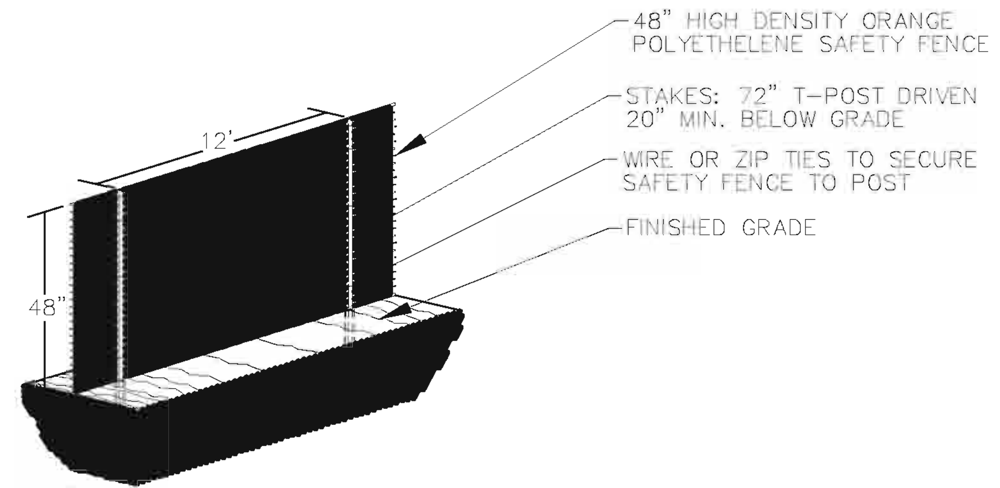


BRUSH MATTRESS TYPICAL STAKE

NOTE
1. BOARD FOR STAKE SHALL BE 2" X 4" X 1.5'
2. STAKES SHALL BE MIX OF SPECIFIED PROPOTION OF LIVESTAKE SPECIES IN PLANTING TABLE

BRUSH MATTRESS

NOT TO SCALE



DETAIL PROVIDED BY: ErosionRunner

1. ALL SENSITIVE AREAS SHALL BE PROTECTED AS PER PLAN OR DIRECTED BY ENGINEER.
2. INSTALL AROUND THE PERIMETER OF WETLANDS AND TRAVEL ROUTES NEAR WETLANDS PRIOR TO BEGINNING ADJACENT CONSTRUCTION ACTIVITIES.
3. SAFETY FENCE SHOULD BE FASTENED SECURELY TO THE T-POSTS.
4. THE FENCING MUST REMAIN IN PLACE DURING ALL PHASES OF CONSTRUCTION; ANY CHANGE OF THE PROTECTIVE FENCING MUST BE APPROVED.

SAFETY FENCE

NOT TO SCALE

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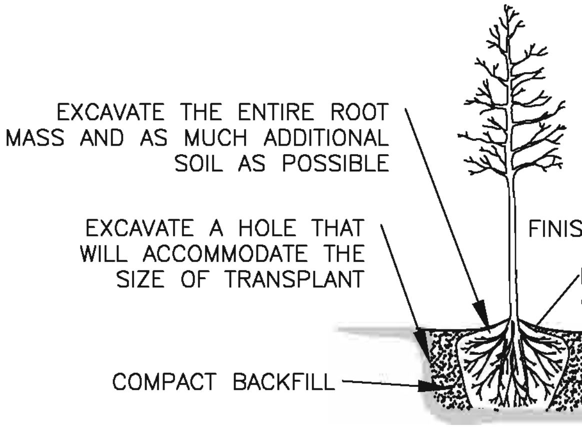
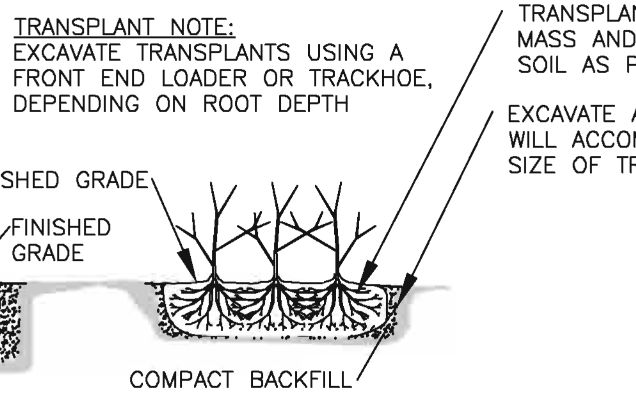
TREE & SHRUB PLANTING
NOT TO SCALE

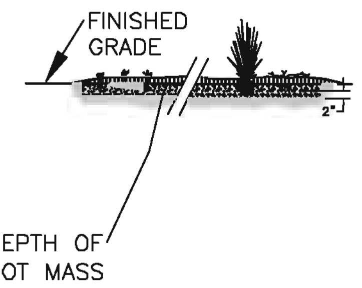


SINGLE TRANSPLANT

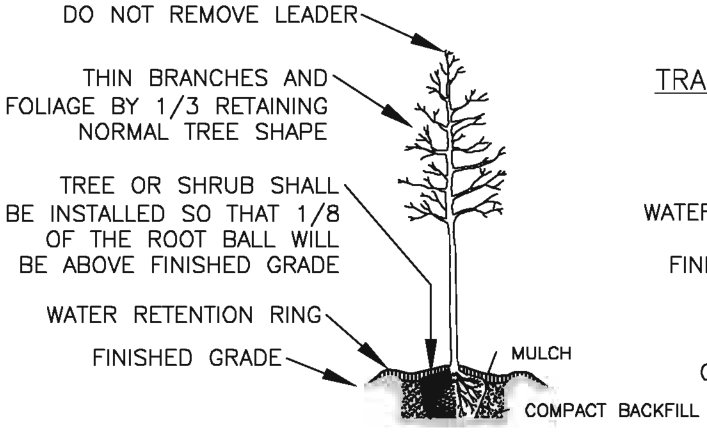
TRANSPLANT NOTE:
EXCAVATE TRANSPLANTS USING A FRONT END LOADER OR TRACKHOE, DEPENDING ON ROOT DEPTH



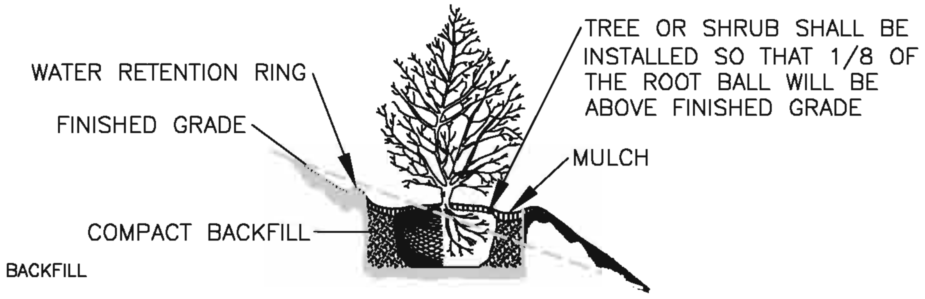
TRANSPLANT CLUSTER



GROUND COVER TRANSPLANT

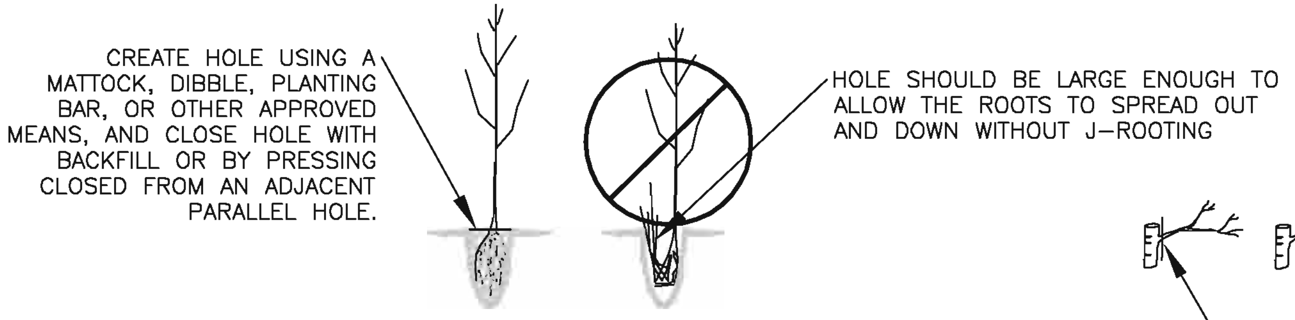


CONTAINERIZED PLANTING
GROUND LEVEL

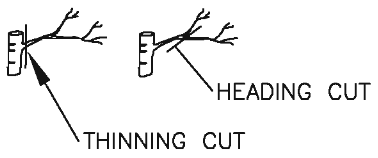


CONTAINERIZED PLANTING
SLOPING GROUND

CONTAINERIZED PLATING NOTES:
1. WHEN PREPARING THE HOLE FOR A CONTAINERIZED PLANT, EXCAVATE THE HOLE 8 -12 INCHES LARGER THAN THE DIAMETER OF THE POT AND THE SAME DEPTH AS THE POT.
2. REMOVE THE PLANT FROM THE POT. LAY THE PLANT ON ITS SIDE IF NECESSARY TO REMOVE THE POT.
3. IF THE PLANT IS ROOTBOUND (ROOTS GROWING IN A SPIRAL AROUND THE ROOT BALL), MAKE VERTICAL CUTS WITH A KNIFE OR SPADE JUST DEEP ENOUGH TO CUT THE NET OF ROOTS. ALSO MAKE A CRISS-CROSS CUT ACROSS THE BOTTOM OF THE BALL.
4. PLACE THE PLANT IN THE HOLE.
5. FILL HALF OF THE HOLE WITH SOIL (SAME SOIL REMOVED FOR BACKFILL).
6. WATER THE SOIL TO REMOVE AIR POCKETS AND FILL THE REST OF THE HOLE WITH THE REMAINING SOIL.



BARE ROOT TREE PLANTING

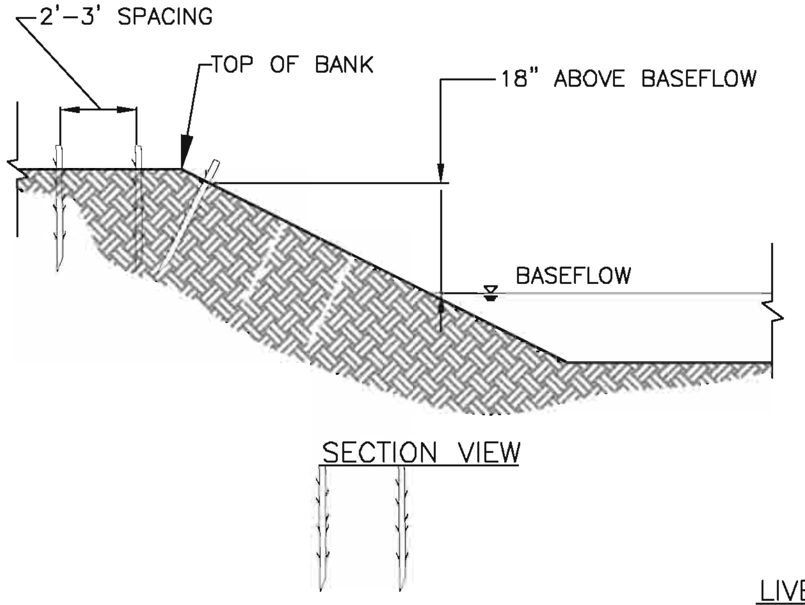


PRUNING CUTS

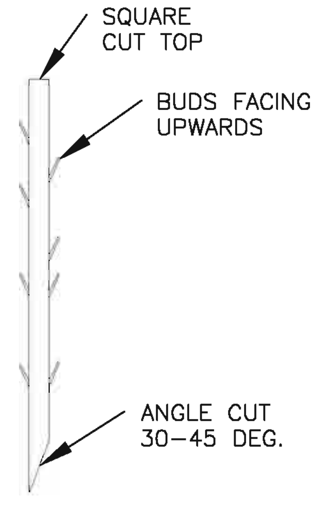
GENERAL NOTES:
1. KEEP ROOTS MOIST WHILE DISTRIBUTING OR WAITING TO PLANT BY MEANS OF WET CANVAS, BURLAP, OR STRAW.
2. HEEL-IN PLANTS IN MOIST SOIL OR SAWDUST IF NOT PROMPTLY PLANTED UPON ARRIVAL TO PROJECT SITE.
3. PRUNE ANY BROKEN LIMBS AND TREAT TORN BARK WITH TREE WOUND DRESSING.
4. EVERY EFFORT SHOULD BE MADE TO KEEP SOIL EXCAVATED FOR PLANTING FROM ENTERING STREAM. ACCIDENTAL FILL SHOULD BE REMOVED IMMEDIATELY

LIVE STAKING
NOT TO SCALE

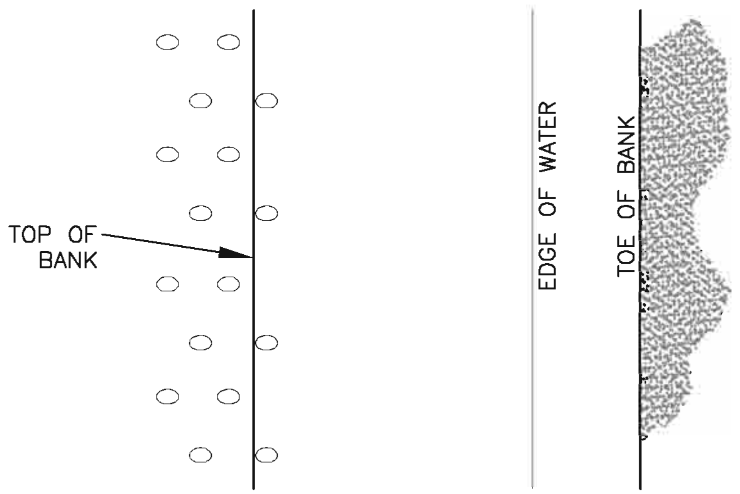
NOTES:
1. STAKES SHALL BE CUT AND INSTALLED ON THE SAME DAY
2. STAKES THAT HAVE BEEN SPLIT SHALL BE REJECTED AND NOT USED FOR CONSTRUCTION
3. STAKES SHALL BE INSTALLED WITH BUDS POINTING UPWARD
4. STAKES SHALL BE INSTALLED PERPENDICULAR TO BANK
5. STAKES SHALL BE 1/2 TO 2 INCHES IN DIAMETER AND 2 TO 3 FT LONG
6. STAKES SHALL BE INSTALLED WITH 1/3 TO 1/5 OF STAKE REMAINING ABOVE GROUND



SECTION VIEW



LIVE STAKE DETAIL



PLAN VIEW

PRELIMINARY PLAN
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033578
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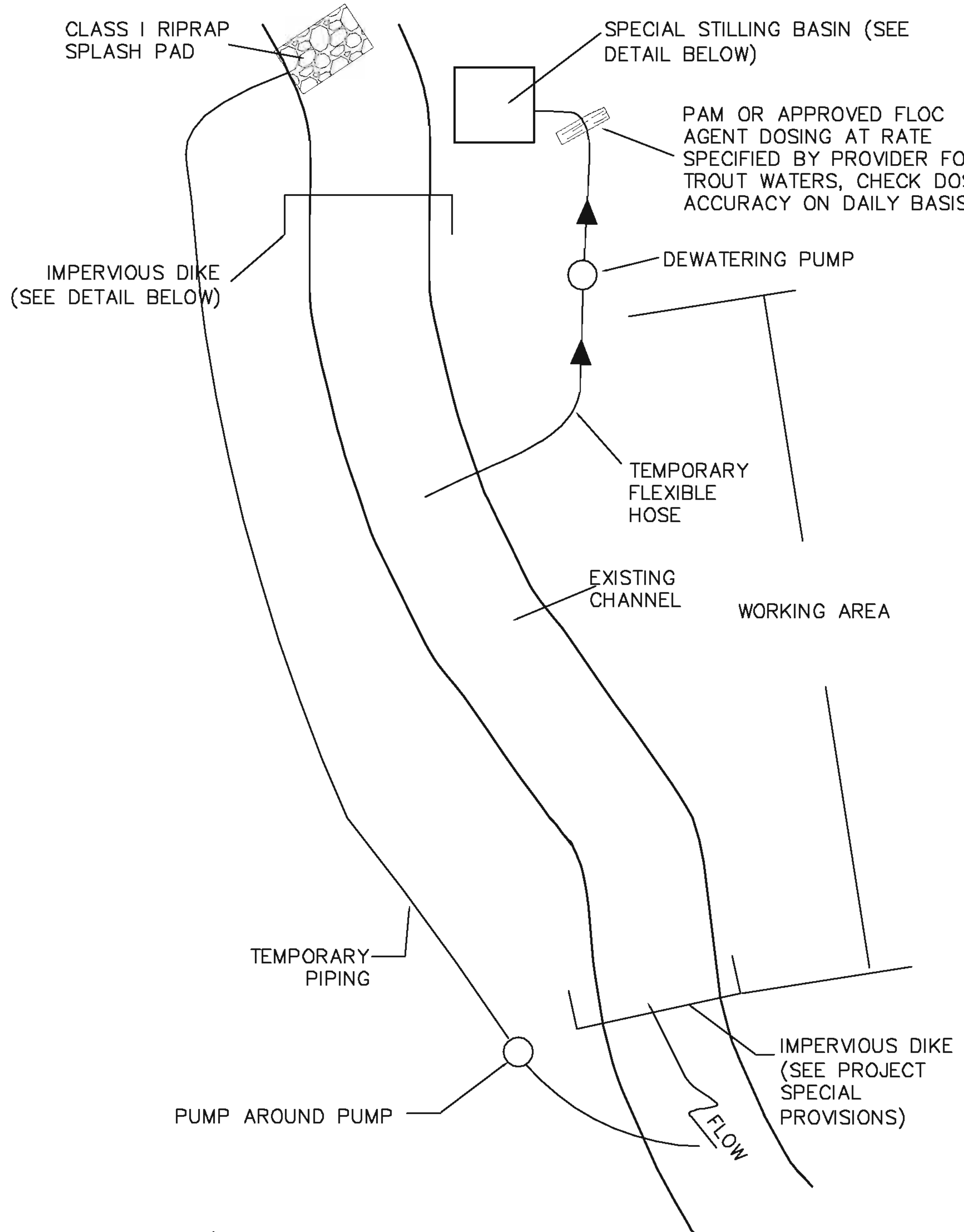
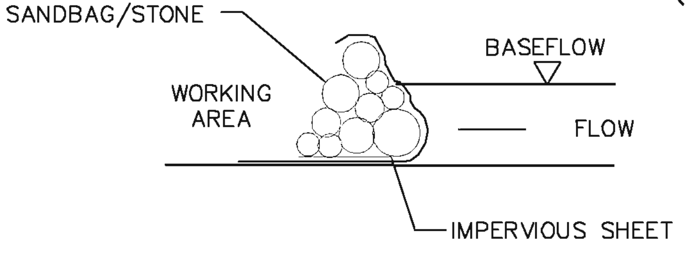
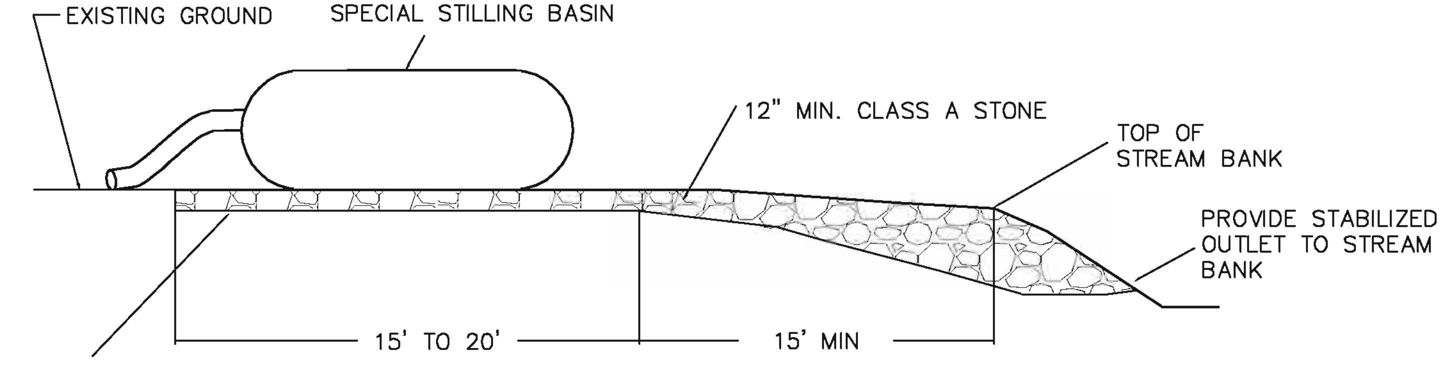




IMPERVIOUS DIKE



SPECIAL STILLING BASIN

SEQUENCE OF CONSTRUCTION FOR TYPICAL PUMP AROUND

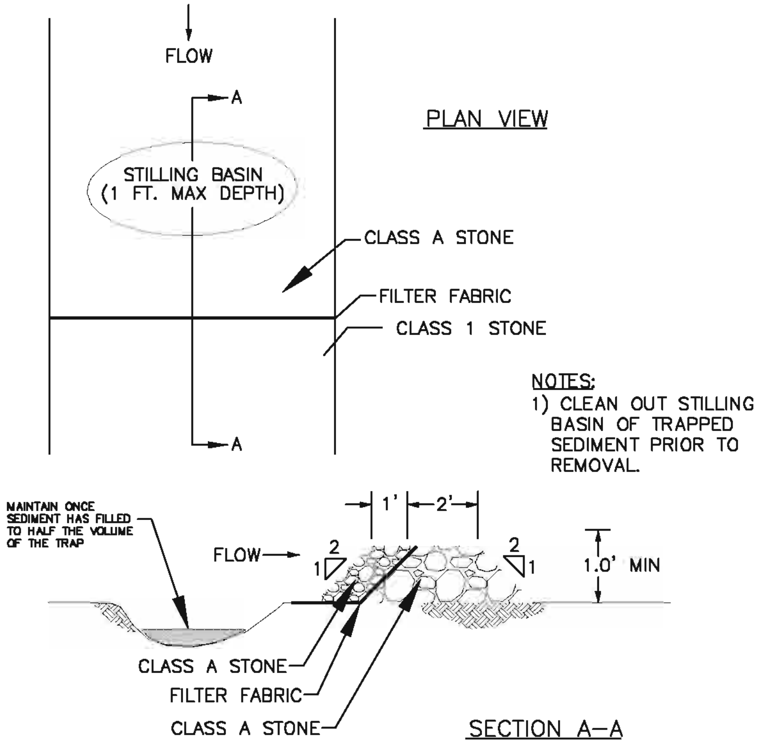
1. INSTALL SPECIAL STILLING BASINS AT THE DOWNSTREAM END OF THE DESIGNATED PROJECT WORKING AREA.
2. THE CONTRACTOR WILL INSTALL THE PUMP AROUND AND THE TEMPORARY PIPING THAT WILL CONVEY THE BASE FLOW FROM UPSTREAM OF THE WORK SITE.
3. INSTALL UPSTREAM IMPERVIOUS DIKE AND BEGIN PUMPING OPERATIONS FOR STREAM DIVERSION.
4. INSTALL THE DOWNSTREAM IMPERVIOUS DIKE AND PUMPING APPARATUS IF NEEDED TO DEWATER THE ENTRAPPED AREA. THE PUMP AND HOSE FOR THIS PURPOSE SHALL BE OF SUFFICIENT SIZE TO DEWATER THE WORK AREA. THIS WATER WILL FLOW INTO A SPECIAL STILLING BASIN.
5. THE CONTRACTOR WILL PERFORM STREAM RESTORATION WORK IN ACCORDANCE WITH THE PLAN AND FOLLOWING THE GENERAL CONSTRUCTION SEQUENCE.
6. THE CONTRACTOR WILL EXCAVATE ANY ACCUMULATED SILT AND DEWATER BEFORE REMOVAL OF THE IMPERVIOUS DIKE. REMOVE IMPERVIOUS DIKES, PUMPS, AND TEMPORARY FLEXIBLE HOSE/PIPING STARTING WITH THE DOWNSTREAM DIKE FIRST.
7. ONCE THE WORKING AREA IS COMPLETED, REMOVE THE STILLING BASINS AND STABILIZE DISTURBED AREAS WITH SEED AND MULCH.

NOTES:

1. EXCAVATION SHALL BE PERFORMED IN ONLY DRY SECTIONS OF CHANNEL.
2. IMPERVIOUS DIKES SHOULD BE USED TO ISOLATE WORK AREAS FROM STREAM FLOW.
3. THE CONTRACTOR SHALL NOT DISTURB MORE AREA THAN CAN BE STABILIZED IN ONE WORKING DAY.
4. THE PUMP AROUND PUMP SHOULD ADEQUATELY CONVEY 3 CFS FOR MAINSTEM.
5. PROVIDE STABILZED OUTLET TO STREAM BANK.

PUMP AROUND OPERATION

NOT TO SCALE



NOTES:
1) CLEAN OUT STILLING BASIN OF TRAPPED SEDIMENT PRIOR TO REMOVAL.

STILLING BASIN

NOT TO SCALE

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

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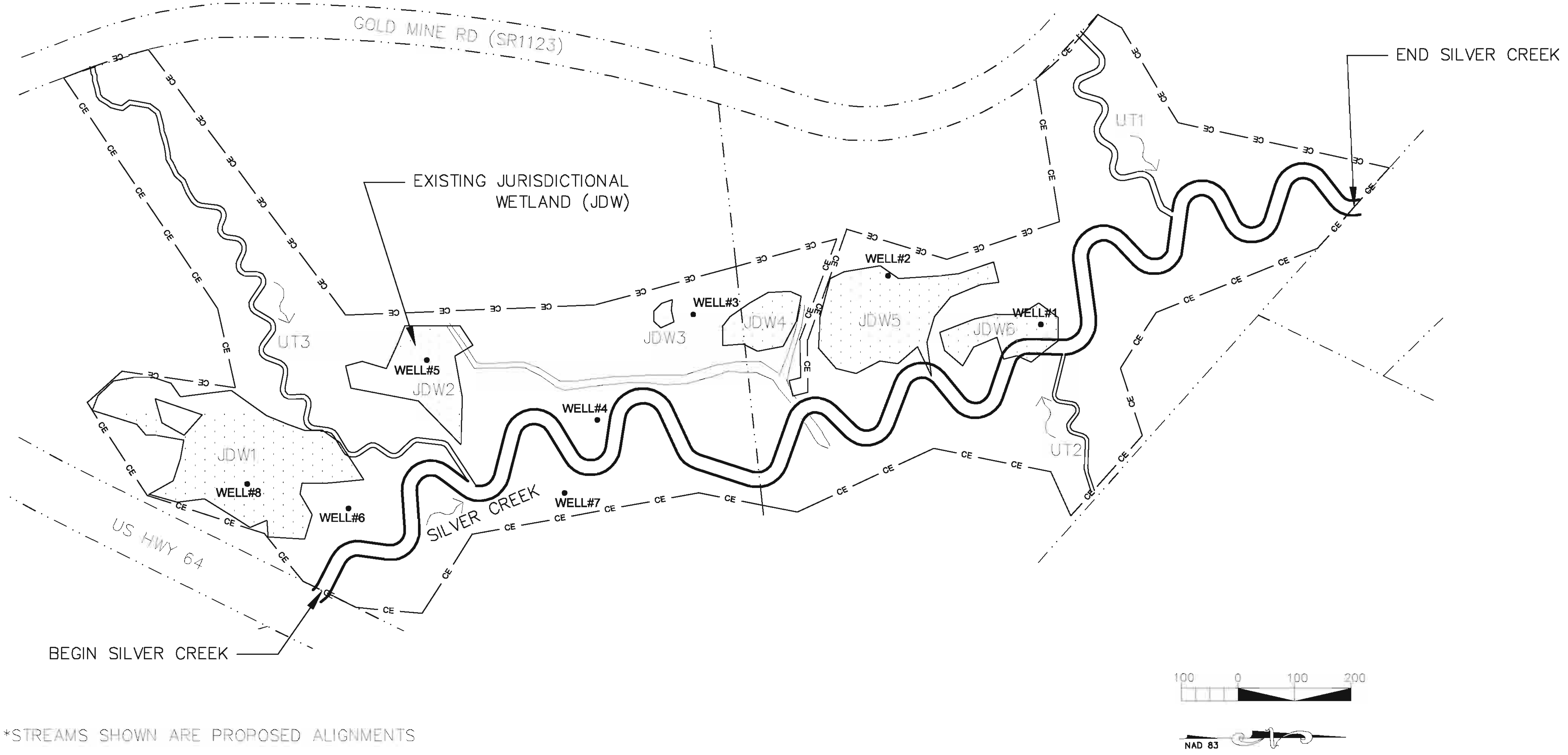
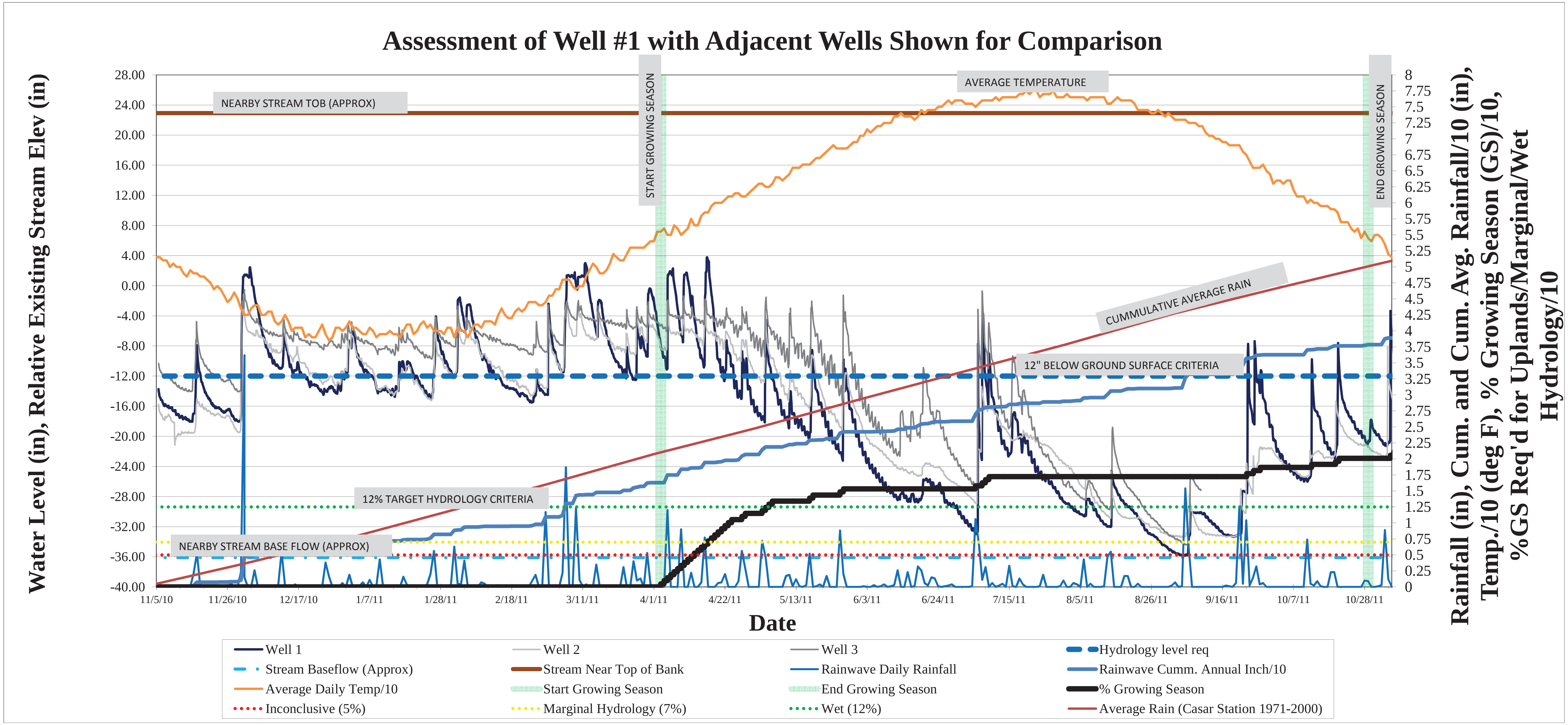
18.0 APPENDIX E – LOCATION OF WELLS AND GROUNDWATER DATA BY WELL

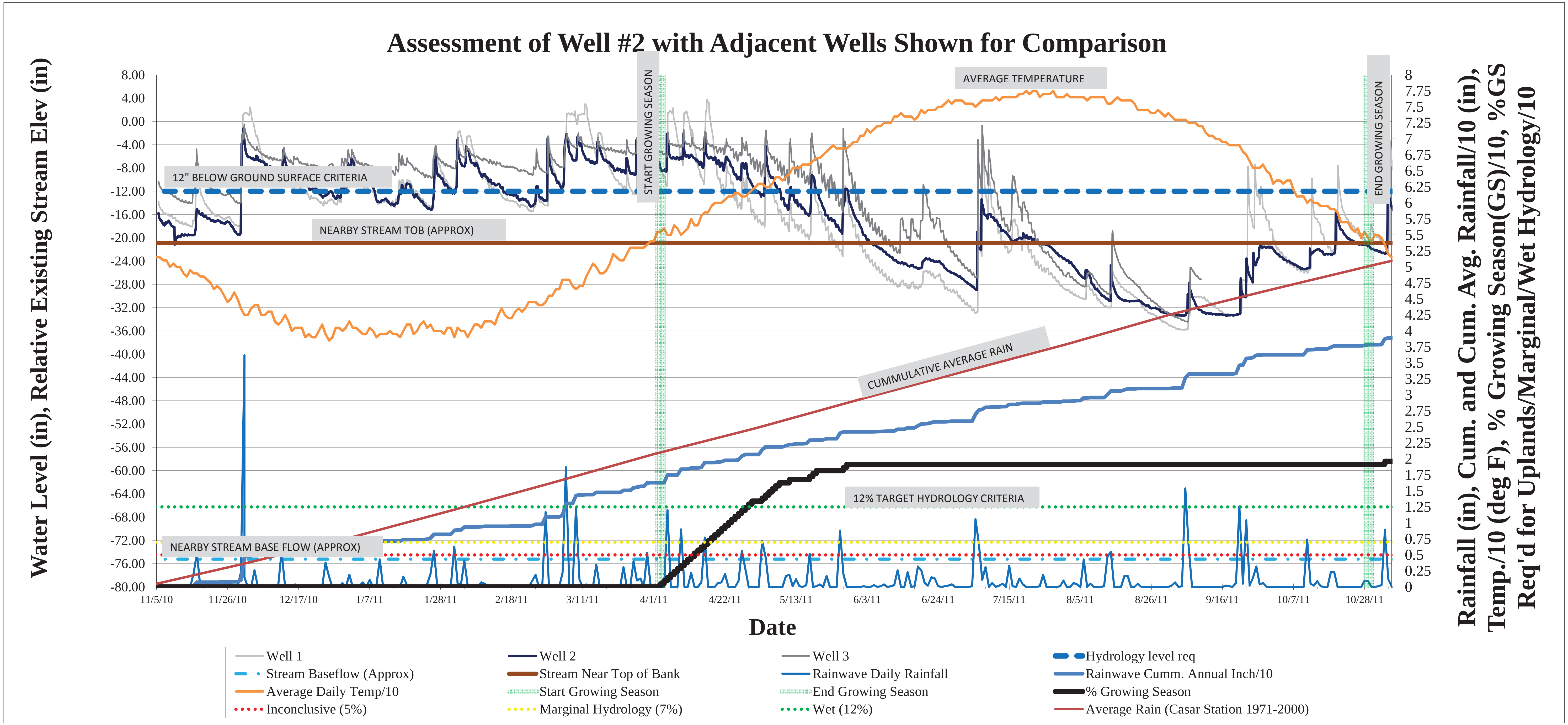


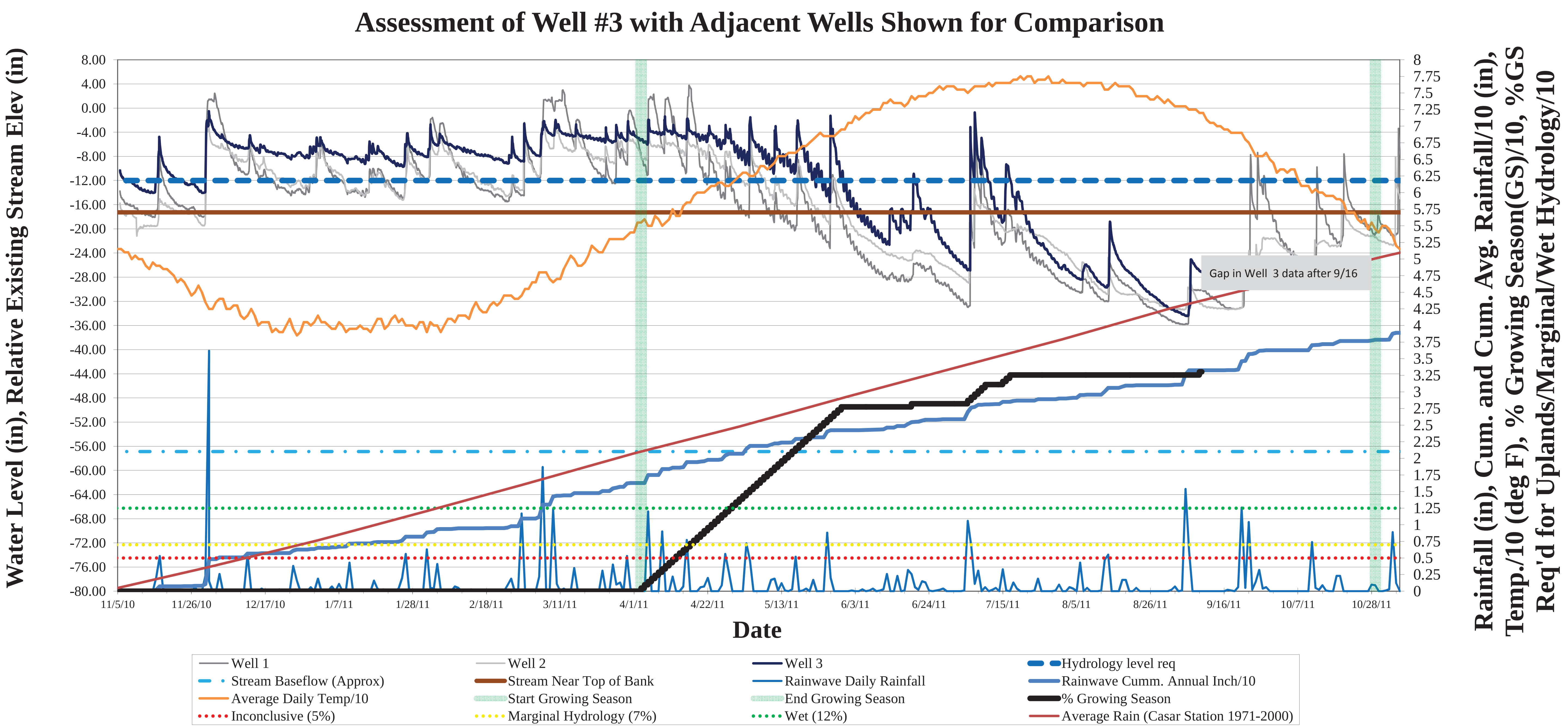
*STREAMS SHOWN ARE PROPOSED ALIGNMENTS

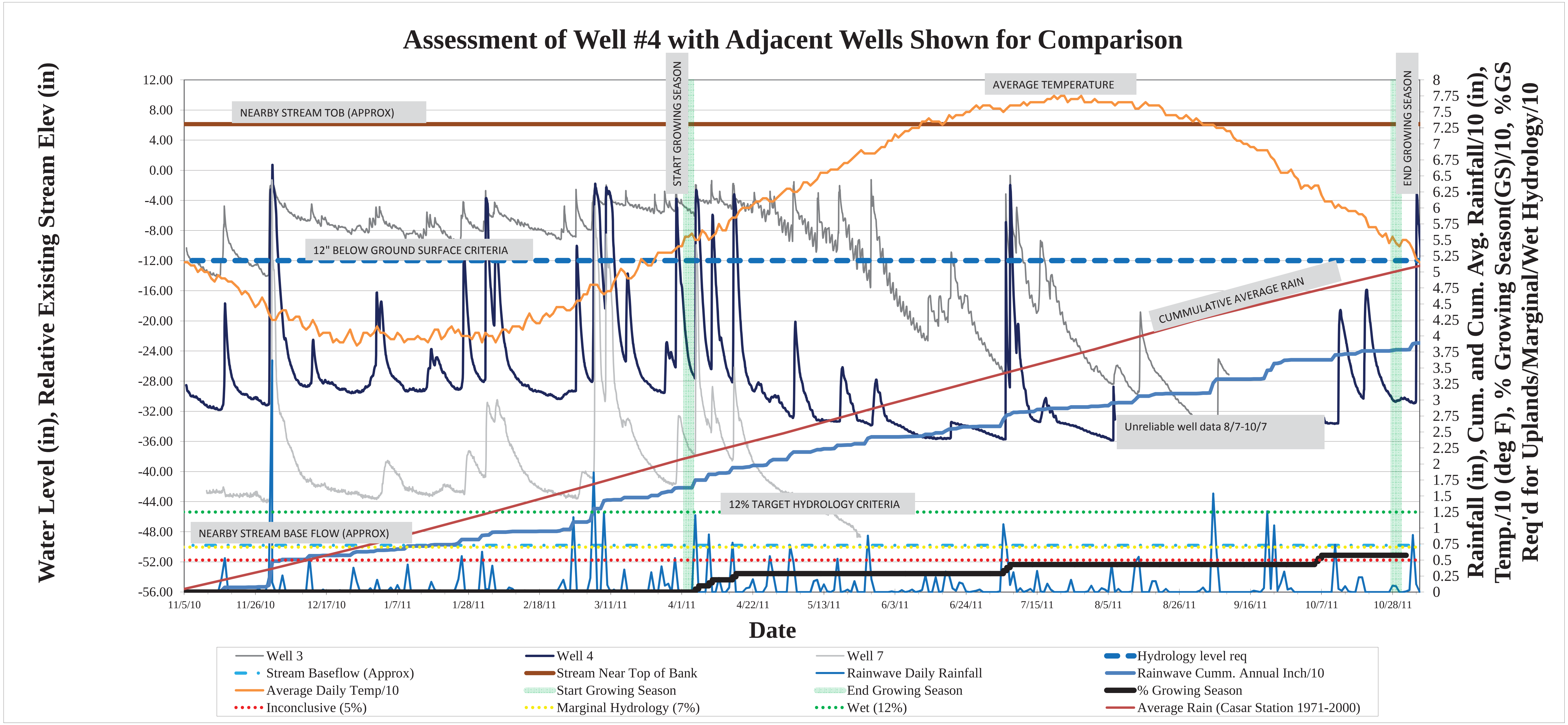
LOCATION OF WELLS
GROUNDWATER MONITORING
UPPER SILVER CREEK WETLAND RESTORATION

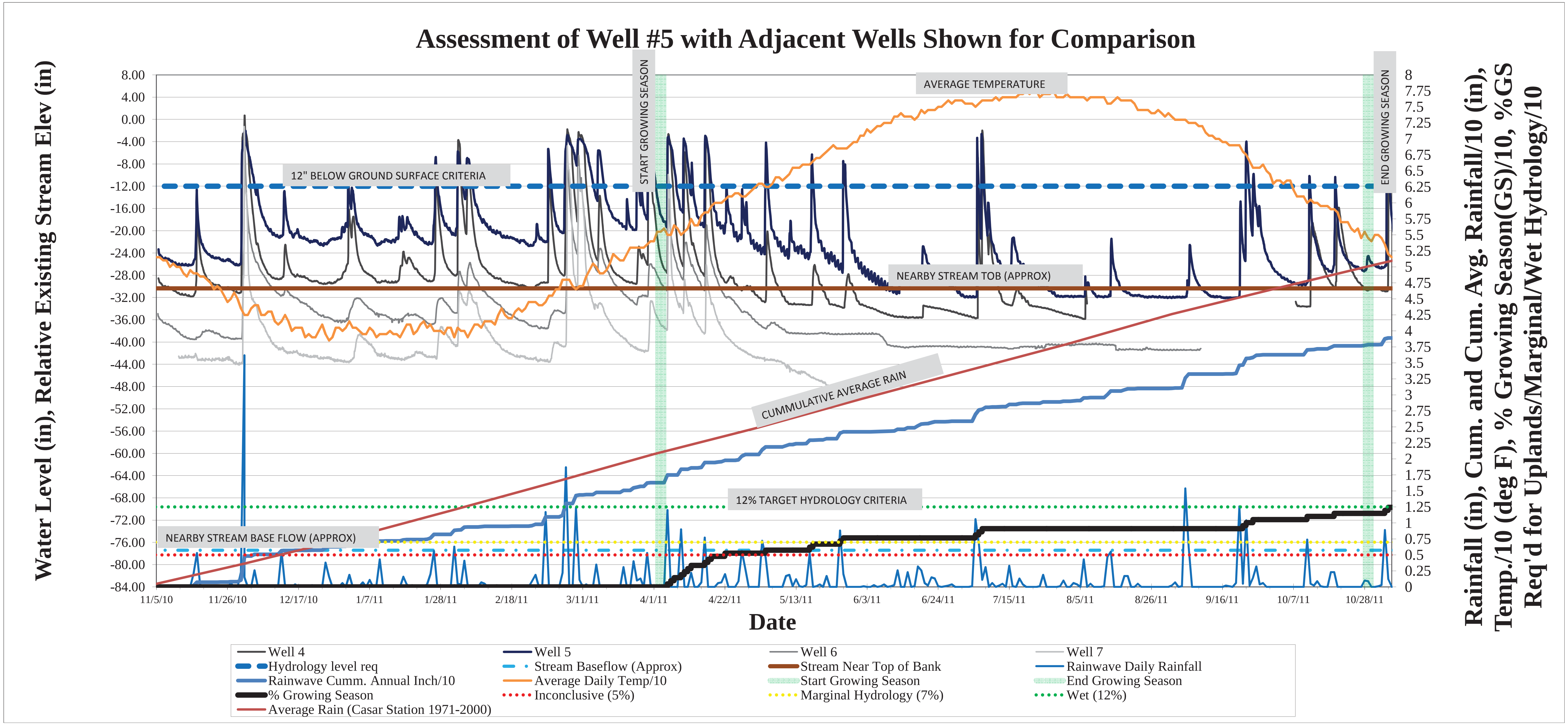


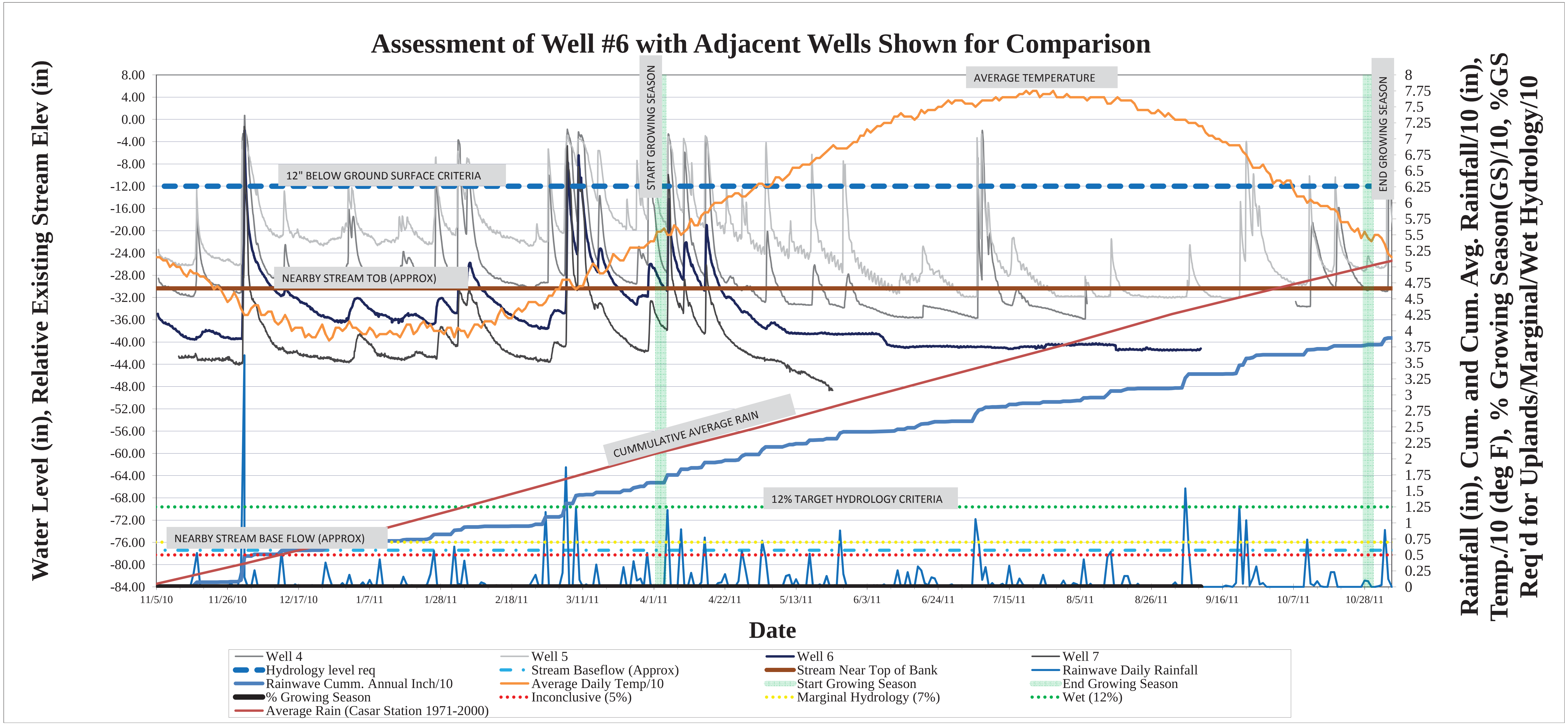
Assessment of Well #1 with Adjacent Wells Shown for Comparison

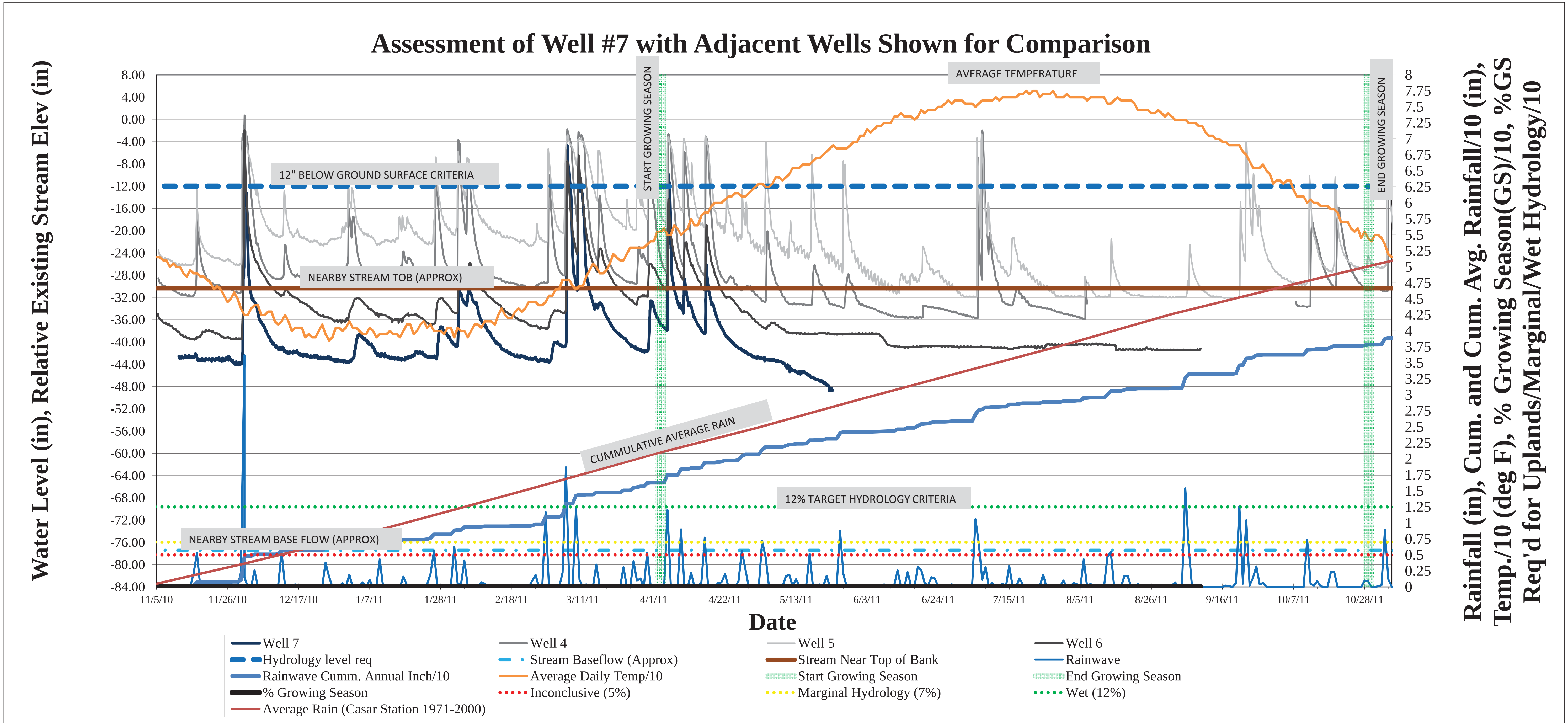

Assessment of Well #2 with Adjacent Wells Shown for Comparison
Water Level (in), Relative Existing Stream Elev (in)
8.00
4.00
0.00
-4.00
-8.00
-12.00
-16.00
-20.00
-24.00
-28.00
-32.00
-36.00
-40.00
-44.00
-48.00
-52.00
-56.00
-60.00
-64.00
-68.00
-72.00
-76.00
-80.00
11/5/10
11/26/10
12/17/10
1/7/11
1/28/11
2/18/11
3/11/11
4/1/11
4/22/11
5/13/11
6/3/11
6/24/11
7/15/11
8/5/11
8/26/11
9/16/11
10/7/11
10/28/11
Date
Rainfall (in), Cum. and Cum. Avg. Rainfall/10 (in), Temp./10 (deg F), % Growing Season(GS)/10, %GS Req'd for Uplands/Marginal/Wet Hydrology/10
8
7.75
7.5
7.25
7
6.75
6.5
6.25
6
5.75
5.5
5.25
5
4.75
4.5
4.25
4
3.75
3.5
3.25
3
2.75
2.5
2.25
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
START GROWING SEASON
END GROWING SEASON
AVERAGE TEMPERATURE
12" BELOW GROUND SURFACE CRITERIA
NEARBY STREAM TOB (APPROX)
CUMMULATIVE AVERAGE RAIN
12% TARGET HYDROLOGY CRITERIA
NEARBY STREAM BASE FLOW (APPROX)
Well 1
Well 2
Well 3
Hydrology level req
Stream Baseflow (Approx)
Stream Near Top of Bank
Rainwave Daily Rainfall
Rainwave Cumm. Annual Inch/10
Average Daily Temp/10
Start Growing Season
End Growing Season
% Growing Season
Inconclusive (5%)
Marginal Hydrology (7%)
Wet (12%)
Average Rain (Casar Station 1971-2000)


Assessment of Well #3 with Adjacent Wells Shown for Comparison
Water Level (in), Relative Existing Stream Elev (in)
8.00
4.00
0.00
-4.00
-8.00
-12.00
-16.00
-20.00
-24.00
-28.00
-32.00
-36.00
-40.00
-44.00
-48.00
-52.00
-56.00
-60.00
-64.00
-68.00
-72.00
-76.00
-80.00
11/5/10
11/26/10
12/17/10
1/7/11
1/28/11
2/18/11
3/11/11
4/1/11
4/22/11
5/13/11
6/3/11
6/24/11
7/15/11
8/5/11
8/26/11
9/16/11
10/7/11
10/28/11
Date
Rainfall (in), Cum. and Cum. Avg. Rainfall/10 (in), Temp./10 (deg F), % Growing Season(GS)/10, %GS Req'd for Uplands/Marginal/Wet Hydrology/10
8
7.75
7.5
7.25
7
6.75
6.5
6.25
6
5.75
5.5
5.25
5
4.75
4.5
4.25
4
3.75
3.5
3.25
3
2.75
2.5
2.25
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
Gap in Well 3 data after 9/16
Well 1
Well 2
Well 3
Hydrology level req
Stream Baseflow (Approx)
Stream Near Top of Bank
Rainwave Daily Rainfall
Rainwave Cumm. Annual Inch/10
Average Daily Temp/10
Start Growing Season
End Growing Season
% Growing Season
Inconclusive (5%)
Marginal Hydrology (7%)
Wet (12%)
Average Rain (Casar Station 1971-2000)

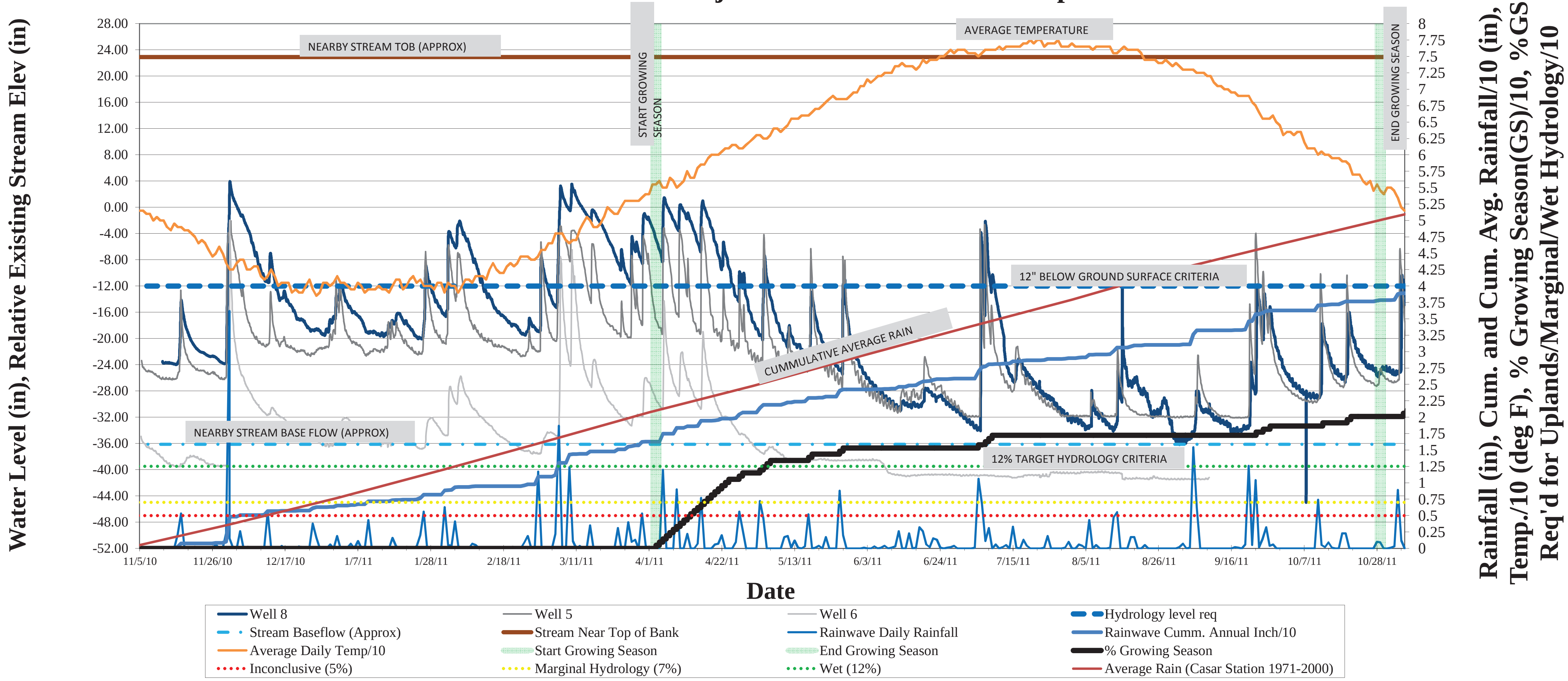

Assessment of Well #4 with Adjacent Wells Shown for Comparison
Water Level (in), Relative Existing Stream Elev (in)
12.00
8.00
4.00
0.00
-4.00
-8.00
-12.00
-16.00
-20.00
-24.00
-28.00
-32.00
-36.00
-40.00
-44.00
-48.00
-52.00
-56.00
Rainfall (in), Cum. and Cum. Avg. Rainfall/10 (in), Temp./10 (deg F), % Growing Season(GS)/10, %GS Req'd for Uplands/Marginal/Wet Hydrology/10
8
7.75
7.5
7.25
7
6.75
6.5
6.25
6
5.75
5.5
5.25
5
4.75
4.5
4.25
4
3.75
3.5
3.25
3
2.75
2.5
2.25
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
NEARBY STREAM TOB (APPROX)
START GROWING SEASON
AVERAGE TEMPERATURE
END GROWING SEASON
12" BELOW GROUND SURFACE CRITERIA
CUMMULATIVE AVERAGE RAIN
Unreliable well data 8/7-10/7
12% TARGET HYDROLOGY CRITERIA
NEARBY STREAM BASE FLOW (APPROX)
11/5/10
11/26/10
12/17/10
1/7/11
1/28/11
2/18/11
3/11/11
4/1/11
4/22/11
5/13/11
6/3/11
6/24/11
7/15/11
8/5/11
8/26/11
9/16/11
10/7/11
10/28/11
Date
Well 3
Well 4
Well 7
Hydrology level req
Stream Baseflow (Approx)
Stream Near Top of Bank
Rainwave Daily Rainfall
Rainwave Cumm. Annual Inch/10
Average Daily Temp/10
Start Growing Season
End Growing Season
% Growing Season
Inconclusive (5%)
Marginal Hydrology (7%)
Wet (12%)
Average Rain (Casar Station 1971-2000)


Assessment of Well #5 with Adjacent Wells Shown for Comparison
Water Level (in), Relative Existing Stream Elev (in)
8.00
4.00
0.00
-4.00
-8.00
-12.00
-16.00
-20.00
-24.00
-28.00
-32.00
-36.00
-40.00
-44.00
-48.00
-52.00
-56.00
-60.00
-64.00
-68.00
-72.00
-76.00
-80.00
-84.00
Rainfall (in), Cum. and Cum. Avg. Rainfall/10 (in), Temp./10 (deg F), % Growing Season(GS)/10, %GS Req'd for Uplands/Marginal/Wet Hydrology/10
8
7.75
7.5
7.25
7
6.75
6.5
6.25
6
5.75
5.5
5.25
5
4.75
4.5
4.25
4
3.75
3.5
3.25
3
2.75
2.5
2.25
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
START GROWING SEASON
END GROWING SEASON
AVERAGE TEMPERATURE
12" BELOW GROUND SURFACE CRITERIA
NEARBY STREAM TOB (APPROX)
CUMMULATIVE AVERAGE RAIN
12% TARGET HYDROLOGY CRITERIA
NEARBY STREAM BASE FLOW (APPROX)
11/5/10
11/26/10
12/17/10
1/7/11
1/28/11
2/18/11
3/11/11
4/1/11
4/22/11
5/13/11
6/3/11
6/24/11
7/15/11
8/5/11
8/26/11
9/16/11
10/7/11
10/28/11
Date
Well 4
Well 5
Well 6
Well 7
Hydrology level req
Stream Baseflow (Approx)
Stream Near Top of Bank
Rainwave Daily Rainfall
Rainwave Cumm. Annual Inch/10
Average Daily Temp/10
Start Growing Season
End Growing Season
% Growing Season
Inconclusive (5%)
Marginal Hydrology (7%)
Wet (12%)
Average Rain (Casar Station 1971-2000)


Assessment of Well #6 with Adjacent Wells Shown for Comparison
Water Level (in), Relative Existing Stream Elev (in)
Rainfall (in), Cum. and Cum. Avg. Rainfall/10 (in), Temp./10 (deg F), % Growing Season(GS)/10, %GS Req'd for Uplands/Marginal/Wet Hydrology/10
Date
8.00
4.00
0.00
-4.00
-8.00
-12.00
-16.00
-20.00
-24.00
-28.00
-32.00
-36.00
-40.00
-44.00
-48.00
-52.00
-56.00
-60.00
-64.00
-68.00
-72.00
-76.00
-80.00
-84.00
8
7.75
7.5
7.25
7
6.75
6.5
6.25
6
5.75
5.5
5.25
5
4.75
4.5
4.25
4
3.75
3.5
3.25
3
2.75
2.5
2.25
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
11/5/10
11/26/10
12/17/10
1/7/11
1/28/11
2/18/11
3/11/11
4/1/11
4/22/11
5/13/11
6/3/11
6/24/11
7/15/11
8/5/11
8/26/11
9/16/11
10/7/11
10/28/11
START GROWING SEASON
END GROWING SEASON
AVERAGE TEMPERATURE
12" BELOW GROUND SURFACE CRITERIA
NEARBY STREAM TOB (APPROX)
CUMMULATIVE AVERAGE RAIN
12% TARGET HYDROLOGY CRITERIA
NEARBY STREAM BASE FLOW (APPROX)
Well 4
Well 5
Well 6
Well 7
Hydrology level req
Stream Baseflow (Approx)
Stream Near Top of Bank
Rainwave Daily Rainfall
Rainwave Cumm. Annual Inch/10
Average Daily Temp/10
Start Growing Season
End Growing Season
% Growing Season
Inconclusive (5%)
Marginal Hydrology (7%)
Wet (12%)
Average Rain (Casar Station 1971-2000)


Assessment of Well #7 with Adjacent Wells Shown for Comparison
Water Level (in), Relative Existing Stream Elev (in)
8.00
4.00
0.00
-4.00
-8.00
-12.00
-16.00
-20.00
-24.00
-28.00
-32.00
-36.00
-40.00
-44.00
-48.00
-52.00
-56.00
-60.00
-64.00
-68.00
-72.00
-76.00
-80.00
-84.00
Rainfall (in), Cum. and Cum. Avg. Rainfall/10 (in), Temp./10 (deg F), % Growing Season(GS)/10, %GS Req'd for Uplands/Marginal/Wet Hydrology/10
8
7.75
7.5
7.25
7
6.75
6.5
6.25
6
5.75
5.5
5.25
5
4.75
4.5
4.25
4
3.75
3.5
3.25
3
2.75
2.5
2.25
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
11/5/10
11/26/10
12/17/10
1/7/11
1/28/11
2/18/11
3/11/11
4/1/11
4/22/11
5/13/11
6/3/11
6/24/11
7/15/11
8/5/11
8/26/11
9/16/11
10/7/11
10/28/11
Date
START GROWING SEASON
AVERAGE TEMPERATURE
END GROWING SEASON
12" BELOW GROUND SURFACE CRITERIA
NEARBY STREAM TOB (APPROX)
CUMMULATIVE AVERAGE RAIN
12% TARGET HYDROLOGY CRITERIA
NEARBY STREAM BASE FLOW (APPROX)
Well 7
Well 4
Well 5
Well 6
Hydrology level req
Stream Baseflow (Approx)
Stream Near Top of Bank
Rainwave
Rainwave Cumm. Annual Inch/10
Average Daily Temp/10
Start Growing Season
End Growing Season
% Growing Season
Inconclusive (5%)
Marginal Hydrology (7%)
Wet (12%)
Average Rain (Casar Station 1971-2000)

Assessment of Well #8 with Adjacent Wells Shown for Comparison



19.0 APPENDIX F – ECS CAROLINAS LLP SOILS REPORT AND FIGURES

Chandler
Soil
Corporation

December 12, 2010

Attn. Mickey Clemmons
Michael Baker Engineering Inc.
797 Haywood Road; Suite 201
Asheville, NC 28806

Dear Mr. Clemmons:

Chandler Soil Corporation and Earthwise Design, Inc. completed the hydric soils investigation within the area provided and described in RFP Figure 1. This investigation is for the proposed restoration site located at the intersection of US 64 and Goldmine Road in southwestern Burke County, North Carolina.

We found approximately 3.4 acres of hydric soils and 1.6 acres of buried hydric soils. However, the hydric system in this area is very complex. The actual areas would require more detail to define the line between the hydric and non-hydric soils. The remaining acreage consisted of non-hydric undisturbed soils or non-hydric buried soils.

Methods

The sampling scheme for the soil evaluation was completed as prescribed by Michael Baker Engineering. A grid of 50 feet by 100 feet was set out on the approximately 15 acre site. This created 160 boring and pit sites. In the prescribed design, pits were to be dug to help to augment information from the borings, however due to significant rock across the site, more pits were needed. Photos were taken of the pits, to illustrate the findings, and the borings were used to augment the pit information. Borings and pits were marked on site with stakes and flagging, to denote findings. Pin stakes, marking position, were either red or yellow. Flagging was attached to the pin stakes to differentiate findings as follows:

- Orange flagging –buried hydric soils
- Yellow flagging- surface hydric soils
- Blue flagging- buried non-hydric soils
- No flagging—non-hydric, undisturbed soils.

Soil Descriptions, provided in the field notes, described pits and borings to a depth of 48” inches or depth of hydric indicator. Other information was also gathered including:

- Texture
- Structure
- Consistence
- Redoximorphic feature
- Depth to perched and non-perched seasonal high water table (if applicable)
- Depth to free water—if applicable
- Presence of any anthropogenic influence on the site.
- Hydric Determination was completed using the USDA and COE standards.

- Hydric soils were determined within the upper 20 inches of the soil, unless buried.
- The buried hydric soils showed increased vegetation at the buried horizon. The buried hydric indicators were determined as if the depth of the buried soil was at surface level.

Results

The results of the soils evaluation is illustrated in the attached maps, spreadsheets and photos.

Maps

The overview map included with this report illustrates the following:

- Pits and borings location.
    - Pits are denoted by a rectangle, and borings are denoted by circles on the map. Triangles are used to identify buried non-hydric soils
    - Some pits and boring locations were not verified by survey data. These appear in a red font.
- Hydric and Buried hydric soil areas.
    - Hydric soils are illustrated with a green hatch.
    - Buried hydric soils are illustrated with a purple hatch.
    - Buried Non-hydric soils are denoted with a blue triangle,
    - And Non-hydric soils are left blank.
- Topography data
    - The topography appearing on the map was a compilation of microtopography data gathered by Michael Baker Engineering. In areas where this level of detail was not available, NCDOT information was used.

Hydric and Buried Hydric Soils versus Non-Hydric and buried Non-hydric Soil

This map shows areas of hydric and buried hydric soils. Although it is usual to delineate the line between hydric and non-hydric soils, this level of detail was not within the scope of this part of the project. Therefore the demarcations of the limits of hydric and buried hydric soils are approximate and were limited to the sampling schedule prescribed and available topographic data. The hydric soil system on this land is very complex and more detailed work would be needed to fully delineate the hydric/non-hydric line. In cases of complex wetlands, areas are referred to as a percentage of wetlands on the acreage. This would change the amount of wetlands (buried (20%) and surface (24%)) to 44% of the area sampled, or approximately 6.6 acres (assuming a 15 acre sampling area).

The hydric soils found were described by three main indicators, F3, F8 and F12 and one pit was described by indicator F1. All these indicators are normally associated with being located at the boundary of the upland and the hydric soil area (adding to the complexity of the hydric soil system). The following is a short description taken from the “Field Indicators of Hydric Soils in the United States”:

- F3, Depleted Matrix, is identified by a layer at least 6 inches thick with a depleted matrix that has 60% or more chroma 2 or less starting with 10 inches of the soil.
- F8, Redox Depressions, is used in closed depressions subject to ponding. Shallow depressions that are maintained by surface runoff tend to be seasonally inundated and

often dry up by mid- to late spring. These wetlands commonly are referred to as “vernal pools. They are describe as having 5% or more distinct or prominent redox concentrations as soft masses or pore linings in a layer 2 inches or more thick entirely within the upper 6 inches of the soil.

- F12, Iron/ Manganese Masses, is found on flood plains. It is identified by a layer 4 inches or greater within the fist 12 inches of the soil consisting of 40% or more chroma 2 or less and 2% or more distinct or prominent redox concentrations as soft iron/manganese masses with diffuse boundaries.
- F1, found in pit 10, had a mucky modified mineral layer 4 inches thick, beginning within 6 inches of the surface.

Seasonal High Water Table Maps and Free Water Table Maps

The depths described as the seasonal high water table is taken at the top to the non-perched layer. This data was not always available due either to the absence of the seasonal high water table or the depth of the boring. It is based on the presence of redoximorphic mottles continuing throughout the depth of the soil.

The free water layer illustrates the depth to the free water entering the soil. This data was not always available due either to the absence of the free water table or the depth of the boring. This data, unlike that of the seasonal high water table, is dependent upon the environmental conditions at the time, and will vary with such.

Spreadsheets

Soil Pit and Boring log

The soil pit and boring log contains the following columns:

A. Pit or boring status,
B. The pit or boring number,
C. The hydric indicator (f1, f3, f8, and f12,), the buried hydric indicator (denoted by a “b” preceding the indicator), or the absence of an indicator (NA)
D. The depth of the seasonal high water table (SHWT) determined by redoximorphic indicators (inches).
E. Whether the SHWT was perched (Y), not perched (N), not determinable (?) or not applicable (NA)
F. The depth of the Free Water (inches), or not determinable (?), or not applicable (NA)
G. Notes beyond the soil description included
    i. The presence of buried horizons,
    ii. The presence of anthropogenic disturbances, such as platy soils due to compaction.
    iii. The presence of other conditions, such as Manganese (Mn) concentrations, or rocky layers. Also there are notes of similarity to other soil descriptions.
H. Depth in inches to conditions in G.

Hydric Soil Descriptions and Photos

The hydric soil description spreadsheet describes the soil to the depth of the hydric indicator including the following parameters (preferred by the ACOE):

- Depth (inches)
- Horizon designation
- Matrix Color
- Mottle Colors
- Redoximorphic features
    - Percentage of Mottle colors
    - Type if mottle
    - Location of mottle
- Texture
- Remarks
- And photos of the hydric soil pits. (Photos were not taken for the borings of hydric soils.)

Our evaluation was made in accordance with the "A Guide for Identifying and Field Indicators of Hydric Soils in the United States, Delineating Hydric Soils, Version 7.0, 2010", United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the National Technical Committee for Hydric Soils. Also this report was made in accordance with the USACOE's Corps Delineation Manual and its Regional Supplement for the Eastern Mountains and Piedmont Region. We guarantee that our work was performed to professional standards. This report represents our professional opinion, and does not guarantee government approval or denial of projects associated with this work.

Thank you for your business. Call us if you have any questions or if we can be of further assistance.

Sincerely,

Dolores M Chandler

Dolores Chandler
North Carolina Licensed Soil Scientist

Enclosed: Invoice.

CAROLINE J. EDWARDS
1220
12/13/2010

DOLORES M. CHANDLER
1187
Dolores Chandler
12/13/2010

Earthwise Designs Inc.
PO Box 187
Harris, NC 28074

828)245-7666 bus./fx
828)289-0122 cell.

Cont .5'
Cont 5'
Cont 2'
Cont 100'
Cont 20'
Cont 4'
FEMA cross section
Parcel boundary
Study area boundary
Wetland
Proposed easement
100yr flood plain
CSC stream
Stream traced from NC floodplain
Stream traced from GIS aerial
Stream - Burke county GIS

🟩 Hydric

■ Buried hydric

▲ Buried non-hydric

71b Located pit
69o Located boring
112 Unlocated pit
159 Unlocated boring

56 Boring/Pit number and flag color
NA Seasonal high water table
? Free water

Flag colors
b-blue, y-yellow, o-orange, p-pink

Square Feet

Totals

Acres

Totals

Intended for preliminary planning only.
Boundaries of the limits of hydric and buried hydric soils are approximate and were limited to the sampling schedule prescribed and available topographic data. These boundaries are subject to change upon further investigation.
The topography appearing on the map was a compilation of micro topography data gathered by Michael Baker Engineering and in areas where this level of detail was not available, NCDOT information.
Some pits and boring locations were not verified by survey data.
Not survey accurate.

LICENSED SOIL SCIENTIST
DOLORES M. CHANDLER
1187
STATE OF NORTH CAROLINA
12/13/2010

Chandler
Soil
Corporation

5306 Hwy. 54 West
Chapel Hill, NC 27516
919-932-5008
chandlersoil@earthlink.net

Area described without microtopography data.

Area described without microtopography data.

Square Feet

Hydric		Buried hydric	
A	67,890	A	3,402
B	621	B	2,644
C	834	C	6,490
D	3,067	D	793
E	72,408	E	2,402
F	2,094	F	1,191
G	1,993	G	6,594
		H	8,214
		I	3,788
		J	11,434
		K	5,274
		L	6,142
		M	1,386
		N	11,858
Totals			
	148,907		71,612

Acres

Hydric		Buried hydric	
A	1.559	A	0.078
B	0.014	B	0.061
C	0.019	C	0.149
D	0.070	D	0.018
E	1.662	E	0.055
F	0.048	F	0.027
G	0.046	G	0.151
		H	0.189
		I	0.087
		J	0.262
		K	0.121
		L	0.141
		M	0.032
		N	0.272
Totals			
	3.418		1.644

Intended for preliminary planning only.
Boundaries of the limits of hydric and buried hydric soils are approximate and were limited to the sampling schedule prescribed and available topographic data. These boundaries are subject to change upon further investigation.
The topography appearing on the map was a compilation of micro topography data gathered by Michael Baker Engineering and in areas where this level of detail was not available, NCDOT information.
Some pits and boring locations were not verified by survey data.
Not survey accurate.

Dolores M. Chandler
1187
12/13/2010

Chandler
Soil
Corporation
5306 Hwy. 54 West
Chapel Hill, NC 27516
919-932-5008
chandlersoil@earthlink.net

SILVER CREEK BORING LOG							
pit?	#	INDICATOR	SHWT	PEARCHED?	FREE	NOTES	DEPTH
pit	1	NA	10	Y	>48		
b	2	NA	>48	NA	38		
b	3	NA	42	N	>48		
b	4	NA	42	N	>48		
b	5	NA	33	N	>48		
b	6	NA	>48	?	>48		
b	7	NA	>48	?	>48		
b	8	NA	>48	?	44		
b	9	NA	30	N	30		
pit	10	bf8	22	N	?	BURIED A	30
b	11	bf1	25	N	?		
b	12	NA	8-10	Y	>48		
b	13	NA	20	N	?		
b	14	bf8	30	Y	>48	BURIED A	30
b	15	bf8	43	N	43	PLATY	10-14
pit	16	F12	7	Y	>48		
pit	16	F12	20	N	>48		
b	17	NA	27	N	>48		
b	18	NA	16	N	20		
b	19	NA	17	N	>48		
pit	20	NA	23	N	>48		
pit	21	NA	NA	NA	>48	PLATY	7-11
b	22	NA	NA	N	?		
pit	23	NA	37	N	>48	BURIED A	12
b	24	NA	37	N	37		
b	25	f12	3	?	?		
pit	26	bF8	8	N	30	BURIED A, platy	8
b	27	NA	22	Y	33		
b	28	NA	8	N	42		
b	29	look @ 85					
b	29	NA	>12	?	?		
b	30	NA	>12	?	?		
b	31	look @90	5	?	?		
b	32	NA	9	Y	?		
b	33	NA	>12	?	?		
b	34	NA	>12	?	?		
b	35	bf8	10	?	?	BURIED A	10-17
b	36	na	30	N	?		
b	37	NA	14	?	?		
b	38	NA	4	Y	?		
b	39	bf8	9	N	?	BURIED A	9-14
pit	40	F8	15	N	15		
b	41	f8	6	?	na		
pit	42	F8	0	N	18		
b	43	f8	3	?	?		

b	44	na	>12		?		
b	45	na	>12		?		
pit	47	NA	>48	NA	>48		
b	48	f8	2	?	?		
b	49	NA	>26	N	>26		
pit	50	F8	4	Y	NA		
pit	50	F8	14	N	NA		
pit	51	f3	1	N	17		
pit	52	F3	0	N	26		
b	53	f8	0	?	?		
pit	54	F8	0-19	Y	26		
pit	54	f8	23	N	26		
b	55	f8	4	?	?		
b	56	NA	NA		?		
b	57	NA	NA		?		
b	58	NA	NA		?		
pit	59	F8	11	Y			
pit	59	F8	22	N	?		
b	60	f12/f8	6	?	?		
pit	61	bf3	15	N	35	BURIED A	25
b	62	f8	0	?	?		
pit	63	NA	22	Y	>48		
b	64	bf8	30	N	>38	BURIED A	30
b	65	na	15	?	?	BURIED A	15
b	66	bf8	0	?	12	BURIED A	28
pit	67	na	14	N	18	10% mn	5-14
b	68	bf8	40	N	NA	BURIED A	40
b	69	bf8	0	?	20	BURIED A	20
b	70	f8	3	?	?		
pit	71	na	26	N	34	BURIED A	9
b	72	too rocky					
pit	73	NA	3	N	34	BURIED A	34
b	74	bf8	0	?	12	BURIED A	22
pit	75	na	14	N	23	BURIED A	2
b	76	bf8	10	?	?	BURIED A	10-17
b	77	bf8	10	?	?	BURIED A	10-18
pit	78	na	7	N	26		
b	79	na	36	N	30	BURIED A	36
pit	80	NA	10	N	25	BURIED A	36
pit	81	bf3	15	N	30	BURIED A	15
b	82	NA	13	?	NA		
pit	83	F3	6	N	24		
pit	84	NA	>48		>48	rocky	48
pit	85	NA	40	N	>48	PLATY	0-7
b	86	na	NA		na		
pit	87	NA	22	N	32		
b	88	f12	0	?	0		

b	89	f12	8	?	?		
pit	90	F12	0	Y	35		
pit	90	f12	15	N	35		
pit	91	NA	27	N	38	PLATY	0-7
pit	92	NA	27	N	>48		
pit	93	NA	24	N	42		
b	94	NA	NA		?		
pit	95	NA	31	N	46		
b	96	bf8	13	?	?	BURIED A	13
pit	97	Bf3	30	Y	32	BURIED A	30
pit	97	Bf3	30	Y	32	platy	0-8
b	98	na	1	?	>48		
pit	99	NA	>48	NA	43		
b	100	bf8	15		NA	BURIED A	7
b	101	NA	NA		NA	similar to 102	
pit	102	NA	32	N	50		
	103					similar to 102	
	104					similar to 105	
pit	105	NA	31	N	37	PLATY	5-9
b	106	na	>48	NA	>48		
b	107	NA	>18	NA	?		
	108	NA	>12	NA	?		
b	109	NA	>12	NA	?		
b	110	BF8	9	?	NA	BURIED A	9-17
b	111	F8	8	?	?		
pit	112	bf8	26	N	56	BURIED A	40
b	113	NA	>29	NA	>29		
b	114	bf8	20	N	>34	BURIED A	30
b	115	na	>20		?		
pit	116	f8	0-7	Y	23	PLATY	0-7
b	117	NA	>12	NA	?		
pit	118	f3	5-8	Y	29	PLATY	0-5
pit	118	f3	21	N	29		
b	119	NA	21	N	>30		
b	120	na	>30		?	BURIED A	20
b	121	bf8	26	N	>36	BURIED A	26
pit	122	BF3	30	N	38	BURIED A	38
pit	123	NA	12	N	>48	BURIED A	36
pit	124	bf8	34	N	48	BURIED A	34
pit	125	bf12	18	N	30	BURIED A	30
b	126	NA	>16	?	?		
b	127	NA	>12	?	?		
b	128	F8	0	?	?		
pit	129	f12	0-11	Y	20		
pit	129	f12	24	N	20		
b	130	f8	0	?	>12		
pit	131	f8	0-6	Y	>48		

pit	132	na	31	N	38	BURIED A	8-19
b	133	BF12	4	?	?	BURIED A	4-8
b	134	na	0	?	24	BURIED A	16
pit	135	f8	0	N	13		
b	136	F8	2	?	?		
b	137	BF12	25	Y	?	BURIED A	20-25
b	138	f8	6	?	?	similar to 136	
b	139	bf8	22	N	?	BURIED A	22
b	140	f8	2	?	?		
pit	141	f8	4	N	28	rocky	45-48
b	142	f8	2	?	?		
pit	143	f12	7	N	43		
pit	144	na	31	N	36		
pit	145	na	12	Y	35		
b	146	f8	0	N	?		
pit	147	f8	0-10	Y	45		
pit	147	f8	41	N	45		
b	148	NA	>12	NA	?	similar to 144	12
pit	149	f3	0	N	40		
b	151	BF8	26	N	>25	BURIED A	13-16
b	152	NA	19	N	>36		
b	153	BF8	14	N	>26	BURIED A	14-16
b	154	NA	19	N	>27		
b	155	NA	>36		>36		
b	156	NA	32	N	>38		
b	157	NA	>27		>27		
b	158	NA	>12		?		
b	159	NA	>12		?		
b	160	NA	>20		?		

HYDRIC SOIL PITS

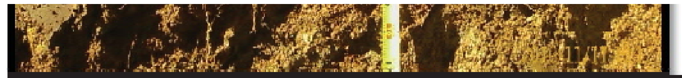
	Depth				Mottle Colors		Redox features				
Pit	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
10	0-6	Ap	5YR	5/8						L	
	6-15	Bt	2.5YR	4/8						SL	Rocks thoughout
	15-22	B	7.5YR	4/6	2.5YR	4/8				SL	
	22-30	B	7.5YR	5/8	2.5YR	4/8				SCL	
					10YR	3/1				SL	
	30-40	2Ag	10YR	3/1	10YR	4/3	>5	Reduced M	pore lining	SL	
					7.5YR	5/6	>5	Concentrat	pore lining	SL	
	40-48	2Bg	10YR	3/2	10YR	3/3		Reduced M	pore lining	SCL	
					2.5YR	4/8		Concentrat	pore lining	SCL	
	Hydric Soil F8*										buried@30"

	Depth				Mottle Colors		Redox features				
Pit	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
26	0-8	Bt	5YR	5/6	10YR	5/4	5	Depletion	pore lining	C	
	8-13	2Ab	10YR	4/2	2.5Y	5/1	>5	Reduced M	matrix	L	
					10YR	4/4	>5	Concentrat	pore lining		
	13-16	CR	7.5YR	4/2	10YR	4/4	>	Depletion	matrix		>50%ROCK, [Mn]
	Hydric Soil F8*										*buried @ 8"

	Depth				Mottle Colors		Redox features				
Pit	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
40	0-15	A	7.5YR	3/4	5Y	4/1	>40	Depletion	pore lining	SCL	na
					5YR	5/6	>40	Concentrat	pore lining		
	Hydric Soil F8										

	Depth				Mottle Colors		Redox features				
Pit	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
42	0-9	A	5Y	4/2	7.5YR	5/6	>40	Concentrat	pore lining	CL	
	9-20	Bw	5Y	3/2				Reduced M	matrix	SL	
	Hydric Soil F8										

	Depth				Mottle Colors		Redox features				
Pit	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
50	0-4	A	2.5Y	5/3	7.5YR	5/6	10	Concentrat	pore lining	SL	
					2.5Y	4/2	10	Depletion	pore lining		
	4-7	Ap	2.5Y	4/3	2.5Y	4/1,4/2	20	Depletion	pore lining	L	
					7.5YR	4/6	20	Concentrat	pore lining		
					10YR	5/1	20	Depletion	pore lining		
	7-14	Bt	7.5YR	4/6	7.5YR	4/4	10	Concentrat	pore lining	SCL	pockets of 40%
	14-18	Bt	7.5YR	4/6	10YR	5/2	20	Depletion	pore lining	SCL	
	18-36	BC	7.5YR	5/6						SL	cobbly
	36-48	Cg	5Y	5/1				Reduced M	matrix	SL	



Hydric Soil F8

Pit	Depth (inches)	Horizon	Matrix Color		Mottle Colors (munsell moist		Redox features %	type	location	Texture	Remarks
52	0-8	A	7.5YR	4/4	2.5Y	4/2,4/3	10	Depletion	pore lining	SL	
	8-16	Bw	2.5Y	4/2	10YR	3/4	>60	Reduced M	pore lining	SL	
					7.5YR	4/6	>60	Concentrat	pore lining		

Hydric Soil F3

Pit	Depth (inches)	Horizon	Matrix Color		Mottle Colors (munsell moist		Redox features %	type	location	Texture	Remarks
54	0-9	A	7.5YR	4/4	2.5Y	4/2,4/3	10	Depletion	pore lining	L	
	9-14	Bw	10YR	4/4	2.5Y	5/2	30	Depletion	pore lining	SL	
					7.5YR	4/6	30	Concentrat	pore lining		[Mn]

Hydric Soil F3

Pit	Depth (inches)	Horizon	Matrix Color		Mottle Colors (munsell moist		Redox features %	type	location	Texture	Remarks
83	0-6	A	7.5YR	5/4	10YR	4/3	<5	Depletion	pore lining	SL	
	6-14	Bw	mottled		2.5Y	5/2	>60	Depletion	pore lining	SCL	
					10YR	5/8	>60	Concentrat	pore lining		

Hydric Soil F3

Pit	Depth (inches)	Horizon	Matrix Color		Mottle Colors (munsell moist		Redox features %	type	location	Texture	Remarks
90	0-8	A	7.5YR	4/6	2.5Y	4/2	30	Depletion	pore lining	SL	
	8-10	Bw	7.5YR	4/6	2.5Y	4/2	50	Depletion	pore lining	SCL	
					5YR	4/6	50	Concentrat	pore lining		
	10-15	Bw	7.5YR	4/6	2.5Y	4/3	30	Depletion	pore lining	SCL	[Mn]
					5YR	4/6	30	Concentrat	pore lining		

Hydric Soil F12

Pit	Depth (inches)	Horizon	Matrix Color		Mottle Colors (munsell moist		Redox features %	type	location	Texture	Remarks
97	0-8	A	7.5YR	5/4						L	
	8-12	Bw	10YR	4/6	7.5YR	5/8				SL	
	12-18	Bt	7.5YR	5/8	10YR	5/8				SCL	
	18-30	C	5YR	5/8	2.5Y	5/2				LS	Sand lenses
	30-40	2Ab	2.5Y	4/2	10YR	5/4	20	Reduced M	pore lining	SL	buried vegitation
	40-48	2Bwb	2.5Y	4/3	7.5YR	5/8	10	Concentrat	pore lining	SL	buried vegitation

Hydric Soil F3* Buried @ 30"

Pit	Depth (inches)	Horizon	Matrix Color		Mottle Colors (munsell moist		Redox features %	type	location	Texture	Remarks
116	0-7	A	2.5Y	5/2	5YR	5/8	>5	Reduced M	pore lining	SL	

	7-18	C	5YR	5/8	10YR	5/6				S	Sandy lenses

Hydric Soil F8

	Depth				Mottle Colors		Redox features				
Pit	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
118	0-5	A	7.5YR	4/9						L	
	5-12	Bw	2.5Y	4/2	7.5YR	4/6	>40	Reduced M	pore lining	L	

Hydric Soil F3

	Depth				Mottle Colors		Redox features				
Pit	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
129	0-4	A	5YR	4/6	7.5YR	4/2	>40	Depletion	pore lining	L	
	4-8	E	10YR	4/2	2.5Y	4/3		Reduced M	pore lining	SL	40% Rock
	8-11	Bw	10YR	4/3	2.5Y	4/2		Depletion	pore lining	L	
					7.5YR	4/6					

Hydric Soil F12

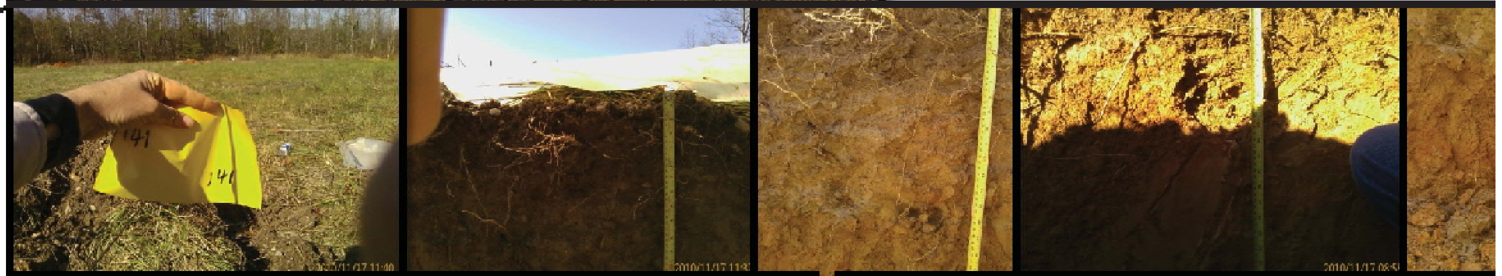
	Depth				Mottle Colors		Redox features				
Pit	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
131	0-6	A	10YR	4/3	10YR	5/2	>40	Depletion	pore lining	SL-SCL	
					2.5Y	4/1	>40	Depletion	pore lining	SL-SCL	
	6-17	C	2.5Y	4/2	7.5YR	5/6	>40	Reduced M	pore lining	S-SL	

Hydric Soil F8

	Depth				Mottle Colors		Redox features				
Pit	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
135	0-4	A	mottled		5YR	5/8	>40	Concentrat	pore lining	SL	
					2.5Y	4/2	>40	Depletion	pore lining	SL	
	4-14	Bw	10YR	4/2	2.5Y	4/1	>40	Reduced M	pore lining	SL	

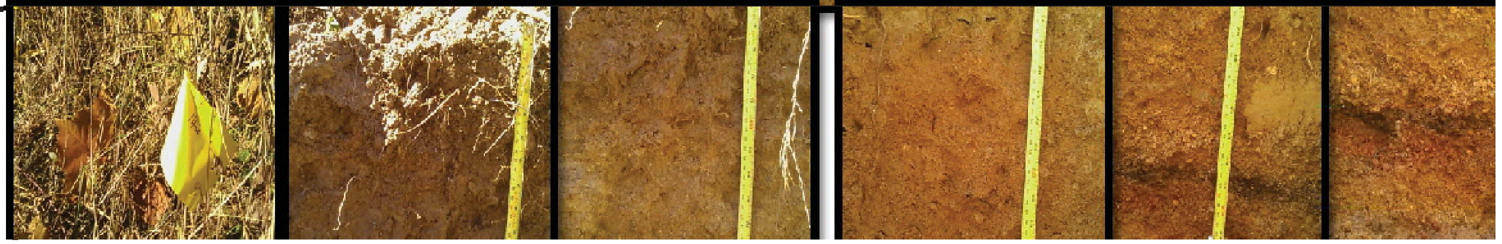
Hydric Soil F8

	Depth				Mottle Colors		Redox features				
Pit	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
141	0-4	A	10YR	3/8						SL	
	4-13	E	2.5Y	3/2	5Y	3/1	>5	Depletion	pore lining	SL	
					7.5YR	5/6	>5	Concentrat	pore lining	SL	



Hydric Soil F8

	Depth				Mottle Colors		Redox features				
Pit	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
143	0-7	A	10YR	3/3						SL	
	7-12	E	2.5Y	4/2	7.5YR	5/6	>40	Reduced M	pore lining	L	



Hydric Soil F12

Pit	Depth (inches)	Horizon	Matrix Color		Mottle Colors (munsell moist		Redox features %	type	location	Texture	Remarks
147	0-10	A	10YR	3/3	2.5Y	6/1	<2	Depletion	pore lining	L	
					2.5Y	4/2	40	Depletion	pore lining	L	
	10-21	E	5YR	5/8	7.5YR	5/6			pore lining	SL	
					10YR	5/6			pore lining	SL	

Hydric Soil F8

Pit	Depth (inches)	Horizon	Matrix Color		Mottle Colors (munsell moist		Redox features %	type	location	Texture	Remarks
149	0-6	A	7.5YR	3/4	10YR	4/2	<2			SL	
	6-17	Bw	mottled		7.5YR	5/8	50	Concentrat	pore lining	SCL	
					2.5Y	5/1	50	Depletion	pore lining		

Hydric Soil F3

HYDRIC BORINGS

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 11	0-28	A, B horizo	5YR	4/6						L, CL	
	28-33	2Ab	2.5Y	2.5/1	2.5Y	3/2	50	Reduced Matrix	matrix	CL	MUCKY MINERAL
	33-44	2Bg	2.5YR	3/2						CL	
	44-48	2BCg	2.5YR	3/2						SL	
	Hydric Soil Indicators:	F1*									buried@28"
	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 14	0-6	Ap	5YR	4/6	2.5YR	4/6				SL	
	6-18	Bt	2.5YR	4/6						SCL	
	18-30	Bt	2.5YR	4/6						SL-SCL	
	30-40	2Ap	10YR	4/6, 4/2	2.5YR	4/6	>5	Concentration	pore lining	L	ROOTS
	40-48	2Bp	7.5YR	5/8						SL-LS	
	Hydric Soil Indicators:	F8*									buried@30"
	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 114	0-3	Ap	10YR	4/4	2.5YR	4/8				SL	
	3-20	Bp	2.5YR	4/8	10YR	4/4				SCL	
	20-34	2Bg	5Y	4/2			80	Reduced Matrix	matrix	C-CL	
	Hydric Soil Indicators:	F8*									buried@20"
	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 139	0-18	Ap	10YR	4/4	2.5YR	4/8				SL	
	18-22	Bp	2.5YR	4/8	10YR	4/4				SCL	
	22-30	2Ap	2.5Y	5/1	5YR	4/4	>5	Depletion	pore lining	SL/SCL/CL	
					2.5YR	4/8		Concentration			
	Hydric Soil Indicators:	F8*									buried@22"
	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 43	0-3	Ap	10YR	3/6	10YR	5/8	10	Concentration	pore lining	SL	
	3-12	BpG	10YR	4/2, 5/2	10YR	5/8	20	Concentration	pore lining	SL-SCL	
					5YR	5/8	20	Concentration	pore lining		
	Hydric Soil Indicators:	F8									
					Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 41	0-6	A	7.5YR	4/4						SL	
	6-12	E	7.5YR	4/4	10YR	3/2	>5	Depletion	pore lining	SL	
	Hydric Soil Indicators:	F8									
					Mottle Colors			Redox features			
boring 36	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
	0-9	A	5YR	4/6	10YR	3/2	30	Depletion	pore lining	SL	
	9-14	E	7.5YR	4/4	10YR	3/2	40	Depletion	pore lining	SL	
	Hydric Soil Indicators:	F8									
					Mottle Colors			Redox features			
boring 53	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
	0-3	A	10YR	4/2	10YR	5/8	60	Concentration	pore lining	SL/SCL	
	3-12	E	10YR	4/4	10YR	3/2	40	Depletion	pore lining	SL/SCL	
	Hydric Soil Indicators:	F8									
	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 62	0-6	Ap	10YR	4/2	5YR	5/8	60	Concentration	pore lining	SL-SCL	
	Hydric Soil Indicators:	F8									

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 64	0-6	Ap									
	6-30	Bp									
	30-32	2Ap	mottled		10YR	/2,5/2,5/8	30	Concentration	pore lining	SL-SCL	
	32-38+	2Bpg									some platy structure
	Hydric Soil Indicators:	F8*									buried @ 30"

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 66	0-28	Ap									
	28-30	2Ap	mottled		10YR	/2,5/2,5/8	30	Concentration	pore lining	SL-SCL	
	30-36+	2Bg									
	Hydric Soil Indicators:	F8*									buried @ 28"

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 69	0-20	Ap									
	20-30	2Ap	mottled		10YR	/2,5/2,5/8	30	Concentration	pore lining	SL-SCL	
	Hydric Soil Indicators:	F8*									buried @ 28"

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 70	0-3	Ap and Bp	10YR	4/4	5YR	5/8				SL	
	3-10	2Apg	mottled		10YR	/2,5/3,6/2	20	Depletion	pore lining	SCL	
					5YR	5/8	20	Concentration	pore lining		
	Hydric Soil Indicators:	F8*									buried@3"

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 74	0-22	Ap and Bp									
	22-32	2Bg	2.5Y	5/1,5/2	5YR	5/8	20	Concentration	pore lining	CL-C	
	Hydric Soil Indicators:	F8*									buried@22"

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 88	0-10	Ap									
	10-14	Bg	10YR	7/2,6/2	5YR	5/8	40	Concentration	pore lining	CL-C	
	Hydric Soil Indicators:	F12									

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 121	0-26	Ap and Bp									
	26-36	2Bg	2.5Y	4/1	5YR	5/8	10	Concentration	pore lining	CL-C	
	Hydric Soil Indicators:	F8*									buried@26"

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 130	0-6	Ap	2.5Y	5/1	5YR	5/8	10	Concentration	pore lining	SL	
	Hydric Soil Indicators:	F8									

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 25	0-3	Ap	7.5YR	4/4	7.5YR	4/3					
	3-9	Ap	7.5YR	4/4	10YR	3/2	40	Depletion	pore lining	SL	
	Hydric Soil Indicators:	F12									

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 55	0-4	Ap	7.5YR	4/4	7.5YR	4/3					
	4-12	Ap	7.5YR	4/4	2.5Y	5/2	40	Depletion	pore lining	SL	
	Hydric Soil Indicators:	F8									

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 48	0-6	Ap	7.5YR	4/4	7.5YR	4/3					
	2-6	Ap	7.5YR	4/4	10YR	5/2	40	Depletion	pore lining	L	
	Hydric Soil Indicators:	F8									

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 60	0-6	Ap	7.5YR	5/8							
	6-11	Ap	7.5YR	5/8	5Y	5/2	40	Depletion	pore lining	SCL	
	Hydric Soil Indicators:	F8									

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 68	0-28	AB									
	28-40	mixed fill									
	40-42	2Ap	7.5YR	4/4	10YR	3/2	30	Depletion	pore lining	CL	
	Hydric Soil Indicators:	F8*									buried @ 40"

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 76	0-10	fill									
	10-17	2Ap	7.5YR	5/4	10YR	4/2	>5	Depletion	pore lining	SL	rocky
	Hydric Soil Indicators:	F8*									buried @ 10"

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 77	0-10	fill									
	10-18	2Ap	7.5YR	5/8	10YR	4/2	>5	Depletion	pore lining	CL	rocky
	Hydric Soil Indicators:	F8*									buried @ 10"

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 96	0-13	fill									
	13-19	2Ap	7.5YR	4/4	10YR	3/2	20	Depletion	pore lining	CL	
	Hydric Soil Indicators:	F8*									buried @ 13"

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 100	0-7	fill									
	7-9	2Ap	5YR	4/4	10YR	4/2	>5	Depletion	pore lining	SL	
					5YR	4/6	>5	Concentration	pore lining	SL	
	Hydric Soil Indicators:	F8*									buried @ 7"

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 89	0-8	Ap	7.5YR	4/4	10YR	3/3	40				
	8-12	Ap	7.5YR	5/6	10YR	4/2	40	Depletion	pore lining	SL	
	Hydric Soil Indicators:	F12									

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 35	0-10	Ap	7.5YR	4/4							
	10-17	Ap	7.5YR	4/4,3/4	10YR	4/3	10	Depletion	pore lining	SL	
					7.5YR	3/1	10	Depletion	pore lining	SL	
	Hydric Soil Indicators:	F8*									buried @10"

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 110	0-9	Ap									
	9-17	2Ap	10YR	5/4	2.5Y	6/2	10	Depletion	pore lining	SL	
	Hydric Soil Indicators:	F8*									buried @9"

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 111	0-8	Ap	10YR	5/6	2.5Y	7/2	>5	Depletion	pore lining	SL	
	Hydric Soil Indicators:	F8									

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 140	2-6	Ap	5YR	5/2	7.5YR	5/8	>5	Concentration	pore lining	CL	
	Hydric Soil Indicators:	F8									

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 146	0-6	Ap	7.5YR	3/3	10YR	3/2	10	Depletion	pore lining	SL	
					5YR	3/1	10	Depletion	pore lining	SL	
	Hydric Soil Indicators:	F8									

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 142	0-6	Ap	5YR	5/2	7.5YR	5/8	>5	Concentration	pore lining	CL	
	Hydric Soil Indicators:	F8									

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 141	0-6	Ap	5YR	5/2	7.5YR	5/8	>5	Concentration	pore lining	CL	
	Hydric Soil Indicators:	F8									

	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 145	2-13	Ap	2.5Y	4/4	10YR	3/2	10	Depletion	pore lining	SL	
					2.5Y	5/2	10	Depletion	pore lining	SL	
	Hydric Soil Indicators:	F8									
	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 129	0-4	Ap	10YR	3/2	7.5YR	5/8	10	Concentration	pore lining	SL	
	Hydric Soil Indicators:	F8									
	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 128	0-6	Ap	10YR	3/2	7.5YR	5/8	10	Concentration	pore lining	SL	
	Hydric Soil Indicators:	F8									
	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 137	0-2	Ap	7.5YR	4/4						SL	
	2-20	Bt	2.5YR	5/8	10YR	4/4				CL	
	20-25	2Ab	10YR	4/4	7.5YR	4/3					
	25-31	BC	10YR	6/6	2.5Y	6/2	40	Depletion	pore lining	CL	
	Hydric Soil Indicators:	F8*									buried@20"
	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 136	0-2	Ap									
	2-10	Ap	7.5YR	5/2	10YR	3/2	10	Reduced Matrix	pore lining	SL	
					2.5Y	6/2	10	Reduced Matrix	pore lining	SL	
	Hydric Soil Indicators:	F8									
	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 133	0-2	Ap									
	2-10	Ap	7.5YR	5/2	10YR	3/2	10	Reduced Matrix	pore lining	SL	
					2.5Y	6/2	10	Reduced Matrix	pore lining	SL	
	Hydric Soil Indicators:	F12*									
	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 138	0-2	Ap									
	2-10	Ap	7.5YR	5/2	10YR	3/2	10	Reduced Matrix	pore lining	SL	
					2.5Y	6/2	10	Reduced Matrix	pore lining	SL	
	Hydric Soil Indicators:	F8									
	Depth				Mottle Colors			Redox features			
	(inches)	Horizon	Matrix Color		(munsell moist		%	type	location	Texture	Remarks
boring 151	0-13										
	13-16	2Ab	7.5YR	4/6	7.5YR	3/2	>5	Depletion	pore lining	SL	
	16-20	2Bt	10YR	5/4	10YR	5/2	>5	Depletion	pore lining	CL	
	20-25	2Bt	10YR	5/4	10YR	6/4				CL	
					7.5YR	4/6					
	Hydric Soil Indicators:	F8*									buried@13"
boring 151	0-13										
	14-16	2Ab	7.5YR	3/3	10YR	4/2	>5	Depletion	pore lining	SL	
	16-22	2Bt	2.5Y	5/3	10YR	3/2	>5	Depletion	pore lining	CL	
					7.5YR	5/6	>5	Concentration	pore lining	CL	
	22-26	2Bt	2.5Y	5/4	10YR	4/2				CL	
					7.5YR	5/6					
	Hydric Soil Indicators:	F8*									buried@14"

20.0 APPENDIX G – NCEEP LETTER TO IRT – DATED MAY 13, 2013

Ecosystem

May 13, 2013

Mr. Todd Tugwell
U.S. Army Corps of Engineers
11405 Falls of Neuse Road
Wake Forest, NC 27587

Re: EEP sites-seven year monitoring

Dear Mr. Tugwell:

At a recent IRT meeting, I presented a list of Full-Delivery sites (9) that EEP had acquired but had forgotten to require seven years of monitoring in the RFP. Currently, these sites are contracted for five years of monitoring for wetlands:

EEP ID	Site	Phase
94151	North Fork Mountain	MY 2
94642	Hermann Dairy	MY 1
94645	Upper Silver Creek	C
94646	Summit Seep	MY 3
94640	Little Troublesome	MY 2
94641	Underwood	MY 1
94643	Lyle Creek	MY 1
94647	Buffalo Flats	MY 2
94648	UT to Town Creek	C

As I stated in the IRT meeting, EEP does not plan to make contractual changes at this time. In the fourth year of monitoring, EEP will decide if the specific site may qualify to close out after five successful monitoring years. For those, EEP will submit to the IRT for early closure. For any of the sites that EEP does not think meet early closeout criteria, EEP will contract out to complete the final two years.

Please contact me with any questions (919-707-8291).

Respectfully,

Jeff Jurek, Operations