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

REPLY TO
ATTENTION OF:

July 14, 2020

Regulatory Division

Re: NCIRT Review and USACE Approval of the NCDMS Lyon Hills Mitigation Site / Wilkes Co./ SAW-2018-01784/ NCDMS Project # 100085

Mr. Tim Baumgartner
North Carolina Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

Dear Mr. Baumgartner:

The purpose of this letter is to provide the North Carolina Division of Mitigation Services (NCDMS) with all comments generated by the North Carolina Interagency Review Team (NCIRT) during the 30-day comment period for the Lyon Hills Draft Mitigation Plan, which closed on May 24, 2020. These comments are attached for your review.

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

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

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

Sincerely,

Kim Browning
Mitigation Project Manager
for Tyler Crumbley

Enclosures

Electronic Copies Furnished:

NCIRT Distribution List
Kelly Phillips, Paul Wiesner—DMS
Jeff Keaton—WEI

MITIGATION PLAN

Final

July 2020

Lyon Hills Mitigation Site
Wilkes County, NC
NCDEQ Contract No. 7620
DMS ID No. 100085

Yadkin River Basin
HUC 03040101

USACE Action ID No. SAW-2018-01784
DWR No. 2018-1274 v1

PREPARED FOR:

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

July 24, 2020

U.S. Army Corps of Engineers
Regulatory Division
Raleigh Field Office
3331 Heritage Trade Drive, Suite 105
Wake Forest, NC 27587

Attention: Kim Browning

Subject: Mitigation Plan Report and Construction Plans
Lyon Hills Mitigation Project, Wilkes County
Yadkin River Basin HUC 03040101
USACE Action ID No. SAW-2018-01784/DWR No. 2018-1274 v1

Dear Kim:

We have reviewed the IRT's comments on the draft mitigation plan for the Lyon Hills Stream Mitigation Site. We have made the necessary revisions to the draft documents and we are submitting revised versions of the documents along with this letter. Below are responses to each of the IRT's comments in your letter dated June 25, 2020. Your original comments are provided below followed by our responses in bold italics.

USACE Comments, Kim Browning:

1. Please include photos of culverts/crossings in monitoring reports.

   I have passed this comment on to the monitoring team who will add the photos to the monitoring reports.

2. Please show location of existing wetlands on Figure 8.

   This revision has been made.

a. Please add a veg plot to the wetland area along UT1.

   We have added a veg plot to the wetland area along UT1. Note that we added a plot rather than move another existing one.

b. It is preferred to move the crossing on UT1 out of the wetland, closer to the confluence.

   We deliberated about the location of this crossing because there is no good place to locate it without creating wetland impacts. We cannot move it closer to the confluence due to the steep slope down to Hanks Branch. There is no way to move it upstream and avoid wetland impacts and have the culvert and road in an appropriate location with a reasonable slope. Despite the wetland impact, it needs to

stay where it is.

3. UT1: The neighbor's existing spring box drainage pipe, and its discharge into the channel, is not permitted within the conservation easement. Please remove.

   The spring box and discharge pipe are located outside of the easement. We are doing work above the easement on an adjacent property (with a temporary construction easement) to tie into a headcut downstream of the culvert and we will leave the spring box and discharge pipe in place.

4. During planting, if species substitutions occur due to availability or refinement, please red-line the As-Built and MY0 report if substitutions occur.

   Any plant substitutions will be noted in the As-Built Report.

5. Table 5 lists five existing invasive species. Please include a performance standard addressing the control of invasive species to less than 5% of the conservation easement.

   We have added this performance standard to Table 20.

6. Section 3.4: Please update with PJD received June 11, 2020. Also, please add discussion regarding work that will be done on (UT1) the adjacent landowner's property in connection with this project.

   The revised PJD is noted in Section 3.4. There is already text describing work that will be done on the neighbor's property in Section 6.6. Text has been added to this section to clarify that the work will be done on the upstream neighbor's property and that Wildlands has a temporary construction easement to do this work.

7. UT4: There is concern that raising the channel bed at the upper end will cause loss of flow. Please add a gauge in the upper 1/3 of the reach.

   We have added a gauge to the upper 1/3 of UT4 as shown in Table 21 and Figure 11.

8. Recommend removing silver maple from the planting list, as it can be invasive.

   The planting plan has been updated including the removal of silver maple.

9. Section 6.7: Please add the target community type and planting window.

   The target community type (mesic mixed hardwood forest) and planting Window (December through April) have been added to Section 6.7.

10. On future planting plans, please add a column that designates whether the species is FAC, FACW, etc.

    A column has been added to the planting plan tables to include the wetland indicator status of each plant.

11. Section 3.8: I appreciate the thoughtfulness of this section. It may be beneficial to add discussion on crossing and culvert maintenance, especially the ford.

    Text describing the monitoring and maintenance of crossings has been added to Section 3.8.

    Table 20: Since several of the reaches are designed as B type channels, please include a performance standard of ER no less than 1.4 for B channels.

    This performance standard has been added to Table 20.

USACE Comments, Casey Haywood:

1. Table 1 Project Information, Project Coordinates- please annotate degrees with symbol

   This revision has been made.

2. Table 2 Add the "0" at the beginning of the 8-digit HUC so that it reflects 8-digits

   This revision has been made.

3. Section 3.1 paragraph 2, 3rd to last sentence "The other tributaries have small watersheds **the** are contained within the project site and adjacent parcels." Please change "the" to "that".

   This revision has been made.

4. Table 3: Drainage Areas and Associated Land Use- Land use source- National Land Cover Database 2011 (NLCD 2011), Multi-Resolution Land Characteristics (MRLC) consortium; why not use the most up to date 2016 NLCD database? Is it much different than 2011?

   We checked the 2016 NLCD and it is no different than 2011, however, we updated the reference in the footnote.

5. Section 3.4 mentions evidence of prolonged saturation within the upper 12 inches of the soil profile; were groundwater gauges installed? Please provide this data if it is available and reference it within the document.

   There are no pre-construction groundwater gauges on site. "Evidence of prolonged saturation within the upper 12 inches of the soil profile" has been replaced with the more common terminology "wetland hydrology indicators" used in delineation.

6. Section 3.6, 1st paragraph, Table 6 is highlighted

   The highlight has been removed.

7. Section 3.7 paragraph 2 typo "These project components are described in Section 4 in terms of goals, objectives, and outcomes for the project and **in in** greater detail as the Section 6 in the project site mitigation plan."

   This revision has been made.

8. Section 3.7 last paragraph, "There is little concern that if the site is properly constructed and maintained that the project goals will not be met." Will or will not be met? Is this a typo?

   This sentence has been rephrased to be clearer.

9. Section 5.2 last paragraph, typo "Wildlands has acquired a temporary construction agreement with this landowner who is **please** that the project will involve fixing the headcut."

   The typo has been corrected.

10. Section 6.6 "The upstream end of the reach will tie into an existing culvert and the bed will be raised somewhat but kept low enough in the valley to allow for neighbor's existing spring box drainage pipe, which currently discharges to the channel, to remain in place **approximately 65** downstream of the culvert." Please add distance, is it 65 feet?

    The sentence now says "65 feet."

11. Table 19 Determination of Credits indicates a bridge crossing on Hanks Branch, reach 2; however, this is not noted in Table 6: Easement Breaks and Crossings. Additionally, Table 19 does not note the internal culvert crossing on Hanks Branch reach 3 as noted in table 6. Are there actually 7

crossings on this site or six? Is there a reason they are not shown on both tables? On figure 8 Concept Map it shows the crossing on Hanks Branch reach 3 but not on reach 2.

The problem was that Table 6 listed the crossing incorrectly as a culvert on Hanks Branch Reach 3 when it is actually a bridge on Hanks Branch Reach 2. These errors in Table 6 have been corrected. Table 19 lists the crossings correctly.

12. Section 12.0 References; please reference the use of the National Land Cover Database 2011 (NLCD 2011) and any other documents mentioned in the document.

The references have been updated.

DWR Comments, Erin Davis:

1. DWR appreciates the high connectivity of the site, as well as the inclusion of stream origins and addition of BMPs. Also, the mitigation plan format made for an efficient review, including the concise text, descriptive tables and photos. The discussions on risks and uncertainties and soil treatment of bench cuts were good to see.

Great. The mitigation plan format was intended to be concise for efficient preparation and review.

2. Page 1, Table 1 – On the DMS comments page 2, a response states the easement area as 20.29 acres. Table 1 specifies 20.72 acres. Please confirm.

The total easement area including internal crossings is 20.72 as stated in Table 1. No revision necessary.

3. Page 9, UT3 – Please include a sentence on the existing condition of UT3 Reach 4.

A sentence summarizing the condition of UT3 Reach 4 has been added.

4. Page 11 & Page 25, UT 4 – The IRT meeting minutes mention a dewatered pond bed within UT4 Reach 1. Is this the area mapped as Wetland Y? Is working within the relic pond bed sediment a concern?

The area you are referring to is Wetland Y. Based on further investigation, we do not think there was a pond in that area. We think that a crossing was established there during the early 90's when it was logged. Pipes were used that were likely too small and they clogged and backed up some water & sediment in that area. Any sediment accumulation within the stream corridor has washed away and will not be an issue.

5. Page 17, Section 5.1 – More than 0.35 acres of wetland is proposed to be permanently impacted by the project, primarily along UT1. The proposed UT1 crossing spans a wide area of existing wetland. Please include an explanation for why this crossing couldn't be located further upstream to reduce wetland impacts.

The culvert was located with consideration of multiple factors including slope of the proposed pipe, existing valley topography, landowner wishes, and wetland impacts. Considering all of these factors, the culvert needs to be located where it is shown on the plans. Text explaining this has been added to Section 5.1.

6. Page 18, Table 10 – Please add "replanting buffer" to Sparks Creek and Hanks Branch R1. Also, please add a row for UT3 Reach 4.

Both of these revisions have been made.

7. Page 24, UT1 – Can you briefly describe the condition of the existing culvert that UT1 will tie into (e.g. adequately sized, perched, partially buried).

The upstream end of UT1 will actually tie into a 2.4-foot high headcut downstream of this culvert and

the text of this paragraph has been changed to clarify this. Some additional information about the culvert has been added.

8. Page 25, UT4 Reach 1 – Echoing DMS question, with the UT4 DWR Stream ID Form score close to the perennial/intermittent threshold, is there a concern that raising the bed will alter the flow regime from perennial to intermittent? DWR may request a flow gauge following the post- construction review.

   We have added a gauge to the upper 1/3 of UT4 as shown in Table 21 and Figure 11.

9. Page 25, UT5 – Has the existing pond sediment been assessed? How will the sediment be handled/reused onsite?

   The pond sediments have not been assessed but will be during construction. A portion of the channel will be built through the dam. It is likely that the material from the pond bottom will be removed along the channel alignment and replaced with material from the dam. This will provide better soil for construction of the channel for the portion that goes through the pond bed. Some sediment may remain in the pond bottom outside of the new channel. These small areas will likely become wetland features. Sediment removed from the pond will be spread on the surrounding pastures. A sentence has been added to this section to describe removing sediment from the pond bed and replacing it with material from the dam.

10. Page 26, Hanks Branch – The IRT meeting minutes' note creating floodplain benches on both sides of Reach 3. Please explain why only a right side floodplain bench is now proposed and how this effects the potential functional uplift.

    We decided to only bench one side of Hanks Branch Reach 3 because the left side is heavily vegetated and we felt it would be better to leave it undisturbed. In addition, the landowner asked that we not clear vegetation on the left side of the stream. The bench on the right side will give the stream floodplain access and will still provide a similar level of uplift.

11. Page 27, Table 19 – The IRT meeting minutes note "improving the buffer by planting native trees" along UT2. However, the existing conditions section describes a mature canopy and Table 10 does not mention replanting. DWR supports a 3:1 ratio for UT2 based on existing conditions and potential functional uplift.

    Upon further assessment of the site, we decided that the only planting that would be feasible for UT2 would be planting understory species. However, we have not had success with understory planting on past projects. We have changed the credit ratio for UT2 to 3:1 which results in a reduction of 5.2 credits. The credit total for the site is now 5,304.783.

12. Page 29, Section 10 – Please define the max. duration between "periodic" inspections.

    It is our understanding that the NC DEQ Stewardship Program conducts inspections every one to three years on closed out projects. This information has been added to Section 10.

13. Figure 6 – Please indicate any existing culvert crossings.

    Existing culvert crossing have been added to Figure 6.

14. Sheet 1.04 – As DMS noted, please address the callout "avoid existing water line". Please assess the condition of the pipe and remove from the easement if possible.

    This pipe is not actually a water line. It is a conduit for electrical wiring that is no longer in use. It will be removed. The call out on the plans has been changed.

15. Sheet 1.08 – Table 10 notes wood being added to Hanks Branch R2, please callout these areas on the design sheet. Also, do the "remove tree" callouts indicate hazard trees not located within the proposed

grading areas?

We added callouts for wood on Hanks Branch Reach 2. "Remove tree" refers to fallen trees or trees likely to fall that we want removed during construction.

16. Sheet 1.09 – Can you please explain why the proposed rock outlet is necessary.

    We plan these to stabilize areas where water accumulates and flows into the channel over the banks. It's very important as these areas will erode if not reinforced. We will use the native rock found on site to construct them.

17. Sheet 1.14 – It would help our review to see the existing channel area proposed to be filled as a shaded feature on the plan view sheets.

    We have shaded the channels to be filled on the plan sheets.

18. Sheets 1.21-1.23 – Please assess the banks along UT3 Reach 2 and Reach 3 that have callouts to "repair trampled stream banks per Engineer's direction" and include specific proposed actions/features in the final design plan.

    We have added callouts for specific locations of bank repairs on the plans.

19. Sheet 2.00 – Either on the design sheet or in the mitigation plan text, please indicate that the proposed BMPs are designed to not require long-term maintenance.

    A sentence has been added to Appendix 10 – Maintenance plan stating that the BMPs are not expected to require maintenance.

20. Sheet 2.01 – Please confirm that the proposed rock sill is being installed over existing bedrock.

    This sill has been removed.

21. Sheets 2.02 & 2.03 – These BMPs are described as ponds in Section 6.6. Are they designed to wet year-round? They are not included in the planting plan, but please confirm at minimum the side slopes will be vegetated. DWR would like to see planting within the BMP ponds if possible.

    These features generally function as "dry ponds" filling to the outlet during large storms but drying out in dry weather. We have added herbaceous plugs to the side slopes and this is now included in the planting plan. If they are observed to hold water most or all of the time, we will install live stakes on the side slopes as well.

22. Sheet 3.0 – Please consider a wetland planting zone replacement species for American Holly, which is FACU. Also, have you had success planting *Helesia tetraptera* in restoration wetland areas? I was not able to identify its wetland indicator status.

    American holly and Carolina silverbell have been removed from the planting plan

23. Design Plans – Please include an overall fencing plan indicating existing and proposed fencing and approximate locations of anticipated gates.

    The fencing plan is included in the revised plans. Gate locations are shown.

    WRC Comments, Travis Wilson:

1. I like the site-specific culvert crossing details shown in the back of the plans. They were also depicted in the plan view, however they were not identified in the plan profiles. For review purposes it is beneficial to record the culvert invert elevations on the profiles as well as the road crossing elevation.

    Culverts are now shown on the profiles.

2. “Outlet stabilization” is shown for each outlet in the plan view detail. A note should be included in this detail to embed the stone into the stream bed substrate. Any outlet protection should function more as an armored plunge pool or bedrock and not a rip rap dissipater pad.

   We have added this note to the plans.

   Please contact me at 919-851-9986 x103 if you have any questions.

   Thank you,

   

   Jeff Keaton, PE
   Project Manager

FINAL MITIGATION PLAN

Lyon Hills Mitigation Site
Wilkes County, NC
NCDEQ Contract No. 7620
DMS ID No. 100085
River Basin
HUC 03040101
USACE Action ID No. SAW-2018-01784

PREPARED FOR:

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

PREPARED BY:

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

July 2020

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

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

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

Contributing Staff:
Jeff Keaton, PE, *Project Manager*
Nicole Macaluso Millns, PE, CFM*, Lead Designer*
John Hutton, *Principal in Charge*
Carolyn Lanza, *Lead Scientist*
Angela Allen, PE, *Lead Quality Assurance*

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APPENDICES

1.0 Introduction

The Lyon Hills mitigation site is in a rural area of the Yadkin River Basin (Cataloging Unit 03040101) in Northeast Wilkes County approximately 11 miles northwest of the Town of Elkin at coordinates 36.32924 degrees N and 81.01018 degrees W (Figure 1). The site is on an active cattle farm in the foothills of the Blue Ridge Mountains. The site is very near the break between the Piedmont and mountain physiographic regions but is technically in the Piedmont. The proposed project will include restoration and enhancement of a network of streams on the property that range in drainage area from four acres to 9.58 square miles. These include a portion of Sparks Creek, Hanks Branch (tributary to Sparks Creek), and five unnamed tributaries to Hanks Branch; four of which originate within the project limits. Restoration will be performed on 3,192 LF of stream and enhancement will be performed on 6,600 LF of stream. Three stormwater treatment best management practices (BMPs) will also be constructed on the site. The outcomes of the project will include significant ecological improvements to the streams and riparian zones on the project site. The project will provide 5,309.983 cool water stream credits. Table 1 shows the basic project information.

The Lyon Hills Mitigation Site was instituted via NCDEQ-DMS RFP # 16-007406. As approved by the NCIRT, all projects contracted under the 16-007406 RFP have a cool or warm service type. Penalties will not be assessed for using these project mitigation credits to satisfy cool or warm requirements.

Table 1: Project Background Information

Project Information	
Project Name	Lyon Hills Mitigation Site
County	Wilkes
Project Area (acres)	20.72
Project Coordinates (latitude and longitude)	36.32924° N, 81.01018° W
Planted Acreage (Acres of Woody Stems Planted)	9.8

2.0 Watershed Approach and Site Selection

The site was selected for development as a mitigation project due to the potential to offset documented stressors within the watershed. Sparks Creek and its tributaries are located within the East Prong Roaring River 12-digit HUC (030401010405). The site is within a targeted local watershed (TLW) but is not in a local watershed planning (LWP) area. The HUC is described in the 2009 Upper Yadkin Pee-Dee River Basin Restoration Priorities (RBRP) document (NC DMS, 2009). According to the RBRP, agricultural land use, including 30 animal operations, is a major stressor to aquatic resources in the lower portion of the HUC. Degraded riparian buffers is also noted as a significant stressor. Stressors described for the 8-digit CU include erosion and sedimentation (including erosion from pasture lands) which lead to aquatic habitat degradation. Turbidity and fecal coliform bacteria violations have been documented across the CU. The RBRP lists primary watershed restoration goals including the improvement of water quality and aquatic habitat in impaired stream segments, implementation of stream and riparian buffer restoration and enhancement, and implementation of agricultural and water quality BMPs to limit sediment, nutrient, and fecal coliform contributions to streams from active farming operations.

The site (Figure 2) is located in DWR Subbasin 03-07-01. The 2008 Yadkin Pee-Dee River Basinwide Water Quality Plan (NC DWR, 2008) indicates that fecal coliform concentrations often exceeded the maximum regulatory limit in the CU which creates a potential health risk. The plan also notes major

stressors in the Yadkin River Basin include excessive sedimentation and changes in hydrology and geomorphology due to urban development and agriculture. Agriculture was identified in the plan as the most significant stressor leading to water quality degradation in the Yadkin river basin.

3.0 Baseline and Existing Conditions

3.1 Watershed Conditions

The project watersheds (Figure 3) are drained by a dense, dendritic network of streams typical for the North Carolina Piedmont. The landscape throughout the area is hilly and valleys of smaller streams tend to be narrow, often with steep side slopes. Larger streams such as Sparks Creek have well defined, meandering floodplains. Table 2 summarizes the overall project watershed information.

Table 2: Project Watershed Summary Information

Project Watershed Summary Information			
Physiographic Province		Piedmont	
River Basin		Yadkin	
USGS Hydrologic Unit 8-digit	03040101	USGS Hydrologic Unit 14-digit	03040101060030
DWR Sub-basin		03-07-01	
Project Drainage Area (acres)		6,131	
Project Drainage Area Percentage of Impervious Area		<1%	
CGIA Land Use Classification		66% forested, 22% agriculture, 2% herbaceous/grassland, 6% developed, 4% shrub/scrub	

The watershed of Sparks Creek extends to the north of the project site and into the Blue Ridge Mountains near Stone Mountain State park. The watershed is very rural with the major land uses being forest and agriculture. The northern perimeter of the watershed is mountainous topography (Figure 4) with elevations ranging up to 3,065 feet MSL. The mountain slopes in this portion of the watershed are steep and completely forested. The central portion and southern perimeter of the watershed are lower in elevation (1,150 to 1,650) and include both large wooded tracks and several large agricultural areas, mostly pasture lands. There are a few chicken houses in the lower watershed and sparse residential development throughout the central and southern portions. There are no large developments or towns.

The watersheds of the other project reaches are much smaller and have a lower range of elevations (1,160 feet to 1,560 feet). The Hanks Branch watershed is the largest of the remaining project streams and extends to the east from the project site. This watershed is largely forested but has some areas that have been cleared for pasture and row crops and some single-family residences. The UT2 watershed borders the Hanks Branch watershed to the south. This watershed is mostly cleared and used for pasture and row crops but the riparian zones along the creek and its tributaries are wooded. The other tributaries have small watersheds that are contained within the project site and adjacent parcels. These watersheds are mostly pastureland though many of the riparian corridors are wooded. Drainage areas and land cover classifications are included in Table 3 below.

The land cover throughout the project watersheds has remained very similar for at least the past 30 years. Some clearing was performed on a large tract of land just north of the project site around 2008, including denuding of the riparian zones. Some of the channels have likely been straightened and/or deepened but there is no evidence of significant hydrologic alterations such as redirecting streamflow. The major watershed disturbances have included the original clearing of land and conversion to pasture or other agricultural uses decades ago, some road building, and the typical impacts related to grazing

livestock and allowing livestock access to streams and riparian corridors. Due to the location and rural nature of the project watersheds along with the consistency in land cover over several decades, there is no reason to think land cover change within the watersheds will impact the project.

Table 3: Drainage Areas and Associated Land Use

Reach Name	NC DWR Stream Identification Form Scores	Intermittent/ Perennial Status	Watershed Area (acres)	Watershed Area (sq. mi.)	Land Use[1]
Sparks Creek	42.5	Perennial	6,131	9.58	66% Forested, 22% Agriculture, 2% Herbaceous/Grassland, 6% Developed, 4% Shrub/Scrub
Hanks Branch	41.5	Perennial	669	1.05	46% Forested, 40% Agriculture, 2% Herbaceous/Grassland, 7% Developed, 5% Shrub/Scrub
UT1	40.75	Perennial	37	.06	36% Forested, 53% Agriculture, 2% Herbaceous/Grassland, 9% Developed
UT2	34.5	Perennial	231	.36	48% Forested, 43% Agriculture, 2% Herbaceous/Grassland, 5% Developed, 2% Shrub/Scrub
UT3	36	Perennial	46	.07	19% Forested, 68% Agriculture, 6.5% Developed, 6.5% Shrub/Scrub
UT3A	31.5	Perennial	5	.007	100% Agriculture
UT4	30.5	Perennial	12	.02	3% Forested, 97% Agriculture
UT5	35.5	Perennial	13	.02	5% Forested, 95% Agriculture
UT5A	30.5	Perennial	5	.006	10% Forested, 90% Agriculture

1. Land Use Source – National Land Cover Database 2016 (NLCD 2016), Multi-Resolution Land Characteristics (MRLC) consortium, https://www.mrlc.gov/data/nlcd-2016-land-cover-conus

3.2 Geology and Soils

3.2.1 Geology

The Site is located in the Blue Ridge Belt of the Piedmont physiographic province. The Blue Ridge Belt is composed of sedimentary and metamorphic rocks. The underlying geology of the site and most of the watersheds is the Alligator Back Formation which are Late Proterozoic aged rocks primarily consisting of gneiss and secondary geology consisting of conglomerate (NCGS, 1985). Gneiss geologic units are foliated rock formed by regional metamorphism and conglomerate geologic units are coarse-grained clastic sedimentary rock. A portion of the Sparks Creek watershed is underlain by quartz diorite to granodiorite formation of Devonian age. These rocks are igneous intrusive rocks of felsic composition.

3.2.2 Soils

Project area soils are described below in Table 4. Figure 5 provides a soil map of the Site.

Table 4: Project Soil Types and Descriptions

Soil Name	Description
CoA – Codorus loam	These somewhat poorly drained to moderately well drained soils form in recently deposited alluvial sediment on floodplains. Texture is loamy throughout the soil profile and saturated hydraulic conductivity is moderately high to high.
DoA – Dan River and Comus Soils	Dan River and Comus series soils are well drained alluvial soils found on floodplains. Both have loamy texture in all horizons and have high saturated hydraulic conductivity.
DpC2 – Danripple sandy clay loam	These soils are formed of old alluvium and located on stream terraces and low hill slopes. Danripple is well drained with high saturated hydraulic conductivity but has an argillic horizon.
FaD/FcC2 – Fairview sand loam and Fairview sandy clay loam	The Fairview series is formed of residuum on upland hillslopes and ridges. These soils have an argillic horizon but are well drained with high to moderately high saturated hydraulic conductivity.
RdE – Rhodhiss fine sandy loam	These soils are located on piedmont hillslopes and ridges and are formed of residuum. They are well drained with moderately high to high saturated hydraulic conductivity and have an argillic horizon.

Source: *Soil Survey of Wilkes County, North Carolina, USDA-NRCS,* https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

3.3 Existing Stream Conditions

Most of the streams on the project site are small, first or second order streams with the exception of Sparks Creek, Hanks Branch, and UT2. Hanks Branch flows across the southern edge of the site and joins Sparks Creek at the southwestern corner. UT5 drains to Sparks Creek. The other project streams drain to Hank's Branch and, except for UT2, flow south across the site (Figure 6). Approximately 85 head of cattle are typically grazed on the site and have access to all of the project streams. The streams are used as water sources for the cattle and the wooded riparian areas are used for shade. The continual cattle access has led to bank erosion, trampling of bed features, fining of substrate material, animal waste in the streams, and reduced habitat quality. Several of the tributaries to Hanks Branch have active head cuts or nick points arrested by tree roots or bedrock features indicating that vertical incision is occurring. As this incision has occurred, the affected channels have become deeply entrenched. Hanks Branch has been impacted by recent high flow events, including large storms in 2018. A culvert crossing was destroyed, and bank erosion has become more severe in a few isolated locations. Figure 6 shows the existing stream features on the site. The stream assessment forms are located in Appendix 1. Surveyed cross sections of existing streams are included in Appendix 2. The following sections include information about the specific reaches.

Sparks Creek

Sparks Creek on the project site is generally vertically and laterally stable. The major stressor to this reach is cattle access to the entire reach. Cattle routinely use it for water and shade. A 20-30 foot mature hardwood canopy lines Sparks Creek.

Reach Summary Information	
Parameters	**Sparks Creek**
Length of Reach (Linear Feet)	994 (on site)
Valley confinement (Confined, moderately confined, unconfined)	Unconfined
Drainage area (acres)	6,131
Perennial, Intermittent, Ephemeral	Perennial
NCDWR Water Quality Classification	C
Stream Classification (Existing and Proposed)	C4/C4
Evolutionary Trend	I
FEMA zone Classification	AE

Hanks Branch

Hanks on the project site is generally vertically and laterally stable. Cattle routinely access Reaches 1 and 2 for water and shade. It does not appear that cattle access Reach 3 as much but Reach 3 is very incised (bank height ratio is 4.6). There are some isolated areas of lateral instability, primarily on Reach 2. The culvert on Reach 2 was destroyed during the storms of Fall 2018. Bank erosion in the vicinity of the culvert became significantly worse during this period. Reach 3 of Hanks Branch is very deep (over 5.5 feet) and narrow (bankfull width is 13.0 feet) and appears to have been channelized. The wooded buffer along much of the right bank of Hanks Branch has been removed or is now very narrow (20 to 25 feet wide). The buffer along the left bank of Reaches 1 and 2 is intact, extending 300 or more feet. The buffer along the left bank of Reach 3 is very narrow.

Reach Summary Information			
Parameters	**Hanks Branch Reach 1**	**Hanks Branch Reach 2**	**Hanks Branch Reach 3**
Length of Reach (Linear Feet)	1,678	1,125	581
Valley confinement (Confined, moderately confined, unconfined)	Unconfined	Unconfined	Unconfined
Drainage area (acres)	358	565	669.5
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial
NCDWR Water Quality Classification	C	C	C
Stream Classification (Existing and Proposed)	C4/C4	C4/C4	C4/C4
Evolutionary Trend	I	I	I
FEMA zone Classification	X	X	X


Hanks Branch - Reach 1


Hanks Branch – Reach 2


Hanks Branch – Reach 2


Hanks Branch – Reach 3

UT1

UT1 is a small stream with severe impacts and erosion related to cattle trampling. In some sections the channel has been nearly destroyed by trampling. There is a bedrock slide that provides grade control near the midpoint along the length of the stream. There are pockets of wetlands in the floodplain of this stream. The buffer zone along this stream is mostly devoid of trees.

Reach Summary Information	
Parameters	**UT1**
Length of Reach (Linear Feet)	930
Valley confinement (Confined, moderately confined, unconfined)	Unconfined
Drainage area (acres)	37.5
Perennial, Intermittent, Ephemeral	Perennial
NCDWR Water Quality Classification	C
Stream Classification (Existing and Proposed)	B4/B4
Evolutionary Trend	I
FEMA zone Classification	X

UT2

There is only a short section of UT2 on the property that will be included in the project. Cattle have access to this reach, but the damage thus far has not been significant. This stream is buffered by a mature canopy extending the length of the watershed.

Reach Summary Information	
Parameters	**UT1**
Length of Reach (Linear Feet)	78
Valley confinement (Confined, moderately confined, unconfined)	Unconfined
Drainage area (acres)	231.3
Perennial, Intermittent, Ephemeral	Perennial
NCDWR Water Quality Classification	C
Stream Classification (Existing and Proposed)	C4/C4
Evolutionary Trend	I
FEMA zone Classification	X

UT3

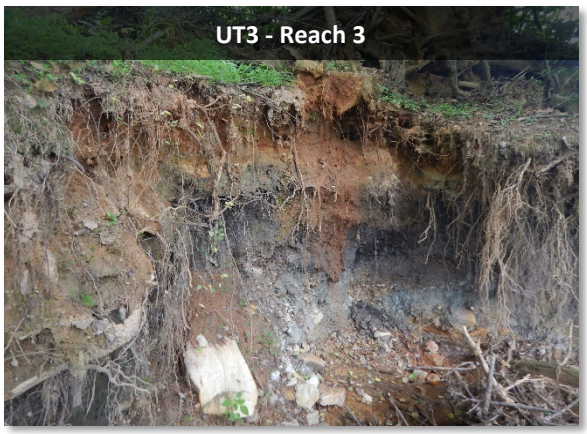
This stream begins on the project property. The watershed is almost entirely on the project property. Cattle have access to the stream and have caused significant damage. Reach 1 is not incised at the upstream end. However, a head cut exists near the downstream end of Reach 1 and below this point, the stream is very incised (bank height ratio is 2.7). Reach 2 also has a head cut. There is exposed bedrock in Reach 2 below the head cut which provides grade control. There is bank erosion and incision along the majority of this stream including some areas of severe erosion on reach 3. Reach 4 is on the Hanks Branch floodplain and has a flatter slope. Most of the damage on this stream is related to cattle access. The buffer zone ranges from a degraded canopy to open pasture.

Reach Summary Information				
Parameters	**UT3 Reach 1**	**UT3 Reach 2**	**UT3 Reach 3**	**UT3 Reach 4**
Length of Reach (Linear Feet)	702	447	691	272
Valley confinement (Confined, moderately confined, unconfined)	Confined	Confined	Confined	Unconfined
Drainage area (acres)	26.8	37.3	46	47.3
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial	Perennial
NCDWR Water Quality Classification	C	C	C	C
Stream Classification (Existing and Proposed)	B4/B4	B4/B4	B4/B4	B4/B4
Evolutionary Trend	IV	IV	IV	IV
FEMA zone Classification	X	X	X	X


UT3 - Reach 1


UT3 – Reach 2


UT3 - Reach 3


UT3 - Reach 3

UT3a

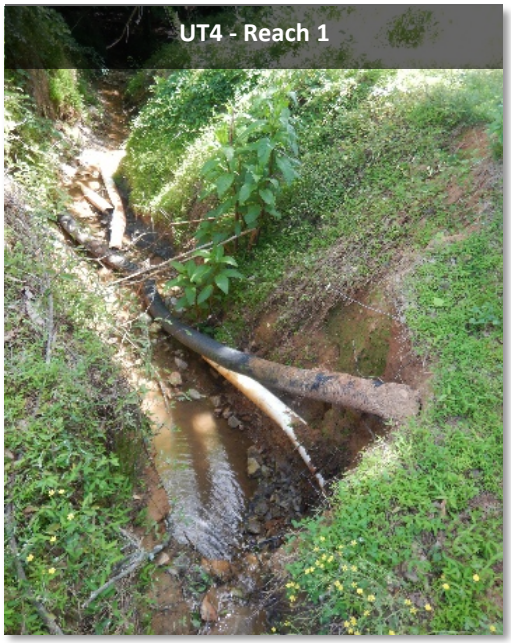
UT3a is a small stream in a deep confined valley. Cattle have access to this stream and have destroyed the stream banks through much of the reach. Large amounts of colluvium have eroded off the hillslopes due to cattle trampling and deposited in the stream. The buffer along this reach is sparse and narrow (approximately 25 feet wide).

Reach Summary Information	
Parameters	**UT3a**
Length of Reach (Linear Feet)	253
Valley confinement (Confined, moderately confined, unconfined)	Confined
Drainage area (acres)	4.9
Perennial, Intermittent, Ephemeral	Perennial
NCDWR Water Quality Classification	C
Stream Classification (Existing and Proposed)	B4/B4
Evolutionary Trend	IV
FEMA zone Classification	X

UT4

UT4 begins on the project property. The watershed is almost entirely on the project property. Most of UT4 is a steep stream (4.4% to 5.3% slope) in a deep, confined valley; however, the downstream end is flatter as it flows across the Hanks Branch floodplain. Cattle have access to this stream and have destroyed the stream banks and bed forms through much of the reach. There are exposed failed drainpipes along the reach. The buffer along most of this reach is sparse and narrow. The buffer is devoid of trees on the downstream end.

Reach Summary Information			
Parameters	**UT4 Reach 1**	**UT4 Reach 2**	**UT4 Reach 3**
Length of Reach (Linear Feet)	237	323	276
Valley confinement (Confined, moderately confined, unconfined)	Confined	Confined	Confined
Drainage area (acres)	7	10.5	12.3
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial
NCDWR Water Quality Classification	C	C	C
Stream Classification (Existing and Proposed)	B5/B5	B4/B4	B4/B4
Evolutionary Trend	IV	IV	IV
FEMA zone Classification	X	X	X

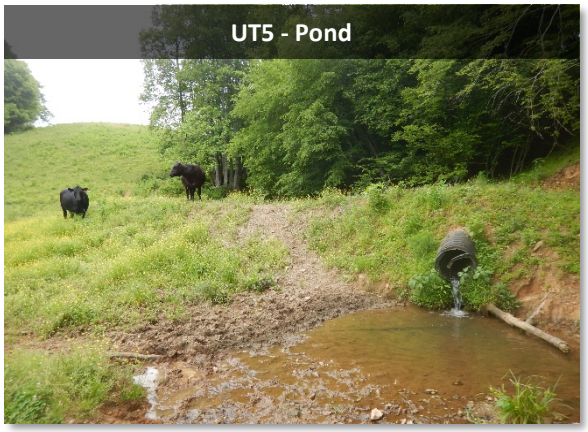


UT5

This stream originates on site and most of the watershed is on the property. Reach 1 of UT5 is a small, steep (channel slope of 8.2%) stream entrenched in a deep, confined valley. Reach 2 is less steep (2.5% slope) than Reach 1 and is not entrenched in a narrow valley but is up against a hill slope on the left side. The right floodplain is open and flat. Cattle have access to this stream and have destroyed the stream banks through much of the reach. There is a small pond at the upstream end of Reach 2 used by cattle for water. The buffer along Reach 1 is wooded and approximately 50 feet on both sides. The buffer along Reach 2 is mostly devoid of trees except for the upstream portion of the reach on the left side.

Reach Summary Information		
Parameters	**UT5 Reach 1**	**UT5 Reach 2**
Length of Reach (Linear Feet)	437	356
Valley confinement (Confined, moderately confined, unconfined)	Confined	Unconfined
Drainage area (acres)	10.9	12.8
Perennial, Intermittent, Ephemeral	Perennial	Perennial
NCDWR Water Quality Classification	C	C
Stream Classification (Existing and Proposed)	B4/B4	B4/C4b
Evolutionary Trend	IV	IV
FEMA zone Classification	X	X


UT5 – Reach 1


UT5 - Pond


UT5 – Reach 2

UT5a

UT5a is a small, steep (9.4% slope) stream in a deep confined valley. Cattle have access to this stream and have destroyed the stream banks through much of the reach. The buffer along this reach is wooded and fairly wide (approximately 50 feet) on both sides.

Reach Summary Information	
Parameters	**UT3a**
Length of Reach (Linear Feet)	318
Valley confinement (Confined, moderately confined, unconfined)	Confined
Drainage area (acres)	4.15
Perennial, Intermittent, Ephemeral	Perennial
NCDWR Water Quality Classification	C
Stream Classification (Existing and Proposed)	B4/B4
Evolutionary Trend	IV
FEMA zone Classification	X

3.4 Existing Wetlands

On May 20-22, 2019, Wildlands investigated the extent of Waters of the United States within the project area. All jurisdictional resources were located by sub-meter accurate GPS or conventional survey. A Preliminary Jurisdictional Determination (JD) has been issued by the U.S. Army Corps of Engineers. The JD and supporting forms are included in Appendix 3.

There are 30 jurisdictional wetland features located within the project area (Figure 6). Jurisdictional wetland features exhibited wetland hydrology indicators, hydric soils, and wetland plant communities. Many of the wetlands are small floodplain benches that have formed within oversized stream channels.

3.5 Existing Vegetation

The site is used for cattle pasture and most of the vegetation on the site consists of herbaceous groundcover such as white clover (*Trifolium repens*), buttercup (*Ranunculus acris*), and dog fennel (*Eupatorium capillifolium*). Portions of the riparian zones are vegetated with narrow strips of deciduous trees and herbaceous undergrowth. The riparian vegetation is shown in Table 5 below by stream.

Table 5: Existing Riparian Vegetation

Scientific Name	Common Name	Sparks Creek	Hanks Branch	UT1	UT2	UT3 / UT3A	UT4	UT5 / UT5A
Acer negundo	Box Elder							X
Acer rubrum	Red Maple	X	X		X	X		X
Aralia spinosa	Devils Walking Stick							X
Carpinus caroliniana	American Hornbeam	X	X			X		X
Celastrus orbiculatus	Oriental Bittersweet*		X	X			X	
Cornus florida	Flowering Dogwood						X	
Fagus grandifolia	American Beech						X	
Festuca arundinacea	Tall Fescue	X	X	X	X	X	X	X
Glechoma hederacea	Ground Ivy	X	X	X	X	X	X	
Ilex opaca	American Holly					X	X	X
Impatiens capensis	Orange Jewelweed		X		X	X		X
Juglans nigra	Black Walnut	X	X					
Juncus spp.	Juncus			X			X	
Juniperus virginiana	Eastern Red Cedar	X	X					
Kalmia latifolia	Mountain Laurel		X		X			
Ligustrum sinense	Chinese Privet*					X	X	
Liriodendron tulipifera	Tulip Poplar		X		X	X		X
Lonicera japonica	Honeysuckle*	X	X	X		X		
Paulownia tomentosa	Princess tree*					X		
Pinus strobus	White Pine		X		X			
Platanus occidentalis	American Sycamore	X	X		X	X		X
Prunus serotina	Black Cherry	X	X			X		
Rosa multiflora	Multiflora Rose*	X	X				X	
Rubus allegheniensis	Blackberry	X	X			X		
Salix nigra	Black Willow					X		
Smilax rotundifolia	Green Brier		X					X
Toxicodendron radicans	Poison Ivy		X					
Tsuga caroliniana	Carolina Hemlock		X		X			X

*Invasive Species

3.6 Utilities, Site Access, and Site Constraints

There are no known utilities on the site. There will be six internal easement breaks for crossings. These are on Hanks Branch, Sparks Creek, UT1, UT3 Reach 3, UT4 Reach 3, and UT5 Reach 2. Table 6 summarizes information about the proposed crossings. Maintenance of crossings will be the responsibility of the landowner once the project is closed by the regulatory agencies (IRT) and transferred to NCDEQ stewardship. The site can be accessed on the southern end of the site from Hanks Street and on the northern end of the site from Lyon Ridge (road). Both of these roads provide direct access to the project properties.

Table 6: Easement Breaks and Crossings

No.	Width (ft)	Location	Internal or External	Crossing Type
1	40	UT1	Internal	Culvert
2	40	UT3 Reach 3	Internal	Culvert
3	40	UT4 Reach 3	Internal	Culvert
4	40	UT5 Reach 2	Internal	Culvert
5	40	Hanks Branch Reach 2	Internal	Bridge
6	40	Sparks Creek	Internal	Ford

3.7 Potential for Functional Uplift and Project Justification

The main stressors on the site are cattle access to streams, removal or narrowing of riparian buffers, runoff from agricultural fields, and some historic channelization of streams. These stressors have led to degraded aquatic habitat; erosion of stream banks; head cutting and disconnection of streams from floodplains; and water quality problems such as sediment and bacteria entering the system from livestock waste, channel erosion and pasture runoff, increases in water temperatures, and decreased dissolved oxygen. These ecological problems are very similar to those described in the watershed planning documents discussed in Section 2 above. These problems will be reduced or eliminated through the following:

- Restoring degraded stream channels to reduce erosion and reconnect streams to floodplains.
- Eliminating bank erosion and associated pollutants.
- Providing grade control in streams to eliminate headcutting.
- Planting riparian buffers to shade streams, help stabilize streams, and filter runoff and overbank flows.
- Installing stormwater BMPs to treat runoff from adjacent pastures.
- Fencing out livestock.
- Protecting the site with a conservation easement.

These project components are described in Section 4 in terms of goals, objectives, and outcomes for the project and in greater detail as the Section 6 in the project site mitigation plan.

The project offers an excellent opportunity for ecological uplift with low risk of failure (Section 3.8 below). Project risks and uncertainties are described in the next section. The risks most likely to cause real problems are all manageable. Therefore, the uplift potential given the site constraints is very high and the project goals will very likely be met if the site is properly constructed and maintained.

3.8 Project Risk and Uncertainties

The level of overall risk on this project is low. Due to the very rural nature of the surrounding area, it is very unlikely that large tracts of land will be developed in the project watersheds. Some of the wooded areas could be cut for timber and/or to create pastureland. The landowner upstream of UT1 informed Wildlands that he has no plans to cut his wooded property. However, any plans for wooded areas of the UT3 or Hanks Branch watersheds are unknown. The Hanks Branch watershed is large (669.5 acres) and it is unlikely that enough of it would be timbered to cause a problem for the project. Foreseeable problems that may arise on the site include easement encroachments, large floods, beaver activity, spreading of invasive species, culverts becoming blocked by debris, and stone washing off roads over culverts and the ford. The main area of concern for easement encroachments will be on the Lyon property adjacent to Reach 3 of Hanks Branch because this is the only area where there will be no fencing adjacent to an area that is routinely mowed. Wildlands will install closely spaced (approximately every 50 feet) easement signs along the boundary in this location and work with the landowner to make

sure they do not mow within the easement. If necessary, Wildlands will install horse tape between the signs to show the easement boundary. Large floods will eventually occur on the site but the grade control structures and bank revetments are designed to handle large flows. While there have been no indications of beaver activity on the site that Wildlands is aware of, there is potential for beaver dams after construction. Wildlands will contract with USDA Animal and Plant Health Inspection Service (APHIS) to remove beaver from the site and dismantle the dams. There are invasive species on the site as noted in Table 5. Wildlands will do pre-construction treatment of these species and will provide ongoing treatments as needed throughout the monitoring period. Culverts will be monitored and blockages will be routinely cleared. Large stone will be used on the crossings, however, if enough stone washes off the roads over culverts or the ford, it will be replaced.

4.0 Goals and Objectives

The overall goal for stream restoration elements of the project is to restore natural/historic functions to degraded stream channels. The overall goal of enhancement reaches is to enhance specific aquatic resource functions. The specific goals and objectives for this mitigation site have been carefully developed so that the project results in 1) alleviation of the specific watershed stressors discussed in Section 2 above and 2) provides maximum ecological uplift to project streams and riparian zones. The goals and objective for this project are described in Table 7 below.

Table 7: Mitigation Goals and Objectives

Goal	Objectives	Expected Outcomes
Improve the stability of stream channels	Construct stream channels that will maintain a stable pattern and profile considering hydrologic and sediment inputs to the system; install bank revetments and grade control; install bank vegetation.	Reduce erosion and sediment inputs; maintain appropriate bed forms and sediment size distribution; support water quality and habitat goals.
Reconnect channels with floodplains and riparian wetlands	Reconstruct stream channels with appropriate bankfull dimensions and depth relative to the existing floodplain.	Reduce shear stress on channel; hydrate adjacent wetland areas and vernal pools; filter pollutants out of overbank flows; provide surface storage of water on floodplain; increase groundwater recharge while reducing outflow of stormwater; support water quality and habitat goals.
Improve instream habitat	Install habitat features such as cover logs, log sills, and brush toes into restored/enhanced streams. Add woody materials to channel beds. Construct a variety of riffle features and pools of varying depth. Fence out livestock.	Support biological communities and processes. Provide aquatic habitats for diverse populations of aquatic organisms.
Improve water quality	Stabilize stream banks. Plant riparian buffers with native trees. Construct BMPs to treat pasture runoff. Fence out livestock.	Reduce sediment and nutrient inputs from stream banks; reduce sediment, nutrient, and bacteria inputs from pasture runoff; keep livestock out of streams, further reducing pollutants in project streams.
Restore/improve riparian buffers	Plant native tree species in riparian zone where currently insufficient.	Provide a canopy to shade streams and reduce thermal loadings; stabilize stream banks and floodplain; support water quality and habitat goals.
Permanently protect the project site from harmful uses	Establish conservation easements on the Site	Ensure that development and agricultural uses that would damage the site or reduce the benefits of the project are prevented.

5.0 Regulatory Considerations

Table 8, below, is a summary of regulatory considerations for the Site. A Categorical Exclusion (included Appendix 4 along with agency correspondence) for the Lyon Hills Mitigation Site was submitted to DMS on November 5, 2018 and approved on November 7, 2018.

Table 8: Project Attribute Table Part 4

Regulatory Considerations			
Parameters	**Applicable?**	**Resolved?**	**Supporting Docs?**
Water of the United States - Section 404	Yes	Yes	PCN[1]
Water of the United States - Section 401	Yes	Yes	PCN
Endangered Species Act	Yes	Yes	Appendix 4
Historic Preservation Act	Yes	Yes	Appendix 4
Coastal Zone Management Act	No	N/A	N/A
FEMA Floodplain Compliance[2]	No	N/A	N/A
Essential Fisheries Habitat	No	N/A	N/A

1. PCN to be provided to DMS with Final Mitigation Plan
2. FEMA boundaries shown on Figure 7

5.1 401/404

Impacts to wetland features are summarized in **Table 9** below. The largest impact is to wetland F due to a culvert crossing in this location. The culvert was located with consideration of multiple factors including slope of the proposed pipe, existing valley topography, landowner wishes, and wetland impacts. The location of the culvert was chosen considering all these factors and is located in the optimal location.

Table 9: Estimated Impacts to Project Wetlands

Jurisdictional Feature	Classification	Acreage	Permanent (P) or Temporary (T)	Type of Activity	Impact Area (acres)
Wetland F	Headwater Forest	0.430	P	Channel Realignment	0.250
Wetland O	Bottomland Hardwood Forest	0.078	P	Channel Realignment	0.078
Wetland R	Headwater Forest	0.013	P	Channel Realignment	0.013
Wetland U	Headwater Forest	0.005	P	Channel Realignment	0.005
Wetland V	Headwater Forest	0.021	T	Floodplain Grading	0.020
Wetland Y	Headwater Forest	0.079	T	Floodplain Grading	0.079
Wetland Z	Headwater Forest	0.004	P	Channel Realignment	0.004
Wetland AA	Headwater Forest	0.004	P	Channel Realignment	0.004

5.2 FEMA Floodplain Compliance and Hydrologic Trespass

Sparks Creek is mapped in Zone AE Special Flood Hazard Area (SFHA) on Wilkes County Flood Insurance Rate Map (FIRM) Panel 4904, as depicted in Figure 7. Hanks Branch and UT5 are located within the mapped Zone AE boundary and flood fringe of Sparks Creek. Base flood elevations are defined for Sparks Creek through the project area. There are no base flood elevations or associated modeling for Hanks Branch or UT5. All other streams within the project limits are located in Zone X. Wildlands will coordinate with the local Floodplain Administrator and the North Carolina Floodplain Mapping program

to make sure that all regulatory requirements are met. It is likely that a floodplain development permit and a technical memo describing the proposed project will be required but that no modeling will be necessary for this project.

There is no concern for hydrologic trespass on adjacent properties as a result of this project. UT3, UT3A, UT4, UT5, and UT5A all begin within the project boundaries. UT1 will be tied into a headcut below an existing culvert at the upstream end on an adjacent landowner's property. Wildlands has acquired a temporary construction agreement with this landowner who is pleased that the project will involve fixing the headcut. Due to the slope of the stream the project will not backup water through this culvert except possibly in extreme flood events. The enhancement section on Hanks Branch will not involve raising the stream bed, and in fact will include cutting a floodplain bench. There is no chance of the project causing hydrologic trespass upstream on Hanks Branch or UT2. Sparks Creek is enhancement II only. Due to the slopes of the streams and valleys, there is not possibility of creating wetlands on upstream properties.

6.0 Design Approach and Mitigation Work Plan

6.1 Design Overview

The design for this mitigation site was developed to maximize the potential uplift described in Section 3.7 above. The approaches for each reach were initially devised by Wildlands but some approaches were modified as a result of IRT input during the post-contract site walk that was conducted on September 26, 2018. Meeting notes from that site walk are included in Appendix 5. Three approaches will be used for the project reaches including stream enhancement I, stream enhancement II, and stream restoration. The least amount of manipulation will be performed on the enhancement II reaches. Enhancement II activities will primarily consist of fencing out livestock, planting riparian buffer zones, and repairing localized bank erosion/instability. Enhancement I activities will include fencing out livestock, planting riparian buffer zones, adding structure to the bed, and cutting a floodplain bench to allow flows higher than the design bankfull discharge to access the floodplain. Restoration will involve the most extensive manipulation and activities will include rebuilding the channel with the appropriate dimensions, plan view pattern, and profile to transport the water and sediment loads. Bed features including riffles, pools, cascades, and step-pool sequences will be constructed. The cascades and step-pool sequences are necessary due to the high slopes of many of the design reaches. Grade control structures such as log sills will be added to the beds and brush toes and log vanes will be used to protect restored stream banks. Restored reaches will be reconnected with their floodplains by raising the channel beds. Livestock will be fenced out and riparian buffer zones will be planted. The entire project area will be protected by a conservation easement. Specific mitigation activities are listed below by reach in Table 10. Figure 8 is an overview of the site design.

Table 10: Stream Stressors and Restoration Approach

Project Reach	Primary Stressors/Impairments	Approach	Mitigation Activities
Sparks Creek	Cattle access	EII	Fencing out cattle, replanting buffers, protecting with conservation easement
Hanks Branch R1	Cattle access	EII	Localized bank repairs, creating floodplain bench at upstream end, fencing out cattle, protecting with conservation easement
Hanks Branch R2	Cattle access, areas of lateral instability, lack of buffer on right floodplain	EII	Fencing out cattle, bank repairs where needed, add wood to channel, replanting buffers, protecting with conservation easement

Project Reach	Primary Stressors/Impairments	Approach	Mitigation Activities
Hanks Branch R3	Channelization, incision, sparse/narrow buffers	EI	Fencing out cattle, creating floodplain bench, replanting buffers, protecting with conservation easement
UT1	Severe erosion and cattle trampling, poor buffer quality/lack of buffer	R	Restoring dimension, pattern, and profile, replanting buffers, protecting with conservation easement
UT2	Cattle access	EII	Fencing out cattle, protecting with conservation easement
UT3 R1	Cattle access, active head cutting and incision, bank erosion, poor buffers	R	Restoring dimension, pattern, and profile, replanting buffers, protecting with conservation easement
UT3 R2	Cattle access, some incision, poor buffers	EII	Fencing out cattle, replanting buffers, localized bank repairs, protecting with conservation easement
UT3 R3	Cattle access, incision, bank erosion, poor buffers	R	Restoring dimension, pattern, and profile, replanting buffers, protecting with conservation easement
UT3 R4	Cattle access, poor buffers	EII	Fencing out cattle, replanting buffers, protecting with conservation easement
UT3A	Cattle access, some incision, poor buffers	EII	Fencing out cattle, replanting buffers, protecting with conservation easement
UT4 R1	Cattle access, incision, bank erosion, poor buffers	R	Restoring dimension, pattern, and profile, replanting buffers, protecting with conservation easement
UT4 R2	Cattle access, some incision, poor buffers	EII	Fencing out cattle, stabilizing head cuts, replanting buffers, protecting with conservation easement
UT4 R3	Severe erosion and cattle trampling, poor buffer quality/lack of buffer	R	Restoring dimension, pattern, and profile, replanting buffers, protecting with conservation easement
UT5 R1	Cattle access, incision	EII	Fencing out cattle, protecting with conservation easement
UT5 R2	Severe erosion and cattle trampling, poor buffer quality/lack of buffer, impoundment	R	Restoring dimension, pattern, and profile, replanting buffers, removing impoundment, protecting with conservation easement
UT5A	Cattle access, incision	EII	Fencing out cattle, protecting with conservation easement

6.2 Reference Streams

Reference reaches were selected from Wildlands' reference database and other sources to develop the range of design parameters for each of the design streams. References were selected for specific design reaches based on design stream type and similarities in drainage area and physical characteristics. Reference reach information is provided in Table 11. More detailed reference reach geomorphic data are included in Appendix 6. Four additional reference reaches were used along with those in Table 11 to create the reference reach regional curve for the discharge analysis discussed in Section 6.3. Locations of reference reaches are shown on Figure 9.

Table 11: Reference Reach Summary

Design Stream	Hanks Branch	Tributaries				
Reference Reach	**UT to Rocky Creek**	**Shrew Trib A**	**UT to Austin Branch DS**	**Timber Trib R1**	**UT to Kelly Branch**	**UT to Gap Branch**
County	Montgomery	Wilkes	Buncombe	Wilkes	McDowell	Rutherford
Reference Type	Pattern, Profile, Discharge	Pattern, Profile, Discharge	Pattern, Profile, Discharge	Pattern, Profile, Discharge	Pattern, Profile, Discharge	Pattern, Profile, Discharge
Region	Slate Belt	Piedmont	Mountains	Piedmont	Inner Piedmont Belt	Piedmont
Basin	Yadkin	Yadkin	French Broad	Yadkin	Broad River	Broad
Drainage Area (sq. mi.)	1.05	0.02	0.12	0.04	0.08	0.04
Stream Type	E4b	A5	B4a	B4	B4/B4a	B4a
Bkf Q (cfs)	85	3.5	27.3	17	23	18.7
Sinuosity	1.1	1.2	1.2	1.1	1.2	1.1
Valley Slope (ft/ft)	0.03	0.05	0.05	0.04	0.049	-
Channel Slope (ft/ft)	0.02	0.03-0.065	0.04	0.03	0.03-0.065	-
D50 (mm)	2.2	2	59	6.5	-	19

6.3 Design Discharge Analysis

Multiple methods were used to estimate bankfull discharges for restoration reaches including regional curve data (Harman et al. 2003 and Walker, unpublished), a regional flood frequency analysis using U.S. Geological Survey (USGS) gage sties, and reference reach data. The methods were compared, and a design discharge was selected based on the results of the different methods. Slightly larger design discharges relative to drainage areas were established for the small tributaries to drive designs of slightly larger channels for these reaches. This will help prevent filling of channels and clogging with vegetation after construction. Results of each method and the final design discharges are shown in Table 12 and illustrated in Figure 10.

Table 12: Summary of Design Bankfull Discharge Analysis

Discharge Estimate Method		Hanks Branch R3 (669.5 ac)	UT1 (37.5 ac)	UT3 R1 (26.8 ac)	UT3 R3 (45.9 ac)	UT4 R1 (7.0 ac)	UT4 R3 (12.3 ac)	UT5 R2 (12.8 ac)
NCSU Rural Piedmont Regional Curve (cfs)		92.0	11.0	9.0	13.0	3.4	5.1	5.3
NRCS Piedmont/Mountain Regional Curve		58.0	6.0	5.0	7.0	2.0	2.0	3.0
Regional Flood Frequency Analysis (cfs)	**1.2-year event**	80.0	10.0	8.0	11.0	3.0	4.0	4.0
	1.5-year event	114.0	14.0	11.0	16.0	4.2	6.3	6.5
Reference Reach Regional Curve (cfs)		94.0	15.0	13.0	18.0	5.4	7.7	7.9
Final Design Q		**85**	**13**	**10**	**15**	**4**	**6**	**6**

6.4 Design Channel Morphological Parameters

Reference reach data and designer experience were used to develop design morphologic parameters for each of the enhancement I and restoration reaches. Key morphological parameters are summarized in Tables 13-17. Complete design morphological parameters are included in Appendix 6.

Table 13: Summary of Design Morphologic Parameters for UT1

Parameter	Existing Parameters	Reference Parameters					Proposed Parameters
	UT1	UT to Kelly Branch	Shrew Trib A	UT to Austin Branch DS	Timber Trib R1	UT to Gap Branch	UT1
Contributing Drainage Area (acres)	37.5	51.2	12.8	76.8	25.6	76.8	37.5
Channel/Reach Classification	B4	B4/B4a	A5	B4a	B4	B4a	B4
Design Discharge Width (ft)	7.2	7.9	3.6	6.2	8.9	6.2	6.6
Design Discharge Depth (ft)	1.2	1.1	0.5	1.2	0.7	1.0	0.7
Design Discharge Area (ft^2)	3.8	5.7	1.1	4.4	4.6	3.8	3.2
Design Discharge Velocity (ft/s)	3.5	5.9	3.3	6.2	3.7	5.0	4.1
Design Discharge (cfs)	13.2	23.0	3.5	27.3	17.0	18.7	13
Channel Slope (ft/ft)	0.051	0.065	0.063	0.040	0.033	0.068	0.053
Sinuosity	1.1	1.2	1.1	1.2	1.1	-	1.05
Width/Depth Ratio	13.5	10.9	12.1	8.8	17.0	10.1	14
Bank Height Ratio	1.7	2.5	1.0	1.0	1.0	1.0	1
Entrenchment Ratio	6.7	1.2	2.1	4.3	1.5	-	>1.4
d50 (mm)	15.4	-	2.0	59.0	6.5	19.0	-

Table 14: Summary of Design Morphologic Parameters for UT3

Parameter	Existing Parameters		Reference Parameters					Proposed Parameters	
	UT3 Reach 1	UT3 Reach 3	UT to Kelly Branch	Shrew Trib A	UT to Austin Branch DS	Timber Trib R1	UT to Gap Branch	UT3 Reach 1	UT3 Reach 3
Contributing Drainage Area (acres)	26.8	45.9	51.2	12.8	76.8	25.6	76.8	26.8	45.9
Channel/Reach Classification	B4	B4	B4/B4a	A5	B4a	B4	B4a	B4	B4
Design Discharge Width (ft)	7.3	6	7.9	3.6	6.2	8.9	6.2	5.9	6.8
Design Discharge Depth (ft)	0.6	1	1.1	0.5	1.2	0.7	1.0	0.5-0.7	0.6-0.8
Design Discharge Area (ft^2)	3.1	5.7	5.7	1.1	4.4	4.6	3.8	2.7	3.5
Design Discharge Velocity (ft/s)	4.9	5.7	5.9	3.3	6.2	3.7	5.0	3.8	4.3
Design Discharge (cfs)	15	27.5	23.0	3.5	27.3	17.0	18.7	10	15
Channel Slope (ft/ft)	0.056	0.039	0.065	0.063	0.040	0.033	0.068	0.040	0.042
Sinuosity	1.02	1.03	1.2	1.1	1.2	1.1	-	1.1	1.05

Parameter	Existing Parameters		Reference Parameters					Proposed Parameters	
	UT3 Reach 1	UT3 Reach 3	UT to Kelly Branch	Shrew Trib A	UT to Austin Branch DS	Timber Trib R1	UT to Gap Branch	UT3 Reach 1	UT3 Reach 3
Width/Depth Ratio	17.5	7.5	10.9	12.1	8.8	17.0	10.1	13	13
Bank Height Ratio	2.7	2.6	2.5	1.0	1.0	1.0	1.0	1.0	1
Entrenchment Ratio	1.4	1.4	1.2	2.1	4.3	1.5	-	>1.4	>1.4
d50 (mm)	11	27.6	-	2.0	59.0	6.5	19.0	-	-

Table 15: Summary of Design Morphologic Parameters for UT4

Parameter	Existing Parameters		Reference Parameters					Proposed Parameters	
	UT4 Reach 1	UT4 Reach 3	UT to Kelly Branch	Shrew Trib A	UT to Austin Branch DS	Timber Trib R1	UT to Gap Branch	UT4 Reach 1	UT4 Reach 3
Contributing Drainage Area (acres)	7	12.3	51.2	12.8	76.8	25.6	76.8	7	12.3
Channel/Reach Classification	B5	B4	B4/B4a	A5	B4a	B4	B4a	B4	B4
Design Discharge Width (ft)	6.2	7.3	7.9	3.6	6.2	8.9	6.2	4.0	4.9
Design Discharge Depth (ft)	0.5	0.3	1.1	0.5	1.2	0.7	1.0	0.4-0.5	0.4
Design Discharge Area (ft^2)	3.1	1.8	5.7	1.1	4.4	4.6	3.8	1.3	1.9
Design Discharge Velocity (ft/s)	5.1	3.1	5.9	3.3	6.2	3.7	5.0	3.3	3.3
Design Discharge (cfs)	15.5	5.6	23.0	3.5	27.3	17.0	18.7	4	6
Channel Slope (ft/ft)	0.053	0.044	0.065	0.063	0.040	0.033	0.068	0.049	0.037
Sinuosity	1.1	1	1.2	1.1	1.2	1.1	-	1.05	1.05
Width/Depth Ratio	12.5	29.1	10.9	12.1	8.8	17.0	10.1	13	13
Bank Height Ratio	1.7	2.3	2.5	1.0	1.0	1.0	1.0	1	1
Entrenchment Ratio	1.2	1.2	1.2	2.1	4.3	1.5	-	>1.4	>1.4
d50 (mm)	0.1	20.6	-	2.0	59.0	6.5	19.0	-	-

Table 16: Summary of Design Morphologic Parameters for UT5

Parameter	Existing Parameters	Reference Parameters					Proposed Parameters
	UT5 Reach 2	UT to Kelly Branch	Shrew Trib A	UT to Austin Branch DS	Timber Trib R1	UT to Gap Branch	UT5 Reach 2
Contributing Drainage Area (acres)	12.8	51.2	12.8	76.8	25.6	76.8	12.8
Channel/Reach Classification	B4	B4/B4a	A5	B4a	B4	B4a	C4b
Design Discharge Width (ft)	5.4	7.9	3.6	6.2	8.9	6.2	5.0

Parameter	Existing Parameters	Reference Parameters					Proposed Parameters
	UT5 Reach 2	UT to Kelly Branch	Shrew Trib A	UT to Austin Branch DS	Timber Trib R1	UT to Gap Branch	UT5 Reach 2
Design Discharge Depth (ft)	0.6	1.1	0.5	1.2	0.7	1.0	0.4
Design Discharge Area (ft^2)	2.2	5.7	1.1	4.4	4.6	3.8	1.9
Design Discharge Velocity (ft/s)	4.1	5.9	3.3	6.2	3.7	5.0	3.2
Design Discharge (cfs)	9	23.0	3.5	27.3	17.0	18.7	6
Channel Slope (ft/ft)	0.025	0.065	0.063	0.040	0.033	0.068	0.028
Sinuosity	1.1	1.2	1.1	1.2	1.1	-	1.2
Width/Depth Ratio	13	10.9	12.1	8.8	17.0	10.1	13
Bank Height Ratio	1.7	2.5	1.0	1.0	1.0	1.0	1
Entrenchment Ratio	2.1	1.2	2.1	4.3	1.5	-	2.2-5.0
d50 (mm)	15.7	-	2.0	59.0	6.5	19.0	-

Table 17: Summary of Design Morphologic Parameters for Hanks Branch

Parameter	Existing Parameters	Reference Parameters	Proposed Parameters
	Hanks Branch Reach 3	UT to Rocky Branch	Hanks Branch Reach 3
Contributing Drainage Area (acres)	669.5	672	669.5
Channel/Reach Classification	C4	E4b	C4
Design Discharge Width (ft)	13	12.2	15.5
Design Discharge Depth (ft)	1	1.8	1.4-1.7
Design Discharge Area (ft^2)	13.4	16.3	17.7
Design Discharge Velocity (ft/s)	5.1	5.5	4.8
Design Discharge (cfs)	68.8	85.0	85
Channel Slope (ft/ft)	0.02	0.024	0.02
Sinuosity	1	1.1	-
Width/Depth Ratio	12.6	9.1	14
Bank Height Ratio	4.8	1.0	1
Entrenchment Ratio	1.2	6.0	2.2-5.0
d50 (mm)	46.1	23.0	-

6.5 Sediment Transport Analysis

A qualitative assessment of sediment supply and sources in the project watershed was performed based on visual inspection and review of historic aerial photos. The watershed assessment indicates that the watershed is stable and there is no reason to believe that land use will change significantly in the foreseeable future, beyond occasional logging. Due to the rural nature of the watershed, the stable land use, and the lack of sediment accumulation in the project streams, the sediment load to the project streams is expected to be low and stable. As a result, design channels are expected to remain stable and pass the sediment delivered from the watershed.

A competence analysis was performed to analyze the ability of the proposed streams to transport the sizes of sediment supplied to them. The results of the competence analysis are shown in Table 18. The competence analysis on these reaches indicates that the reaches will be able to transport the sediment supplied to them by the watersheds.

Table 18: Results of Competence Analysis

	Hanks Branch R3	UT1	UT3 R1	UT3 R3	UT4 R1	UT4 R3	UT5 R2
Abkf (sq ft)	17.7	3.2	2.7	3.5	1.3	1.9	1.9
Wbkf (ft)	15.5	6.6	5.9	6.8	4.0	4.9	5.0
Dbkf (ft)	1.1	0.5	0.5	0.5	0.3	0.4	0.4
Schan (ft/ft)	0.015	0.043	0.040	0.042	0.049	0.037	0.028
Bankfull Velocity (fps)	4.8	4.1	3.8	4.3	3.3	3.3	3.2
Bankfull Shear Stress, t (lb/sq ft)	1.01	1.26	1.10	1.29	0.95	0.86	0.64
Movable particle size (mm)	79	99	87	102	74	67	49
Largest particle from bar sample (mm)	80	50	80	80	72	72	25

6.6 Design Summary

Below are descriptions of the designs for the restoration and enhancement I reaches. Enhancement II reaches will generally include fencing out cattle, planting with native tree species, permanent protection in a conservation easement, and bank repairs where necessary.

UT1

UT1 will be built as a B type stream with the existing tight valley. The alignment will be constructed with little meander pattern, similar to a natural B stream. The upstream end of the reach will tie into a 2.4-foot high headcut downstream of an existing 48-inch metal culvert. The bed will be raised somewhat in this upstream section but kept low enough in the valley to allow for a neighbor's existing spring box drainage pipe, which currently discharges to the channel, to remain in place approximately 65 feet downstream of the culvert. This work at the upstream end will be done with a temporary construction easement on the property of a non-participating neighbor. Downstream of the drainage pipe, the easement begins and the bed will be constructed so that the top of bank is raised to the grade of existing wetlands on the right bank. This will improve wetland hydrology. Beginning at approximately 225 linear feet downstream of the existing culvert, the channel will be tied to existing bankfull benches. For much of the rest of this reach, the channel grade will be established to connect to existing bankfull features or to existing wetlands along both the left and right banks. At approximately 600 feet downstream from the culvert, the channel will be tied into an existing bedrock feature in a meander bend. Downstream of this meander bend there will be a forty-foot internal crossing with a culvert. Beyond the culvert, the channel will tie back into existing bedrock on a very steep grade until the point it ties into Hanks Branch. Rock step-pools and boulder cascades are strategically placed to stabilize very steep sections of channel. Most of the mild meander bends will be protected with brush toe. Approximately 200 feet downstream of the UT1 confluence on Hanks Branch, a step-pool stormwater conveyance BMP will be installed on an existing ephemeral headcut. This BMP feature will treat 3.2 acres of cattle pasture.

UT3 Reach 1

UT3 Reach 1 begins at a natural springhead seep at the upstream end of the existing channel. The upstream tie in has been designed below this springhead. The reach is designed as a B-type stream channel. Below this section, the reach transitions to raise grade to allow the stream to tie to natural, infrequently occurring, stable bankfull bench features throughout Reach 1. A 3-foot wide, bankfull bench will be built on the left side and then transition to a 4:1 slope to tie to existing left floodplain

grade. Fill dirt generated will be used to backfill portions of the oversized existing UT3 channel. Continuing downstream, the channel will be raised to meet existing bench features and rebuilt to an appropriately sized channel for the watershed. UT3 Reach 1 pattern follows the natural fall of the valley, creating a stable channel that meanders gently through the existing valley topography. Following the natural valley, the design stream profile was created to connect these low bench features, alternating between constructed riffles and rock or log step-pool sequences. Reach 1 restoration ends just below the confluence with UT3A where the existing UT3 channel regains natural flood relief through an existing low bench feature and the reach transitions to enhancement II approach through UT3 Reach 2. A BMP pond will be constructed above the head of the jurisdictional channel and will capture upper watershed runoff and flow into the UT3 jurisdictional stream through a rock-lined swale.

UT3 Reach 3

UT3 Reach 3 was designed as a B type channel, with few gentle meanders and frequent step-pool sequences. Most of the pool bends will be protected with brush toe, while in line pools will be built following drop structures. The reach starts in a confined valley but will be moved offline shortly downstream from the origin to tie into an existing bench approximately 30 feet wide that maintains grade with the existing channel and preserves mature native trees. After the bench feature ends, the channel will be constructed in-line, an existing head cut will be filled, and the bed will be raised to improve access to the floodplain. The channel design downstream remains confined to the existing valley; however, grade work will be done to lessen the slope of the valley walls adjacent to the channel. The next section of channel will be constructed offline in the lower slope portion of the reach to enter a culvert passing through an internal easement break. Below the culvert, streamflow will be conveyed through a step pool system to tie into grade with the existing channel of UT3 Reach 4.

UT4 Reach 1

UT4 is has been designed to be a steep B stream type within the existing valley. The existing valley is wide enough to allow for floodplain creation within the valley. UT4 begins at a spring head near the bed of the existing channel. Reach 1 will be designed to tie into this springhead at the upstream end and then quickly transition to a raised streambed. The bed will be raised enough to tie into some existing terrace features in the valley. A portion of low-quality wetland area (wetland Yon Figure 6), created by cattle wallows, will be filled to create a steady longitudinal valley slope. For the downstream portion of this wetland, the channel bed will be raised to improve hydrology for adjacent wetlands. A series of rock cascades and pools will be constructed on a very steep section of channel to stabilize the headcut and transition to the lower grade at the beginning of Reach 2. A BMP pond will be constructed above the head of the jurisdictional channel and will capture runoff and flow into the UT4 jurisdictional stream through a rock-lined swale.

UT4 Reach 3

Although somewhat less steep than Reach 1, UT4 Reach 3 is also a fairly steep B type stream. This channel will be slightly more sinuous than Reach 1. This reach transitions from being deeply entrenched in a tight valley to be much less entrenched. In the entrenched section, the bed will be raised, and the cross section will be sized appropriately for the watershed, but the stream will remain entrenched to make the downstream grades for the culvert crossing work. Once the entrenchment is decreased, the channel will be raised to tie into the existing floodplain elevations. There is an internal culvert crossing approximately two-thirds of the way through this reach. The downstream end of this reach will tie into Hanks Branch with a series of rock step-pool features.

UT5 Reach 2

UT5 Reach 2 will begin as a Cb type channel where the valley widens downstream of the incised UT5 Reach 1. UT5 Reach 2 was designed in-line until entering the existing pond. The channel will be

positioned towards the pond dam on the right perimeter to maximize access to compacted soil that will form the bed of the channel. Some sediment may be removed from the pond bed along the channel alignment and replaced with material from the dam to provide better soil for constructing the new channel. Downstream of the pond dam, UT5 will be moved westward to take advantage of a more gently sloped pasture area (~2%) and to move the channel away from the base of very steep valley wall on the left. The channel will be designed to allow for greater access to the floodplain and to be a more sinuous channel with pools in the meander bends. A portion of the channel will enter a culvert passing through an internal easement break. Beyond the culvert, the channel will be designed as a B stream and will be purposefully incised to drop through a step pool system and tie into existing bankful features at the confluence of Sparks Creek.

Hanks Branch

Hanks Branch Reach 3 starts immediately downstream of a culvert crossing on Hanks branch. The stream is characterized by having large particles in the substrate and good bed forms but being straightened and channelized. The existing channel has few pools, so the design includes a series of alternating j-hooks to force inline pools to form. The right bank of the channel will be graded back and benched to allow for better floodplain access.

6.7 Planting Plan

One of the goals of the project is to restore and improve riparian buffers on the site. To that end, native trees appropriate for the site will be planted to establish a mesic mixed hardwood forest within the conservation easement. The wetland and buffer planting zones will be planted with bare root seedlings, at a maximum spacing of 12 feet, from the tops of bank to the extents of the conservation easement or extents of disturbance where currently forested. Hanks Branch Reach 3 will be planted with live stakes in two rows along the banks with a three foot by three foot staggered spacing along both sides of riffles and one row with a spacing of six feet on the outsides of meander bends. Hanks Branch will also be planted with herbaceous plugs at normal baseflow stage with a linear spacing of four feet along both sides of riffles and 3 feet along outsides of meander bends. For the restoration and enhancement I reaches on UT1, UT3, UT4, and UT5, a single row of live stakes will be planted at one to two feet offset from the tops of banks on both sides of riffles and outsides of meander bends with a spacing of six feet. For these streams, a single row of herbaceous plugs will be planted between the normal baseflow stage and the top of bank on the outsides of meander bends with a spacing of six feet and immediately upstream and downstream of sills. Permanent seed will be spread on streambanks, floodplain areas, and all disturbed areas within the conservation easement. See Sheets 3.0 and 3.01 of the construction plans for the species lists and planting zones layout. The site will be planted between December and April.

Construction practices are intended to minimize effects to soil properties, but some impacts are unavoidable. Ripping may be implemented to ameliorate soil compaction resulting from haul roads, stockpile areas, etc. Areas of compacted soil such as haul roads will be ripped to a depth of 18 inches in a grid-like pattern with a maximum rip shank spacing of six feet. Ripping will be performed during the driest conditions feasible to maximize shatter of the plow pan. Where grading is required, topsoil will be stockpiled and reapplied. Soil amendments may be incorporated to enhance survival and growth of planted vegetation as determined necessary by soil testing.

Most invasive species within the project area will be treated and/or mechanically removed during construction, but additional treatment is expected to be necessary. Invasive species presence will be monitored and treated as necessary throughout the monitoring period. Additional monitoring and management issues regarding vegetation are included in Sections 10 and 11.

The pasture grass that occurs throughout the project includes tall fescue (*Festuca* arundinacea). Wildlands will treat the existing fescue within the conservation easement to prevent any effects on tree growth. The treatment will be a part of the site management plan and will include spraying the fescue throughout the easement with a boom sprayer and/or ring sprays around planted trees.

7.0 Determination of Credits

The final stream credits associated with the Site are listed in Table 19. Stream Restoration is at a ratio of 1:1. All buffers meet the minimum 50-foot requirement. Credit ratios for multiple reaches including UT3 Reach 4, UT5 Reach 1, and UT5a were agreed upon at the post-contract IRT site walk. The credit release schedule is located in Appendix 7.

Table 19: Determination of Credits

Project Segment	Existing Footage or Acreage	Mitigation Plan Footage or Acreage	Mitigation Category	Restoration Level	Priority Level	Mitigation Ratio (X:1)	Notes
Sparks Creek - Not for Credit	215	215	Cool	EII	N/A	2.5	No buffer on right side
Sparks Creek	405	405	Cool	EII	N/A	2.5	
Sparks Creek - Not for Credit	42	42	Cool	EII	N/A	2.5	Ford crossing
Sparks Creek	332	332	Cool	EII	N/A	2.5	
Hanks Branch Reach 1	1678	1678	Cool	EII	N/A	2.5	
Hanks Branch Reach 2	1083	1065	Cool	EII	N/A	2.5	
Hanks Branch Reach 2 - Not for Credit	42	42	Cool	EII	N/A	2.5	Bridge crossing
Hanks Branch Reach 3	581	581	Cool	EI	PII	1.5	
UT1 - Not for Credit	61	60	Cool	R	PI	1	TCE to work above property line
UT1	717	659	Cool	R	PI	1	
UT1 - Not for Credit	42	40	Cool	R	PI	1	Culvert crossing
UT1	110	106	Cool	R	PI	1	
UT2	78	78	Cool	EII	N/A	3	
UT3 Reach 1	702	655	Cool	R	PI	1	
UT3 Reach 2	447	447	Cool	EII	N/A	2.5	
UT3 Reach 3	560	513	Cool	R	PI	1	
UT3 Reach 3 - Not for Credit	47	45	Cool	R	PI	1	Culvert crossing
UT3 Reach 3	84	74	Cool	R	PI	1	
UT3 Reach 4	272	272	Cool	EII	N/A	4	
UT3A	253	253	Cool	EII	N/A	2.5	
UT4 Reach 1	237	233	Cool	R	PI	1	
UT4 Reach 2	323	323	Cool	EII	N/A	2.5	
UT4 Reach 3	138	140	Cool	R	PI	1	

Project Segment	Existing Footage or Acreage	Mitigation Plan Footage or Acreage	Mitigation Category	Restoration Level	Priority Level	Mitigation Ratio (X:1)	Notes
UT4 Reach 3 - Not for Credit	42	40	Cool	R	PI	1	Culvert crossing
UT4 Reach 3	96	100	Cool	R	PI	1	
UT5 Reach 1	437	437	Cool	EII	N/A	4	
UT5 Reach 2	207	220	Cool	R	PI	1	
UT5 Reach 2 - Not for Credit	36	35	Cool	R	PI	1	Culvert crossing
UT5 Reach 2	113	107	Cool	R	PI	1	
UT5A	318	318	Cool	EII	N/A	3	

Project Credits							
Restoration Level	Stream (LF)			Riparian Wetland (Acres)		Non-Riparian Wetland (Acres)	Coastal Marsh
	Warm	Cool	Cold	Riverine	Non-Riverine		
Restoration		2,807.000		N/A	N/A	N/A	N/A
Re-establishment				N/A	N/A	N/A	N/A
Rehabilitation				N/A	N/A	N/A	N/A
Enhancement				N/A	N/A	N/A	N/A
Enhancement I		387.333		N/A	N/A	N/A	N/A
Enhancement II		2,110.450		N/A	N/A	N/A	N/A
Creation				N/A	N/A	N/A	N/A
Preservation		0.000		N/A	N/A	N/A	N/A
Totals		**5,304.783**		**0.000**	**0.000**	**0.000**	

8.0 Performance Standards

The stream performance standards for the project will follow approved performance standards presented in the DMS Mitigation Plan Template (Version 2.3, June 2017), the Annual Monitoring Template (June 2017), and the Wilmington District Stream and Wetland Compensatory Mitigation Update issued October 2016 by the USACE and NCIRT. Annual monitoring and routine site visits will be conducted by a qualified scientist to assess the condition of the finished project. Specific performance standards that apply to this project are those described in the 2016 Compensatory Mitigation Update including Vegetation (Section V, B, Items 1 through 3) and Stream Channel Stability and Stream Hydrology Performance Standards (Section VI, B, Items 1 through 7). Performance standards are summaries in Table 20.

Table 20: Summary of Performance Standards

Parameter	Monitoring Feature	Performance Standard
Dimension	Cross-Section Survey	BHR <1.2; ER <2.2 for C/E channels, ER <1.4 for B channels
Pattern and Profile	Visual Assessment	Should indicate stream stability
Substrate	Pebble Counts	Coarser material in riffles; finer particles in pools
Photo Documentation	• Cross-Section Photos • Photo Points	No excessive erosion or degradation of banks No mid-channel bars, Stable grade control
Hydrology	Pressure Transducer	• Four bankfull events during the 7-year period; in separate years • 30 days of consecutive flow on restored intermittent streams
Vegetation	Vegetation Plots	MY3 success criteria: 320 planted stems per acre, MY5 success criteria: 260 planted stems per acre, average of 7 feet in height in each plot MY7 success criteria: 210 planted stems per acre, average of 10 feet in height in each plot
Visual Assessment	CCPV	Signs of encroachment, stream instability, invasive species - <5% of conservation easement

9.0 Monitoring Plan

The Site monitoring plan has been developed to ensure that the required performance standards are met, and project goals and objectives are achieved. Project monitoring requirements are shown in Table 21. Approximate locations of the proposed monitoring components are illustrated in Figure 11.

Table 21: Monitoring Requirements

Parameter	Monitoring Feature	Quantity/ Length by Reach					Frequency	Notes
		Hanks Branch Reach 3	UT1	UT3 Reach 1 & 3	UT4 Reach 1 & 3	UT5 Reach 2		
Dimension	Riffle Cross Sections	1	1	2	2	1	Year 1, 2, 3, 5, & 7	
	Pool Cross Section	1	1	2	N/A	N/A		
Pattern	Pattern	N/A					N/A	1
Profile	Longitudinal Profile							
Substrate	Reach Wide (RW)	1	1	2	2	1	Year 1, 2, 3, 5, & 7	
Hydrology	Pressure Transducer: Crest Gauge (CG) or Flow Gauge (FG)	1 CG	1 CG	1 CG	1 CG 1 FG	1 CG	N/A	2
Vegetation	CVS Level 2	9					Year 1, 2, 3, 5, & 7	
Exotic and Nuisance Vegetation							Annual	3
Project Boundary							Annual	4
Reference Photos	Photographs	34					Annual	

1. Pattern and profile will be assessed visually during semi-annual site visits. Longitudinal profile will be collected during MY0 only, unless observations indicate lack of stability and profile survey is warranted in additional years.
2. Crest gages and/or transducers will be inspected quarterly and downloaded, evidence of bankfull events will be documented with a photo when possible. Transducers will be set to record stage once every four hours.
3. Locations of exotic and nuisance vegetation will be mapped.
4. Locations of vegetation damage, boundary encroachments, etc. will be mapped

10.0 Long-Term Management Plan

The site will be transferred to the North Carolina Department of Environmental Quality (NCDEQ) Stewardship Program. This party shall serve as conservation easement holder and long-term steward for the property and will conduct inspections of the site to ensure that restrictions required in the conservation easement are upheld. The Stewardship Program usually conducts inspections every one to three years. The NCDEQ Stewardship Program is developing an endowment system within the non-reverting, interest-bearing Conservation Lands Conservation Fund Account. The use of funds from the Endowment Account will be governed by North Carolina General Statue GS 113A-232(d)(3). Interest gained by the endowment fund may be used for the purpose of stewardship, monitoring, stewardship administration, and land transaction costs, if applicable. The Site Protection Instrument can be found in Appendix 8 and financial assurances are in Appendix 9.

11.0 Adaptive Management Plan

Upon completion of site construction Wildlands will implement the post-construction monitoring protocols previously defined in this document. Project maintenance will be performed as described Appendix 10. If, during the course of annual monitoring, it is determined the site's ability to achieve site performance standards are jeopardized, DMS will notify the USACE of the need to develop a Plan of Corrective Action. The Plan of Corrective Action may be prepared using in-house technical staff or may require engineering and consulting services. Once the Corrective Action Plan is prepared and finalized DMS will:

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

12.0 References

Harman, W.H., et al. 1999. Bankfull Hydraulic Geometry Relationships for North Carolina

North Carolina Division of Water Resources, 2008. Yadkin-Pee Dee River Basin Plan. https://deq.nc.gov/about/divisions/water-resources/planning/basin-planning/water-resource-plans/yadkin-pee-dee-2008

North Carolina Ecosystem Enhancement Program (EEP), 2009. Upper Yadkin River Basin Restoration Priorities. https://files.nc.gov/ncdeq/Mitigation%20Services/Watershed_Planning/Yadkin_River_Basin/2009%20Upper%20Yadkin%20RBRP_Final%20Final%2C%2026feb%2709.pdf

North Carolina Geological Survey (NCGS), 1985. Geologic map of North Carolina 1:500,000 scale. Compiled by Philip M. Brown at el. Raleigh, NC, NCGS. http://ncdenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a8281cbd24b84239b29cd2ca798d4a10

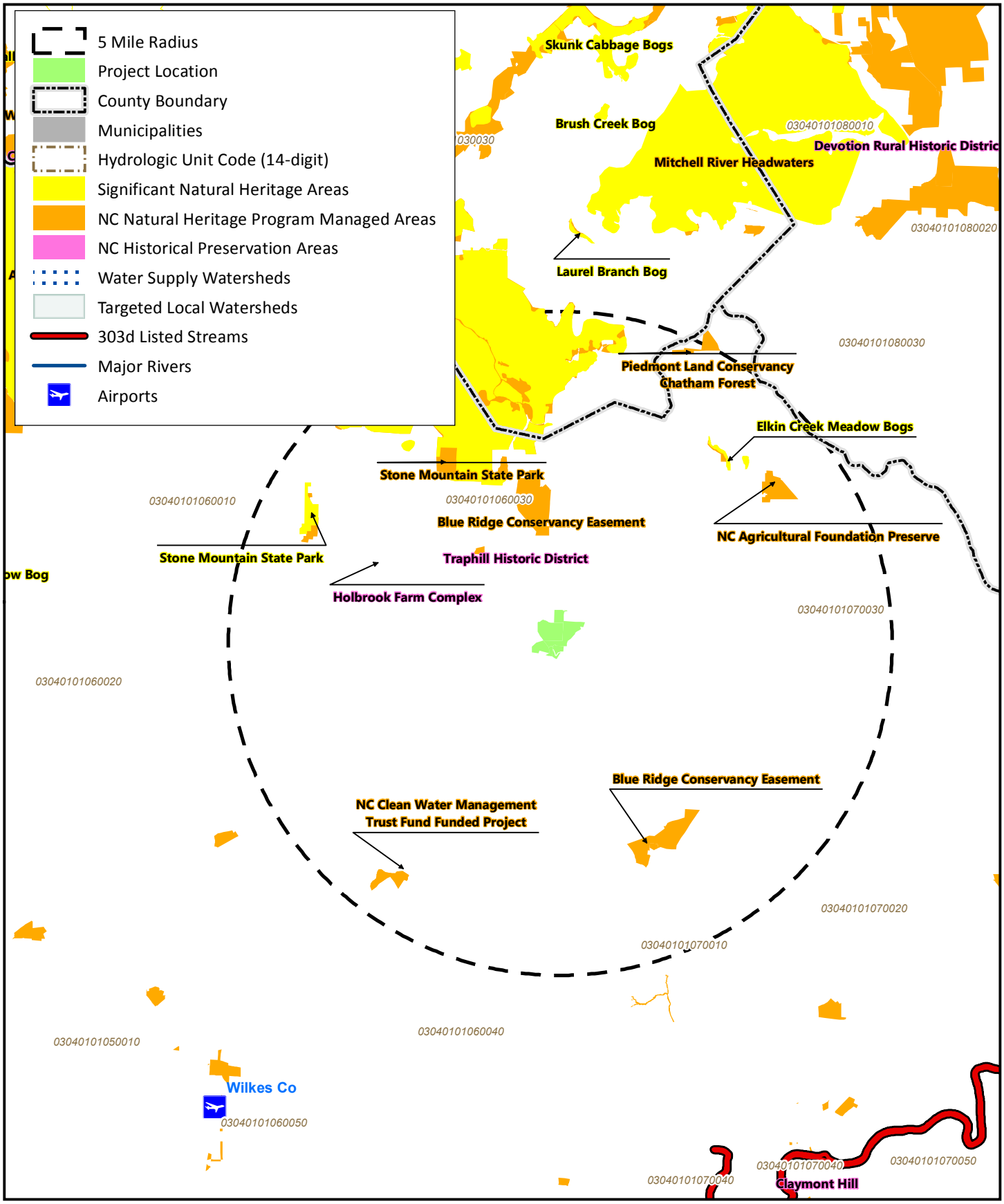
North Carolina Interagency Review Team, 2016. Wilmington District Stream and Wetland Compensatory Mitigation Update. https://saw-reg.usace.army.mil/PN/2016/Wilmington-District-Mitigation-Update.pdf

Web Soil Survey, 2020. US Department of Agriculture-Natural Resources Conservation Survey, https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

Multi-Resolution Land Characteristics (MRLC) consortium, 2016. National Land Cover Database 2016 (NLCD 2016). https://www.mrlc.gov/data/nlcd-2016-land-cover-conus

Walker, Alan, unpublished. NC Rural Mountain and Piedmont Regional Curve.

Figures



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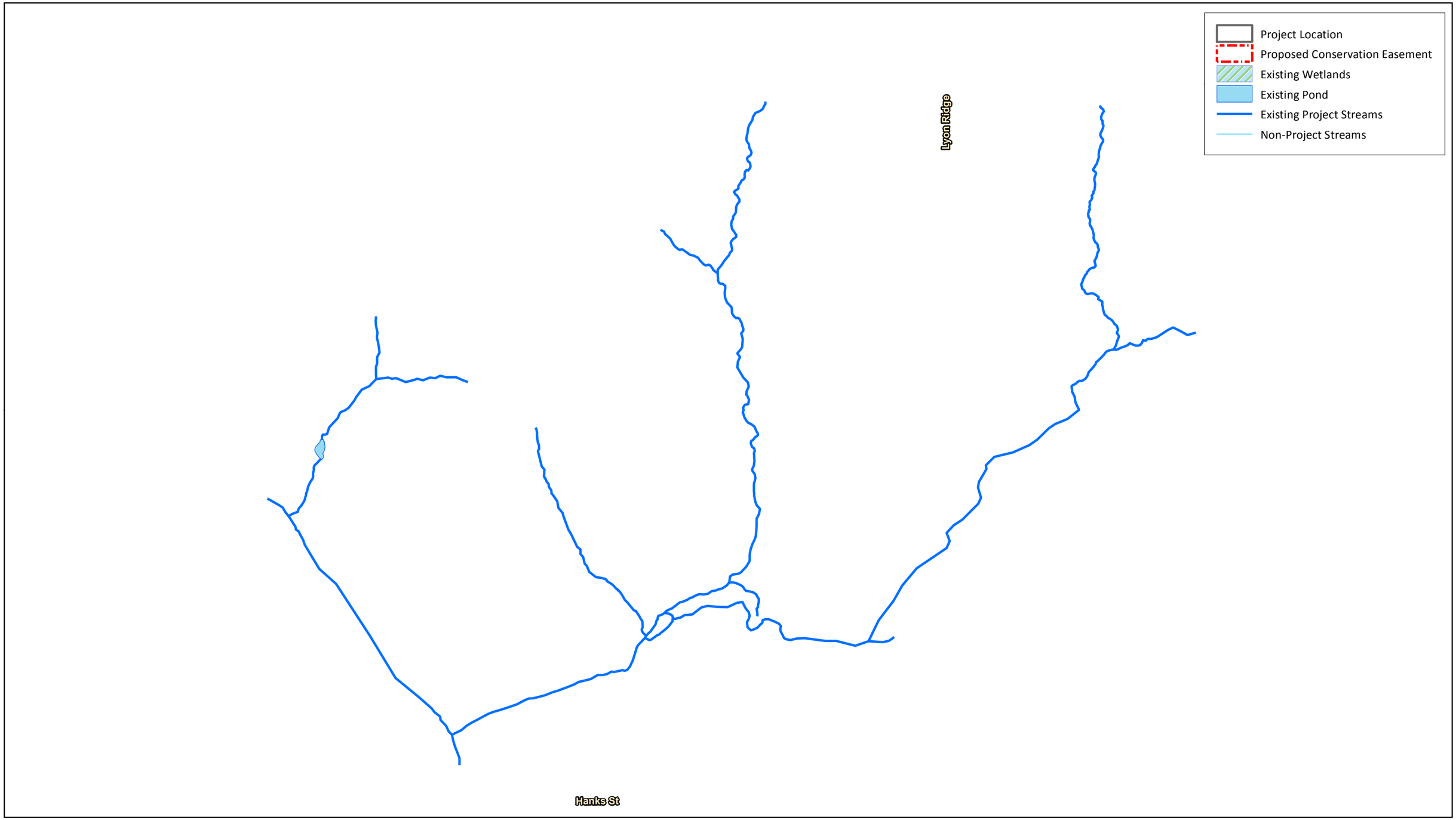
0 1 2 Miles

N

Figure 1 - Vicinity Map
Lyon Hills Mitigation Site
Yadkin River Basin 03040101

Wilkes County, NC



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0 300 600 Feet

N

Figure 2 - Site Map
Lyon Hills Mitigation Site
Yadkin River Basin 03040101

Wilkes County, NC

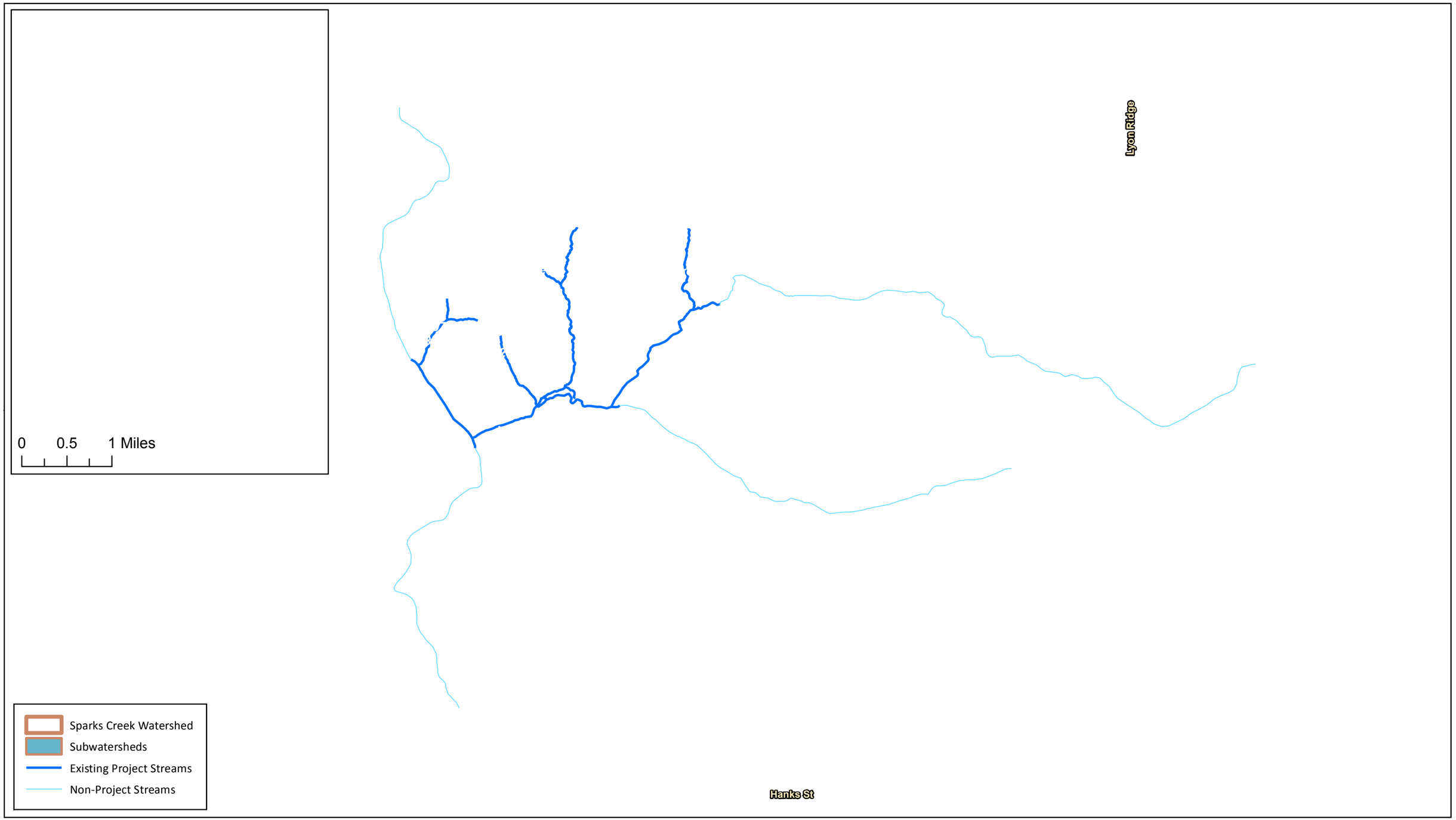

Figure 3 - Watershed Map
Lyon Hills Mitigation Site
Yadkin River Basin 03040101

Wilkes County, NC

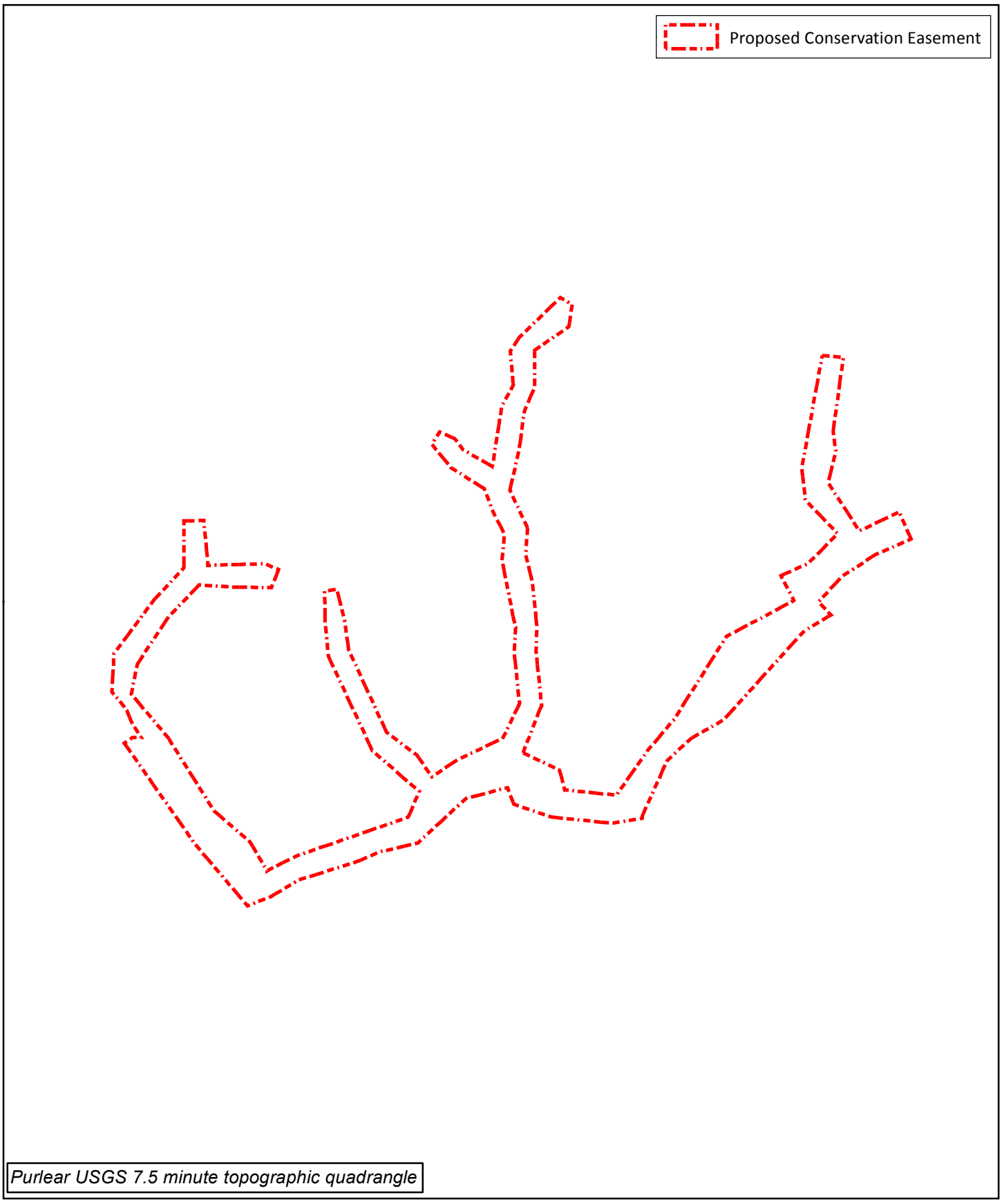

Figure 4 - USGS Topographic Map
Lyon Hills Mitigation Site
Yadkin River Basin 03040101

Wilkes County, NC

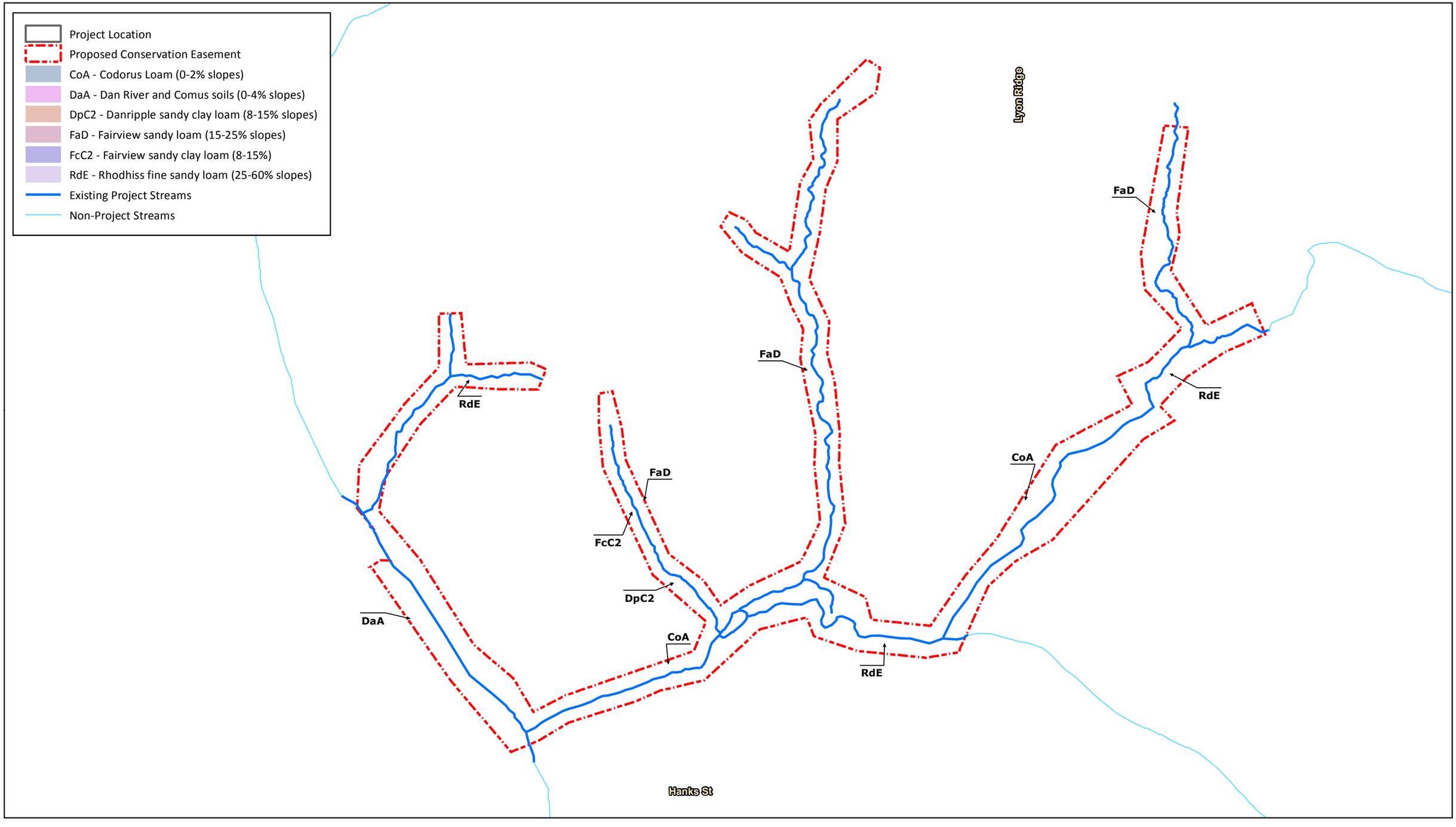

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Figure 5 - Soils Map
Lyon Hills Mitigation Site
Yadkin River Basin 03040101

Wilkes County, NC

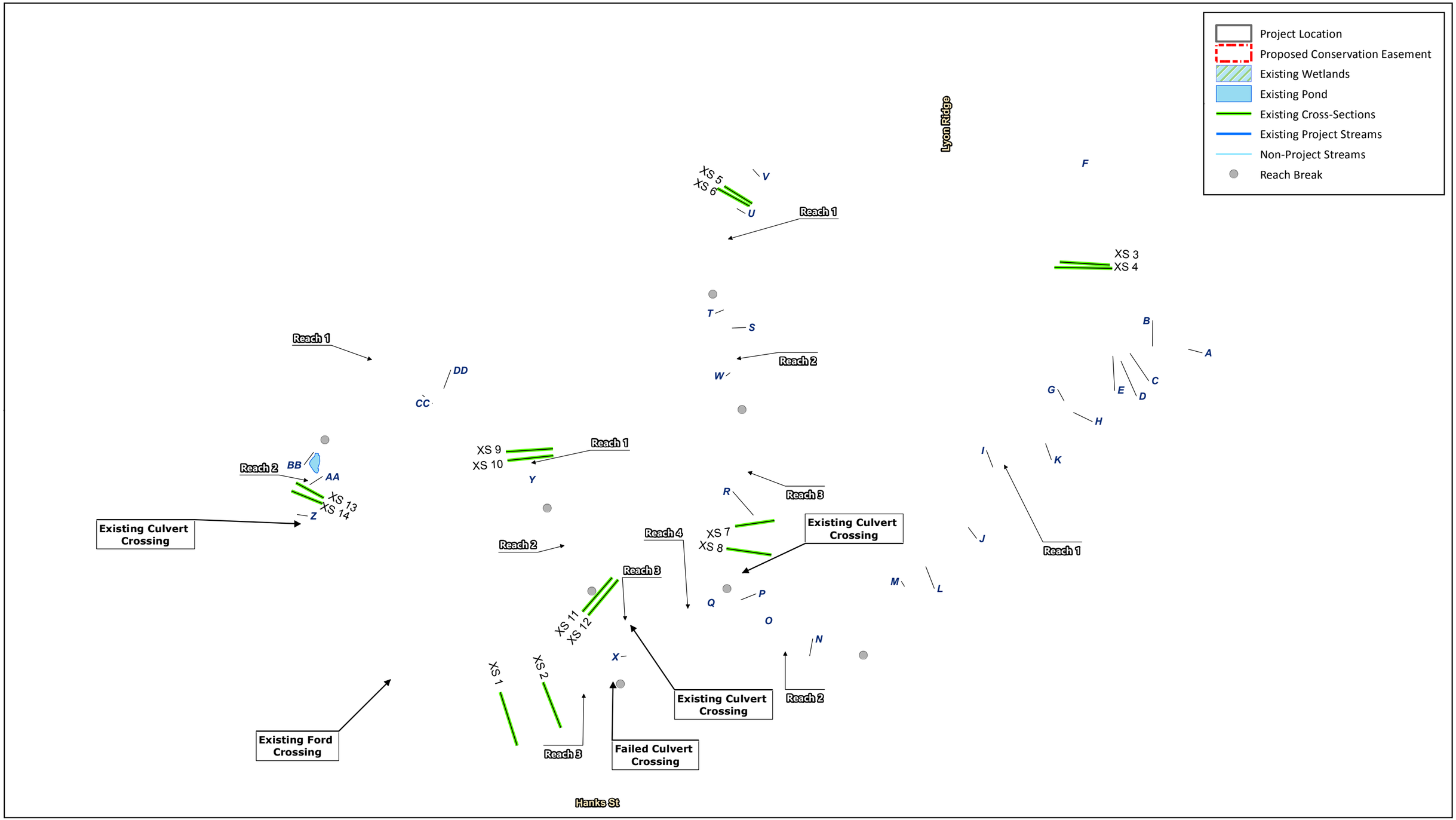

Figure 6 - Existing Conditions Map
Lyon Hills Mitigation Site
Yadkin River Basin 03040101

Wilkes County, NC

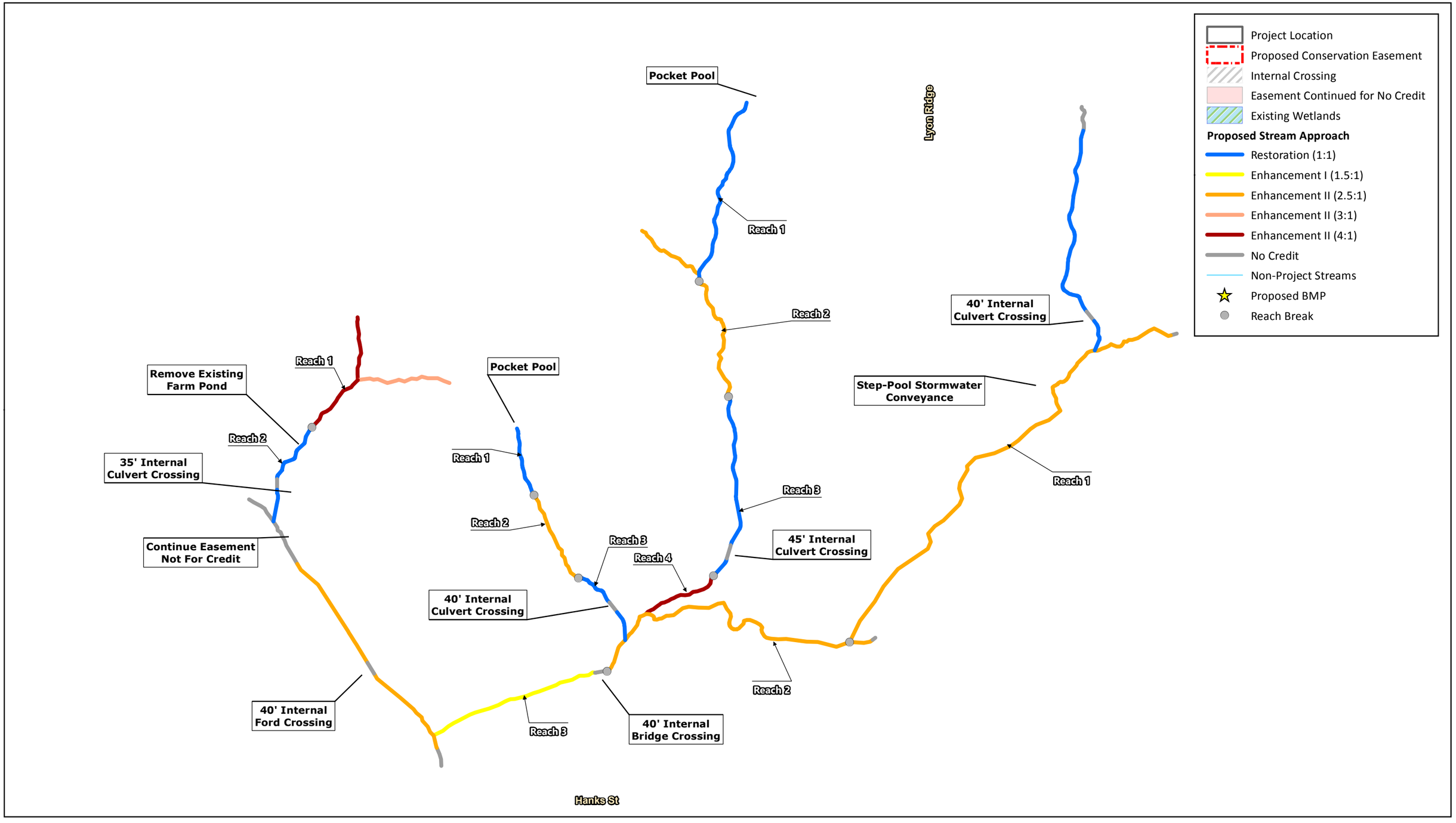

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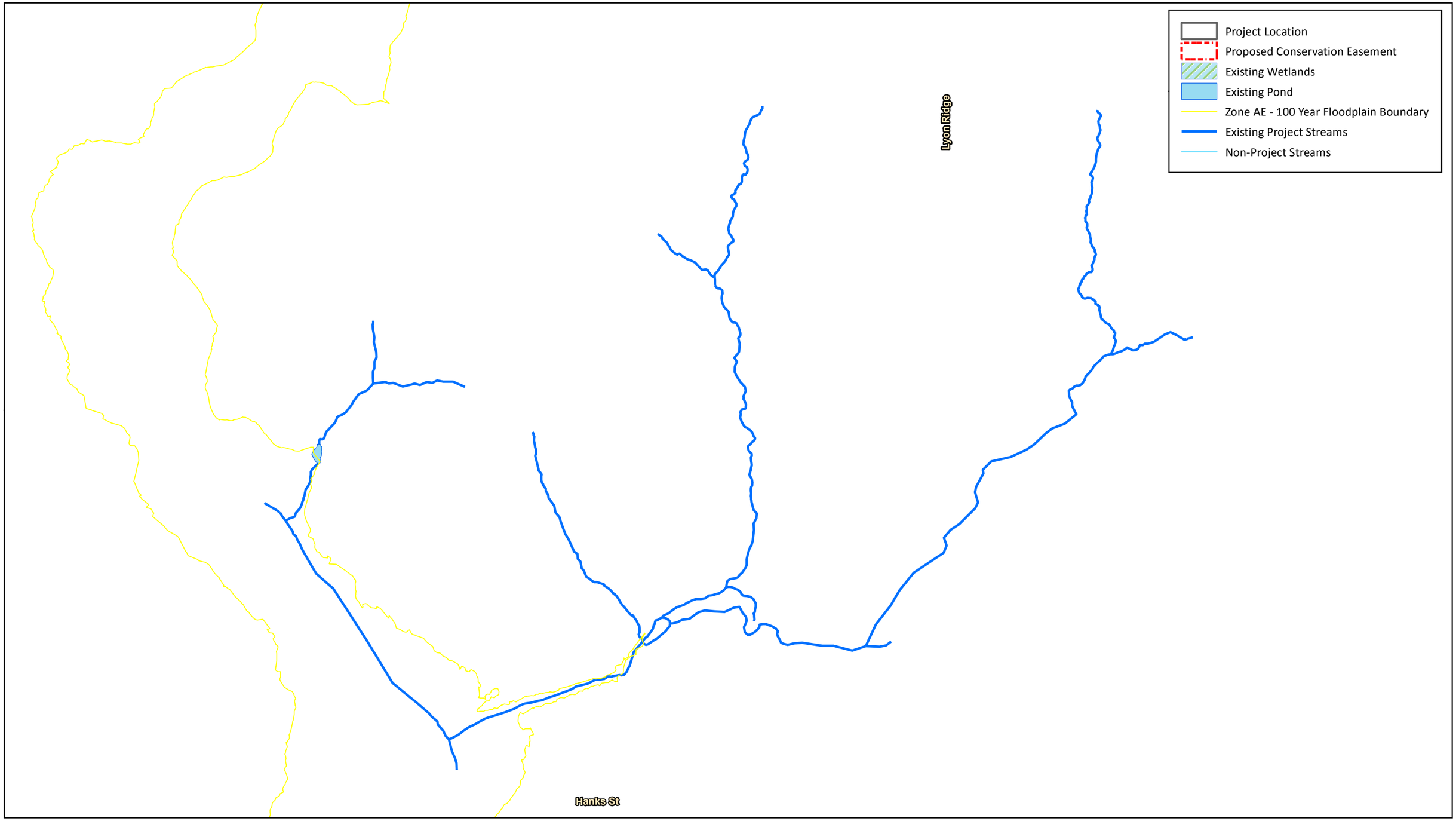
Figure 7 - Concept Map
Lyon Hills Mitigation Site
Yadkin River Basin 03040101

Wilkes County, NC



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0 300 600 Feet

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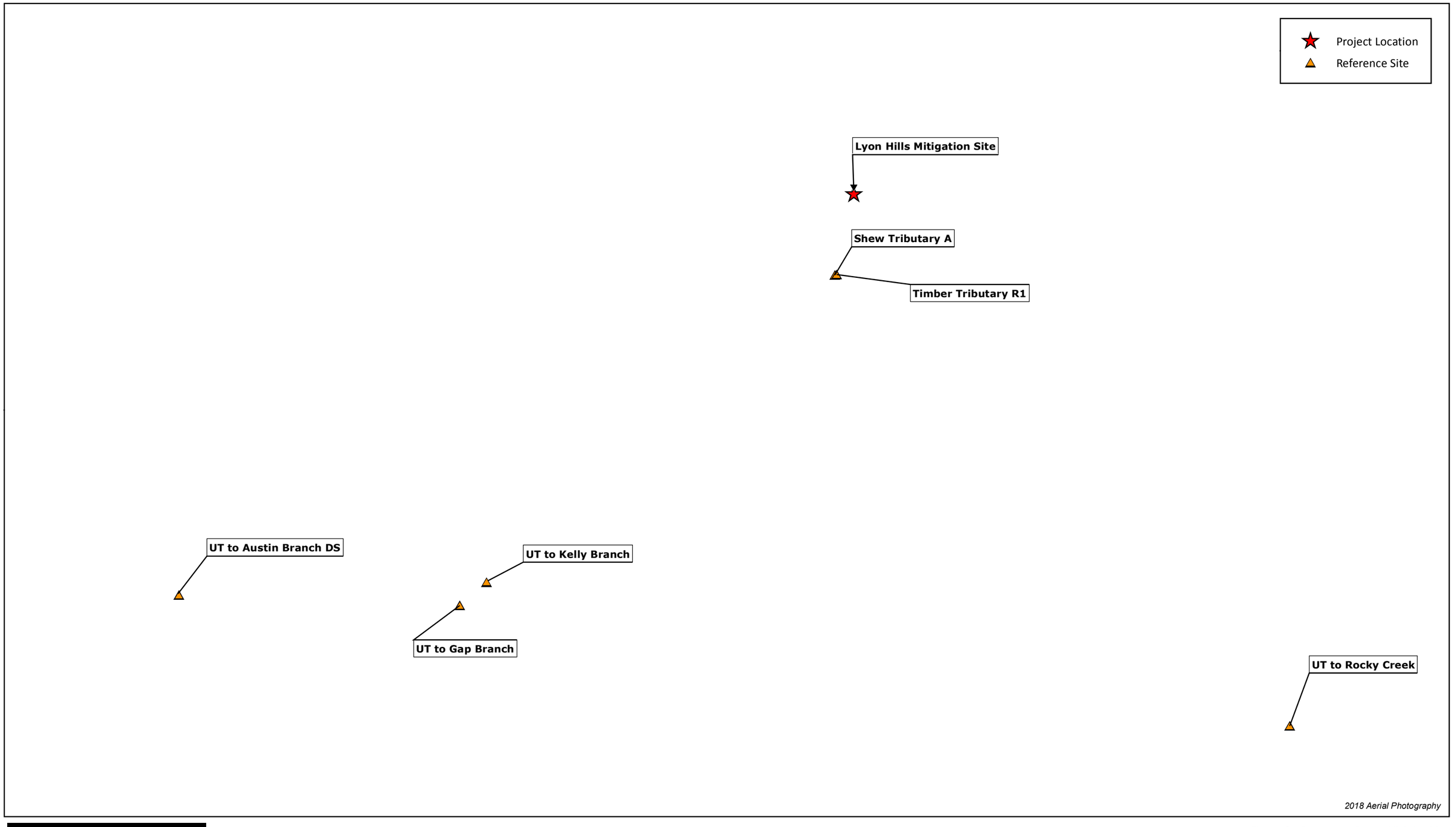
Figure 8 - FEMA Floodplain Map
Lyon Hills Mitigation Site
Yadkin River Basin 03040101

Wilkes County, NC



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0 12 24 Miles

N

Figure 9 - Reference Reach Vicinity Map
Lyon Hills Mitigation Site
Yadkin River Basin 03040101

Wilkes County, NC

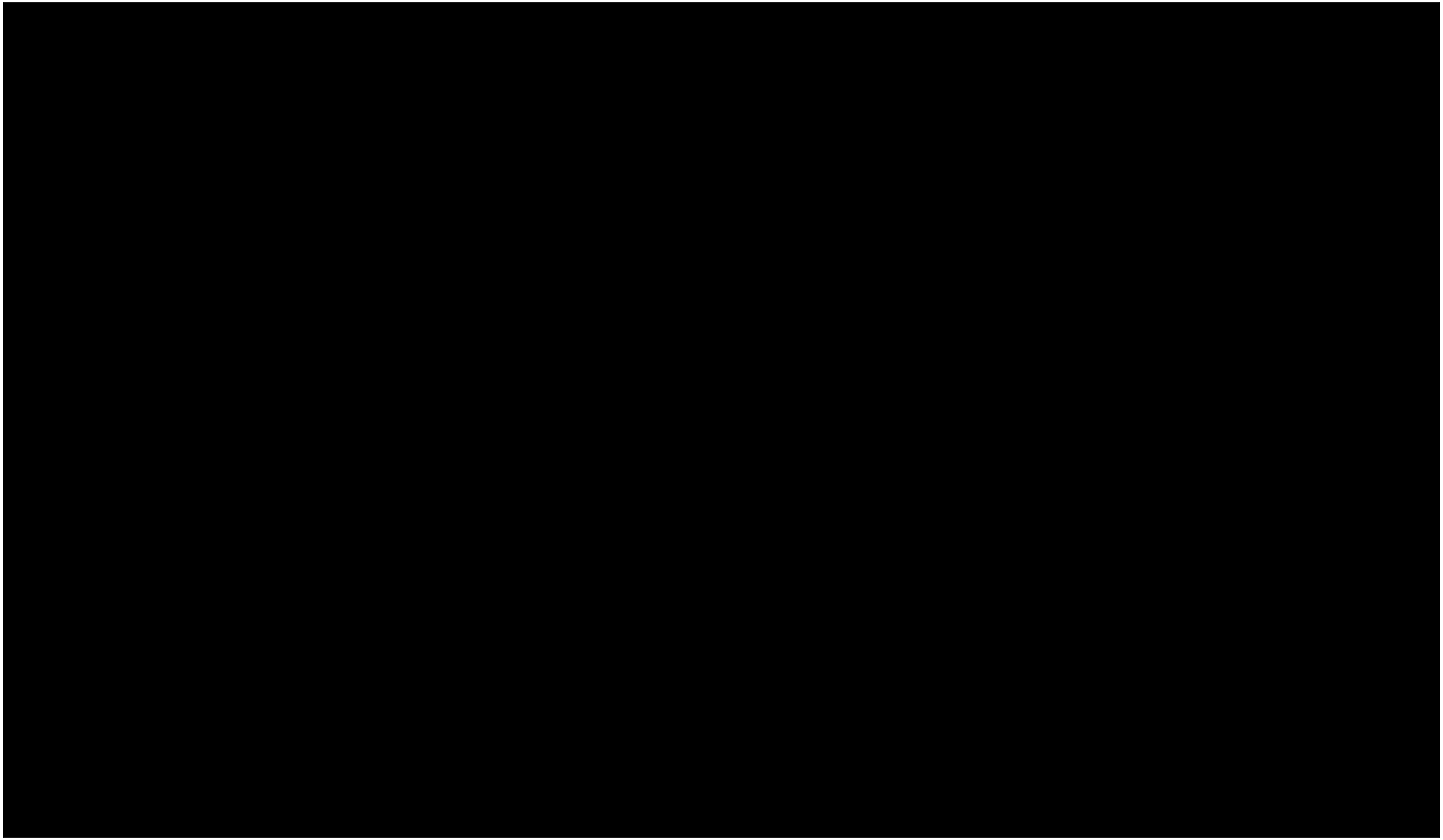
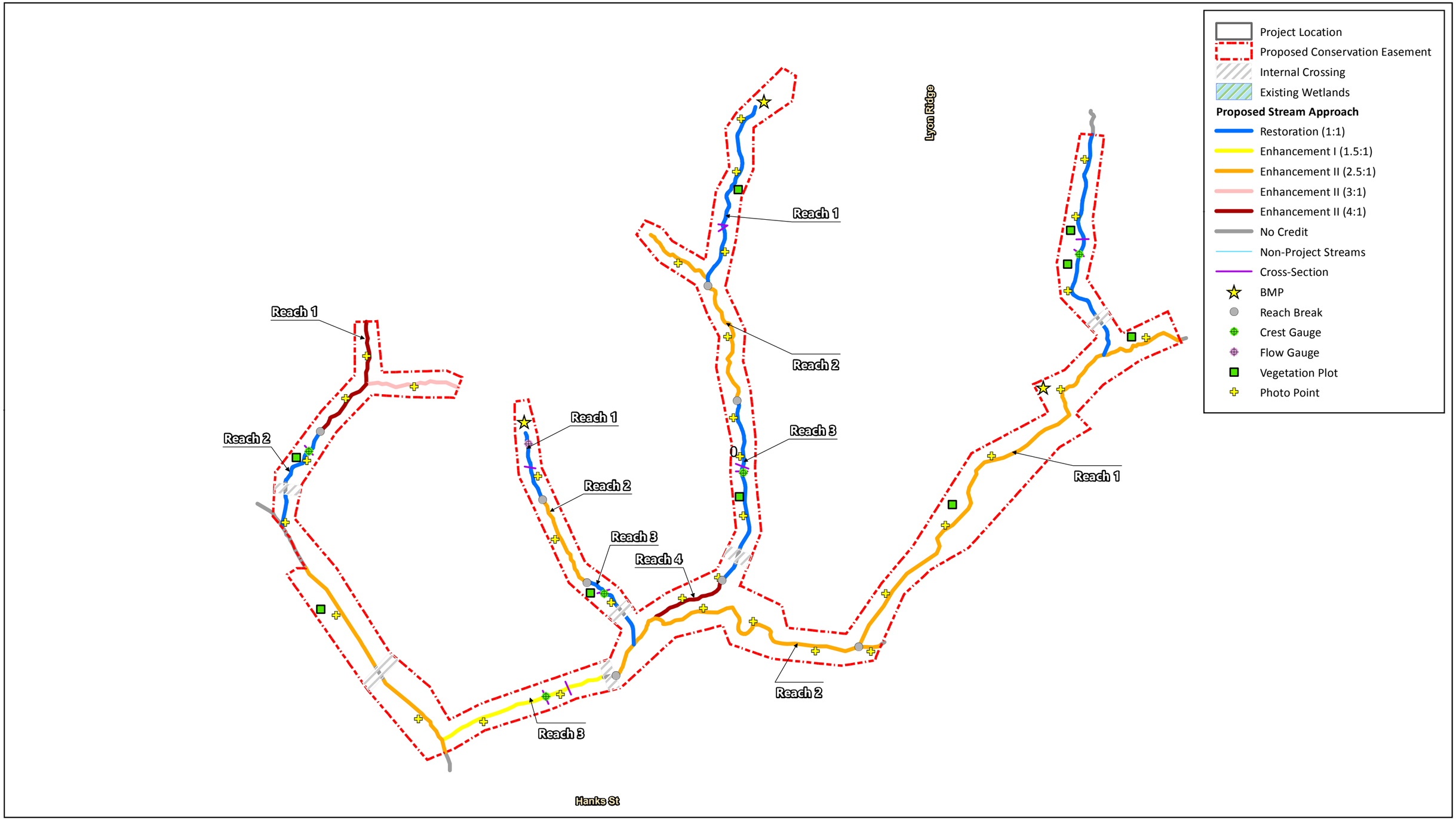


Figure 10 - Discharge Analysis Graph
Lyon Hills Mitigation Site
Yadkin River Basin 03040101

Wilkes County, NC



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0 300 600 Feet

N

Figure 11 - Monitoring Components Map
Lyon Hills Mitigation Site
Yadkin River Basin 03040101

Wilkes County, NC

Appendices

Appendix 1

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name: Lyon Hills - Sparks Creek
Date of Evaluation: 5/22/19
Stream Category: Pa4
Assessor Name/Organization: Carolyn Lanza

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	NO
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**HIGH**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**HIGH**	
(3) Streamside Area Attenuation	**HIGH**	
(4) Floodplain Access	**HIGH**	
(4) Wooded Riparian Buffer	**MEDIUM**	
(4) Microtopography	**LOW**	
(3) Stream Stability	**HIGH**	
(4) Channel Stability	**HIGH**	
(4) Sediment Transport	**HIGH**	
(4) Stream Geomorphology	**HIGH**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**MEDIUM**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**HIGH**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**MEDIUM**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**HIGH**	
(2) In-stream Habitat	**HIGH**	
(3) Baseflow	**HIGH**	
(3) Substrate	**HIGH**	
(3) Stream Stability	**HIGH**	
(3) In-stream Habitat	**HIGH**	
(2) Stream-side Habitat	**HIGH**	
(3) Stream-side Habitat	**MEDIUM**	
(3) Thermoregulation	**HIGH**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	**HIGH**	

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name: Lyon Hills - Hanks Branch R 1 & 2
Date of Evaluation: 5/22/19
Stream Category: Pb3
Assessor Name/Organization: Carolyn Lanza

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	NO
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**MEDIUM**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**MEDIUM**	
(3) Streamside Area Attenuation	**MEDIUM**	
(4) Floodplain Access	**MEDIUM**	
(4) Wooded Riparian Buffer	**HIGH**	
(4) Microtopography	NA	
(3) Stream Stability	**MEDIUM**	
(4) Channel Stability	**HIGH**	
(4) Sediment Transport	**MEDIUM**	
(4) Stream Geomorphology	**MEDIUM**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**MEDIUM**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**HIGH**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**MEDIUM**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**HIGH**	
(2) In-stream Habitat	**MEDIUM**	
(3) Baseflow	**HIGH**	
(3) Substrate	**MEDIUM**	
(3) Stream Stability	**HIGH**	
(3) In-stream Habitat	**MEDIUM**	
(2) Stream-side Habitat	**HIGH**	
(3) Stream-side Habitat	**MEDIUM**	
(3) Thermoregulation	**HIGH**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	**MEDIUM**	

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name: Lyon Hills - Hanks Branch R3 | Date of Evaluation: 5/22/19
Stream Category: Pb3 | Assessor Name/Organization: Carolyn Lanza

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	NO
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**MEDIUM**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**MEDIUM**	
(3) Streamside Area Attenuation	**MEDIUM**	
(4) Floodplain Access	**MEDIUM**	
(4) Wooded Riparian Buffer	**HIGH**	
(4) Microtopography	NA	
(3) Stream Stability	**MEDIUM**	
(4) Channel Stability	**HIGH**	
(4) Sediment Transport	**MEDIUM**	
(4) Stream Geomorphology	**MEDIUM**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**MEDIUM**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**HIGH**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**MEDIUM**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**HIGH**	
(2) In-stream Habitat	**MEDIUM**	
(3) Baseflow	**HIGH**	
(3) Substrate	**MEDIUM**	
(3) Stream Stability	**HIGH**	
(3) In-stream Habitat	**MEDIUM**	
(2) Stream-side Habitat	**HIGH**	
(3) Stream-side Habitat	**MEDIUM**	
(3) Thermoregulation	**HIGH**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	**MEDIUM**	

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name: Lyon Hills - UT1 | Date of Evaluation: 5/22/19
Stream Category: Pb2 | Assessor Name/Organization: Carolyn Lanza

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	NO
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**LOW**	
(2) Baseflow	**MEDIUM**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**LOW**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	NA	
(3) Stream Stability	**MEDIUM**	
(4) Channel Stability	**MEDIUM**	
(4) Sediment Transport	**HIGH**	
(4) Stream Geomorphology	**MEDIUM**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**MEDIUM**	
(2) Streamside Area Vegetation	**LOW**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**MEDIUM**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**LOW**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**MEDIUM**	
(2) In-stream Habitat	**HIGH**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**HIGH**	
(3) Stream Stability	**MEDIUM**	
(3) In-stream Habitat	**HIGH**	
(2) Stream-side Habitat	**LOW**	
(3) Stream-side Habitat	**LOW**	
(3) Thermoregulation	**LOW**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	**LOW**	

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name: Lyon Hills - Hanks Branch UT2 | Date of Evaluation: 5/22/19
Stream Category: Pb2 | Assessor Name/Organization: Carolyn Lanza

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	NO
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**HIGH**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**HIGH**	
(3) Streamside Area Attenuation	**HIGH**	
(4) Floodplain Access	**HIGH**	
(4) Wooded Riparian Buffer	**HIGH**	
(4) Microtopography	NA	
(3) Stream Stability	**MEDIUM**	
(4) Channel Stability	**HIGH**	
(4) Sediment Transport	**MEDIUM**	
(4) Stream Geomorphology	**MEDIUM**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**MEDIUM**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**MEDIUM**	
(3) Upland Pollutant Filtration	**MEDIUM**	
(3) Thermoregulation	**HIGH**	
(2) Indicators of Stressors	**NO**	
(2) Aquatic Life Tolerance	**MEDIUM**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**HIGH**	
(2) In-stream Habitat	**MEDIUM**	
(3) Baseflow	**HIGH**	
(3) Substrate	**MEDIUM**	
(3) Stream Stability	**HIGH**	
(3) In-stream Habitat	**MEDIUM**	
(2) Stream-side Habitat	**HIGH**	
(3) Stream-side Habitat	**HIGH**	
(3) Thermoregulation	**HIGH**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	**HIGH**	

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	Lyon Hills - UT3 R1	Date of Evaluation	5/22/19
Stream Category	Pb1	Assessor Name/Organization	Carolyn Lanza

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	NO
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**LOW**	
(2) Baseflow	**MEDIUM**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**LOW**	
(4) Wooded Riparian Buffer	**MEDIUM**	
(4) Microtopography	NA	
(3) Stream Stability	**LOW**	
(4) Channel Stability	**LOW**	
(4) Sediment Transport	**LOW**	
(4) Stream Geomorphology	**MEDIUM**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**MEDIUM**	
(2) Streamside Area Vegetation	**LOW**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**MEDIUM**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**MEDIUM**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**MEDIUM**	
(2) In-stream Habitat	**MEDIUM**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**LOW**	
(3) Stream Stability	**LOW**	
(3) In-stream Habitat	**HIGH**	
(2) Stream-side Habitat	**MEDIUM**	
(3) Stream-side Habitat	**MEDIUM**	
(3) Thermoregulation	**MEDIUM**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	**LOW**	

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	Lyon Hills - UT3 R2	Date of Evaluation	5/22/19
Stream Category	Pb1	Assessor Name/Organization	Carolyn Lanza

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	NO
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**MEDIUM**	
(2) Baseflow	**MEDIUM**	
(2) Flood Flow	**MEDIUM**	
(3) Streamside Area Attenuation	**MEDIUM**	
(4) Floodplain Access	**MEDIUM**	
(4) Wooded Riparian Buffer	**MEDIUM**	
(4) Microtopography	NA	
(3) Stream Stability	**MEDIUM**	
(4) Channel Stability	**MEDIUM**	
(4) Sediment Transport	**LOW**	
(4) Stream Geomorphology	**HIGH**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**MEDIUM**	
(2) Streamside Area Vegetation	**MEDIUM**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**HIGH**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**MEDIUM**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**MEDIUM**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**LOW**	
(3) Stream Stability	**MEDIUM**	
(3) In-stream Habitat	**MEDIUM**	
(2) Stream-side Habitat	**HIGH**	
(3) Stream-side Habitat	**MEDIUM**	
(3) Thermoregulation	**HIGH**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	**MEDIUM**	

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name: Lyon Hills - UT3 R3 | Date of Evaluation: 5/22/19
Stream Category: Pb2 | Assessor Name/Organization: Carolyn Lanza

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	NO
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**LOW**	
(2) Baseflow	**MEDIUM**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**HIGH**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	NA	
(3) Stream Stability	**MEDIUM**	
(4) Channel Stability	**MEDIUM**	
(4) Sediment Transport	**HIGH**	
(4) Stream Geomorphology	**MEDIUM**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**MEDIUM**	
(2) Streamside Area Vegetation	**LOW**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**LOW**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**LOW**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**MEDIUM**	
(2) In-stream Habitat	**HIGH**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**HIGH**	
(3) Stream Stability	**MEDIUM**	
(3) In-stream Habitat	**HIGH**	
(2) Stream-side Habitat	**LOW**	
(3) Stream-side Habitat	**LOW**	
(3) Thermoregulation	**LOW**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	**LOW**	

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	Lyon Hills - UT3 R4	Date of Evaluation	5/22/19
Stream Category	Pb2	Assessor Name/Organization	Carolyn Lanza

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	NO
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**HIGH**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**HIGH**	
(3) Streamside Area Attenuation	**MEDIUM**	
(4) Floodplain Access	**MEDIUM**	
(4) Wooded Riparian Buffer	**MEDIUM**	
(4) Microtopography	NA	
(3) Stream Stability	**HIGH**	
(4) Channel Stability	**HIGH**	
(4) Sediment Transport	**LOW**	
(4) Stream Geomorphology	**HIGH**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**MEDIUM**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**MEDIUM**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**HIGH**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**HIGH**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**LOW**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**HIGH**	
(3) Substrate	**LOW**	
(3) Stream Stability	**HIGH**	
(3) In-stream Habitat	**MEDIUM**	
(2) Stream-side Habitat	**HIGH**	
(3) Stream-side Habitat	**MEDIUM**	
(3) Thermoregulation	**HIGH**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	**MEDIUM**	

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	Lyon Hills - UT3A	Date of Evaluation	5/22/19
Stream Category	Pb1	Assessor Name/Organization	Carolyn Lanza

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	NO
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**HIGH**	
(2) Baseflow	**MEDIUM**	
(2) Flood Flow	**HIGH**	
(3) Streamside Area Attenuation	**MEDIUM**	
(4) Floodplain Access	**MEDIUM**	
(4) Wooded Riparian Buffer	**MEDIUM**	
(4) Microtopography	NA	
(3) Stream Stability	**HIGH**	
(4) Channel Stability	**HIGH**	
(4) Sediment Transport	**LOW**	
(4) Stream Geomorphology	**HIGH**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**MEDIUM**	
(2) Baseflow	**MEDIUM**	
(2) Streamside Area Vegetation	**MEDIUM**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**HIGH**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**HIGH**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**MEDIUM**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**LOW**	
(3) Stream Stability	**HIGH**	
(3) In-stream Habitat	**MEDIUM**	
(2) Stream-side Habitat	**HIGH**	
(3) Stream-side Habitat	**MEDIUM**	
(3) Thermoregulation	**HIGH**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	**MEDIUM**	

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name: Lyon Hills - UT4 R1 | Date of Evaluation: 5/22/19
Stream Category: Pb2 | Assessor Name/Organization: Carolyn Lanza

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	NO
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**LOW**	
(2) Baseflow	**MEDIUM**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**MEDIUM**	
(4) Floodplain Access	**MEDIUM**	
(4) Wooded Riparian Buffer	**HIGH**	
(4) Microtopography	NA	
(3) Stream Stability	**LOW**	
(4) Channel Stability	**MEDIUM**	
(4) Sediment Transport	**LOW**	
(4) Stream Geomorphology	**MEDIUM**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**MEDIUM**	
(2) Streamside Area Vegetation	**MEDIUM**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**HIGH**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**LOW**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**LOW**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**LOW**	
(3) Stream Stability	**MEDIUM**	
(3) In-stream Habitat	**MEDIUM**	
(2) Stream-side Habitat	**HIGH**	
(3) Stream-side Habitat	**HIGH**	
(3) Thermoregulation	**HIGH**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	**LOW**	

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	Lyon Hills - UT4 R2	Date of Evaluation	5/22/19
Stream Category	Pb2	Assessor Name/Organization	Carolyn Lanza

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	NO
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**MEDIUM**	
(2) Baseflow	**MEDIUM**	
(2) Flood Flow	**MEDIUM**	
(3) Streamside Area Attenuation	**MEDIUM**	
(4) Floodplain Access	**MEDIUM**	
(4) Wooded Riparian Buffer	**MEDIUM**	
(4) Microtopography	NA	
(3) Stream Stability	**MEDIUM**	
(4) Channel Stability	**MEDIUM**	
(4) Sediment Transport	**HIGH**	
(4) Stream Geomorphology	**MEDIUM**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**MEDIUM**	
(2) Streamside Area Vegetation	**LOW**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**MEDIUM**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**LOW**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**HIGH**	
(2) In-stream Habitat	**HIGH**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**HIGH**	
(3) Stream Stability	**MEDIUM**	
(3) In-stream Habitat	**HIGH**	
(2) Stream-side Habitat	**MEDIUM**	
(3) Stream-side Habitat	**MEDIUM**	
(3) Thermoregulation	**MEDIUM**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	**MEDIUM**	

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name: Lyon Hills - UT4 R3 | Date of Evaluation: 5/22/19
Stream Category: Pb2 | Assessor Name/Organization: Carolyn Lanza

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	NO
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**LOW**	
(2) Baseflow	**MEDIUM**	
(2) Flood Flow	**LOW**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**LOW**	
(4) Wooded Riparian Buffer	**LOW**	
(4) Microtopography	NA	
(3) Stream Stability	**MEDIUM**	
(4) Channel Stability	**MEDIUM**	
(4) Sediment Transport	**HIGH**	
(4) Stream Geomorphology	**MEDIUM**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**MEDIUM**	
(2) Streamside Area Vegetation	**LOW**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**MEDIUM**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**LOW**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**MEDIUM**	
(2) In-stream Habitat	**HIGH**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**HIGH**	
(3) Stream Stability	**MEDIUM**	
(3) In-stream Habitat	**HIGH**	
(2) Stream-side Habitat	**LOW**	
(3) Stream-side Habitat	**LOW**	
(3) Thermoregulation	**LOW**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	**LOW**	

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name: Lyon Hills - UT5 R1 | Date of Evaluation: 5/22/19
Stream Category: Pb1 | Assessor Name/Organization: Carolyn Lanza

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	NO
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**MEDIUM**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**MEDIUM**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**LOW**	
(4) Wooded Riparian Buffer	**HIGH**	
(4) Microtopography	NA	
(3) Stream Stability	**HIGH**	
(4) Channel Stability	**HIGH**	
(4) Sediment Transport	**HIGH**	
(4) Stream Geomorphology	**HIGH**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**MEDIUM**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**HIGH**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**MEDIUM**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**HIGH**	
(2) In-stream Habitat	**HIGH**	
(3) Baseflow	**HIGH**	

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name: Lyon Hills - UT5 R2 | Date of Evaluation: 5/22/19
Stream Category: Pa2 | Assessor Name/Organization: Carolyn Lanza

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	NO
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**HIGH**	
(2) Baseflow	**MEDIUM**	
(2) Flood Flow	**HIGH**	
(3) Streamside Area Attenuation	**HIGH**	
(4) Floodplain Access	**HIGH**	
(4) Wooded Riparian Buffer	**MEDIUM**	
(4) Microtopography	**LOW**	
(3) Stream Stability	**MEDIUM**	
(4) Channel Stability	**HIGH**	
(4) Sediment Transport	**LOW**	
(4) Stream Geomorphology	**MEDIUM**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**MEDIUM**	
(2) Streamside Area Vegetation	**LOW**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**MEDIUM**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**LOW**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**LOW**	
(2) In-stream Habitat	**LOW**	
(3) Baseflow	**MEDIUM**	
(3) Substrate	**LOW**	
(3) Stream Stability	**HIGH**	
(3) In-stream Habitat	**MEDIUM**	
(2) Stream-side Habitat	**LOW**	
(3) Stream-side Habitat	**LOW**	
(3) Thermoregulation	**MEDIUM**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	**LOW**	

NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name: Lyon Hills - UT5A
Date of Evaluation: 5/22/19
Stream Category: Pb1
Assessor Name/Organization: Carolyn Lanza

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	NO
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**MEDIUM**	
(2) Baseflow	**HIGH**	
(2) Flood Flow	**MEDIUM**	
(3) Streamside Area Attenuation	**LOW**	
(4) Floodplain Access	**LOW**	
(4) Wooded Riparian Buffer	**HIGH**	
(4) Microtopography	NA	
(3) Stream Stability	**HIGH**	
(4) Channel Stability	**HIGH**	
(4) Sediment Transport	**HIGH**	
(4) Stream Geomorphology	**HIGH**	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	**LOW**	
(2) Baseflow	**HIGH**	
(2) Streamside Area Vegetation	**MEDIUM**	
(3) Upland Pollutant Filtration	**LOW**	
(3) Thermoregulation	**HIGH**	
(2) Indicators of Stressors	**YES**	
(2) Aquatic Life Tolerance	**LOW**	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	**HIGH**	
(2) In-stream Habitat	**HIGH**	
(3) Baseflow	**HIGH**	
(3) Substrate	**HIGH**	
(3) Stream Stability	**HIGH**	
(3) In-stream Habitat	**HIGH**	
(2) Stream-side Habitat	**HIGH**	
(3) Stream-side Habitat	**MEDIUM**	
(3) Thermoregulation	**HIGH**	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone Habitat	NA	
Overall	**MEDIUM**	

UT1

NC DWQ Stream Identification Form Version 4.11

Date: 03/14/2018	**Project/Site:** Lyon - UT1	**Latitude:**
Evaluator: JDW	**County:** Wilkes	**Longitude:**
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 40.75	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 24)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	1	2	(3)
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	(3)
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	1	(2)	3
6. Depositional bars or benches	0	1	2	(3)
7. Recent alluvial deposits	0	1	(2)	3
8. Headcuts	0	1	(2)	3
9. Grade control	0	0.5	1	(1.5)
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 9)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	1	2	(3)
14. Leaf litter	(1.5)	1	0.5	0
15. Sediment on plants or debris	0	0.5	(1)	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	(No = 0)		Yes = 3	

C. Biology (Subtotal = 7.75)				
18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	0	0.5	(1)	1.5
25. Algae	0	0.5	(1)	1.5
26. Wetland plants in streambed	(FACW = 0.75) OBL = 1.5 Other = 0			

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

Notes: Juncus located on Streambank and Floodplain

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 03/14/2018	**Project/Site:** Lyon - UT2	**Latitude:**
Evaluator: JDW	**County:** Wilkes	**Longitude:**
Total Points: 34.5 *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30**	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 23.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	1	2	(3)
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	(3)
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	1	2	(3)
6. Depositional bars or benches	0	1	2	(3)
7. Recent alluvial deposits	0	1	(2)	3
8. Headcuts	0	(1)	2	3
9. Grade control	0	0.5	(1)	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 6)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	(No = 0)		Yes = 3	

C. Biology (Subtotal = 5)				
18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

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

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 03/14/2018	**Project/Site:** Lyon - UT3	**Latitude:**
Evaluator: JDW	**County:** Wilkes	**Longitude:**
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 36	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 28)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	1	2	(3)
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	(3)
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	1	(2)	3
6. Depositional bars or benches	0	1	(2)	3
7. Recent alluvial deposits	0	1	2	(3)
8. Headcuts	0	1	2	(3)
9. Grade control	0	0.5	1	(1.5)
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	No = 0		(Yes = 3)	

[a] artificial ditches are not rated; see discussions in manual

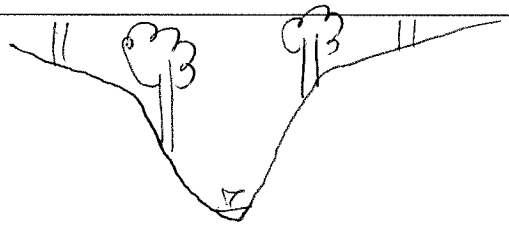
B. Hydrology (Subtotal = 4)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	(0)	0.5	1	1.5
17. Soil-based evidence of high water table?	(No = 0)		Yes = 3	

C. Biology (Subtotal = 4)				
18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	3	2	(1)	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	0	0.5	(1)	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

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

Notes:

Sketch:



NC DWQ Stream Identification Form Version 4.11

Date: 03/14/2018	**Project/Site:** Lyon - UT3A	**Latitude:**
Evaluator: JDW	**County:** Wilkes	**Longitude:**
Total Points: 31.5 *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30**	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 20)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	1	(2)	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	(2)	3
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	1	2	(3)
6. Depositional bars or benches	0	1	2	(3)
7. Recent alluvial deposits	0	1	(2)	3
8. Headcuts	(0)	1	2	3
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

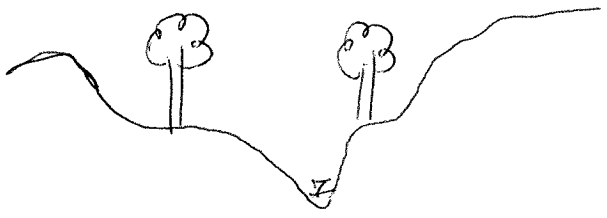
B. Hydrology (Subtotal = 6.5)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	0.5	(1)	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	(No = 0)		Yes = 3	

C. Biology (Subtotal = 5)				
18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

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

Notes: Significant Cattle impacts

Sketch:



NC DWQ Stream Identification Form Version 4.11

Date: 03/14/18	**Project/Site:** Lyons - UT4	**Latitude:**
Evaluator: JDW	**County:**	**Longitude:**
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 30.5	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 21)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	(1)	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	(1)	2	3
4. Particle size of stream substrate	0	1	(2)	3
5. Active/relict floodplain	0	1	2	(3)
6. Depositional bars or benches	0	1	2	(3)
7. Recent alluvial deposits	0	1	2	(3)
8. Headcuts	0	1	2	(3)
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

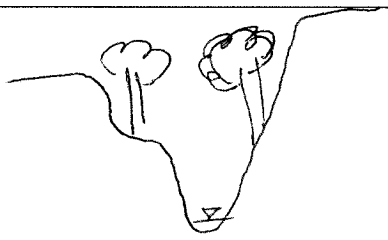
B. Hydrology (Subtotal = 4.5)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	1	(0.5)	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	(0)	0.5	1	1.5
17. Soil-based evidence of high water table?		(No = 0)	Yes = 3	

C. Biology (Subtotal = 5)				
18. Fibrous roots in streambed	3	2	(1)	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	0	0.5	(1)	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

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

Notes:

Sketch:



NC DWQ Stream Identification Form Version 4.11

Date: 03/14/2018	**Project/Site:** Lyons - UT5	**Latitude:**
Evaluator: JDW	**County:** Wilkes	**Longitude:**
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 35.5	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 24)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	1	2	(3)
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	(3)
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	(1)	2	3
6. Depositional bars or benches	0	1	2	(3)
7. Recent alluvial deposits	0	1	2	(3)
8. Headcuts	0	1	(2)	3
9. Grade control	0	0.5	1	(1.5)
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

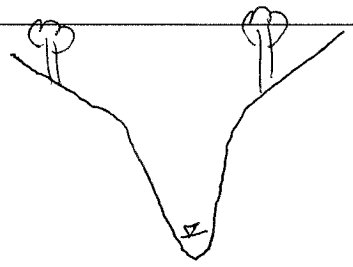
B. Hydrology (Subtotal = 6)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	0.5	(1)	1.5
16. Organic debris lines or piles	(0)	0.5	1	1.5
17. Soil-based evidence of high water table?		(No = 0)	Yes = 3	

C. Biology (Subtotal = 5.5)				
18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	0	(0.5)	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

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

Notes:

Sketch:



NC DWQ Stream Identification Form Version 4.11

Date: 03/14/2018	**Project/Site:** Lyons - UTSA	**Latitude:**
Evaluator: JDW	**County:** Wilkes	**Longitude:**
Total Points: 30.5 *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30**	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 22.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	(2)	3
2. Sinuosity of channel along thalweg	0	1	2	(3)
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	(3)
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	1	2	(3)
6. Depositional bars or benches	0	1	2	(3)
7. Recent alluvial deposits	0	1	(2)	3
8. Headcuts	0	1	(2)	3
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	0	0.5	(1)	1.5
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

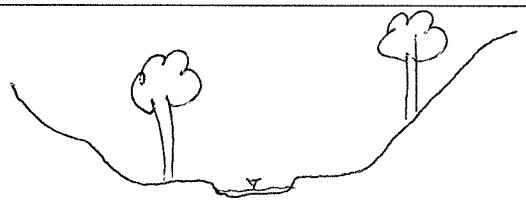
B. Hydrology (Subtotal = 4)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	1.5	1	(0.5)	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	(0)	0.5	1	1.5
17. Soil-based evidence of high water table?	(No = 0)		Yes = 3	

C. Biology (Subtotal = 4)				
18. Fibrous roots in streambed	3	2	1	(0)
19. Rooted upland plants in streambed	3	(2)	1	0
20. Macrobenthos (note diversity and abundance)	0	(1)	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	0	0.5	(1)	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

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

Notes: Caddis fly larvae, very low abundance

Sketch:



NC DWQ Stream Identification Form Version 4.11

Date: 03/14/2018	**Project/Site:** Lyons - Hen ks	**Latitude:**
Evaluator: JDW	**County:** Wilkes	**Longitude:**
Total Points: 41.5 *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30**	**Stream Determination (~~circle one~~)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 28)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	1	2	(3)
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	(3)
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	1	2	(3)
6. Depositional bars or benches	0	1	2	(3)
7. Recent alluvial deposits	0	1	2	(3)
8. Headcuts	0	(1)	2	3
9. Grade control	0	0.5	1	(1.5)
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	No = 0		(Yes = 3)	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 7)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	1	(2)	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	(No = 0)		Yes = 3	

C. Biology (Subtotal = 6.5)				
18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	0	(0.5)	1	1.5
25. Algae	0	0.5	(1)	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

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

Notes:

Sketch:

Sparks Creek

NC DWQ Stream Identification Form Version 4.11

Date: 03/14/2018	**Project/Site:** Lyons - Sparks	**Latitude:**
Evaluator: JDW	**County:** Wilkes	**Longitude:**
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 42.5	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 26.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	1	(2)	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	(3)
4. Particle size of stream substrate	0	1	2	(3)
5. Active/relict floodplain	0	1	2	(3)
6. Depositional bars or benches	0	1	2	(3)
7. Recent alluvial deposits	0	1	2	(3)
8. Headcuts	0	(1)	2	3
9. Grade control	0	0.5	(1)	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 7.5)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	0.5	(1)	1.5
16. Organic debris lines or piles	0	0.5	1	(1.5)
17. Soil-based evidence of high water table?	(No = 0)		Yes = 3	

C. Biology (Subtotal = 8.5)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	0	(1)	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	0	(0.5)	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	0	0.5	(1)	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 (Other = 0)			

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

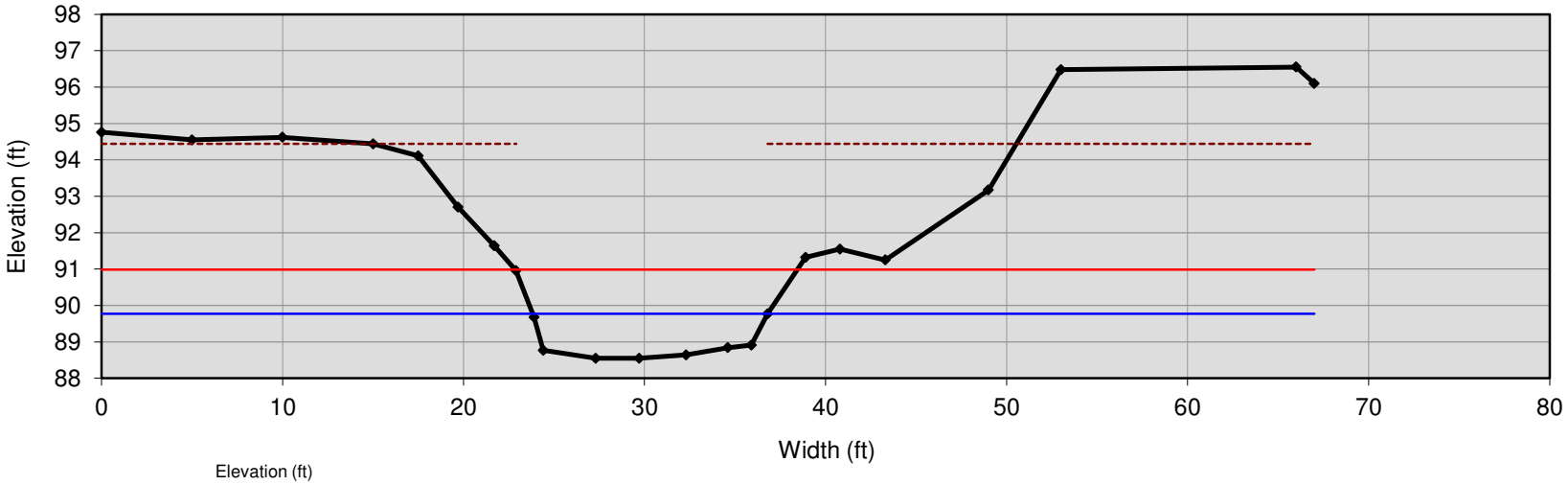
Notes:

Sketch:

Appendix 2

Cross Section 1

XS 1 (Hanks Branch Reach 3 - Riffle)



Elevation (ft)

Bankfull Dimensions

13.4	x-section area (ft.sq.)
13.0	width (ft)
1.0	mean depth (ft)
1.2	max depth (ft)
13.9	wetted perimeter (ft)
1.0	hydraulic radius (ft)
12.6	width-depth ratio

Flood Dimensions

15.6	W flood prone area (ft)
1.2	entrenchment ratio
5.9	low bank height (ft)
4.8	low bank height ratio

Materials

42.5	D50 (mm)
90	D84 (mm)
62	threshold grain size (mm):

Rosgen Stream Type

Bankfull Flow

5.3	velocity (ft/s)
70.5	discharge rate (cfs)
0.95	Froude number

Flow Resistance

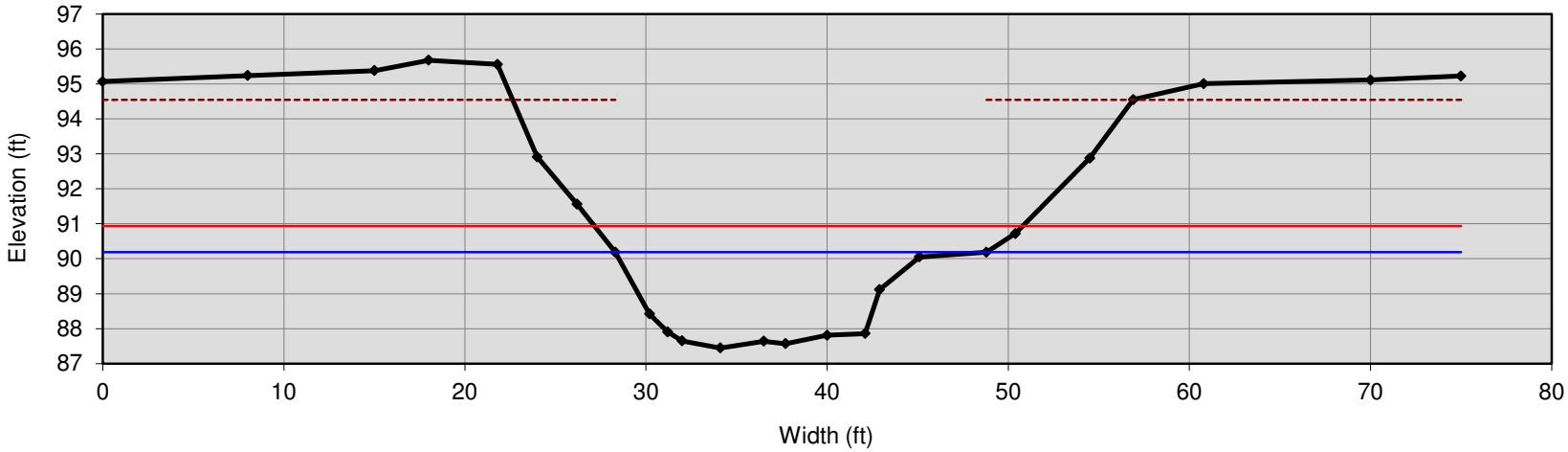
0.040	Manning's roughness
0.19	Darcy-Weisbach fric.
6.0	resistance factor u/u*
3.5	relative roughness

Forces & Power

2.1	channel slope (%)
1.26	shear stress (lb/sq.ft.)
0.81	shear velocity (ft/s)
7.1	unit strm power (lb/ft/s)

Cross Section 2

XS 2 (Hanks Branch Reach 3 - Pool)



Bankfull Dimensions

34.3	x-section area (ft.sq.)
20.5	width (ft)
1.7	mean depth (ft)
2.7	max depth (ft)
22.3	wetted perimeter (ft)
1.5	hydraulic radius (ft)
12.3	width-depth ratio

Flood Dimensions

23.7	W flood prone area (ft)
1.2	entrenchment ratio
7.1	low bank height (ft)
2.6	low bank height ratio

Materials

---	D50 (mm)
---	D84 (mm)
99	threshold grain size (mm):

Rosgen Stream Type

b

Bankfull Flow

7.2	velocity (ft/s)
246.5	discharge rate (cfs)
1.02	Froude number

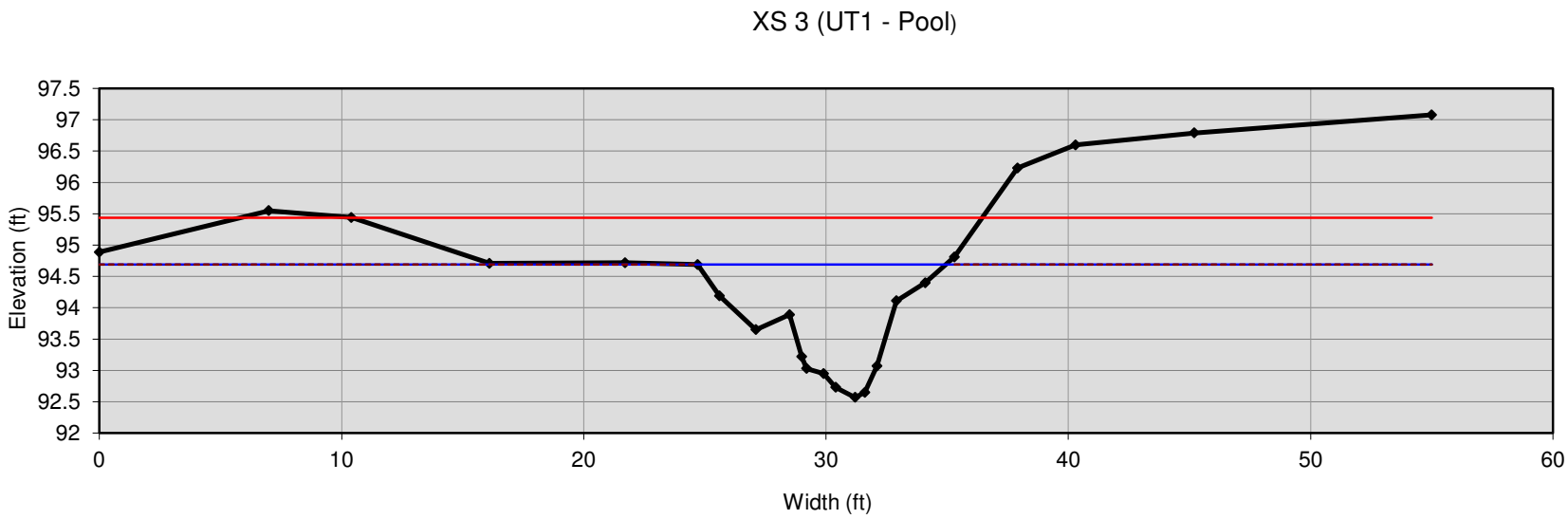
Flow Resistance

0.040	Manning's roughness
0.16	Darcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power

2.1	channel slope (%)
2.02	shear stress (lb/sq.ft.)
1.02	shear velocity (ft/s)
15.8	unit strm power (lb/ft/s)

Cross Section 3



Bankfull Dimensions

10.6	x-section area (ft.sq.)
10.2	width (ft)
1.0	mean depth (ft)
2.1	max depth (ft)
11.7	wetted perimeter (ft)
0.9	hydraulic radius (ft)
9.9	width-depth ratio

Flood Dimensions

---	W flood prone area (ft)
---	entrenchment ratio
2.1	low bank height (ft)
1.0	low bank height ratio

Materials

---	D50 (mm)
---	D84 (mm)
69	threshold grain size (mm):

Rosgen Stream Type

b

Bankfull Flow

5.5	velocity (ft/s)
58.1	discharge rate (cfs)
1.02	Froude number

Flow Resistance

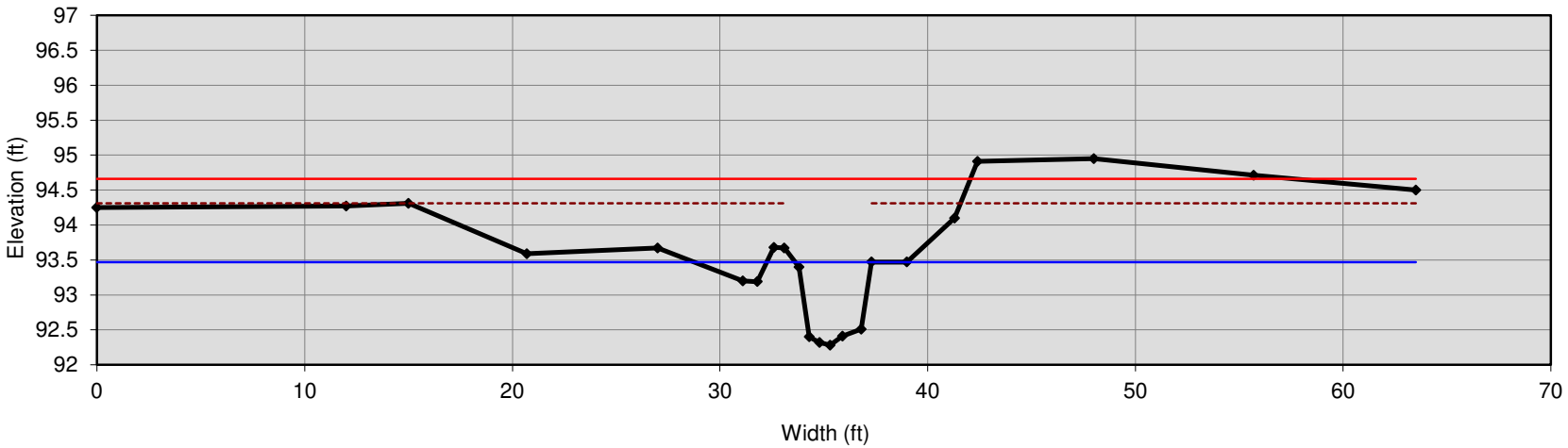
0.040	Manning's roughness
0.19	Darcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power

2.5	channel slope (%)
1.41	shear stress (lb/sq.ft.)
0.85	shear velocity (ft/s)
8.8	unit strm power (lb/ft/s)

Cross Section 4

XS 4 (UT1 - Riffle)



Bankfull Dimensions

3.3	x-section area (ft.sq.)
3.7	width (ft)
0.9	mean depth (ft)
1.2	max depth (ft)
4.9	wetted perimeter (ft)
0.7	hydraulic radius (ft)
4.2	width-depth ratio

Flood Dimensions

48.0	W flood prone area (ft)
13.0	entrenchment ratio
2.0	low bank height (ft)
1.7	low bank height ratio

Materials

16.9	D50 (mm)
43.7	D84 (mm)
103	threshold grain size (mm):

Rosgen Stream Type

b	Missing: , , Sinuosity, D50,

Bankfull Flow

6.4	velocity (ft/s)
20.8	discharge rate (cfs)
1.38	Froude number

Flow Resistance

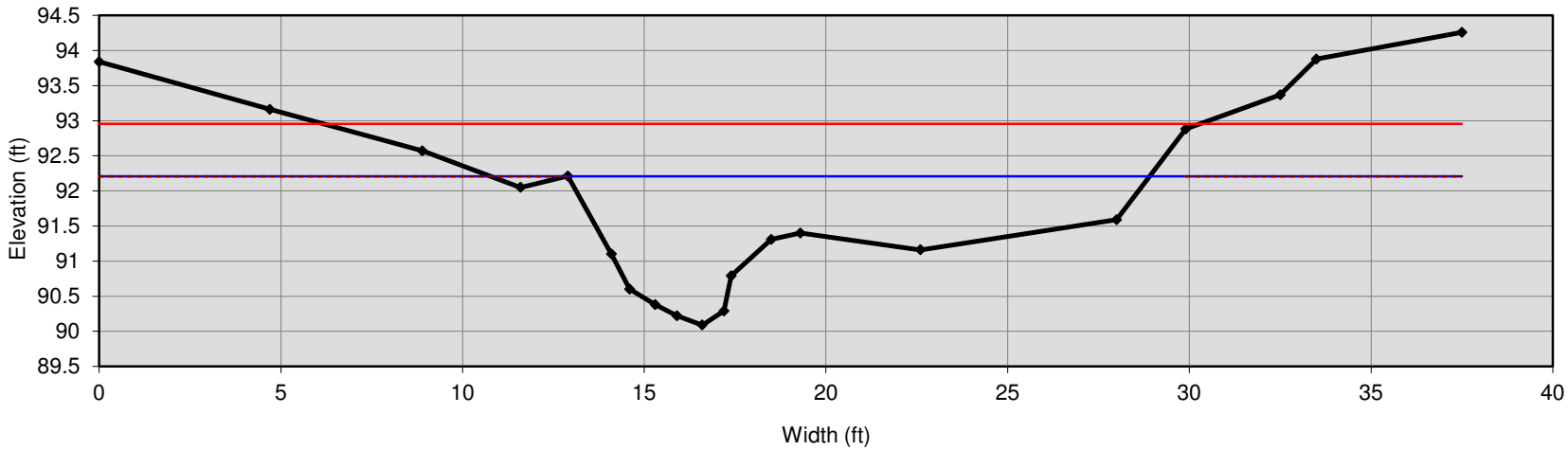
0.040	Manning's roughness
0.21	Darcy-Weisbach fric.
7.2	resistance factor u/u*
6.2	relative roughness

Forces & Power

5.1	channel slope (%)
2.10	shear stress (lb/sq.ft.)
1.04	shear velocity (ft/s)
18	unit strm power (lb/ft/s)

Cross Section 5

XS 5 (UT3 Reach 1 - Pool)



Bankfull Dimensions

16.5	x-section area (ft.sq.)
16.0	width (ft)
1.0	mean depth (ft)
2.1	max depth (ft)
17.4	wetted perimeter (ft)
0.9	hydraulic radius (ft)
15.5	width-depth ratio

Flood Dimensions

24.2	W flood prone area (ft)
1.5	entrenchment ratio
2.1	low bank height (ft)
1.0	low bank height ratio

Materials

---	D50 (mm)
---	D84 (mm)
163	threshold grain size (mm):

Rosgen Stream Type

a

Bankfull Flow

8.5	velocity (ft/s)
140.2	discharge rate (cfs)
1.54	Froude number

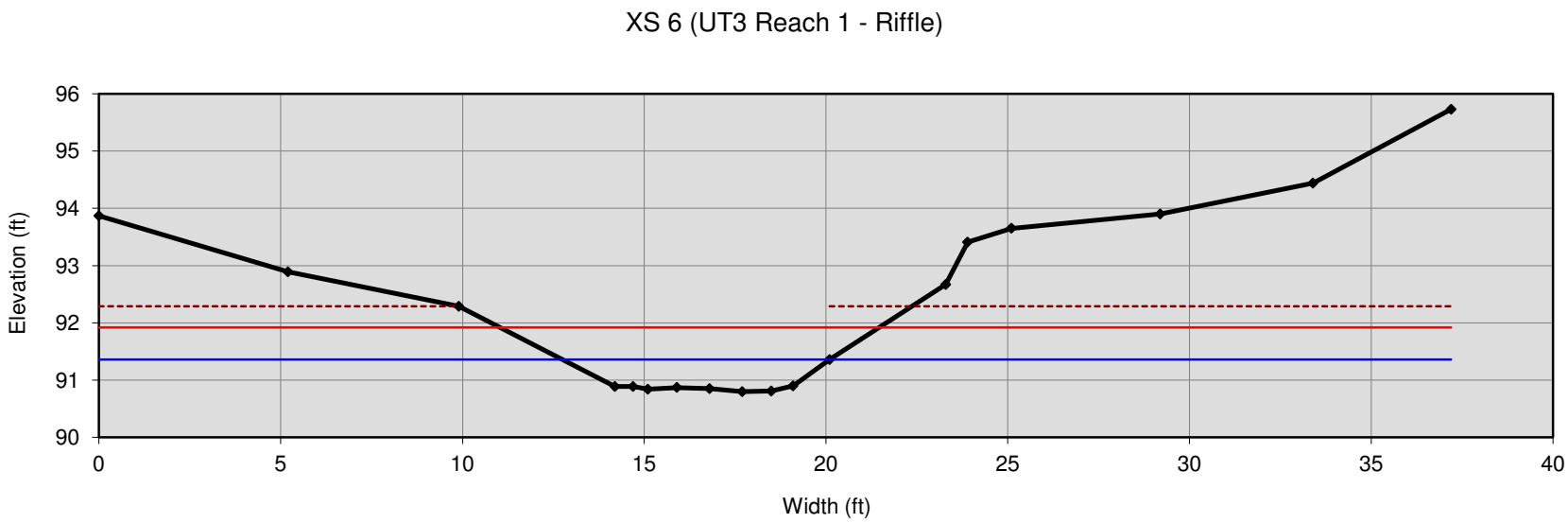
Flow Resistance

0.040	Manning's roughness
0.19	Darcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power

5.6	channel slope (%)
3.31	shear stress (lb/sq.ft.)
1.31	shear velocity (ft/s)
31	unit strm power (lb/ft/s)

Cross Section 6



Bankfull Dimensions

3.1	x-section area (ft.sq.)
7.3	width (ft)
0.4	mean depth (ft)
0.6	max depth (ft)
7.5	wetted perimeter (ft)
0.4	hydraulic radius (ft)
17.5	width-depth ratio

Flood Dimensions

10.4	W flood prone area (ft)
1.4	entrenchment ratio
1.5	low bank height (ft)
2.7	low bank height ratio

Materials

19.9	D50 (mm)
50	D84 (mm)
70	threshold grain size (mm):

Rosgen Stream Type

a	Missing: , , Sinuosity, D50,

Bankfull Flow

4.9	velocity (ft/s)
15.0	discharge rate (cfs)
1.34	Froude number

Flow Resistance

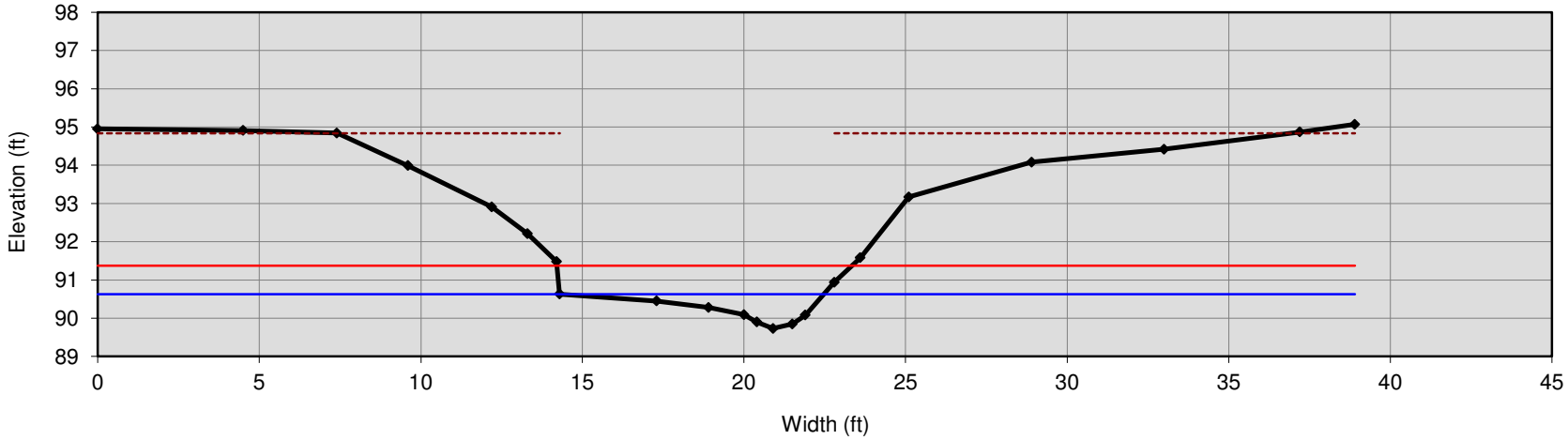
0.040	Manning's roughness
0.25	Darcy-Weisbach fric.
5.4	resistance factor u/u*
2.6	relative roughness

Forces & Power

5.6	channel slope (%)
1.43	shear stress (lb/sq.ft.)
0.86	shear velocity (ft/s)
7.1	unit strm power (lb/ft/s)

Cross Section 7

XS 7 (UT3 Reach 3 - Pool)



Bankfull Dimensions

2.8	x-section area (ft.sq.)
8.2	width (ft)
0.3	mean depth (ft)
0.9	max depth (ft)
8.6	wetted perimeter (ft)
0.3	hydraulic radius (ft)
24.1	width-depth ratio

Flood Dimensions

9.1	W flood prone area (ft)
1.1	entrenchment ratio
5.1	low bank height (ft)
5.7	low bank height ratio

Materials

---	D50 (mm)
---	D84 (mm)
39	threshold grain size (mm):

Rosgen Stream Type

b

Bankfull Flow

3.5	velocity (ft/s)
9.6	discharge rate (cfs)
1.07	Froude number

Flow Resistance

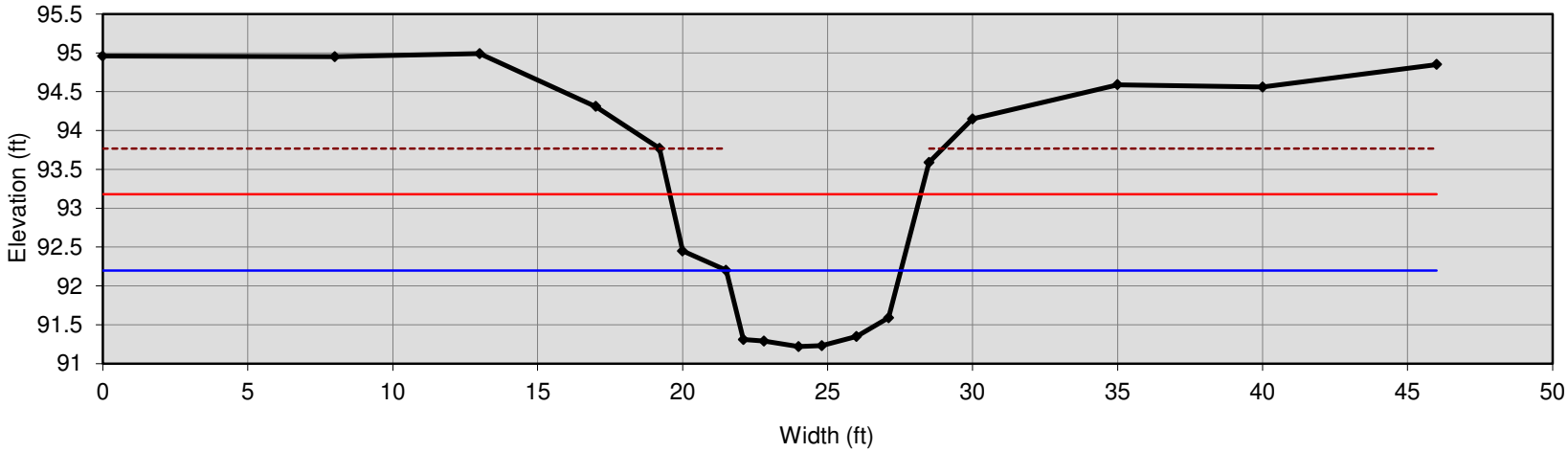
0.040	Manning's roughness
0.27	Darcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power

3.9	channel slope (%)
0.79	shear stress (lb/sq.ft.)
0.64	shear velocity (ft/s)
2.9	unit strm power (lb/ft/s)

Cross Section 8

XS 8 (UT3 Reach 3 - Riffle)



Bankfull Dimensions

4.8	x-section area (ft.sq.)
6.0	width (ft)
0.8	mean depth (ft)
1.0	max depth (ft)
6.9	wetted perimeter (ft)
0.7	hydraulic radius (ft)
7.5	width-depth ratio

Flood Dimensions

8.7	W flood prone area (ft)
1.4	entrenchment ratio
2.6	low bank height (ft)
2.6	low bank height ratio

Materials

23.6	D50 (mm)
57.6	D84 (mm)
84	threshold grain size (mm):

Rosgen Stream Type

---	Missing: , , , D50,

Bankfull Flow

5.8	velocity (ft/s)
28.2	discharge rate (cfs)
1.22	Froude number

Flow Resistance

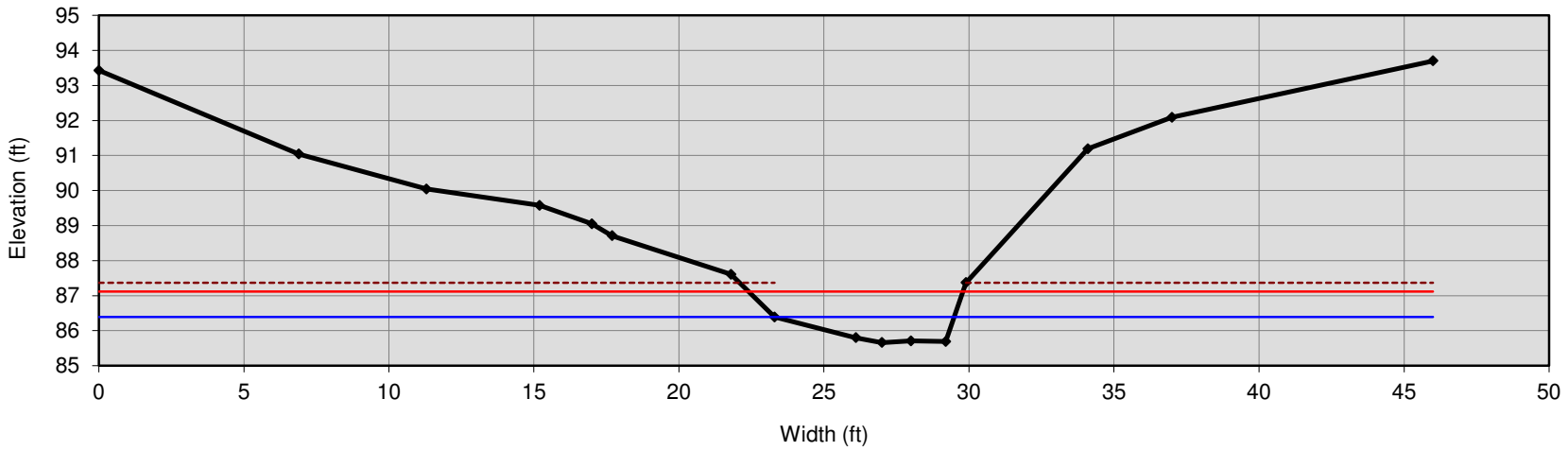
0.040	Manning's roughness
0.21	Darcy-Weisbach fric.
6.4	resistance factor u/u*
4.2	relative roughness

Forces & Power

3.9	channel slope (%)
1.72	shear stress (lb/sq.ft.)
0.94	shear velocity (ft/s)
11.4	unit strm power (lb/ft/s)

Cross Section 9

XS 9 (UT4 Reach 1 - Riffle)



Bankfull Dimensions

3.1	x-section area (ft.sq.)
6.2	width (ft)
0.5	mean depth (ft)
0.7	max depth (ft)
6.7	wetted perimeter (ft)
0.5	hydraulic radius (ft)
12.5	width-depth ratio

Flood Dimensions

7.4	W flood prone area (ft)
1.2	entrenchment ratio
1.7	low bank height (ft)
2.3	low bank height ratio

Materials

0.1	D50 (mm)
6.3	D84 (mm)
74	threshold grain size (mm):

Rosgen Stream Type

---	Missing: , , Sinuosity, D50,

Bankfull Flow

5.1	velocity (ft/s)
15.5	discharge rate (cfs)
1.33	Froude number

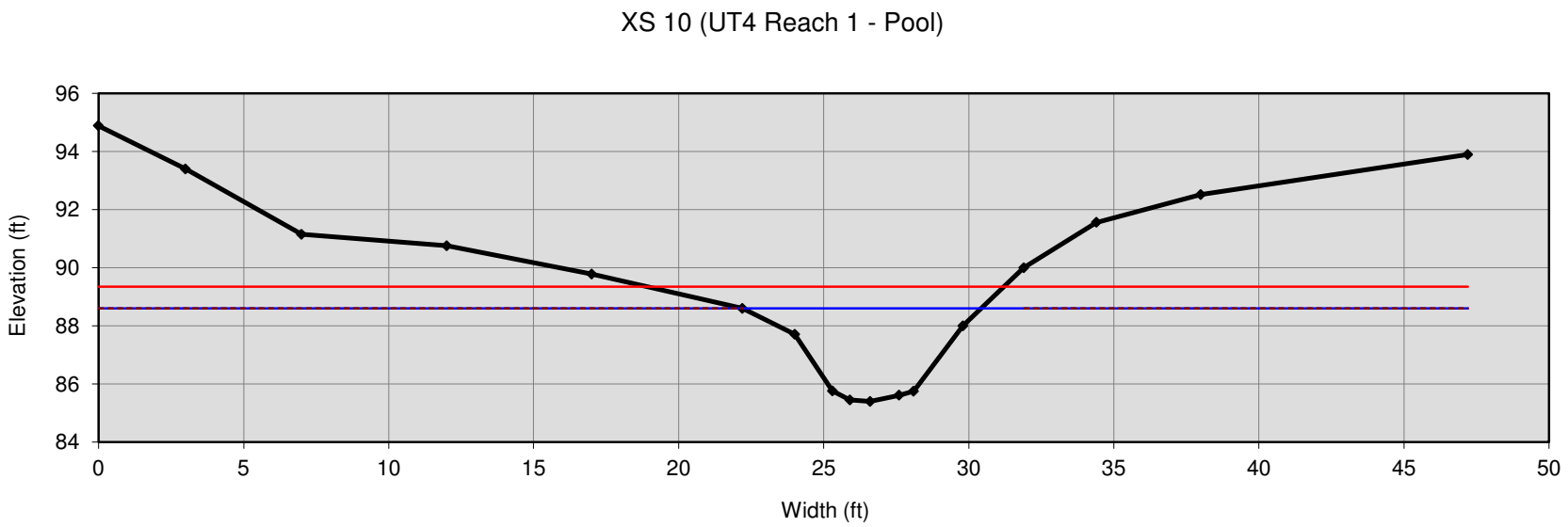
Flow Resistance

0.040	Manning's roughness
0.24	Darcy-Weisbach fric.
11.0	resistance factor u/u*
23.9	relative roughness

Forces & Power

5.3	channel slope (%)
1.50	shear stress (lb/sq.ft.)
0.88	shear velocity (ft/s)
8.3	unit strm power (lb/ft/s)

Cross Section 10



Bankfull Dimensions

14.9	x-section area (ft.sq.)
8.2	width (ft)
1.8	mean depth (ft)
3.2	max depth (ft)
11.0	wetted perimeter (ft)
1.4	hydraulic radius (ft)
4.5	width-depth ratio

Flood Dimensions

12.3	W flood prone area (ft)
1.5	entrenchment ratio
3.2	low bank height (ft)
1.0	low bank height ratio

Materials

---	D50 (mm)
---	D84 (mm)
221	threshold grain size (mm):

Rosgen Stream Type

Bankfull Flow

10.5	velocity (ft/s)
157.2	discharge rate (cfs)
1.59	Froude number

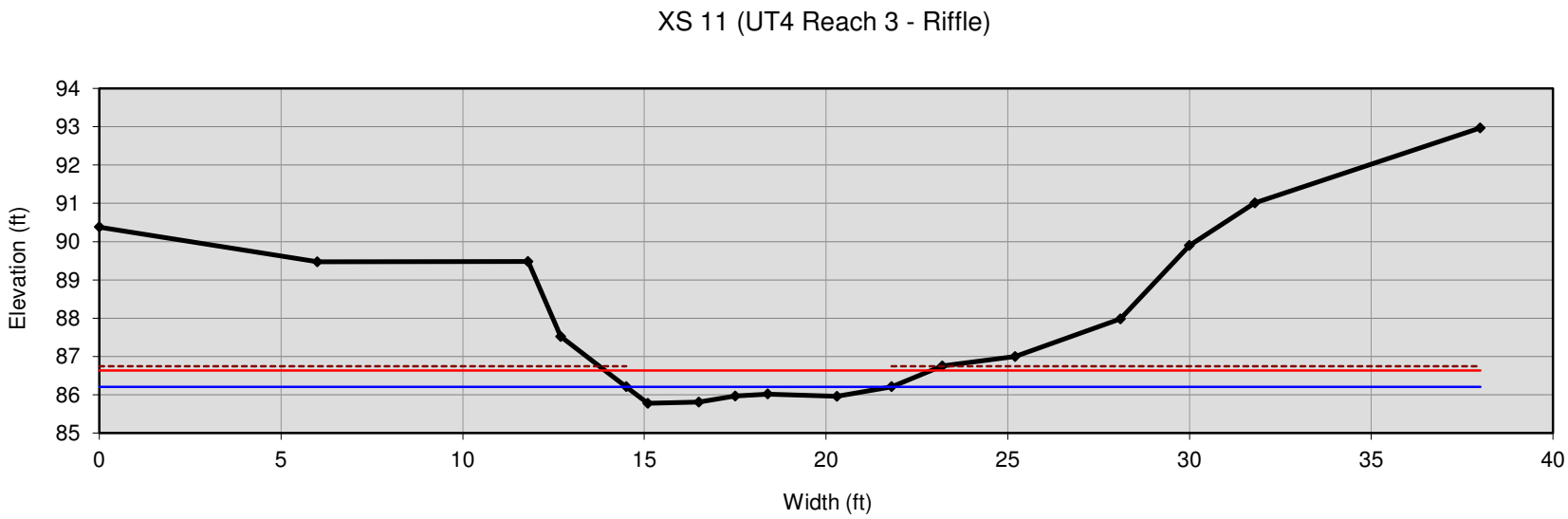
Flow Resistance

0.040	Manning's roughness
0.17	Darcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power

5.3	channel slope (%)
4.50	shear stress (lb/sq.ft.)
1.52	shear velocity (ft/s)
63	unit strm power (lb/ft/s)

Cross Section 11



Bankfull Dimensions

1.8	x-section area (ft.sq.)
7.3	width (ft)
0.3	mean depth (ft)
0.4	max depth (ft)
7.5	wetted perimeter (ft)
0.2	hydraulic radius (ft)
29.1	width-depth ratio

Flood Dimensions

9.0	W flood prone area (ft)
1.2	entrenchment ratio
1.0	low bank height (ft)
2.3	low bank height ratio

Materials

37.9	D50 (mm)
70.8	D84 (mm)
33	threshold grain size (mm):

Rosgen Stream Type

---	Missing: , , Sinuosity, D50,

Bankfull Flow

3.1	velocity (ft/s)
5.6	discharge rate (cfs)
1.09	Froude number

Flow Resistance

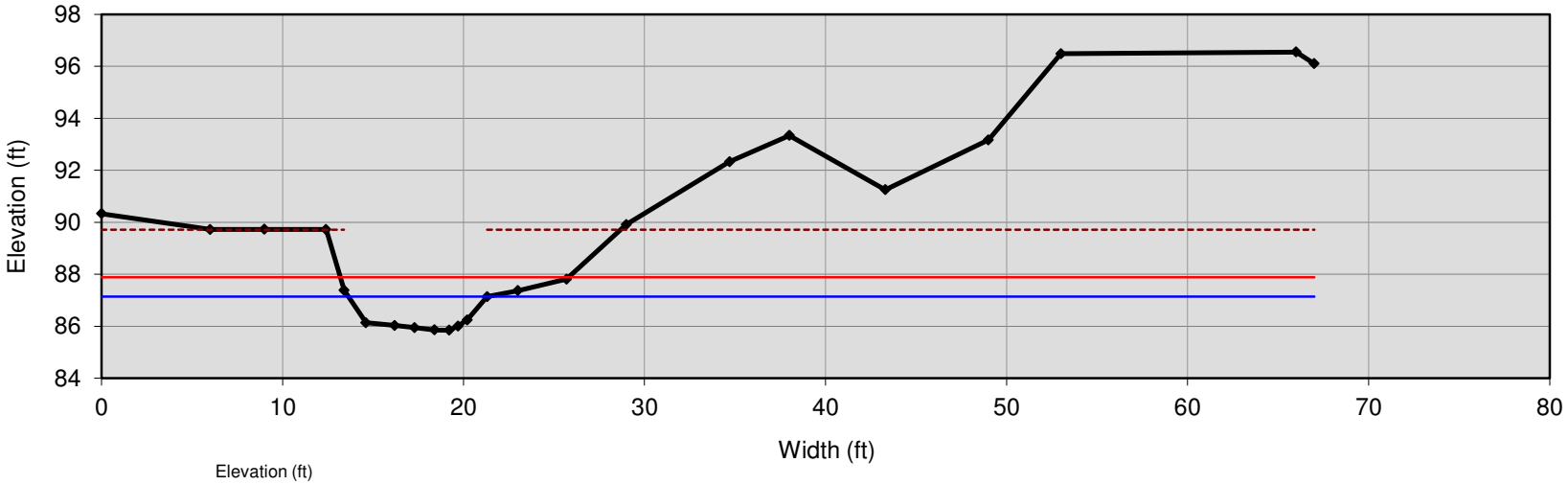
0.040	Manning's roughness
0.30	Darcy-Weisbach fric.
3.5	resistance factor u/u*
1.1	relative roughness

Forces & Power

4.4	channel slope (%)
0.67	shear stress (lb/sq.ft.)
0.59	shear velocity (ft/s)
2.1	unit strm power (lb/ft/s)

Cross Section 12

XS 12 (UT4 Reach 3 - Pool)



Elevation (ft)

Bankfull Dimensions

7.4	x-section area (ft.sq.)
7.7	width (ft)
1.0	mean depth (ft)
1.3	max depth (ft)
8.5	wetted perimeter (ft)
0.9	hydraulic radius (ft)
7.9	width-depth ratio

Flood Dimensions

12.6	W flood prone area (ft)
1.6	entrenchment ratio
3.9	low bank height (ft)
3.0	low bank height ratio

Materials

---	D50 (mm)
---	D84 (mm)
118	threshold grain size (mm):

Rosgen Stream Type

Bankfull Flow

7.1	velocity (ft/s)
53.1	discharge rate (cfs)
1.35	Froude number

Flow Resistance

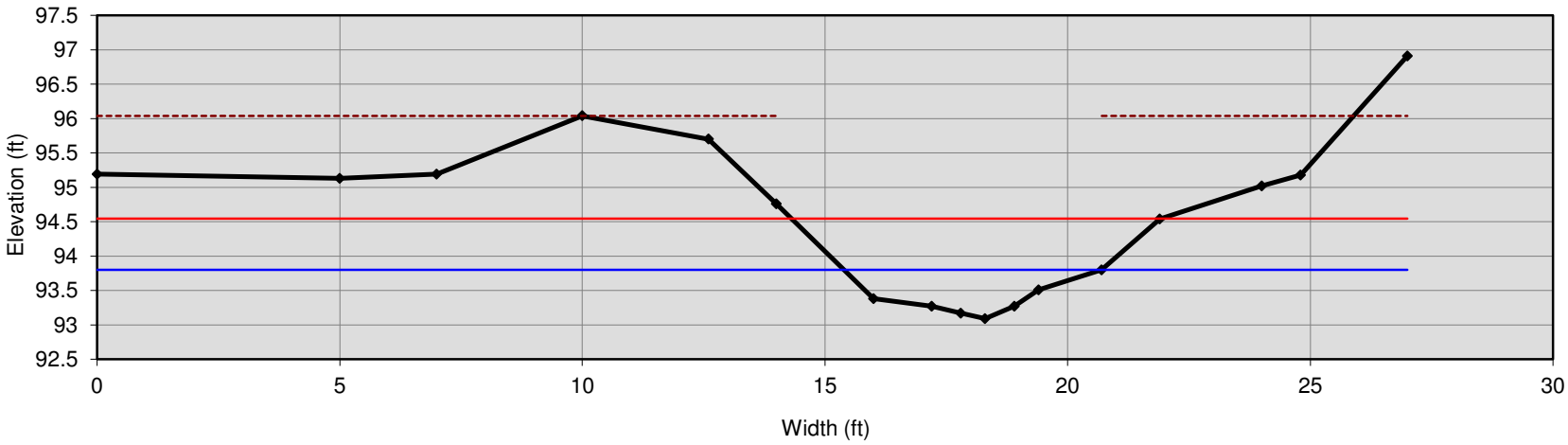
0.040	Manning's roughness
0.19	Darcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power

4.4	channel slope (%)
2.40	shear stress (lb/sq.ft.)
1.11	shear velocity (ft/s)
19	unit strm power (lb/ft/s)

Cross Section 13

XS 13 (UT5 Reach 2 - Pool)



Bankfull Dimensions

2.1	x-section area (ft.sq.)
5.3	width (ft)
0.4	mean depth (ft)
0.7	max depth (ft)
5.6	wetted perimeter (ft)
0.4	hydraulic radius (ft)
13.1	width-depth ratio

Flood Dimensions

7.6	W flood prone area (ft)
1.4	entrenchment ratio
3.0	low bank height (ft)
4.2	low bank height ratio

Materials

---	D50 (mm)
---	D84 (mm)
30	threshold grain size (mm):

Rosgen Stream Type

Bankfull Flow

3.1	velocity (ft/s)
6.7	discharge rate (cfs)
0.89	Froude number

Flow Resistance

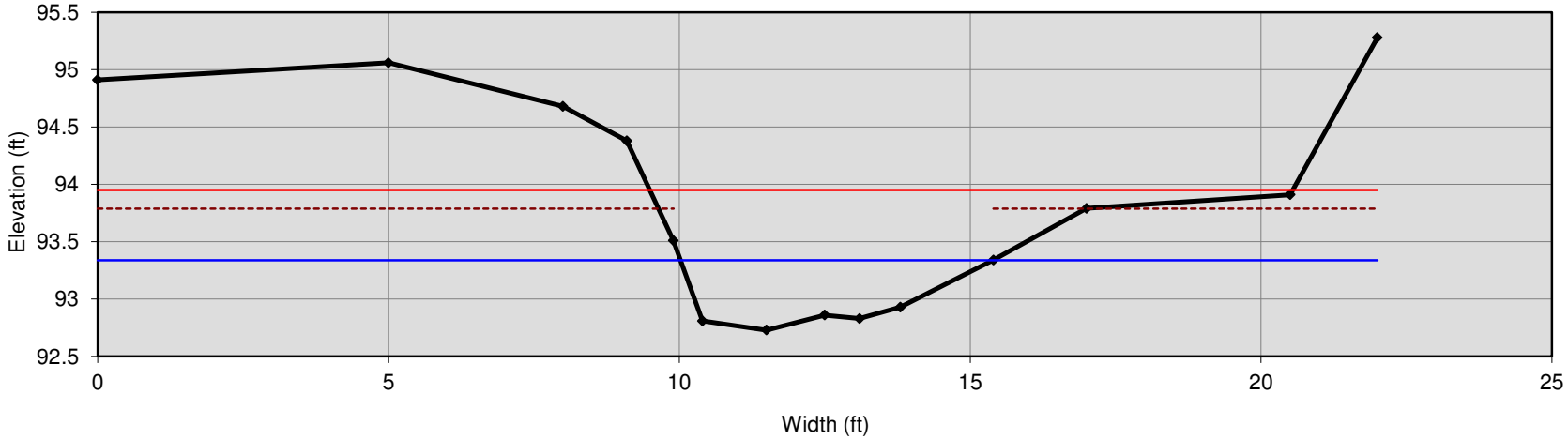
0.040	Manning's roughness
0.26	Darcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power

2.5	channel slope (%)
0.60	shear stress (lb/sq.ft.)
0.56	shear velocity (ft/s)
1.97	unit strm power (lb/ft/s)

Cross Section 14

XS 14 (UT5 - Riffle)



Bankfull Dimensions

2.2	x-section area (ft.sq.)
5.4	width (ft)
0.4	mean depth (ft)
0.6	max depth (ft)
5.7	wetted perimeter (ft)
0.4	hydraulic radius (ft)
13.0	width-depth ratio

Flood Dimensions

11.0	W flood prone area (ft)
2.1	entrenchment ratio
1.1	low bank height (ft)
1.7	low bank height ratio

Materials

16.9	D50 (mm)
43.7	D84 (mm)
30	threshold grain size (mm):

Rosgen Stream Type

a	Missing: , , Sinuosity, D50,

Bankfull Flow

3.1	velocity (ft/s)
7.0	discharge rate (cfs)
0.89	Froude number

Flow Resistance

0.040	Manning's roughness
0.25	Darcy-Weisbach fric.
5.7	resistance factor u/u*
2.9	relative roughness

Forces & Power

2.5	channel slope (%)
0.61	shear stress (lb/sq.ft.)
0.56	shear velocity (ft/s)
2	unit strm power (lb/ft/s)

Appendix 3

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action Id. **SAW-2018-01784** County: **Wilkes** U.S.G.S. Quad: **NC- Traphill**

NOTIFICATION OF JURISDICTIONAL DETERMINATION (revised)

Requestor: **Wildlands Engineering, Inc.**
Charlie Neaves
Address: **312 West Millbrook Road, Suite 225**
Raleigh, NC 27609
Telephone Number: **919-851-9986**
E-mail: **cneaves@wildlandseng.com**

Size (acres) **52**
Nearest Waterway **Hanks Branch**
USGS HUC **03040101**
Nearest Town **Traphill**
River Basin **Upper Pee Dee**
Coordinates Latitude: **36.327449**
Longitude: **-81.008201**

Location description: **The Lyon Hills Mitigation Site is located at 334 Lyon Ridge, south of Austin-Traphill Road and north of Hanks Street in Traphill, Wilkes County, North Carolina.**

Indicate Which of the Following Apply:

A. Preliminary Determination

☒ There appear to be **waters, including wetlands** on the above described project area/property, that may be subject to Section 404 of the Clean Water Act (CWA)(33 USC § 1344) and/or Section 10 of the Rivers and Harbors Act (RHA) (33 USC § 403). The **waters, including wetlands** have been delineated, and the delineation has been verified by the Corps to be sufficiently accurate and reliable. The approximate boundaries of these waters are shown on the enclosed revised delineation map received **5/28/2020**. Therefore this preliminary jurisdiction determination may be used in the permit evaluation process, including determining compensatory mitigation. For purposes of computation of impacts, compensatory mitigation requirements, and other resource protection measures, a permit decision made on the basis of a preliminary JD will treat all waters and wetlands that would be affected in any way by the permitted activity on the site as if they are jurisdictional waters of the U.S. This preliminary determination is not an appealable action under the Regulatory Program Administrative Appeal Process (Reference 33 CFR Part 331). However, you may request an approved JD, which is an appealable action, by contacting the Corps district for further instruction.

☐ There appear to be **waters, including wetlands** on the above described project area/property, that may be subject to Section 404 of the Clean Water Act (CWA)(33 USC § 1344) and/or Section 10 of the Rivers and Harbors Act (RHA) (33 USC § 403). However, since the **waters, including wetlands** have not been properly delineated, this preliminary jurisdiction determination may not be used in the permit evaluation process. Without a verified wetland delineation, this preliminary determination is merely an effective presumption of CWA/RHA jurisdiction over all of the **waters, including wetlands** at the project area, which is not sufficiently accurate and reliable to support an enforceable permit decision. We recommend that you have the **waters, including wetlands** on your project area/property delineated. As the Corps may not be able to accomplish this wetland delineation in a timely manner, you may wish to obtain a consultant to conduct a delineation that can be verified by the Corps.

B. Approved Determination

☐ There are Navigable Waters of the United States within the above described project area/property subject to the permit requirements of Section 10 of the Rivers and Harbors Act (RHA) (33 USC § 403) and Section 404 of the Clean Water Act (CWA)(33 USC § 1344). Unless there is a change in law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

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

☐We recommend you have the **waters, including wetlands** on your project area/property delineated. As the Corps may not be able to accomplish this wetland delineation in a timely manner, you may wish to obtain a consultant to conduct a delineation that can be verified by the Corps.

☐The **waters, including wetlands** on your project area/property have been delineated and the delineation has been verified by the Corps. The approximate boundaries of these waters are shown on the enclosed delineation map dated **DATE**. We strongly

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

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

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

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

Placement of dredged or fill material within waters of the US, including wetlands, without a Department of the Army permit may constitute a violation of Section 301 of the Clean Water Act (33 USC § 1311). Placement of dredged or fill material, construction or placement of structures, or work within navigable waters of the United States without a Department of the Army permit may constitute a violation of Sections 9 and/or 10 of the Rivers and Harbors Act (33 USC § 401 and/or 403). If you have any questions regarding this determination and/or the Corps regulatory program, please contact **Steve Kichefski at 828-271-7980 ext. 4234 or steven.l.kichefski@usace.army.mil**.

C. Basis For Determination: Basis For Determination: See the preliminary jurisdictional determination form signed 6/11/2020. Due to an expanded project area, a revised PJD was requested by email (with supporting documentation) on May 28, 2020. This revised PJD replaces the PJD issued on April 2, 2020.

D. Remarks: None.

E. Attention USDA Program Participants

This delineation/determination has been conducted to identify the limits of Corps' Clean Water Act jurisdiction for the particular site identified in this request. The delineation/determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA Program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

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

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

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

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR part 331.5, and that it has been received by the Division Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by **Not applicable**.
It is not necessary to submit an RFA form to the Division Office if you do not object to the determination in this correspondence.

Corps Regulatory Official: _____

Date of JD: **6/11/2020** Expiration Date of JD: **Not applicable**

SAW-2018-01784

The Wilmington District is committed to providing the highest level of support to the public. To help us ensure we continue to do so, please complete the Customer Satisfaction Survey located at http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0

Copy furnished:

Property Owner:	**Linda & Mickey Durham**
Address:	**10246 Austin Traphill Road** **Traphill, NC 28685**
Telephone Number:	**336-957-2702**
E-mail:	**n/a**

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: **Wildlands Engineering, Inc., Charlie Neaves**	File Number: **SAW-2018-01784**	Date: **6/11/2020**

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 or http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits.aspx or the Corps regulations at 33 CFR Part 331.

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

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

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

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

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

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

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

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

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

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

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

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:	If you only have questions regarding the appeal process you may also contact:
District Engineer, Wilmington Regulatory Division **Attn: Steve Kichefski** **Asheville Regulatory Office** **U.S Army Corps of Engineers** **151 Patton Avenue, Room 208** **Asheville, North Carolina 28801**	Mr. Phillip Shannin, Administrative Appeal Review Officer CESAD-PDO U.S. Army Corps of Engineers, South Atlantic Division 60 Forsyth Street, Room 10M15 Atlanta, Georgia 30303-8801 Phone: (404) 562-5137

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

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

For appeals on Initial Proffered Permits send this form to:

District Engineer, Wilmington Regulatory Division, **Attn: Steve Kichefski, 69 Darlington Avenue, Wilmington, North Carolina 28403**

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

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

PRELIMINARY JURISDICTIONAL DETERMINATION (PJD) FORM

BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR PJD: 6/11/2020

B. NAME AND ADDRESS OF PERSON REQUESTING PJD: Wildlands Engineering, Inc., Charlie Neaves, 312 West Millbrook Road, Suite 225, Raleigh, NC 27609

C. DISTRICT OFFICE, FILE NAME, AND NUMBER: Wilmington District, NCDMS Lyon Hills Mitigation Site, SAW-2018-01784

D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION: The Lyon Hills Mitigation Site is located at 334 Lyon Ridge, south of Austin-Traphill Road and north of Hanks Street in Traphill, Wilkes County, North Carolina.

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

State: NC County: Wilkes City: Traphill
Center coordinates of site (lat/long in degree decimal format): Latitude: 36.327449 Longitude: -81.008201

Universal Transverse Mercator:

Name of nearest waterbody: Hanks Branch

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

☐Office (Desk) Determination. Date:

☒Field Determination. Date(s): February 11, 2020 with Steve Kichefski (USACE) and Charlie Neaves (Wildlands Engineering, Inc.)

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

Site Number	Latitude (decimal degrees)	Longitude (decimal degrees)	Estimated amount of aquatic resources in review area (acreage and linear feet, if applicable	Type of aquatic resources (i.e., wetland vs. non-wetland waters)	Geographic authority to which the aquatic resource "may be" subject (i.e., Section 404 or Section 10/404)
1	2	3	4	5	6
See attached table and map					

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

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

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

- [x] Maps, plans, plots or plat submitted by or on behalf of the PJD requestor:
  Map: _____.
- [x] Data sheets prepared/submitted by or on behalf of the PJD requestor.
  - [ ] Office concurs with data sheets/delineation report.
  - [ ] Office does not concur with data sheets/delineation report. Rationale: _____.
- [ ] Data sheets prepared by the Corps: _____.
- [ ] Corps navigable waters' study: _____.
- [ ] U.S. Geological Survey Hydrologic Atlas: _____.
  - [ ] USGS NHD data.
  - [ ] USGS 8 and 12 digit HUC maps.
- [x] U.S. Geological Survey map(s). Cite scale & quad name: 1:12000 Traphill Quadrangle.
- [x] Natural Resources Conservation Service Soil Survey. Citation: Web Soil Survey.
- [ ] National wetlands inventory map(s). Cite name: _____.
- [ ] State/local wetland inventory map(s): _____.
- [ ] FEMA/FIRM maps: _____.
- [ ] 100-year Floodplain Elevation is: _____.(National Geodetic Vertical Datum of 1929)
- [x] Photographs: [x] Aerial (Name & Date): NC Onemap, 2018.
  or [ ] Other (Name & Date): _____.
- [ ] Previous determination(s). File no. and date of response letter: _____.
- [ ] Other information (please specify): _____.

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

_____	Charlie Neaves 5/28/2020
Signature and date of Regulatory staff member completing PJD	Signature and date of person requesting PJD (REQUIRED, unless obtaining the signature is impracticable)[1]

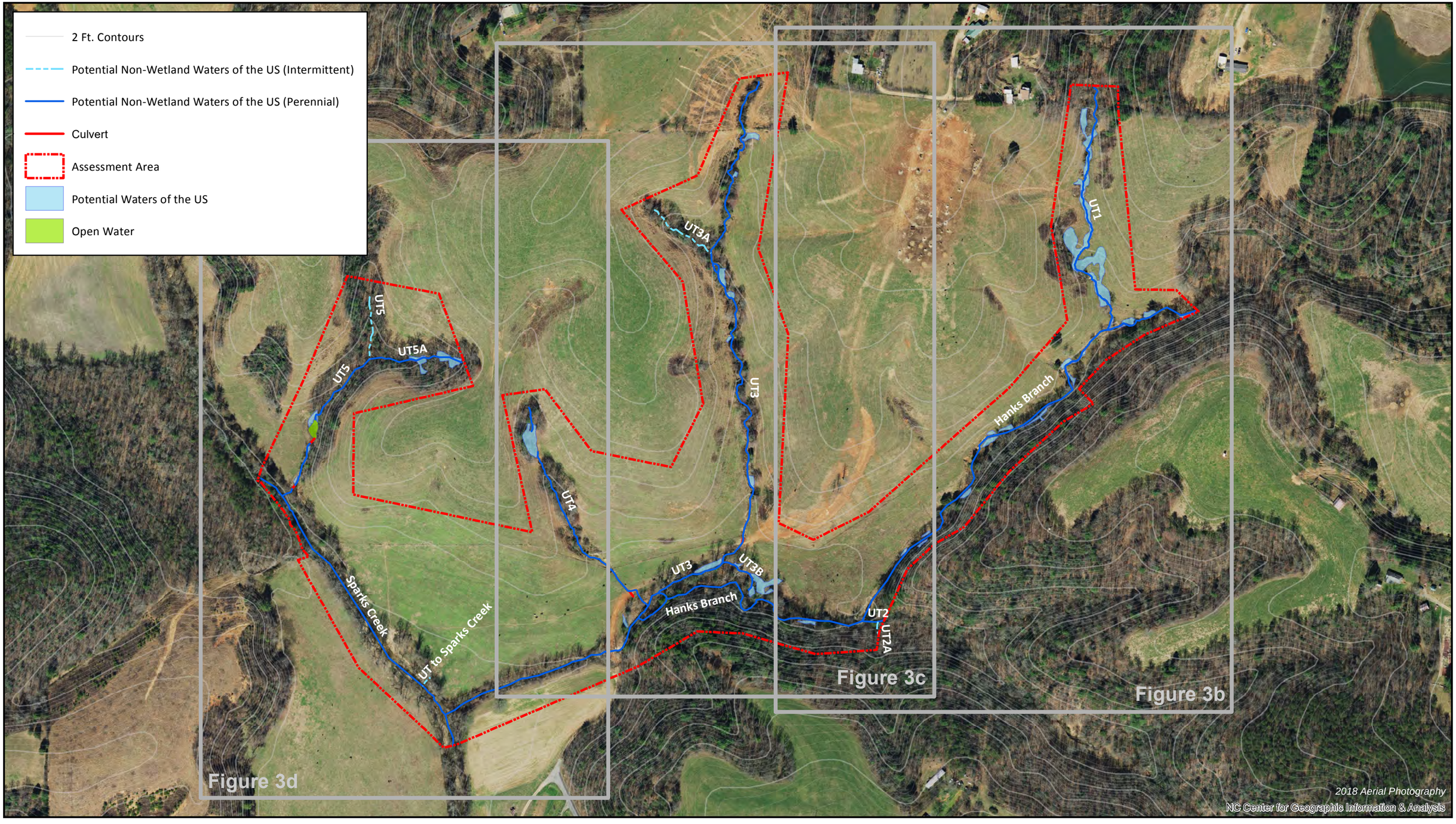
[1] Districts may establish timeframes for requestor to return signed PJD forms. If the requestor does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action.

Table 1. Summary of On-Site Jurisdictional Waters

Feature	Latitude	Longitude	Cowardin Class	Estimated Amount of Aquatic Resource in Review Area	Class of Aquatic Resource
Sparks Creek	36.326588	-81.012224	Riverine - Streambed	1117.02	Potential Non-Wetland Waters of the US (Perennial)
Hanks Branch	36.326727	-81.008730	Riverine - Streambed	3558.14	Potential Non-Wetland Waters of the US (Perennial)
UT to Sparks Creek	36.325918	-81.011459	Unconsolidated Bottom	39.38	Potential Non-Wetland Waters of the US (Intermittent)
UT1	36.330269	-81.004109	Riverine - Streambed	952.82	Potential Non-Wetland Waters of the US (Perennial)
UT2	36.326555	-81.006409	Riverine - Streambed	78.08	Potential Non-Wetland Waters of the US (Perennial)
UT2A	36.326418	-81.006362	Unconsolidated Bottom	49.88	Potential Non-Wetland Waters of the US (Intermittent)
UT3	36.328733	-81.007952	Riverine - Streambed	2151.66	Potential Non-Wetland Waters of the US (Perennial)
UT3A	36.330059	-81.008677	Unconsolidated Bottom	252.54	Potential Non-Wetland Waters of the US (Intermittent)
UT3B	36.327005	-81.007829	Riverine-Streambed	161.51	Potential Non-Wetland Waters of the US (Perennial)
UT4	36.327420	-81.009886	Riverine - Streambed	757.47	Potential Non-Wetland Waters of the US (Perennial)
UT5	36.329714	-81.012342	Riverine – Streambed	691.75	Potential Non-Wetland Waters of the US (Intermittent/Perennial)
UT5A	36.328847	-81.011757	Riverine - Streambed	318.01	Potential Non-Wetland Waters of the US (Perennial)
Wetland A	36.329405	-81.002931	Palustrine – Emergent	0.007	Potential Waters of the US
Wetland B	36.329402	-81.002931	Palustrine – Emergent	0.014	Potential Waters of the US

Feature	Latitude	Longitude	Cowardin Class	Estimated Amount of Aquatic Resource in Review Area	Class of Aquatic Resource
Wetland C	36.329344	-81.003610	Palustrine – Emergent	0.015	Potential Waters of the US
Wetland D	36.32930077	-81.003679	Palustrine – Emergent	0.002	Potential Waters of the US
Wetland E	36.3293255	-81.003815	Palustrine – Emergent	0.004	Potential Waters of the US
Wetland F	36.329893	-81.003971	Palustrine – Emergent	0.431	Potential Waters of the US
Wetland G	36.328956	-81.004307	Palustrine – Emergent	0.019	Potential Waters of the US
Wetland H	36.328800	-81.004239	Palustrine – Emergent	0.009	Potential Waters of the US
Wetland I	36.328212	-81.005166	Palustrine – Emergent	0.035	Potential Waters of the US
Wetland J	36.327736	-81.005399	Palustrine – Emergent	0.012	Potential Waters of the US
Wetland K	36.328475	-81.004579	Palustrine – Emergent	0.016	Potential Waters of the US
Wetland L	36.327298	-81.005863	Palustrine – Emergent	0.010	Potential Waters of the US
Wetland M	36.327199	-81.006090	Palustrine – Emergent	0.005	Potential Waters of the US
Wetland N	36.326540	-81.007134	Palustrine – Emergent	0.011	Potential Waters of the US
Wetland O	36.326883	-81.007695	Palustrine – Emergent	0.078	Potential Waters of the US
Wetland P	36.327042	-81.007960	Palustrine – Emergent	0.004	Potential Waters of the US
Wetland Q	36.327034	-81.008272	Palustrine – Emergent	0.032	Potential Waters of the US
Wetland R	36.327812	-81.007827	Palustrine – Emergent	0.013	Potential Waters of the US
Wetland S	36.329508	-81.008101	Palustrine – Emergent	0.010	Potential Waters of the US
Wetland T	36.329670	-81.008202	Palustrine – Emergent	0.023	Potential Waters of the US
Wetland U	36.330603	-81.008076	Palustrine – Emergent	0.005	Potential Waters of the US
Wetland V	36.330966	-81.007904	Palustrine – Emergent	0.021	Potential Waters of the US

Feature	Latitude	Longitude	Cowardin Class	Estimated Amount of Aquatic Resource in Review Area	Class of Aquatic Resource
Wetland W	36.329104	-81.008115	Palustrine – Emergent	0.004	Potential Waters of the US
Wetland X	36.326493	-81.009214	Palustrine – Emergent	0.007	Potential Waters of the US
Wetland Y	36.328073	-81.010287	Palustrine – Emergent	0.079	Potential Waters of the US
Wetland Z	36.327737	-81.012955	Palustrine – Emergent	0.004	Potential Waters of the US
Wetland AA	36.328023	-81.012816	Palustrine – Emergent	0.004	Potential Waters of the US
Wetland BB	36.328311	-81.012775	Palustrine – Emergent	0.017	Potential Waters of the US
Wetland CC	36.328828	-81.011586	Palustrine – Emergent	0.028	Potential Waters of the US
Wetland DD	36.328828	-81.011586	Palustrine – Emergent	0.046	Potential Waters of the US
Pond A	36.328205	-81.012852	Palustrine – Unconsolidated Bottom	0.033	Potential Waters of the US



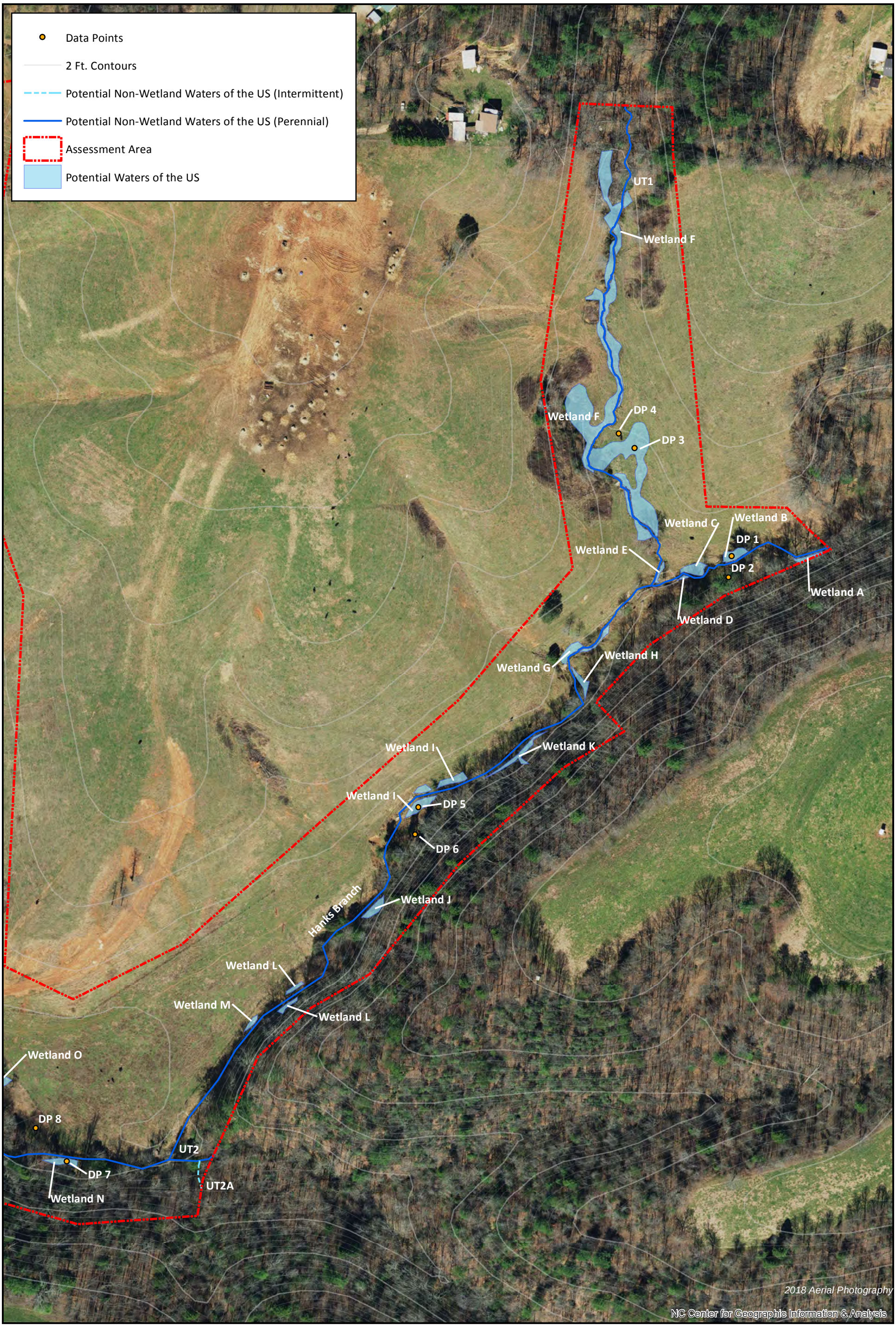
WILDLANDS ENGINEERING

0 150 300 Feet

N

Figure 3a Site Map Overview
Lyon Hills Mitigation Site
Yadkin 03040101

Wilkes County, NC



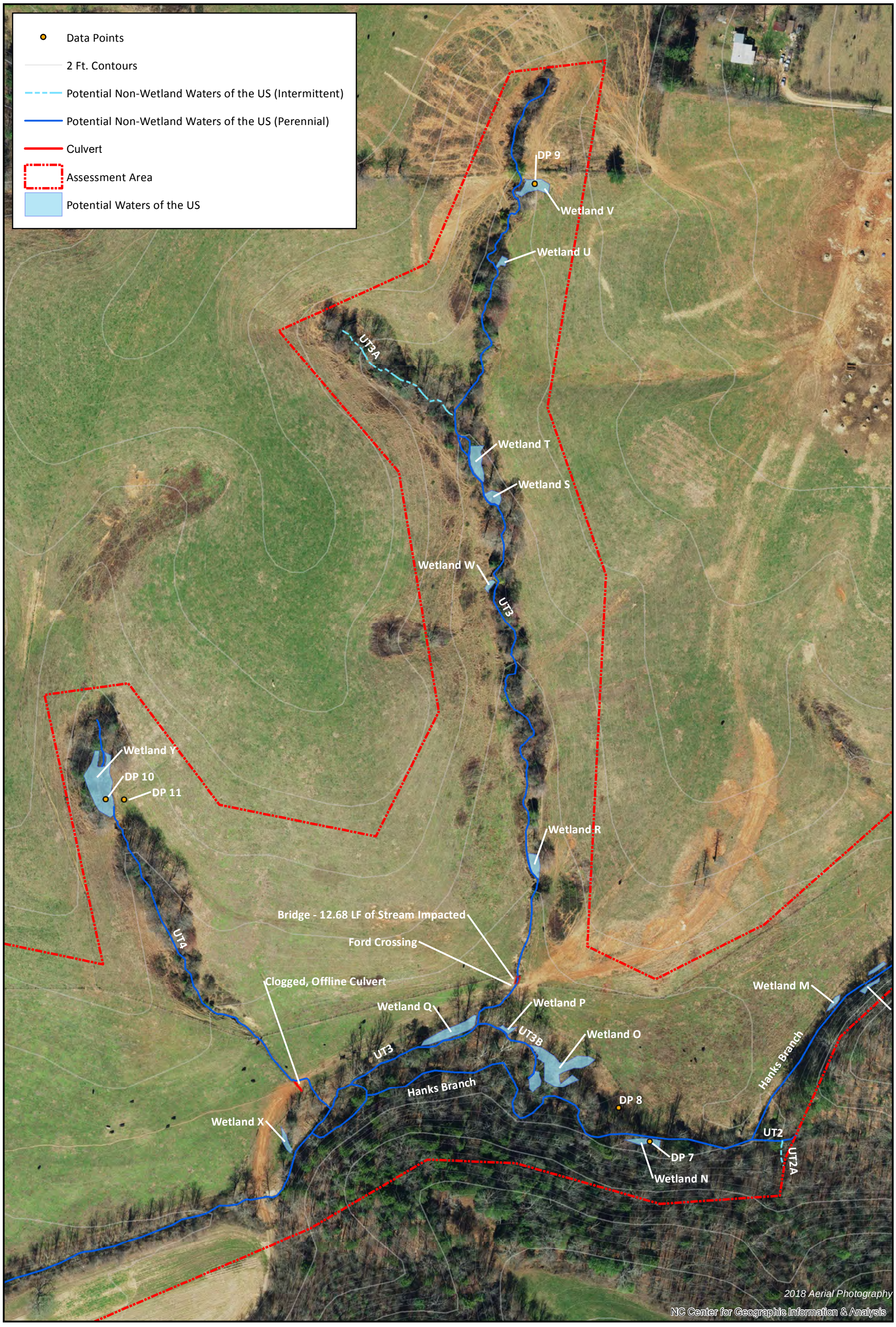
WILDLANDS ENGINEERING

0 75 150 Feet

N

Figure 3b Site Map
Lyon Hills Mitigation Site
Yadkin 03040101

Wilkes County, NC



WILDLANDS ENGINEERING

0 75 150 Feet

N

Figure 3c Site Map
Lyon Hills Mitigation Site
Yadkin 03040101

Wilkes County, NC

WILDLANDS ENGINEERING

0 75 150 Feet

N

Figure 3d Site Map
Lyon Hills Mitigation Site
Yadkin 03040101

Wilkes County, NC

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Lyon Hills Mitigation Site City/County: Traphill/Wilkes Sampling Date: 5/20/19

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: DP1-Wetland A-E

Investigator(s): C. Neaves Section, Township, Range:

Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): None Slope (%): 1

Subregion (LRR or MLRA): LRR P, MLRA 136 Lat: 36.329402 Long: -81.003403 Datum: NAD 1983

Soil Map Unit Name: Rhodhiss fine sandy loam NWI classification:

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

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

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

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

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

Remarks:
Impacted by cattle grazing.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 10

Wetland Hydrology Present? **Yes** X **No** ____

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

Remarks:

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

Sampling Point: DP1-Wetland A-E

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Herb Stratum (Plot size: 5')			
1. *Carex lurida*	80	Yes	OBL
2. *Impatiens capensis*	8	No	FACW
3. *Ranunculus spp.*	3	No	FAC
4. *Salix nigra*	2	No	OBL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	93 =Total Cover		
50% of total cover: 47	20% of total cover: 19		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	82	x 1 =	82
FACW species	8	x 2 =	16
FAC species	3	x 3 =	9
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	93 (A)		107 (B)

Prevalence Index = B/A = 1.15

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

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

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? **Yes** X **No** ___

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

SOIL

Sampling Point: DP1-Wetland A-E

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

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 4/1	96	10YR 5/6	4	C	PL	Loamy/Clayey	Prominent redox concentrations
8-12								Cobble

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

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

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

Remarks:

This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Lyon Hills Mitigation Site City/County: Traphill/Wilkes Sampling Date: 5/20/19

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: DP2 Upland

Investigator(s): C. Neaves Section, Township, Range:

Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): None Slope (%): 2

Subregion (LRR or MLRA): LRR P, MLRA 136 Lat: 36.329304 Long: -81.003418 Datum: NAD 1983

Soil Map Unit Name: Rhodhiss fine sandy loam NWI classification:

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

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

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

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

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

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

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

Wetland Hydrology Present? **Yes** ____ **No** X

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP2 Upland

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. ***Betula lenta***	15	Yes	FACU
2. ***Pinus strobus***	18	Yes	FACU
3. ***Liriodendron tulipifera***	10	Yes	FACU
4. ***Oxydendrum arboreum***	5	No	UPL
5.			
6.			
7.			
	48	=Total Cover	
50% of total cover: 24		20% of total cover:	10
Sapling/Shrub Stratum (Plot size: 15')			
1. ***Acer rubrum***	5	Yes	FAC
2. ***Cornus florida***	5	Yes	FACU
3. ***Betula lenta***	10	Yes	FACU
4. ***Rhododendron maximum***	5	Yes	FAC
5.			
6.			
7.			
8.			
9.			
	25	=Total Cover	
50% of total cover: 13		20% of total cover:	5
Herb Stratum (Plot size: 5')			
1. ***Schedonorus arundinaceus***	80	Yes	FACU
2. ***Microstegium vimineum***	15	No	FAC
3. ***Ranunculus spp.***	2	No	FAC
4. ***Eupatorium capillifolium***	2	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	99	=Total Cover	
50% of total cover: 50		20% of total cover:	20
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

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

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 25.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	27	x 3 =	81
FACU species	140	x 4 =	560
UPL species	5	x 5 =	25
Column Totals:	172 (A)		666 (B)

Prevalence Index = B/A = 3.87

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

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

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? **Yes** ___ **No** X

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

SOIL

Sampling Point: DP2 Upland

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

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 4/1	100					Loamy/Clayey	
3-12	10YR 5/6	100					Loamy/Clayey	

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

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

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

Remarks:

This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Lyon Hills Mitigation Site City/County: Traphill/Wilkes Sampling Date: 5/20/19

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: DP3 Wetland F

Investigator(s): C. Neaves Section, Township, Range:

Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): Concave Slope (%): 4

Subregion (LRR or MLRA): LRR P, MLRA 136 Lat: 36.329893 Long: -81.003971 Datum: NAD 1983

Soil Map Unit Name: Rhodhiss fine sandy loam NWI classification:

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

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

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

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

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

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

Surface Water Present?	Yes X	No	Depth (inches): 0
Water Table Present?	Yes X	No	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No**

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP3 Wetland F

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size: 15')			
1. ***Juncus effusus***	40	Yes	FACW
2. ***Juncus tenuis***	30	Yes	FAC
3. ***Ranunculus spp.***	10	No	FAC
4. ***Schedonorus arundinaceus***	5	No	FACU
5. ***Eupatorium capillifolium***	2	No	FACU
6. ***Carex lurida***	10	No	OBL
7.			
8.			
9.			
	97 =Total Cover		
50% of total cover: 49	20% of total cover: 20		
Herb Stratum (Plot size: 5')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

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

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x 1 =	10
FACW species	40	x 2 =	80
FAC species	40	x 3 =	120
FACU species	7	x 4 =	28
UPL species	0	x 5 =	0
Column Totals:	97 (A)		238 (B)

Prevalence Index = B/A = 2.45

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

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

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? **Yes** X **No** ___

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

SOIL

Sampling Point: DP3 Wetland F

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 4/1	92	10YR 5/6	8	C	PL	Loamy/Clayey	Prominent redox concentrations

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

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

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

Remarks:

This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Lyon Hills Mitigation Site City/County: Traphill/Wilkes Sampling Date: 5/20/19

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: DP4 Upland

Investigator(s): C. Neaves Section, Township, Range:

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

Subregion (LRR or MLRA): LRR P, MLRA 136 Lat: 36.329959 Long: -81.004062 Datum: NAD 1983

Soil Map Unit Name: Rhodhiss fine sandy loam NWI classification:

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

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

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

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

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

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

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

Wetland Hydrology Present? **Yes** ____ **No** X

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP4 Upland

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Herb Stratum (Plot size: 5')			
1. ***Trifolium repens***	60	Yes	FACU
2. ***Ranunculus spp.***	20	Yes	FAC
3. ***Eupatorium capillifolium***	10	No	FACU
4. ***Schedonorus arundinaceus***	10	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 =Total Cover		
50% of total cover: 50	20% of total cover: 20		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	20	x 3 =	60
FACU species	80	x 4 =	320
UPL species	0	x 5 =	0
Column Totals:	100 (A)		380 (B)

Prevalence Index = B/A = 3.80

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

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

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? **Yes** X **No** ___

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

SOIL

Sampling Point: DP4 Upland

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

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 4/3	100					Loamy/Clayey	
4-12	10YR 5/6	100					Loamy/Clayey	

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

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

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

Remarks:

This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Lyon Hills Mitigation Site City/County: Traphill/Wilkes Sampling Date: 5/20/19

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: DP5-Wetland G-M

Investigator(s): C. Neaves Section, Township, Range:

Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): None Slope (%): 2

Subregion (LRR or MLRA): LRR P, MLRA 136 Lat: 36.328212 Long: -81.005166 Datum: NAD 1983

Soil Map Unit Name: Codorus loam NWI classification:

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

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

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

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

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

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 9

Wetland Hydrology Present? **Yes** X **No** ____

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP5-Wetland G-M

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Herb Stratum (Plot size: 5')			
1. *Schedonorus arundinaceus*	25	Yes	FACU
2. *Trifolium repens*	10	No	FACU
3. *Ranunculus spp.*	15	Yes	FAC
4. *Polygonum spp.*	15	Yes	FAC
5. *Impatiens capensis*	5	No	FACW
6. *Vernonia noveboracensis*	5	No	FACW
7. *Carex lurida*	5	No	OBL
8.			
9.			
10.			
11.			
	80 =Total Cover		
50% of total cover: 40	20% of total cover: 16		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

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

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	5	x 1 =	5
FACW species	10	x 2 =	20
FAC species	30	x 3 =	90
FACU species	35	x 4 =	140
UPL species	0	x 5 =	0
Column Totals:	80 (A)		255 (B)

Prevalence Index = B/A = 3.19

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

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

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? **Yes** X **No** ___

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

SOIL

Sampling Point: DP5-Wetland G-M

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

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 7/6	90	10YR 5/6	10	C	M	Sandy	Faint redox concentrations
5-8	10YR 4/1	50	10YR 5/6	50	C	M	Sandy	Prominent redox concentrations
8-12	10YR 4/1	90	7.5YR 5/8	10	C	PL	Loamy/Clayey	Prominent redox concentrations

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

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

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

Remarks:

Cobble layer encountered below 12" so a full 6" of depleted matrix was not observed. It is believed that saturated conditions persist below this depth.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Lyon Hills Mitigation Site City/County: Traphill/Wilkes Sampling Date: 5/20/19

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: DP6 Upland

Investigator(s): C. Neaves Section, Township, Range:

Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): None Slope (%): 1

Subregion (LRR or MLRA): LRR P, MLRA 136 Lat: 36.328085 Long: -81.005180 Datum: NAD 1983

Soil Map Unit Name: Codorus loam NWI classification:

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

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

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

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

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

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

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

Wetland Hydrology Present? **Yes** ____ **No** X

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP6 Upland

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Herb Stratum (Plot size: 5')			
1. ***Microstegium vimineum***	75	Yes	FAC
2. ***Schedonorus arundinaceus***	10	No	FACU
3. ***Eupatorium capillifolium***	2	No	FACU
4. ***Ranunculus spp.***	5	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	92 =Total Cover		
50% of total cover: 46	20% of total cover: 19		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	80	x 3 =	240
FACU species	12	x 4 =	48
UPL species	0	x 5 =	0
Column Totals:	92 (A)		288 (B)

Prevalence Index = B/A = 3.13

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

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

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? **Yes** X **No** ___

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

SOIL

Sampling Point: DP6 Upland

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

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/2	90	10YR 5/6	10			Loamy/Clayey	disturbed
6-12	10YR 5/6	90	10YR 3/2	10			Loamy/Clayey	disturbed

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

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

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

Remarks:

Soil color is due to mixing of A and B horizons, not redox reactions.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Lyon Hills Mitigation Site City/County: Traphill/Wilkes Sampling Date: 5/21/19

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: DP7-Wetland N-Q, X

Investigator(s): C. Neaves Section, Township, Range:

Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): None Slope (%): 1

Subregion (LRR or MLRA): LRR P, MLRA 136 Lat: 36.326540 Long: -81.007134 Datum: NAD 1983

Soil Map Unit Name: Rhodhiss fine sandy loam NWI classification:

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

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

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

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

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

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

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

Wetland Hydrology Present? **Yes** X **No** ____

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

Remarks:

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

Sampling Point: DP7-Wetland N-Q,X

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Herb Stratum (Plot size: 5')			
1. Unknown grass	75	Yes	FAC
2. *Impatiens capensis*	15	No	FACW
3. *Microstegium vimineum*	8	No	FAC
4. *Ranunculus spp.*	2	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 =Total Cover		
50% of total cover: 50	20% of total cover: 20		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	15	x 2 =	30
FAC species	85	x 3 =	255
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		285 (B)

Prevalence Index = B/A = 2.85

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

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

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? **Yes** X **No** ___

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

SOIL

Sampling Point: DP7-Wetland N-Q,X

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

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 5/4	100					Loamy/Clayey	
4-12	10YR 4/1	85	7.5YR 4/6	15	C	PL	Loamy/Clayey	Prominent redox concentrations

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

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

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

Remarks:

This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Lyon Hills Mitigation Site City/County: Traphill/Wilkes Sampling Date: 5/21/19

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: DP8 Upland

Investigator(s): C. Neaves Section, Township, Range:

Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): None Slope (%): 1

Subregion (LRR or MLRA): LRR P, MLRA 136 Lat: 36.326692 Long: -81.007315 Datum: NAD 1983

Soil Map Unit Name: Rhodhiss fine sandy loam NWI classification:

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

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

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

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

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

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

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

Wetland Hydrology Present? **Yes** ____ **No** X

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP8 Upland

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Herb Stratum (Plot size: 5')			
1. ***Schedonorus arundinaceus***	85	Yes	FACU
2. ***Trifolium repens***	10	No	FACU
3. ***Ranunculus spp.***	2	No	FAC
4. ***Eupatorium capillifolium***	2	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	99 =Total Cover		
50% of total cover: 50	20% of total cover: 20		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	2	x 3 =	6
FACU species	97	x 4 =	388
UPL species	0	x 5 =	0
Column Totals:	99 (A)		394 (B)

Prevalence Index = B/A = 3.98

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

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

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? **Yes** ___ **No** X

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

SOIL

Sampling Point: DP8 Upland

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

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	7.5YR 4/4	100					Loamy/Clayey	
4-12	7.5YR 4/6	100					Loamy/Clayey	

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

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

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

Remarks:

This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Lyon Hills Mitigation Site City/County: Traphill/Wilkes Sampling Date: 5/21/19

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: DP9 Wetland R-W

Investigator(s): C. Neaves Section, Township, Range:

Landform (hillside, terrace, etc.): Sideslope Local relief (concave, convex, none): Concave Slope (%): 6

Subregion (LRR or MLRA): LRR P, MLRA 136 Lat: 36.330996 Long: -81.007904 Datum: NAD 1983

Soil Map Unit Name: Fairview sandy loam NWI classification:

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

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

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

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

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

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

Surface Water Present?	Yes X	No	Depth (inches): 0
Water Table Present?	Yes X	No	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No**

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

Remarks:

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

Sampling Point: DP9 Wetland R-W

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Herb Stratum (Plot size: 5')			
1. ***Juncus effusus***	25	Yes	FACW
2. ***Carex lurida***	25	Yes	OBL
3. ***Eleocharis spp.***	40	Yes	FACW
4. ***Ranunculus spp.***	5	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	95 =Total Cover		
50% of total cover: 48	20% of total cover: 19		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	25	x 1 =	25
FACW species	65	x 2 =	130
FAC species	5	x 3 =	15
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	95 (A)		170 (B)

Prevalence Index = B/A = 1.79

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

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

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? **Yes** X **No** ___

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

SOIL

Sampling Point: DP9 Wetland R-W

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

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	5Y 3/1	95	10YR 6/8	5	C	PL	Loamy/Clayey	Prominent redox concentrations
3-12	10YR 5/2	80	10YR 6/8	20	C	PL	Loamy/Clayey	Prominent redox concentrations

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

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- X Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

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

Remarks:

This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Lyon Hills Mitigation Site City/County: Traphill/Wilkes Sampling Date: 5/21/19

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: DP10 Wetland Y

Investigator(s): C. Neaves Section, Township, Range:

Landform (hillside, terrace, etc.): Head of drain Local relief (concave, convex, none): Concave Slope (%): 2

Subregion (LRR or MLRA): LRR P, MLRA 136 Lat: 36.328073 Long: -81.010287 Datum: NAD 1983

Soil Map Unit Name: Fairview sandy clay loam NWI classification:

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

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

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

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

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

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 0
Water Table Present?	Yes X	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

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

Remarks:

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

Sampling Point: DP10 Wetland Y

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. ***Acer rubrum***	5	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	5	=Total Cover	
50% of total cover: 3		20% of total cover:	1
Sapling/Shrub Stratum (Plot size: 15')			
1. ***Salix nigra***	8	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	8	=Total Cover	
50% of total cover: 4		20% of total cover:	2
Herb Stratum (Plot size: 5')			
1. ***Carex lurida***	40	Yes	OBL
2. ***Polygonum spp.***	40	Yes	FAC
3. ***Juncus effusus***	10	No	FACW
4. Unknown grass	10	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100	=Total Cover	
50% of total cover: 50		20% of total cover:	20
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

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

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	48	x 1 =	48
FACW species	10	x 2 =	20
FAC species	55	x 3 =	165
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	113 (A)		233 (B)

Prevalence Index = B/A = 2.06

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

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

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? **Yes** X **No** ___

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

SOIL

Sampling Point: DP10 Wetland Y

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

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 4/1	100					Loamy/Clayey	Redox masked by OM, disturbance

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

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

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

Remarks:

Cattle trampling and organic matter incorporation suspected of disturbing and masking iron concentrations required to meet indicator F3. Abundant iron deposits suggest soil is hydric by Technical Standard.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Lyon Hills Mitigation Site City/County: Traphill/Wilkes Sampling Date: 5/21/19

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: DP11 Upland

Investigator(s): C. Neaves Section, Township, Range:

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

Subregion (LRR or MLRA): LRR P, MLRA 136 Lat: 36.328073 Long: -81.010287 Datum: NAD 1983

Soil Map Unit Name: Fairview sandy loam NWI classification:

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

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

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

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

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

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

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

Wetland Hydrology Present? **Yes** ____ **No** X

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP11 Upland

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Herb Stratum (Plot size: 5')			
1. ***Schedonorus arundinaceus***	50	Yes	FACU
2. ***Trifolium repens***	35	Yes	FACU
3. ***Ranunculus spp.***	10	No	FAC
4. ***Eupatorium capillifolium***	5	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 =Total Cover		
50% of total cover: 50	20% of total cover: 20		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	10	x 3 =	30
FACU species	90	x 4 =	360
UPL species	0	x 5 =	0
Column Totals:	100 (A)		390 (B)

Prevalence Index = B/A = 3.90

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

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

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? **Yes** ___ **No** X

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

SOIL

Sampling Point: DP11 Upland

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

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	7.5YR 4/6	100					Loamy/Clayey	
3-12	7.5YR 5/8	100					Loamy/Clayey	

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

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

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

Remarks:

This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Lyon Hills Mitigation Site City/County: Traphill/Wilkes Sampling Date: 5/22/19

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: DP12 Wetland Z-DD

Investigator(s): C. Neaves Section, Township, Range:

Landform (hillside, terrace, etc.): Head of Drain Local relief (concave, convex, none): None Slope (%): 5

Subregion (LRR or MLRA): LRR P, MLRA 136 Lat: 36.328812 Long: -81.011199 Datum: NAD 1983

Soil Map Unit Name: Rhodhiss fine sady loam NWI classification:

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

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

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

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

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

Remarks:
Excessively trampled by cattle.

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

Surface Water Present?	Yes X	No	Depth (inches): 0
Water Table Present?	Yes X	No	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No**

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

Remarks:

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

Sampling Point: DP12 Wetland Z-DD

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Herb Stratum (Plot size: 5')			
1. ***Polygonum spp.***	8	Yes	FAC
2. ***Microstegium vimineum***	6	Yes	FAC
3. ***Ranunculus spp.***	6	Yes	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	20 =Total Cover		
50% of total cover: 10	20% of total cover: 4		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	20	x 3 =	60
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	20 (A)		60 (B)

Prevalence Index = B/A = 3.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

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

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? **Yes** X **No** ___

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

SOIL

Sampling Point: DP 12 Wetland Z-DD

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

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 2/2	100					Loamy/Clayey	
2-12								Unconsolidated rock

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

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

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

Remarks:

Dark surface and abundant iron deposits suggest the area maintains saturation via groundwater discharge year round and meets hydric soil technical standard.

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

Project/Site: Lyon Hills Mitigation Site City/County: Traphill/Wilkes Sampling Date: 5/22/19

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: DP13 Upland

Investigator(s): C. Neaves Section, Township, Range:

Landform (hillside, terrace, etc.): Side slope Local relief (concave, convex, none): convex Slope (%): 4

Subregion (LRR or MLRA): LRR P, MLRA 136 Lat: 36.328791 Long: -81.011385 Datum: NAD 1983

Soil Map Unit Name: Rhodhiss fine sandy loam NWI classification:

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

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

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

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

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

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

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

Wetland Hydrology Present? **Yes** ____ **No** X

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP13 Upland

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. ***Acer rubrum***	12	No	FAC
2. ***Quercus alba***	6	No	FACU
3. ***Liriodendron tulipifera***	30	Yes	FACU
4. ***Carpinus caroliniana***	20	Yes	FAC
5. ***Quercus rubra***	10	No	FACU
6. ***Magnolia acuminata***	6	No	FACU
7.			
	84	=Total Cover	
50% of total cover: 42		20% of total cover:	17
Sapling/Shrub Stratum (Plot size: 15')			
1. ***Ilex opaca***	40	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	40	=Total Cover	
50% of total cover: 20		20% of total cover:	8
Herb Stratum (Plot size: 5')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
		=Total Cover	
50% of total cover:		20% of total cover:	
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	32	x 3 =	96
FACU species	92	x 4 =	368
UPL species	0	x 5 =	0
Column Totals:	124 (A)		464 (B)

Prevalence Index = B/A = 3.74

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

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

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? **Yes** ___ **No** X

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

SOIL

Sampling Point: DP13 Upland

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

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 2/2	100					Loamy/Clayey	
2-12	10YR 6/6	100					Loamy/Clayey	

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

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

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

Remarks:

This data sheet is revised from Eastern Mountains and Piedmont Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 8.0, 2016.

Appendix 4

Categorical Exclusion Form for Ecosystem Enhancement Program Projects
Version 1.4

Note: Only Appendix A should to be submitted (along with any supporting documentation) as the environmental document.

Part 1: General Project Information	
Project Name:	Lyon Hill Mitigation Site
County Name:	Wilkes County
EEP Number:	100085
Project Sponsor:	Wildlands Engineering, Inc.
Project Contact Name:	Carolyn Lanza
Project Contact Address:	312 W. Millbrook, Suite 225 Raleigh, NC 27609
Project Contact E-mail:	clanza@wildlandseng.com
EEP Project Manager:	Kelly Phillips

Project Description

The Lyon Hills Mitigation Site is a stream mitigation project located approximately 10 miles northwest of Elkin and 14 miles northeast of North Wilkesboro in Wilkes County. The project includes Hanks Branch, Sparks Creek, and 7 unnamed tributaries for a total of 8,680 linear feet of stream. Agriculture, specifically livestock, has been the main use of the land. The project will provide stream mitigation units to the Division of Mitigation Services in the Yadkin River Basin (03040101).

For Official Use Only

Reviewed By:

11/6/2018 — Kelly Phillips

Date — **EEP Project Manager**

Conditional Approved By:

Date — **For Division Administrator FHWA**

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

Final Approval By:

11-7-18 — [signature]

Date — **For Division Administrator FHWA**

Part 2: All Projects Regulation/Question	Response
Coastal Zone Management Act (CZMA)	
1. Is the project located in a CAMA county?	☐ Yes ☑ No
2. Does the project involve ground-disturbing activities within a CAMA Area of Environmental Concern (AEC)?	☐ Yes ☐ No ☑ N/A
3. Has a CAMA permit been secured?	☐ Yes ☐ No ☑ N/A
4. Has NCDCM agreed that the project is consistent with the NC Coastal Management Program?	☐ Yes ☐ No ☑ N/A
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)	
1. Is this a "full-delivery" project?	☑ Yes ☐ No
2. Has the zoning/land use of the subject property and adjacent properties ever been designated as commercial or industrial?	☐ Yes ☑ No ☐ N/A
3. As a result of a limited Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☑ No ☐ N/A
4. As a result of a Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☐ No ☑ N/A
5. As a result of a Phase II Site Assessment, are there known or potential hazardous waste sites within the project area?	☐ Yes ☐ No ☑ N/A
6. Is there an approved hazardous mitigation plan?	☐ Yes ☐ No ☑ N/A
National Historic Preservation Act (Section 106)	
1. Are there properties listed on, or eligible for listing on, the National Register of Historic Places in the project area?	☐ Yes ☑ No
2. Does the project affect such properties and does the SHPO/THPO concur?	☐ Yes ☐ No ☑ N/A
3. If the effects are adverse, have they been resolved?	☐ Yes ☐ No ☑ N/A
Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)	
1. Is this a "full-delivery" project?	☑ Yes ☐ No
2. Does the project require the acquisition of real estate?	☑ Yes ☐ No ☐ N/A
3. Was the property acquisition completed prior to the intent to use federal funds?	☐ Yes ☑ No ☐ N/A
4. Has the owner of the property been informed: * prior to making an offer that the agency does not have condemnation authority; and * what the fair market value is believed to be?	☑ Yes ☐ No ☐ N/A

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

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

Lyon Hills Mitigation Site
Categorical Exclusion

SUMMARY

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

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) provides a Federal "Superfund" to clean up uncontrolled or abandoned hazardous-waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment.

As the Lyon Hills Mitigation Site is a full-delivery project; an EDR Radius Map Report with Geocheck was ordered for the site through Environmental Data Resources, Inc on July 11, 2018. While neither the target property nor any adjacent properties were listed in any of the Federal, State, or Tribal environmental databases searched by the EDR, a property located over 0.25 miles away from the target property called Anderson Grocery was listed under the Leaking Underground Storage Tank Management Database (LUST), Incident Management Database (IMD), and the Petroleum Underground Storage Tank Database (UST) database for soil to groundwater contamination on October 30, 2000. The incident phase was closed out on February 22, 2001 in the IMD and LUST database. The assessment revealed no evidence of any "recognized environmental conditions" in connection to the target property. The Executive Summary of the EDR report is included in the Appendix. The full report is available if needed.

National Historic Preservation Act (Section 106)

The National Historic Preservation Act declares a national policy of historic preservation to protect, rehabilitate, restore, and reuse districts, sites, buildings, structures, and objects significant in American architecture, history, archaeology, and culture, and Section 106 mandates that federal agencies take into account the effect of an undertaking on a property that is included in, or is eligible for inclusion in, the National Register of Historic Places.

Wildlands Engineering, Inc. (Wildlands) requested review and comment from the State Historic Preservation Office (SHPO) with respect to any archeological and architectural resources related to the Lyon Hills Mitigation Site on July 11, 2018. SHPO responded on August 16, 2018 and stated they were aware of "no historic resources which would be affected by the project" and would have no further comment. All correspondence related to Section 106 is included in the Appendix.

American Indian Religious Freedom Act (AIRFA)

The American Indian Religious Freedom Act provides for the protection and preservation of places of religious importance to American Indians, Eskimos, and Native Hawaiians.

Wildlands requested review and comment from the Eastern Band of Cherokee Indians Tribal Historic Preservation Office (THPO) with respect to any archeological or religious resources related to the Lyon Hills Mitigation Site on August 15, 2018. The Cherokee Nation and United Keetoowah Band of Cherokee Indians in Oklahoma THPO were contacted on October 5, 2018. The Cherokee nation responded on November 2, 2018 saying Lyon Hills is "outside the Cherokee Nation's Area of Interest". At this time, Wildlands has not received a response from EBCI and United Keetoowah Band of Cherokee Indians in Oklahoma. All correspondence related to AIRFA is included in the Appendix.

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

These acts, collectively known as the Uniform Act, provide for uniform and equitable treatment of persons displaced from their homes, businesses, non-profit associations, or farms by federal and federally-assisted programs, and establish uniform and equitable land acquisition policies.

Lyon Hills Mitigation Site is a full-delivery project that includes land acquisition. Notification of the fair market value of the project property and the lack of condemnation authority by Wildlands was included

in the signed Option Agreements for the project properties. A copy of the relevant sections of the Option Agreements are included in the Appendix.

Endangered Species Act (ESA)

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

The Wilkes County listed endangered species includes the bog turtle (*Glyptemys muhlenbergii*), Northern long-eared bat (*Myotis septentrionalis*), and the rusty-patched bumble bee (*bombus affinis*). The United States Fish and Wildlife Service (USFWS) does not currently list any Critical Habitat Designations for the Federally-listed species within Wilkes County nor are there any known occurrences of the NLEB documented within the County (https://www.fws.gov/asheville/htmls/project_review/NLEB_in_WNC.html). The project site is over 40 miles from the nearest known hibernaculum for the NLEB. A pedestrian survey conducted on August 9, 2018, indicated that the Site provides potential habitat for the bog turtle and potential summer roosting for the NLEB but no individuals were located at the time. No habitat was found on site for the rusty-patched bumble bee.

Forested habitats containing trees at least 3-inch dbh in the project area provide suitable habitat for NLEB. Due to the decline of the NLEB population from the White Nose Syndrome (WNS), the USFWS has issued the finalization of a special rule under section 4(d) of the ESA to addresses the effects to the NLEB resulting from purposeful and incidental take based on the occurrence of WNS. Because the project is located within a WNS zone and will include the removal/clearing of trees, it is subject to the final 4(d) ruling. A review of North Carolina Natural Heritage Program (NCNHP) records did not indicate any known NLEB populations within 2.0 mile of the study area; therefore, the project is eligible to use the NLEB 4(d) Rule Streamlined Consultation Form to meet regulatory requirements for section 7(a)(2) compliance 4(d) consultation.

To meet regulatory requirements, a letter requesting comment from the USFWS was sent on July 11, 2018. No response from the USFWS was received within the 30-day response period. Therefore, the signing of the NLEB 4(d) Rule Streamlined Consultation Form by the FHWA determines that this project may affect the NLEB, but that any resulting incidental take of the NLEB is not prohibited by the final 4(d) rule. Due to the absence of species, Wildlands determined that the project "may affect, but is not likely to adversely affect" the bog turtle, however it is listed as threatened due to similarity of appearance and as such is not subject to Section 7 consultation. Due to the absence of habitat, Wildlands determined "no effect" on the rusty-patched bumble bee. A FHWA signed 4(d) consultation form and the correspondence associated with this determination are included in the Appendix.

Farmland Protection Policy Act (FPPA)

The FPPA requires that, before taking or approving any federal action that would result in conversion of farmland, the agency must examine the effects of the action using the criteria set forth in the FPPA, and, if there are adverse effects, must consider alternatives to lessen them.

The Lyon Hills Mitigation Site includes the conversion of prime farmland. As such, Form AD-1006 has been completed and submitted to the Natural Resources Conservation Service (NRCS). The completed form and correspondence documenting its submittal is included in the Appendix.

Fish and Wildlife Coordination Act (FWCA)

The FWCA requires consultation with the USFWS and the appropriate state wildlife agency on projects that alter or modify a water body. Reports and recommendations prepared by these agencies document project effects on wildlife and identify measures that may be adopted to prevent loss or damage to wildlife resources.

The Lyon Hills Mitigation Site includes stream restoration. Wildlands requested comment on the project from both the USFWS and the North Carolina Wildlife Resources Commission (NCWRC) on July 11, 2018. NCWRC responded on August 7, 2018 and had no objections to the project. At this time, Wildlands has not received a response from the USFWS. All correspondence with the two agencies is included in the Appendix.

Migratory Bird Treaty Act (MBTA)

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

Wildlands requested comment on the Lyon Hills Mitigation Site from the USFWS regarding migratory birds on July 11, 2018. No response from the USFWS was received within the 30-day response period. All correspondence with USFWS is included in the Appendix.

WILDLANDS
ENGINEERING

July 11, 2018

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

Subject: Lyon Hills Mitigation Site
Wilkes County, North Carolina

Dear Ms. Gledhill-Earley,

Wildlands Engineering, Inc. requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with the Lyon Hills Mitigation Site. A Site Map and USGS Topographic Map with approximate project areas are enclosed. The topographic figure was prepared from the Purlear, NC USGS 7.5-minute topographic quadrangle.

The Lyon Hills Mitigation Site is being developed to provide in-kind mitigation for unavoidable stream channel impacts. Several sections of channel have been identified as significantly degraded. The project will include stream restoration and enhancement on Sparks Creek, Hanks Branch (tributary to Spark Creek) and five unnamed tributaries all which eventually drains to the Yadkin River. The site is currently all in active cattle pasture with some small areas of mature vegetation. Furthermore, no archeological artifacts have been observed or noted during preliminary surveys of the site for restoration purposes.

We ask that you review this site based on the attached information to determine the presence of any historic properties.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the project.

Sincerely,

Carolyn Lanza

Carolyn Lanza
Environmental Scientist

Attachment:
Figure 1 Site Map
Figure 2 USGS Topographic Map

North Carolina Department of Natural and Cultural Resources

State Historic Preservation Office

Ramona M. Bartos, Administrator

Governor Roy Cooper
Secretary Susi H. Hamilton

Office of Archives and History
Deputy Secretary Kevin Cherry

August 16, 2018

Carolyn Lanza
Wildlands Engineering
312 West Millbrook Road, Suite 225
Raleigh, NC 27609

Re: Lyon Hills Mitigation Site, Wilkes County, ER 18-1613

Dear Ms. Lanza:

Thank you for your letter of July 11, 2018, concerning the above project.

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

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

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

Sincerely,

Renee Gledhill-Earley

for Ramona M. Bartos

WILDLANDS
ENGINEERING

August 15, 2018

Mr. Russell Townsend
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians
PO Box 455
Cherokee, NC 28719

Subject: Lyon Hills Mitigation Site
Wilkes County, North Carolina

Dear Mr. Townsend,

Wildlands Engineering, Inc. requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with the proposed Lyon Hills Mitigation Site. A USGS Topographic Map and an Overview Site Map showing the approximate project area are enclosed. The topographic figure was prepared from the Purlear, NC USGS 7.5-minute topographic quadrangle.

The Lyon Hills Mitigation Site is being developed to provide in-kind mitigation for unavoidable stream channel impacts. Several sections of channel have been identified as significantly degraded. The project will include stream restoration and enhancement on Sparks Creek, Hanks Branch (tributary to Spark Creek) and five unnamed tributaries all which eventually drains to the Yadkin River. The site is currently all in active cattle pasture with some small areas of mature vegetation.

We ask that you review this site based on the attached information to determine the presence of any historic properties.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning this project.

Sincerely,

Carolyn Lanza

Carolyn Lanza
Environmental Scientist

Attachment:
Figure 1 Site Map
Figure 2 USGS Topographic Map

cc: via email
Ms. Holly Austin, Federal Cultural Resource Law Liaison, EBCI Tribal Historic Preservation Office
Mr. Donnie Brew, Federal Highway Administration
Mr. Matthew Reid, Division of Mitigation Services

October 5, 2018

Ms. Sheila Bird
Tribal Historic Preservation Office
United Keetoowah Band of Cherokee Indians in Oklahoma
PO Box 746
Tahlequah, OK 74465

Subject: Lyon Hills Mitigation Site
Wilkes County, North Carolina

Dear Ms. Bird,

Wildlands Engineering, Inc. requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with the proposed Lyon Hills Mitigation Site. A USGS Topographic Map and an Overview Site Map showing the approximate project area are enclosed. The topographic figure was prepared from the Purlear, NC USGS 7.5-minute topographic quadrangle.

The Lyon Hills Mitigation Site is being developed to provide in-kind mitigation for unavoidable stream channel impacts. Several sections of channel have been identified as significantly degraded. The project will include stream restoration and enhancement on Sparks Creek, Hanks Branch (tributary to Spark Creek) and five unnamed tributaries all which eventually drains to the Yadkin River. The site is currently all in active cattle pasture with some small areas of mature vegetation.

We ask that you review this site based on the attached information to determine the presence of any historic properties.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning this project.

Sincerely,

Andrea S. Eckardt

Andrea S. Eckardt
Senior Environmental Scientist

Attachment:
Figure 1 Site Map
Figure 2 USGS Topographic Map

WILDLANDS
ENGINEERING

October 5, 2018

Ms. Elizabeth Toombs
Tribal Historic Preservation Office
Cherokee Nation
PO Box 948
Tahlequah, OK 74465

Subject: Lyon Hills Mitigation Site
Wilkes County, North Carolina

Dear Ms. Toombs,

Wildlands Engineering, Inc. requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with the proposed Lyon Hills Mitigation Site. A USGS Topographic Map and an Overview Site Map showing the approximate project area are enclosed. The topographic figure was prepared from the Purlear, NC USGS 7.5-minute topographic quadrangle.

The Lyon Hills Mitigation Site is being developed to provide in-kind mitigation for unavoidable stream channel impacts. Several sections of channel have been identified as significantly degraded. The project will include stream restoration and enhancement on Sparks Creek, Hanks Branch (tributary to Spark Creek) and five unnamed tributaries all which eventually drains to the Yadkin River. The site is currently all in active cattle pasture with some small areas of mature vegetation.

We ask that you review this site based on the attached information to determine the presence of any historic properties.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning this project.

Sincerely,

Andrea S. Eckardt

Andrea S. Eckardt
Senior Environmental Scientist

Attachment:
Figure 1 Site Map
Figure 2 USGS Topographic Map

Andrea Eckardt

From: Elizabeth Toombs <elizabeth-toombs@cherokee.org>
Sent: Friday, November 02, 2018 3:31 PM
To: Andrea Eckardt
Subject: RE: Information Request: Bug Headwaters and Lyon Hills Mitigation Sites

Good Afternoon, Ms. Eckardt:

Many thanks for the follow-up email. While Wilkes County is within Cherokee Nation's Area of Interest, both the Bug Headwaters and Lyon Hills Mitigation Sites are outside the Cherokee Nation's Area of Interest. Thus, this Office respectfully defers to federally recognized Tribes that have an interest in this landbase.

Many thanks for the opportunity to comment upon this proposed undertaking. Please contact me if there are any questions or concerns.

Wado,

Elizabeth Toombs, Tribal Historic Preservation Officer
Cherokee Nation
Tribal Historic Preservation Office
PO Box 948
Tahlequah, OK 74465-0948
918.453.5389

From: Andrea Eckardt [mailto:aeckardt@wildlandseng.com]
Sent: Friday, November 2, 2018 1:05 PM
To: Elizabeth Toombs <elizabeth-toombs@cherokee.org>
Subject: <EXTERNAL> RE: Information Request: Bug Headwaters and Lyon Hills Mitigation Sites

Elizabeth-
We spoke yesterday about where to email the correspondence for Bug Headwaters and Lyon Hills. I just thought it might be easier if I sent an email so you would have the email address to reply to.

Have a great weekend,

Andrea

Andrea S. Eckardt | *Senior Environmental Planner*
704.332.7754 x101

From: Elizabeth Toombs <elizabeth-toombs@cherokee.org>
Sent: Tuesday, October 16, 2018 4:49 PM
To: Andrea Eckardt <aeckardt@wildlandseng.com>
Subject: RE: Information Request: Bug Headwaters and Lyon Hills Mitigation Sites

Thanks so much, Ms. Eckardt.

Wado,

Elizabeth Toombs, Tribal Historic Preservation Officer
Cherokee Nation
Tribal Historic Preservation Office
PO Box 948
Tahlequah, OK 74465-0948
918.453.5389

From: Andrea Eckardt [mailto:aeckardt@wildlandseng.com]
Sent: Tuesday, October 16, 2018 8:23 AM
To: Elizabeth Toombs <elizabeth-toombs@cherokee.org>
Subject: <EXTERNAL> RE: Information Request: Bug Headwaters and Lyon Hills Mitigation Sites

The contact is Donnie Brew. Below is his contact information.

Donnie Brew
Preconstruction & Environment Engineer
Federal Highway Administration
310 New Bern Ave, Suite 410
Raleigh, NC 27601
donnie.brew@dot.gov
919-747-7017

Andrea S. Eckardt | *Senior Environmental Planner*
704.332.7754 x101

From: Elizabeth Toombs <elizabeth-toombs@cherokee.org>
Sent: Tuesday, October 16, 2018 9:20 AM
To: Andrea Eckardt <aeckardt@wildlandseng.com>
Subject: RE: Information Request: Bug Headwaters and Lyon Hills Mitigation Sites

Many thanks for the details, Ms. Eckardt. To follow-up, who is your contact for FHWA, North Carolina division?

Wado,

Elizabeth Toombs, Tribal Historic Preservation Officer
Cherokee Nation
Tribal Historic Preservation Office
PO Box 948
Tahlequah, OK 74465-0948
918.453.5389

From: Andrea Eckardt [mailto:aeckardt@wildlandseng.com]
Sent: Tuesday, October 16, 2018 7:17 AM
To: Elizabeth Toombs <elizabeth-toombs@cherokee.org>
Subject: <EXTERNAL> RE: Information Request: Bug Headwaters and Lyon Hills Mitigation Sites

This is a NC Division of Mitigation Services project, so we are working on behalf of the Federal Highway Administration in this case.

Andrea

Andrea S. Eckardt | *Senior Environmental Planner*
704.332.7754 x101

From: Elizabeth Toombs <elizabeth-toombs@cherokee.org>
Sent: Monday, October 15, 2018 6:00 PM
To: Andrea Eckardt <aeckardt@wildlandseng.com>
Subject: Information Request: Bug Headwaters and Lyon Hills Mitigation Sites

Good Afternoon, Ms. Eckardt:

This Office recently received two review requests for Bug Headwaters and Lyon Hills Mitigation Sites, and I have a follow-up question. Is Wildlands Engineering working on behalf of a federal agency or grant program?

Many thanks for your time and any clarification.

Wado,

Elizabeth Toombs, Tribal Historic Preservation Officer
Cherokee Nation
Tribal Historic Preservation Office
PO Box 948
Tahlequah, OK 74465-0948
918.453.5389

TO SELLER: John Irving Lyon
PO Box 122
Traphill, NC 28685
e-mail:

Notice of change of address shall be given by written notice in the manner described in this paragraph.

3.4 **Assignment.** Buyer has the right to assign this agreement without the consent of Seller. No assignment will be effective unless the assignee has delivered to Seller a written assumption of Buyer's obligations under this agreement. Seller hereby releases Buyer from any obligations under this agreement arising after the effective date of any assignment of this agreement by Buyer.

3.5 **Value of Conservation Easement; No Power of Eminent Domain.** In accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Buyer hereby notifies Seller that: (i) Buyer believes that the fair market value of the Conservation Easement is an amount equal to the Purchase Price; and (ii) Buyer does not have the power of eminent domain.

3.6 **Modification; Waiver.** No amendment of this agreement will be effective unless it is in writing and signed by the parties. No waiver of satisfaction of a condition or failure to comply with an obligation under this agreement will be effective unless it is in writing and signed by the party granting the waiver, and no such waiver will constitute a waiver of satisfaction of any other condition or failure to comply with any other obligation.

3.7 **Attorneys' Fees.** If either party commences an action against the other to interpret or enforce any of the terms of this agreement or because of the breach by the other party of any of the terms of this agreement, the losing party shall pay to the prevailing party reasonable attorneys' fees, expenses, court costs, litigation costs and any other expenses incurred in connection with the prosecution or defense of such action, whether or not the action is prosecuted to a final judgment.

3.8 **Memorandum of Option Agreement.** Concurrently with the signing of this agreement, Buyer and Seller agree to sign a Memorandum of Option that will be recorded against the Property in the Register of Deeds in the County stated in paragraph A within five days after the Effective Date.

3.9 **Tax Deferred Exchange**. If Seller desires to implement a tax-deferred exchange (the "**Exchange**") in connection with Buyer's purchase of the Conservation Easement, the parties agree to cooperate in affecting the Exchange. Seller is responsible for all additional costs associated with the Exchange and Buyer shall not have any additional liability with respect to the Exchange. The parties will execute any additional documents required for the Exchange at no cost to Buyer.

3.10 **Brokers**. Shawn D. Wilkerson, Robert W. Bugg and Ian Hazelhoff are North Carolina Real Estate Brokers. Neither Buyer nor Seller has incurred any liability for any brokerage fee, commission or finder's fee in connection with this agreement or the transactions contemplated by this agreement.

3.11 **Entire Agreement.** Each party acknowledges they are not relying on any statements made by the other party, other than in this agreement, regarding the subject matter of this agreement. Neither party will have a basis for bringing any claim for fraud in connection with any such statements.

3.12 **Mutual Agreement.** This is a mutually negotiated agreement and regardless of which party was more responsible for its preparation, this agreement shall be construed neutrally between the parties.

Buyer
JEL Seller

TO BUYER:	Wildlands Engineering, Inc. 1430 S. Mint Street, Suite 104 Charlotte, North Carolina 28203 Attention: Robert W. Bugg e-mail: rbugg@wildlandseng.com
TO SELLER:	Horace Randle Wood PO Box 9 Thurmond, NC 28683 e-mail:
COPY TO:	Dale F. Fulk Rogers Realty and Auction 1310 EMS Drive Mount Airy, NC 27030 e-mail: dalefulk@rogersrealty.com

Notice of change of address shall be given by written notice in the manner described in this paragraph.

3.6 **Assignment.** Buyer has the right to assign this agreement without the consent of Seller. No assignment will be effective unless the assignee has delivered to Seller a written assumption of Buyer's obligations under this agreement. Seller hereby releases Buyer from any obligations under this agreement arising after the effective date of any assignment of this agreement by Buyer.

3.7 **Value of Conservation Easement; No Power of Eminent Domain.** In accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Buyer hereby notifies Seller that: (i) Buyer believes that the fair market value of the Conservation Easement is an amount equal to the Purchase Price; and (ii) Buyer does not have the power of eminent domain.

3.8 **Modification; Waiver.** No amendment of this agreement will be effective unless it is in writing and signed by the parties. No waiver of satisfaction of a condition or failure to comply with an obligation under this agreement will be effective unless it is in writing and signed by the party granting the waiver, and no such waiver will constitute a waiver of satisfaction of any other condition or failure to comply with any other obligation.

3.9 **Attorneys' Fees.** If either party commences an action against the other to interpret or enforce any of the terms of this agreement or because of the breach by the other party of any of the terms of this agreement, the losing party shall pay to the prevailing party reasonable attorneys' fees, expenses, court costs, litigation costs and any other expenses incurred in connection with the prosecution or defense of such action, whether or not the action is prosecuted to a final judgment.

3.10 **Memorandum of Option Agreement.** Concurrently with the signing of this agreement, Buyer and Seller agree to sign a Memorandum of Option that will be recorded against the Property in the Register of Deeds in the County stated in paragraph A within five days after the Effective Date.

3.11 **Tax Deferred Exchange.** If Seller desires to implement a tax-deferred exchange (the "**Exchange**") in connection with Buyer's purchase of the Conservation Easement, the parties agree to cooperate in affecting the Exchange. Seller is responsible for all additional costs associated with the Exchange and Buyer shall not have any

Buyer
Seller

WILDLANDS
ENGINEERING

July 11, 2018

Marella Buncick
US Fish and Wildlife Service
Asheville Field Office
160 Zillicoa Street
Asheville, NC 28801

Subject: Lyons Hill Mitigation Site
Wilkes County, North Carolina

Dear Ms. Buncick,

Wildlands Engineering, Inc. requests review and comment on any possible issues that might emerge with respect to endangered species, migratory birds, or other trust resources associated with the proposed Lyons Hill Mitigation Site. A USGS Topographic Map and an Overview Site Map showing the approximate project area are enclosed. The topographic figure was prepared from the Purlear, NC USGS 7.5-minute topographic quadrangle.

The Lyons Hill Mitigation Site is being developed to provide in-kind mitigation for unavoidable stream channel impacts. Several sections of channel have been identified as significantly degraded. The project will include stream restoration and enhancement on Sparks Creek, Hanks Branch (tributary to Spark Creek) and five unnamed tributaries all which eventually drains to the Yadkin River. The site is currently all in active cattle pasture with some small areas of mature vegetation.

According to your website (https://www.fws.gov/raleigh/species/cntylist/wilkes.html) the threatened or endangered species for Wilkes County are: the bog turtle (*Glyptemys muhlenbergii*), Northern long-eared bat (*Myotis septentrionalis*), and the rusty-patched bumble bee (*bombus affinis*). If we have not heard from you in 30 days, we will assume that you do not have any comments regarding associated laws and that you do not have any information relevant to this project at the current time.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning this project.

Sincerely,

Carolyn Lanza

Carolyn Lanza
Environmental Scientist

Attachment:
Figure 1 Site Map
Figure 2 USGS Topographic Map

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

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

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

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

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

Agency and Applicant[3] (Name, Email, Phone No.):
Carolyn Lanza, clanza@wildlandseng.com, 919-851-9986 ext 113
Donnie Brew, Donnie.brew@dot.gov, 919-747-7017

Project Name: Lyon Hills Mitigation Site

Project Location (include coordinates if known): 36°19'32.9"N 81°00'40.3"W

Basic Project Description (provide narrative below or attach additional information):
The Lyon Hills Mitigation Site is a stream mitigation project located approximately 10 miles northwest of Elkin and 14 miles northeast of North Wilkesboro in Wilkes County. The project includes Hanks Branch, Sparks Creek, and 7 unnamed tributaries for a total of 8,680 linear feet of stream. Agriculture, specifically livestock, has been the main use of the land. The

[1] http://www.fws.gov/midwest/endangered/mammals/nleb/pdf/WNSZone.pdf
[2] See http://www.fws.gov/midwest/endangered/mammals/nleb/nhisites.html
[3] If applicable - only needed for federal actions with applicants (e.g., for a permit, etc.) who are party to the consultation.

project will provide stream mitigation units to the Division of Mitigation Services in the Yadkin River Basin (03040101). Construction of the stream restoration project will include some tree removal (>3"DBH) – approximately 7.52 acres.

General Project Information	**YES**	**NO**
Does the project occur within 0.25 miles of a known hibernaculum?	☐	☒
Does the project occur within 150 feet of a known maternity roost tree?	☐	☒
Does the project include forest conversion[4]? (if yes, report acreage below)	☒	☐
Estimated total acres of forest conversion	7.52 ac	
If known, estimated acres[5] of forest conversion from April 1 to October 31	7.52 ac	
If known, estimated acres of forest conversion from June 1 to July 31[6]		
Does the project include timber harvest? (if yes, report acreage below)	☐	☒
Estimated total acres of timber harvest		
If known, estimated acres of timber harvest from April 1 to October 31		
If known, estimated acres of timber harvest from June 1 to July 31		
Does the project include prescribed fire? (if yes, report acreage below)	☐	☒
Estimated total acres of prescribed fire		
If known, estimated acres of prescribed fire from April 1 to October 31		
If known, estimated acres of prescribed fire from June 1 to July 31		
Does the project install new wind turbines? (if yes, report capacity in MW below)	☐	☒
Estimated wind capacity (MW)		

Agency Determination:

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

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

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

Signature: _____ Date Submitted: 9-26-18

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

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

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

From:	Brew, Donnie (FHWA)
To:	Marella_Buncick@fws.gov
Cc:	Phillips, Kelly D; Carolyn Lanza; Andrea Eckardt
Subject:	Lyon Hills site DMS_mitigation project_Wilkes County_NLEB 4(d) rule consultation
Date:	Wednesday, September 26, 2018 2:25:07 PM
Attachments:	NLEB 4(d) Rule Streamlined Consultation form Lyons Hills site 9-26-18.pdf Figure1_SiteMaps.pdf Figure2_TopoMap.pdf

Good afternoon Marella,

The purpose of this message is to notify your office that FHWA will use the streamlined consultation framework for the Lyon Hills Mitigation Site in Wilkes County, NC.

Attached is a completed NLEB 4(d) Rule Streamlined Consultation form, as well as site maps/figures.

Thank you,

Donnie

Notifying the Service Under the Framework

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

Federal agencies (or designated non-federal representatives) should use the Northern Long-Eared Bat 4(d) Rule Streamlined Consultation form to notify the Service of their project and meet the requirements of the framework.

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

Information requested in the Northern Long-Eared Bat 4(d) Rule Streamlined Consultation Form serves to

> (1) notify the field office that an action agency will use the streamlined framework;
>
> (2) describe the project with sufficient detail to support the required determination; and
>
> (3) enable the USFWS to track effects and determine if reinitiation of consultation for the 4(d) rule is required. This form requests the minimum amount of information required for the Service to be able to track this information.

Providing information in the Streamlined Consultation Form does not address section 7(a)(2) compliance for any other listed species.

Donnie Brew
Preconstruction & Environment Engineer
Federal Highway Administration
310 New Bern Ave, Suite 410
Raleigh, NC 27601
donnie.brew@dot.gov
919-747-7017

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 7/27/18
Name Of Project Lyon Hills Mitigation Site	Federal Agency Involved NC Division of Mitigation Services
Proposed Land Use Stream Restoration	County And State Wilkes, NC
PART II *(To be completed by NRCS)*	Date Request Received By NRCS 7/27/18

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply -- do not complete additional parts of this form).*	Yes ☑	No ☐	Acres Irrigated none	Average Farm Size 114 acres
Major Crop(s) CORN	Farmable Land In Govt. Jurisdiction Acres: 119,998 acres % 25		Amount Of Farmland As Defined in FPPA Acres: 65,591 acres % 14	
Name Of Land Evaluation System Used Wilkes Co., NC LESA	Name Of Local Site Assessment System N/A		Date Land Evaluation Returned By NRCS August 27, 2018 by eMail	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	17.7			
B. Total Acres To Be Converted Indirectly				
C. Total Acres In Site	17.7	0.0	0.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	7.1			
B. Total Acres Statewide And Local Important Farmland	0.9			
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	0.0122			
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	24.7			
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	25	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	15			
2. Perimeter In Nonurban Use	10	10			
3. Percent Of Site Being Farmed	20	20			
4. Protection Provided By State And Local Government	20	20			
5. Distance From Urban Builtup Area	15	8			
6. Distance To Urban Support Services	15	0			
7. Size Of Present Farm Unit Compared To Average	10	5			
8. Creation Of Nonfarmable Farmland	10	10			
9. Availability Of Farm Support Services	5	0			
10. On-Farm Investments	20	0			
11. Effects Of Conversion On Farm Support Services	10				
12. Compatibility With Existing Agricultural Use	10				
TOTAL SITE ASSESSMENT POINTS	160	88	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	25	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	88	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	113	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

(See Instructions on reverse side) **Form AD-1006 (10-83)**

This form was electronically produced by National Production Services Staff

From:	Carolyn Lanza
To:	"Cortes, Milton - NRCS, Raleigh, NC"
Subject:	RE: AD1006 Form - Lyon Hills Mitigation Site - Wilkes County, NC
Date:	Wednesday, September 12, 2018 9:32:00 AM
Attachments:	Lyon Hills AD1006.pdf image001.png

Milton,

Attached is the completed AD1006 for Lyons Hill Mitigation Site for your records.

Thank you for your help,

Carolyn Lanza | *Environmental Scientist*
O: 919.851.9986 x113 **M**: 313.969.7318

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

From: Cortes, Milton - NRCS, Raleigh, NC <Milton.Cortes@nc.usda.gov>
Sent: Monday, August 27, 2018 4:49 PM
To: Carolyn Lanza <clanza@wildlandseng.com>
Subject: AD1006 Form - Lyon Hills Mitigation Site - Wilkes County, NC
Importance: High

Carolyn;

Please, find attached the Farmland Conversion Impact Rating evaluation for Lyon Hills Mitigation Site.

Pease let us know if we can be of further assistance.

Best Regards;

Milton Cortes
Acting State Soil Scientist
Natural Resources Conservation Service
4407 Bland Rd, Suite 117
Raleigh, NC 27609
Phone: 919-873-2171
milton.cortes@nc.usda.gov
USDA

From: Carolyn Lanza [mailto:clanza@wildlandseng.com]
Sent: Friday, July 27, 2018 11:14 AM
To: Cortes, Milton - NRCS, Raleigh, NC <Milton.Cortes@nc.usda.gov>

Subject: Request for AD1006 Form - Lyon Hills Mitigation Site - Wilkes County, NC

Milton,

I have a request for a completed AD-1006 form for a NCDENR Division of Mitigation Services (DMS) stream restoration project (Lyon Hills Mitigation Site) located in Wilkes County. Please find a Soils Map attached in addition to the AD-1006 form with Parts I and III filled out. The soil breakdown is included on the Soils Map.

Thank you for your assistance with all the projects and please let me know if you need any additional information.

Carolyn Lanza | *Environmental Scientist*
O: 919.851.9986 x113 **M**: 313.969.7318

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

July 11, 2018

Shannon Deaton
North Carolina Wildlife Resource Commission
Division of Inland Fisheries
1721 Mail Service Center
Raleigh, NC 27699

Subject: Lyon Hills Mitigation Site
Wilkes County, North Carolina

Dear Ms. Deaton,

Wildlands Engineering, Inc. requests review and comment on any possible issues that might emerge with respect to fish and wildlife issues associated with the proposed Lyon Hills Mitigation Site. A USGS Topographic Map and an Overview Site Map showing the approximate project area are enclosed. The topographic figure was prepared from the Purlear, NC USGS 7.5-minute topographic quadrangle.

The Lyon Hills Mitigation Site is being developed to provide in-kind mitigation for unavoidable stream channel impacts. Several sections of channel have been identified as significantly degraded. The project will include stream restoration and enhancement on Sparks Creek, Hanks Branch (tributary to Spark Creek) and five unnamed tributaries all which eventually drains to the Yadkin River. The site is currently all in active cattle pasture with some small areas of mature vegetation.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning this project.

Sincerely,

Carolyn Lanza

Carolyn Lanza
Environmental Scientist

Attachment:
Figure 1 Site Map
Figure 2 USGS Topographic Map

North Carolina Wildlife Resources Commission

Gordon Myers, Executive Director

August 7, 2018

Carolyn Lanza
Wildlands Engineering
1430 S. Mint Street, Suite 104
Charlotte, NC 28203

SUBJECT: Lyon Hills Mitigation Site

Dear Ms. Lanza:

Biologists with the North Carolina Wildlife Resources Commission (NCWRC) received your July 11, 2018 letter regarding plans for a stream restoration project on Sparks Creek and unnamed tributaries in Wilkes County. You requested review and comment on any possible issues that might emerge with respect to fish and wildlife associated with the project. Our comments on this project are offered for your consideration under provisions of the Clean Water Act of 1977 (33 U.S.C. 466 et. seq.) and Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667d).

Details were not provided in the letter on design nor the size of the project. The project is proposed as a mitigation project and will involve stream enhancement and restoration.

This project should not impact wild trout resources. We recommend that riparian buffers that are to be reestablished be as wide as possible, given site constraints and landowner needs. NCWRC generally recommends a woody buffer of 100 feet on perennial streams to maximize the benefits of buffers, including bank stability, stream shading, treatment of overland runoff, and wildlife habitat.

Thank you for the opportunity to review and comment on this project. Please contact me at (828) 803-6054 if you have any questions about these comments.

Sincerely,

Andrea Leslie
Mountain Region Coordinator
Habitat Conservation Program

Mailing Address: Habitat Conservation • 1721 Mail Service Center • Raleigh, NC 27699-1721
Telephone: (919) 707-0220 • **Fax:** (919) 707-0028

Appendix 5

WILDLANDS
ENGINEERING

MEETING NOTES

MEETING: IRT Site Walk
Lyon Hills Mitigation Site
Yadkin 03040101; Wilkes County, NC
DEQ Contract No. 7620
DMS Project No. 100085
Wildlands Project No. 005-02177

DATE: Wednesday, September 26, 2018

LOCATION: Hanks Street
Traphill, NC

Attendees

Todd Tugwell, USACE
Todd Bowers, USEPA
Mac Haupt, DWR
Paul Wiesner, DMS
Matthew Reid, DMS
Kirsten Ullman, DMS
Periann Russell, DMS
Kelly Phillips, DMS
Shawn Wilkerson, Wildlands
Jeff Keaton, Wildlands

Materials

- Wildlands Engineering Lyons Hills Mitigation Site Technical Proposal dated March 28, 2018 (in response to RFP #16-007403)

Meeting Notes

Shawn Wilkerson of Wildlands Engineering, Inc. (Wildlands) led the group on a tour of the proposed mitigation site on September 26, 2018. The purpose of the tour was to present the site to a group of IRT members and to get input into the management/mitigation options proposed for the site. During the tour, the group discussed the approaches proposed by Wildlands and the design options they felt would be most appropriate to enhance and restore the streams on the site.

1. **Hanks Branch**
    - The tour began with Reach 2 of Hanks Branch. The stream runs along the toe of a steep slope on the left floodplain between the confluences of UT2 and UT3. Most of the right bank and floodplain are devoid of vegetation and there are areas of localized fluvial erosion and trampling. This reach is proposed as enhancement 2 and the group agreed that this was the right approach but needs to include some bank repairs and revetments at specific locations and adding wood to the channel bed. This work will support a 2.5:1 credit ratio. There is a crossing proposed near the downstream end of this reach.

- The tour continued with Hanks Branch Reach 1. This is a longer reach that flows along the property line on the east side of the site from UT2 to the northeast property boundary. Similar to Reach 2, cattle have access from the right floodplain but not the left due to the steep, wooded slope on that side. This reach is proposed for enhancement 2 which will include some localized bank repairs and cutting a bench on the right floodplain near the upstream end of the reach. There is a step-pool stormwater conveyance planned for a small swale flowing into Reach 1 from the right floodplain near the upstream end. The group agreed with the proposed treatments for this reach and the credit ratio for the E2 work will be 2.5:1. There was some discussion about the uncertainty of how much of the stream and left floodplain is on the participating landowner's property and related issues of Wildlands' ability to acquire a wide enough easement on the left side. Shawn indicated that we will know more about these issues after the site is surveyed.
- Reach 3 of Hanks Branch was toured near the end of the site visit. This reach flows through a more open floodplain between UT4 and Sparks Creek and is not confined on the left by a steep valley wall like the other reaches. This reach is incised and has areas of bank erosion and is proposed as enhancement 1. Shawn indicated that the work planned for this reach includes cutting a floodplain bench for 15 to 20 feet on both sides of the channel and installing instream structures for bedform habitat. The group agreed with this approach.

2. UT1

- The group toured UT1 after Hanks Branch Reach 1. This small tributary flows from the northern property boundary to the confluence with Hanks Branch and is proposed for restoration. Shawn indicated that the design would tie into an existing bedrock slide near the mid-way point along the reach. Other than this area, Shawn explained that the bed would be raised and the channel would be built to meander to the extent possible in the tight valley. There are two pockets of wetlands in the valley and Wildlands will try to avoid them as much as possible with the redesigned alignment and will expand the easement to incorporate the wetlands. The group agreed with the restoration approach.

3. UT2

- The group briefly looked at the short section of UT2 that will be within the conservation easement. The confluence of this stream with Hanks Branch is at the reach break between Hanks Branch Reaches 1 and 2. This short reach is proposed for enhancement 2 and will involve fencing out cattle and improving the buffer by planting native trees. The credit ratio will be 2.5:1.

4. UT3

- UT3 flows to the south through the middle of the project area and connects with Hanks Branch Reach 2. Cattle have access to this entire stream. The lower reach (Reach 3) was reviewed first and is proposed for restoration. This reach is incised, eroded, and trampled by cattle in spots. There is a crossing proposed near the confluence with Hanks Branch. UT3 Reach 2 was walked next and is proposed for enhancement 2. Shawn explained that the treatments would include replanting the buffer, excluding cattle with fencing, and some bank work to repair eroded/trampled areas. UT3 Reach 1 was the last section toured by the group. This reach is proposed for restoration. The conservation easement will capture the headwaters of this

stream. Shawn explained that Wildlands would install a pocket wetland BMP above the jurisdictional channel and connect it to the channel with a series of step-pool structures. The group agreed with these approaches and that Reach 2 would have an E2 credit ratio of 2.5:1.

5. **UT3A**
    - This is a short tributary to UT3 that is proposed for enhancement 2 with a pocket wetland at the upstream end above the jurisdictional channel. The work proposed on this reach is mainly fencing out cattle and planting. The group agreed that E2 is appropriate and the ratio credit ratio should be 2.5:1.
6. **UT4**
    - Next, the group walked UT4. The upstream reach (Reach 1) of this stream is proposed for restoration through an old dewatered pond bed. Similar to UT3, the headwaters of this stream will be captured by the conservation easement and a pocket wetland BMP will be installed above the jurisdictional channel. Reach 2 of this stream is proposed for enhancement 2. Shawn explained that the treatments would include planting, fencing out cattle, stabilizing head cuts, and adding log drop structures to provide grade control and scour pools. The group agreed to these approaches including E2 on most of Reach 2. There was discussion about the downstream end of Reach 2 which is more incised and eroded. Multiple members of the group said that they thought restoration would be appropriate for this section. Shawn explained that Wildlands planned to restore the section but, since it is relatively short, the restored section was planned to be an element of the E2 work. Wildlands will re-evaluate this reach as a full restoration section at 1:1 credit. The credit ratio for the E2 reach will be 2.5:1.
7. **Sparks Creek**
    - The group toured a section of Sparks Creek on the property. This is a large creek (Drainage area of 8.58 sq. mi.) that is proposed for enhancement 2. A group of cattle were standing in the creek during the tour. The treatments on this reach will include cattle exclusion, planting, and treatments of invasive species in the buffer. The group accepted the approach of E2 with a 2.5:1 ratio. There is a crossing approximately two thirds of the way from the upstream extent of the reach at the confluence with UT5 and the confluence with Hanks Branch. A small additional section of Sparks Creek will be buffered in the easement for no credit on one side of the creek.
8. **UT5**
    - The next reach the group reviewed was UT5, a tributary to Sparks Creek. As the group walked upstream, an old pond embankment was pointed out near the downstream end and Shawn stated that Wildlands would remove it. The entire stream is on the project property and the headwaters will be captured in the conservation easement. The stream will be fenced and the easement will be planted as part of the E2 approach. The stream is entrenched in a tight valley and has moderate erosion. The group debated between a restoration or enhancement 2 approach for the stream. The problem with enhancement 2 is that the major component of that approach would be fencing out cattle and some members of the group did not feel like that activity would provide enough uplift for full E2 credit. However, the technical difficulties involved with full restoration and relatively little uplift provided by reconstructing the channel do not make restoration a more appropriate option. The group agreed that an E2 approach at a 4:1 ratio would be appropriate. The lower portion of this reach will include the pond removal and restoration at a 1:1 ratio.

9. UT5A

- The last stream the group looked at was UT5A which is a short tributary that flows into UT5. This reach is mostly stable but cattle have easy access to it because it is not as entrenched at UT5. The headwaters of this reach will be encompassed in the conservation easement, cattle will be fenced out, and the buffer enhanced and treated for invasives. This reach is proposed for enhancement 2 and the group agreed on a ratio of 3:1.

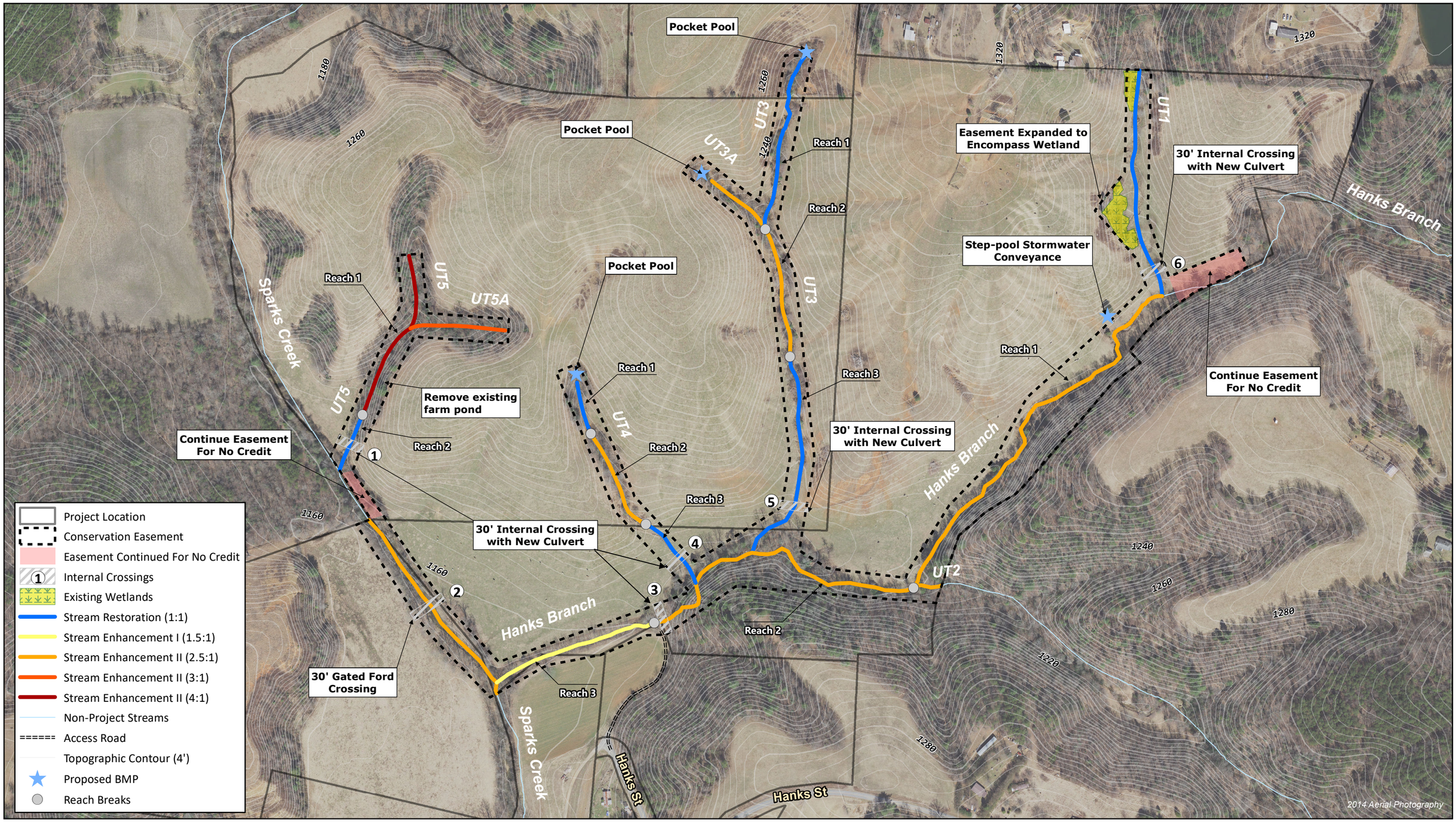
The approaches and ratios described above were agreed upon at this IRT field visit and will be utilized during the project design. Wildlands and DMS understand that the final design approach and crediting rationale must be justified in the Mitigation Plan. A revised asset table with updated approaches and agreed upon credit ratios is shown below. A revised concept map showing the updated approaches for each project reach is attached.

These meeting minutes were prepared by Jeff Keaton October1, 2018 and reviewed by Shawn Wilkerson on October 4, 2018 and represent the authors' interpretation of events.

Stream Credits proposed for the Lyon Hills Mitigation Site – Revised

Stream Credits					
Reach	**Management Objectives**	**Type of Mitigation**	**Length (feet)[1]**	**Ratio**	**Cool Stream Credits**
RESTORATION					
UT1	Restore appropriate dimension, pattern, and profile with Priority 1 restoration. Install habitat structures and protect and enhance pocket wetland floodplain features. Establish native riparian buffer and exclude cattle.	Restoration	770	1:1	770
UT3 Reach 1	Encompass headwaters within the Conservation Easement and install a pocket pool BMP at the upstream end of the reach. Restore appropriate dimension, pattern, and profile with Priority 1 restoration. Install habitat structures and allow bankfull floodplain access. Establish native woody riparian buffer and exclude cattle.	Restoration	605	1:1	605
UT3 Reach 3	Restore appropriate dimension, pattern, and profile with Priority 1 restoration. Install habitat structures, allow bankfull floodplain access. Establish native riparian buffer and exclude cattle. Stabilize confluence with Hanks Branch Reach 1.	Restoration	735	1:1	735
UT4 Reach 1	Encompass headwaters within the Conservation Easement and install a pocket pool BMP at the upstream end of the reach. Restore appropriate dimension, pattern, and profile with Priority 1 restoration. Install habitat structures and allow bankfull floodplain access. Establish native woody riparian buffer and exclude cattle.	Restoration	182	1:1	182
UT4 Reach 3	Restore appropriate dimension, pattern, and profile with Priority 1 restoration. Install habitat structures,	Restoration	330	1:1	330

	allow bankfull floodplain access. Establish native riparian buffer and exclude cattle.				
UT5 Reach 2	Remove pond embankment. Restore appropriate dimension, pattern, and profile with Priority 1 restoration. Install habitat structures, allow bankfull floodplain access. Establish native riparian buffer and exclude cattle.	Restoration	297	1:1	297
		Restoration Subtotal	2,919		2,919
ENHANCEMENT I					
Hanks Branch Reach 3	Establish native woody riparian buffer, exclude cattle, install bed structures to enhance pool habitat, and spot treat invasive vegetation.	Enhancement I	660	1.5:1	440
		Enhancement I Subtotal	660		440
ENHANCEMENT II					
Sparks Creek	Establish native woody riparian buffer, exclude cattle, and spot treat invasive vegetation.	Enhancement II	715	2.5:1	286
Hanks Branch Reach 1	Establish native woody riparian buffer, exclude cattle, install SPSC BMP to treat floodplain pasture drainage, and spot treat invasive vegetation.	Enhancement II	1,375	2.5:1	550
Hanks Branch Reach 2	Establish native woody riparian buffer, exclude cattle, and spot treat invasive vegetation.	Enhancement II	990	2.5:1	396
UT2	Establish native woody riparian buffer, exclude cattle with fencing, and spot treat invasive vegetation.	Enhancement II	95	2.5:1	38
UT3 Reach 2	Stabilize active headcuts, establish native woody riparian buffer, exclude cattle, and spot treat invasive vegetation.	Enhancement II	431	2.5:1	172
UT3A	Encompass headwaters within the Conservation Easement and install a pocket pool BMP at the upstream end of the reach. Establish native woody riparian buffer, exclude cattle with fencing, and spot treat invasive vegetation.	Enhancement II	242	2.5:1	97
UT4 Reach 2	Stabilize active headcuts, establish native woody riparian buffer, exclude cattle, and spot treat invasive vegetation.	Enhancement II	330	2.5:1	132
UT5 Reach 1	Encompass headwaters within the Conservation Easement. Establish native woody riparian buffer, exclude cattle, remove the existing farm pond, and spot treat invasive vegetation.	Enhancement II	665	4:1	166
UT5A	Encompass headwaters within the Conservation Easement. Stabilize active headcuts, establish native woody riparian buffer, exclude cattle, and spot treat invasive vegetation.	Enhancement II	315	3:1	105
		Enhancement II Subtotal	5,158		1,942
		Project Total	**8,737 LF**	**- - -**	**5,301 Cool Stream Credits**



WILDLANDS ENGINEERING

0 150 300 600 Feet

N

Figure 6 Concept Map
Lyon Hills Mitigation Site
Yadkin River Basin 03040101

Wilkes County, NC

Appendix 6

Existing Conditions Geomorphic Parameters																
Parameter	**Notation**	**Units**	**Hanks Branch Reach 3**		**UT1**		**UT3 Reach 1**		**UT3 Reach 3**		**UT4 Reach 1**		**UT4 Reach 3**		**UT5 Reach 2**	
			min	**max**	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**
stream type	-	-	C4		B4		B4		B4		B4		B4		C4b	
drainage area	DA	*sq mi*	1.05		0.06		0.04		0.07		0.01		0.02		0.02	
bankfull cross-sectional area	A_{bkf}	*SF*	13		3		3		5		3		2		2	
average velocity during bankfull event	v_{bkf}	*fps*	5.3		4.9		4.9		5.8		6.4		3.1		7.0	
width at bankfull	w_{bkf}	*feet*	13		7		7		6		4		7		5	
maximum depth at bankfull	d_{max}	*feet*	1.2		1.2		0.6		1.0		1.2		0.4		0.6	
mean depth at bankfull	d_{bkf}	*feet*	1.0		0.5		0.4		0.8		0.9		0.3		0.4	
bankfull width to depth ratio	w_{bkf}/d_{bkf}	-	13		14		18		8		4		29		13	
low bank height	-	*feet*	5.9		2		1.5		2.6		2		1		1.1	
bank height ratio	BHR	-	4.8		1.7		2.7		2.6		1.7		2.3		1.7	
floodprone area width	w_{fpa}	*feet*	-		-		10		9		7		9		11	
entrenchment ratio	ER	-	1.2		6.7		1.4		1.4		13.0		1.2		2.1	
max pool depth at bankfull	d_{pool}	*feet*	2.7		2.1		2.1		0.9		3.2		1.3		0.7	
pool depth ratio	d_{pool}/d_{bkf}	-	2.7		4.2		5.3		1.1		3.6		4.3		1.8	
pool width at bankfull	w_{pool}	*feet*	21		3		18		8		8		8		5	
pool width ratio	w_{pool}/w_{bkf}	-	1.6		0.5		2.5		1.4		2.2		1.1		1.0	
bankfull pool cross-sectional area	A_{pool}	*SF*	34		3		17		3		15		7		2	
pool area ratio	A_{pool}/A_{bkf}	-	2.6		0.9		5.4		0.6		4.5		4.1		1.0	
pool-pool spacing	p-p	*feet*	80	178	26	115	51	92	52	113	16	93	23	72	21	36
pool-pool spacing ratio	$p\text{-}p/W_{bkf}$	-	6	14	4	16	7	13	9	19	4	25	3	10	4	7
valley slope	S_{valley}	*feet/foot*	0.022		0.056		0.039		0.058		0.059		0.049		0.033	
channel slope	$S_{channel}$	*feet/foot*	0.021		0.051		0.056		0.039		0.053		0.044		0.025	
sinuosity	K	-	1.06		1.10		1.02		1.03		1.10		1.00		1.10	
belt width	w_{blt}	*feet*	37.0	41.0	-		-		-		-		-		13.0	21.0
meander width ratio	w_{blt}/w_{bkf}	-	2.8	3.2	-		-		-		-		-		2.4	3.9
meander length	L_m	*feet*	84.0	98.0	-		-		-		-		-		21.0	31.0
meander length ratio	L_m/w_{bkf}	-	6.5	7.5	-		-		-		-		-		3.9	77.5
linear wavelength	LW	-	37.0	108.0	-		-		-		-		-		32.0	55.0
linear wavelength ratio	LW/w_{bkf}	-	2.8	8.3	-		-		-		-		-		5.9	50.0
radius of curvature	R_c	*feet*	24.0	113.0	-		-		-		-		-		17.0	31.0
radius of curvature ratio	R_c/ w_{bkf}	-	1.9	8.7	-		-		-		-		-		1.3	2.8

Proposed Geomorphic Parameters																							
	Notation	Units	Hanks Branch Reach 3			UT1			UT3 Reach 1			UT3 Reach 3			UT4 Reach 1			UT4 Reach 3			UT5 Reach 2		
			Typical Section	Min	Max	Typical Section	Min	Max	Typical Section	Min	Max	Typical Section	Min	Max	Typical Section	Min	Max	Typical Section	Min	Max	Typical Section	Min	Max
stream type			C4			B4			B4			B4			B4			B4			C4b		
drainage area	DA	*sq mi*	1.05			0.0586			0.04			0.07			0.01			0.01			0.01		
design discharge	Q	*cfs*	85.0	-		13.0	-		10.0	-		15.0	-		4.0	-		6.0	-		6.0	-	
bankfull cross-sectional area	A_{bkf}	*SF*	17.7	-		3.2	-		2.7	-		3.5	-		1.3	-		1.9	-		1.9	-	
average velocity during bankfull event	v_{bkf}	*fps*	4.8	-		4.1	-		3.8	-		4.3	-		3.3	-		3.3	-		3.2	-	
width at bankfull	w_{bkf}	*feet*	15.5	-		6.6	-		5.9	-		6.8	-		4.0	-		4.9	-		5.0	-	
maximum depth at bankfull	d_{max}	*feet*	1.7	-		0.7	-		0.7	-		0.80	-		0.5	-		0.6	-		0.6	-	
mean depth at bankfull	d_{bkf}	*feet*	1.1	-		0.5	-		0.5	-		0.5	-		0.3	-		0.4	-		0.4	-	
bankfull width to depth ratio	w_{bkf}/d_{bkf}		14.0	-		14.0	-		13.0	-		13.0	-		13.0	-		13.0	-		13.0	-	
max depth ratio	d_{max}/d_{bkf}	*feet*	1.5	-		1.5	-		1.5	-		1.5	-		1.5	-		1.5	-		1.5	-	
bank height ratio	BHR		-	14.0		-	1.0		-	1.0		-	1.0		-	1.0		-	1.0		-	1.0	
floodprone area width	w_{fpa}	*feet*	-	34	78	-	9	15	-	8	13	-	10	15	-	6	9	-	7	11	-	11	25
entrenchment ratio	ER		-	2.2	5.0	-	>1.4		-	>1.4		-	>1.4		-	>1.4		-	>1.4		-	2.2	5.0
valley slope	S_{valley}	*feet/foot*	0.0220			0.0560			0.0390			0.0580			0.059			0.049			0.033		
channel slope	S_{chnl}	*feet/foot*	-	0.0169	0.0200	-	0.0509	0.0560	-	0.0355	0.040	-	0.0527	0.0420	-	0.054	0.059	-	0.045	0.049	-	0.028	0.033
riffle slope	S_{riffle}	*feet/foot*	-	0.2540	0.060	-	0.0509	0.101	-	0.0355	0.070	-	0.0527	0.104	-	0.0536	0.106	-	0.045	0.088	-	0.028	0.059
riffle slope ratio	S_{riffle}/S_{chnl}		-	1.5	3.0	-	1.0	1.8	-	1.0	1.8	-	1.0	1.8	-	1.0	1.8	-	1.0	1.8	-	1.0	1.8
pool slope	S_p	*feet/foot*	-	0.000	0.0040	-	0.000	0.0224	-	0.000	0.0156	-	0.000	0.0232	-	0.000	0.0236	-	0.000	0.0196	-	0.000	0.0132
pool slope ratio	S_p/S_{chnl}		-	0.00	0.20	-	0.00	0.04	-	0.0	0.40	-	0.0	0.40	-	0.0	0.40	-	0.0	0.40	-	0.0	0.40
pool-pool spacing	$L_{p\text{-}p}$	*feet*	-	47	104	-	10	33	-	9.0	30.0	-	10	34	-	6	20	-	7.0	25.0	-	8.0	25.0
pool spacing ratio	$L_{p\text{-}p}/w_{bkf}$		-	3.0	6.7	-	1.5	5.0	-	1.5	5.0	-	1.5	5.0	-	1.5	5.0	-	1.5	5.0	-	1.5	5.0
pool cross-sectional area	A_{pool}	*SF*	-	40.7	53.0	-	6.3	9.5	-	5.3	8.0	-	7.0	10.6	-	2.5	3.8	-	26.0	39.0	-	4.4	5.8
pool area ratio	A_{pool}/A_{bkf}		-	2.3	3.0	-	2.0	3.0	-	2.0	3.0	-	2.0	3.0	-	2.0	3.0	-	2.0	3.0	-	2.3	3.0
maximum pool depth	d_{pool}	*feet*	-	3.4	4.6	-	1.0	1.7	-	0.9	1.6	-	1.0	1.8	-	0.6	1.1	-	0.8	1.3	-	1.2	1.5
pool depth ratio	d_{pool}/d_{bkf}		-	3.0	4.0	-	2.0	3.5	-	2.0	3.5	-	2.0	3.5	-	2.0	3.5	-	2.0	3.5	-	3.0	4.0
pool width at bankfull	w_{pool}	*feet*	-	18.6	23.3	-	7.9	9.2	-	7.1	8.3	-	8.2	9.5	-	4.8	5.6	-	5.9	6.9	-	6	7.5
pool width ratio	w_{pool}/w_{bkf}		-	1.2	1.5	-	1.2	1.4	-	1.2	1.4	-	1.2	1.4	-	1.2	1.4	-	1.2	1.4	-	1.2	1.5
sinuosity	K		-	-		-	1.05		-	1.10		-	1.05		-	1.05		-	1.05		-	1.20	
belt width	w_{blt}	*feet*	-	-	-	-	17	53	-	17	47	-	17	54	-	10	32	-	12	39	-	13	40
meander width ratio	w_{blt}/w_{bkf}		-	-	-	-	2.5	8.0	-	2.5	8.0	-	2.5	8.0	-	2.5	8.0	-	2.5	8.0	-	2.5	8
linear wavelength (formerly meander length)	LW	*feet*	-	-	-	-	33	78	-	33	78	-	34	81	-	20	48	-	25	58	-	25	59
linear wavelength ratio (formerly meander length ratio)	LW/w_{bkf}		-	-	-	-	5.0	11.9	-	5.0	11.9	-	5.0	11.9	-	5.0	11.9	-	5.0	11.9	-	5.0	11.9
meander length	L_m	*feet*	-	-	-	-	33	86	-	33	86	-	33	86	-	20	52	-	25	64	-	25	71
meander length ratio	L_m/W_{bkf}		-	-	-	-	5.0	13.1	-	5.0	13.1	-	5.0	13.1	-	5.0	13.1	-	5.0	13.1	-	5.0	14.3
radius of curvature	R_c	*feet*	-	-	-	-	13	23	-	13	23	-	14	24	-	8	14	-	10	17	-	10	18
radius of curvature ratio	R_c/ w_{bkf}		-	-	-	-	2.0	3.5	-	2.0	3.5	-	2.0	3.5	-	2.0	3.5	-	2.0	3.5	-	2.0	3.5

Appendix 7

Credit Release Schedule

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

For ILF sites (including all NCDMS projects), no initial release of credits (Milestone 1) is provided because ILF programs utilized advance credits, so no initial release is necessary to help fund site construction. To account for this, the 15% credit release associated with the first milestone (bank establishment) is held until the second milestone, so that the total credits release at the second milestone is 30%. In order for NCDMS to receive the 30% release (shown in the schedules as Milestone 2), they must comply with the credit release requirements stated in Section IV(I)(3) of the approved NCDMS Instrument.
The following conditions apply to the credit release schedules:

A. A reserve of 10% of a site's total stream credits will be released after four bankfull events have occurred, in separate years, provided the channel is stable and all other performance standards are met. In the event that less than four bankfull events occur during the monitoring period, release of these reserve credits is at the discretion of the NCIRT.

B. For mitigation banks, implementation of the approved Mitigation Plan must be initiated no later than the first full growing season after the date of the first credit transaction (credit sale).

C. After the second milestone, the credit releases are scheduled to occur on an annual basis, assuming that the annual monitoring report has been provided to the USACE in accordance with Section IV (General Monitoring Requirements) of this document, and that the monitoring report demonstrates that interim performance standards are being met and that no other concerns have been identified on-site during the visual monitoring. All credit releases require written approval from the USACE.

D. The credits associated with the final credit release milestone will be released only upon a determination by the USACE, in consultation with the NCIRT, of functional success as defined in the Mitigation Plan.

Credit Release Schedule – Stream Credits

Credit Release Milestone	Credit Release Activity	Interim Release	Total Released
1	Site Establishment (includes all required criteria stated above)	0%	0%
2	Completion of all initial physical and biological improvements made pursuant to the Mitigation Plan	30%	30%
3	Year 1 monitoring report demonstrates performance	10%	40%

Credit Release Milestone	Credit Release Activity	Interim Release	Total Released
	standards have been met		
4	Year 2 monitoring report demonstrates performance standards have been met	10%	50%
5	Year 3 monitoring report demonstrates performance standards have been met	10%	60%
6	Year 4 monitoring report demonstrates performance standards have been met	5%	65% (75%**)
7	Year 5 monitoring report demonstrates performance standards have been met	15%	75% (85%**)
8*	Year 6 monitoring report demonstrates performance standards have been met	5%	80% (90**)
9	Year 7 monitoring report demonstrates performance standards have been met	10%	90% (100**)

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

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

Appendix 8

Site Protection Instrument

The land required for construction, management, and stewardship of this mitigation project includes portions of the parcels listed in Table 1. This area totals 29.8 acres. The deed book and page number listed are for the agreements on an option to purchase a conservation easement. A conservation easement will be recorded on the parcels and includes streams being restored along with their corresponding riparian buffers.

Table 1: Site Protection Instrument

Property Owner	Parcel ID Number	County	Site Protection Instrument	Memorandum of Option Deed Book (DB) and Page Number (PG)
Horace Randle Wood	4904-85-2899	Wilkes	CE	DB: 1156, PG: 106
Horace Randle Wood	4904-74-6732	Wilkes	CE	DB: 1156, PG: 106
Horace Randle Wood	4904-94-1831	Wilkes	CE	DB: 1156, PG: 106
Horace Randle Wood	4904-63-7463	Wilkes	CE	DB: 1156, PG: 106
John Lyon	4904-82-1964	Wilkes	CE	DB: 557, PG: 433

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

Appendix 9

Financial Assurances

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

Appendix 10

Maintenance Plan

The site shall be monitored on a regular basis and a physical inspection of the site shall be conducted a minimum of once per year throughout the post-construction monitoring period until performance standards are met. These site inspections may identify site components and features that require routine maintenance. Routine maintenance should be expected most often in the first two (2) years following site construction and may include the following:

Table1: Maintenance Plan

Component/Feature	Maintenance through project close-out
Stream	Routine channel maintenance and repair activities may include chinking of in-stream structures to prevent piping, securing of loose coir matting, and supplemental installations of live stakes and other target vegetation along the channel. Areas where storm water and floodplain flows intercept the channel may also require maintenance to prevent bank erosion. If beaver become active on the site, Wildlands will contract with the USDA to trap the beaver and remover the dams. No maintenance is expected to be necessary for the BMPs.
Vegetation	Vegetation shall be maintained to ensure the health and vigor of the targeted community. Routine vegetation maintenance and repair activities may include supplemental planting, pruning, mulching, and fertilizing. Exotic invasive plant species shall be controlled by mechanical and/or chemical methods. Any vegetation control requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDA) rules and regulations.
Site boundary	Site boundaries shall be identified in the field to ensure clear distinction between the mitigation site and adjacent properties. Boundaries may be identified by fence, marker, bollard, post, tree-blazing, or other means as allowed by site conditions and/or conservation easement. Boundary markers disturbed, damaged, or destroyed will be repaired and/or replaced on an as-needed basis.

July 27, 2020

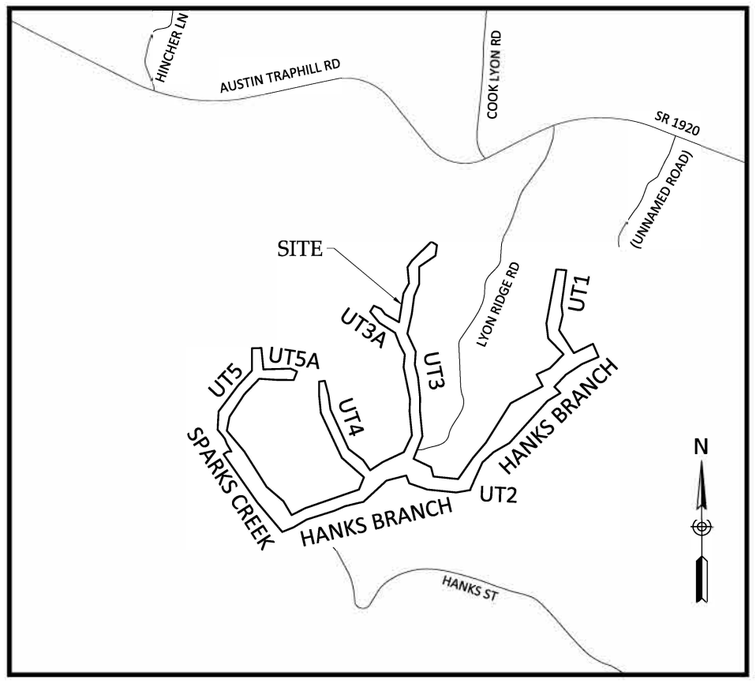
Lyon Hills Mitigation Site

Wilkes County, North Carolina

for

NCDEQ

Division of Mitigation Services



Vicinity Map
Not to Scale

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ISSUED JUNE 20, 2020

Sheet Index

Project Directory

Engineering:
Wildlands Engineering, Inc
License No. F-0831
312 W. Millbrook Rd, Suite 225
Raleigh, NC 27609
Jeff Keaton, Project Manager
Nicole Millns, Project Engineer
919-851-9986

Surveying:
Kee Mapping and Surveying, PA
88 Central Avenue
Asheville, NC 28801
Phillip B. Kee, PLS
828-645-8275

Owner:
DEQ NCDMS
1652 Mail Service Center
Raleigh, NC 27699-1652
Attention: Kelly Phillips
919-707-8976

NCDEQ Contract No. 7620
DMSID No. 100085

WILDLANDS ENGINEERING
312 W. Millbrook Rd, Suite 225
Raleigh, NC 27609
Tel: 919.851.9986
Licensed No. F-0831

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Lyon Hills Mitigation Site
Wilkes County, North Carolina

Title

Revisions:

Date: 06.05.20
Job Number: 005-02177
Project Engineer: NMM
Drawn By: CAW
Checked By: GAT

Sheet 0.1

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July 27, 2020

HORACE RANDLE WOOD
PIN: 4904-85-2899
DB: 1156 PG: 106 (EXHIBIT R, TRACT II & III)

RICKY C. CARROLL & WIFE
LISA B. CARROLL
PIN: 4904-76-4116
PORTION OF DB: 859 PG: 207
(FIRST TRACT)

BOBBY J. HOLBROOK & WIFE
RITA K. HOLBROOK
PIN: 4904-85-7507
DB: 849 PG: 279

BENJAMIN J. LYON & WIFE
LINDA LYON
PIN: 4904-95-0764
DB: 1051 PG: 212

MICKEY L. DURHAM & WIFE
LINDA M. DURHAM
PIN: 4914-05-0896
DB: 1249 PG: 99
PB: 11 PG: 569 (TRACT 4)

40' SURRY-YADKIN E.M.C.
UTILITY LINE EASEMENT

EDDIE D. BLACKBURN, JR. & WIFE
HEATHER BLACKBURN
PIN: 4904-95-3428
DB: 1199 PG: 210

RICHARD D. LYON & WIFE
TAMMY W. LYON
PIN: 4914-05-1582
DB: 731 PG: 267

HORACE RANDLE WOOD
PIN: 4904-74-6732
DB: 1156 PG: 106 (EXHIBIT R, TRACT I)

HORACE RANDLE WOOD
PIN: 4904-94-1831
DB: 1156 PG: 106 (EXHIBIT Q, TRACT III)

JANIE W. CHEEK
PIN: 4904-55-7721
DB: 1068 PG: 452 (TRACTS 1, 2 & 3)
ESTATE FILE 11 E-574

JANIE W. CHEEK
PIN: 4904-54-8184
DB: 1068 PG: 452 (PORTION OF TRACT FOUR)
ESTATE FILE 11 E-574

HORACE RANDLE WOOD
PIN: 4904-63-7463
DB: 1156 PG: 106 (EXHIBIT Q, TRACT II)

JOHN E. LYON
PIN: 4904-82-0576
PORTION OF DB: 557 PG: 433

JOHN E. LYON
PIN: 4904-73-6035
PORTION OF DB: 557 PG: 437
ESTATE FILE 00E-173

RANDEL M. FENDER & WIFE
ETTA FENDER
PIN: 4904-82-1964
DB: 1270 PG: 163

RANDEL M. FENDER & WIFE
ETTA FENDER
PIN: 4904-83-4149
DB: 1254 PG: 205

RANDEL M. FENDER & WIFE
ETTA FENDER
PIN: 4904-83-7188
DB: 1216 PG: 280

JENNIFER A. LEONARD
& HUSBAND JIMMIE E. LEONARD
PIN: 4904-93-0182
DB: 766 PG: 199 &
DB: 1179 PG: 338

LEFF J. BENGE
PIN: 4914-04-5444
DB: 819 PG: 474

N/F
LEFF J. BENGE
PIN: 4914-04-5444
DB: 819 PG: 474

TO S.R. 1749

LYON RIDGE ROAD
(FORMERLY T.W. LYON ROAD)
(PRIVATE)

FEMA-XS

SFHA

BEGIN UT5
REACH 1 (ENHANCEMENT II)
STA. 800+00

END UT5A
(ENHANCEMENT II)
STA. 703+18
UT5 REACH 1
(ENHANCEMENT II)
STA. 802+12

BEGIN UT5A
(ENHANCEMENT II)
STA. 700+00

END UT5
REACH 1 (ENHANCEMENT II)
BEGIN UT5
REACH 2 (RESTORATION)
STA. 804+37

BEGIN SPARKS CREEK
(ENHANCEMENT II)
STA. 100+61

SPARKS CREEK
(ENHANCEMENT II)
START CREDITS
STA. 102+75

END UT5
REACH 2 (RESTORATION)
STA. 808+00
SPARKS CREEK (ENHANCEMENT II)
STA. 101+12

END SPARKS CREEK
(ENHANCEMENT II)
STA. 110+54

BEGIN UT4
REACH 1 (RESTORATION)
STA. 600+00

END UT4
REACH 1 (RESTORATION)
BEGIN UT4
REACH 2 (ENHANCEMENT II)
STA. 602+33

END UT4
REACH 2 (ENHANCEMENT II)
BEGIN UT4
REACH 3 (RESTORATION)
STA. 605+55

END UT4
REACH 3 (RESTORATION)
STA. 608+36
HANKS BRANCH
REACH 2 (ENHANCEMENT II)
STA. 226+42

BEGIN UT3
REACH 1 (RESTORATION)
STA. 500+00

BEGIN UT3A
(ENHANCEMENT II)
STA. 550+00

END UT3A (ENHANCEMENT II)
STA. 552+53
UT3 REACH 1 (RESTORATION)
STA. 506+30

END UT3
REACH 1 (RESTORATION)
BEGIN UT3
REACH 2 (ENHANCEMENT II)
STA. 506+55

END UT3
REACH 2 (ENHANCEMENT II)
BEGIN UT3
REACH 3 (RESTORATION)
STA. 511+02

END UT3
REACH 3 (RESTORATION)
BEGIN UT3
REACH 4 (ENHANCEMENT II)
STA. 517+34

END UT3
REACH 4 (ENHANCEMENT II)
STA. 520+06
HANKS BRANCH
REACH 2 (ENHANCEMENT II)
STA. 225+25

END HANKS BRANCH
REACH 2 (ENHANCEMENT II)
BEGIN HANKS BRANCH
REACH 3 (ENHANCEMENT I)
STA. 228+06

END HANKS BRANCH
REACH 3 (ENHANCEMENT I)
STA. 233+87
SPARKS CREEK (ENHANCEMENT II)
STA. 110+12

BEGIN UT1
(RESTORATION)
STA. 300+28

UT1 (RESTORATION)
BEGIN CREDITS
STA. 300+88

END UT1 (RESTORATION)
STA. 308+93
HANKS BRANCH REACH 1
(ENHANCEMENT II)
STA. 203+08

BEGIN HANKS BRANCH
REACH 1 (ENHANCEMENT II)
STA. 200+21

END HANKS BRANCH
REACH 1 (ENHANCEMENT II)
BEGIN HANKS BRANCH
REACH 2 (ENHANCEMENT II)
STA. 216+99
END UT2 (ENHANCEMENT II)
STA. 400+90

BEGIN UT2
(ENHANCEMENT II)
STA. 400+12

UT5A
UT5
UT4
UT3A
UT3
UT1
UT2
SPARKS CREEK
HANKS BRANCH
HANKS STREET
(S.R. 2078)
R/W

1.36 1.41 1.40 1.35 1.37 1.38 1.39 1.01 1.02 1.03 1.11 1.10 1.34 1.09 1.08 1.17 1.26 1.27 1.29 1.21 1.22 1.23 1.24 1.25 1.30 1.31 1.32 1.33 1.28 1.20 1.19 1.18 1.12 1.13 1.14 1.15 1.16 1.04 1.05 1.06 1.07

CE TB SFHA FEMA-XS

N

0' 150' 300' 450'
(HORIZONTAL)

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Raleigh, NC 27609
Tel: 919.851.9986
License No. F-0831

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Lyon Hills Mitigation Site
Wilkes County, North Carolina

Project Overview

Revisions:

Date:	06.05.20
Job Number:	005-02177
Project Engineer:	NMM
Drawn By:	CAW
Checked By:	GAT

Sheet 0.2

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July 27, 2020

General Construction Notes

1. All erosion and sediment control practices shall comply with the North Carolina Erosion and Sediment Control Planning and Design Manual.
2. Contractor will install pump-around systems to divert flow while working in live, flowing channels. Contractor shall operate and maintain the pump-around system 24 hours a day until all disturbed areas are stabilized. The disturbed area being pumped around must be stabilized with temporary seeding, mulch, and erosion control matting by the end of each work day. Contractor shall not remove pump-around systems and advance to the next work area until the current work area is completed and stabilized.
3. No material from the off-line proposed stream channel excavation may be backfilled into the adjacent existing stream channel until the newly-constructed proposed stream section is completed, stabilized, and the stream flow has been diverted into it, not even if that section of old/existing stream is being pumped.
4. A pump-around operation is required for all in-stream work, but is not required to be running if there is no flow. Contractor shall disturb only as much channel bank as can be stabilized with temporary seeding, mulch, and erosion control matting by the end of each work day.
5. Clearing and grubbing activities shall not extend more than 150 linear feet ahead of in-stream work.
6. When crossing an active section of new or old stream channel, a Timber Mat shall be installed according to the Details and Specifications.
7. All graded areas with slopes steeper than 3:1 will be stabilized within seven (7) working days. All other areas will be stabilized within 14 working days.
8. Locations for staging and stockpile areas and temporary stream crossings have been provided on the Plans. Additional or alternative short-term stockpile areas and stream crossings may be used by the Contractor provided that all practices comply with the North Carolina Erosion and Sediment Control Planning and Design Manual and that the areas are approved by the Engineer prior to implementation. Short-term stockpile areas are those that will remain in place for a short period of time so that disturbed areas can be stabilized within the timeframes stated in item #7 of General Construction Notes. Additional stockpile areas other than short-term stockpiles, staging areas, and stream crossings not shown on the plans will require approval of the Division of Energy, Mineral and Land Resources.
9. Vegetation on-site to be used as transplant material (juncus, small trees, and sod mats) shall not be disturbed until the Contractor is prepared to install transplants.
10. Various types of constructed riffles are specified on the plans. Contractor shall build the specific types of constructed riffles at locations shown on the plans. Changes in constructed riffle type must be approved by the Engineer.
11. Fertilizer and soil amendments are discussed in the Permanent Seeding Specification. Lime and fertilizer may be applied to assist with grass establishment in some disturbed areas. The limits of applications will be determined by the Engineer in the field.
12. Existing fence located inside the conservation easement shall be removed during construction.
13. Contractor is to make every effort to avoid damaging or removing existing trees.
14. Materials harvested on-site for construction of structures must be obtained within the conservation easement and approved by the Engineer.
15. Under no circumstances will the Contractor exceed the Limits of Disturbance as shown on the plans.
16. The construction site will be accessed from two construction entrance points, one off Hanks Street and one off Lyon Ridge Road as shown on the plans.

Initial Site Preparation

1. Contact the North Carolina "One Call" Center (1.800.632.4949) before any excavation.
2. Mobilize equipment and materials to the site.
3. Identify and establish construction entrances, staging and stockpile areas, haul roads, silt fence, tree protection fencing, safety fencing, and temporary stream crossings as indicated on the plans for work areas.
4. All haul roads shall be monitored for sediment loss daily. In the event of sediment loss, silt fence or other acceptable sediment and erosion control practices shall be installed. Silt fence outlets shall be located at points of low elevation or a minimum spacing of 150 ft.
5. Set up temporary facilities, locate equipment within the staging area, and stockpile materials needed for the initial stages of construction within the stockpile areas. Install and maintain an on-site rain gauge and log book to record rainfall amounts and dates. Maintain an approved copy of the ESC Plan with placard and approval letter and a copy of the NPDES permit with a minimum of 30 days of self-inspection reports on site until project closure by NCDEQ.
6. The Contractor shall conduct self-inspections of the erosion and sedimentation control measures and complete the combined self-inspection form found on the DEMLR website (DEMLR-CSW-Monitoring-Form-Rev-April-1-2019.pdf) as required by NCDEQ permit. Rainfall records, completed self-inspection forms, and permits should be maintained on site.
7. Monitor site for sediment loss and inspect all erosion control features after each rain event. Maintain erosion control features according to the North Carolina Erosion and Sediment Control Manual.

Construction Sequence

1. This project may be constructed in phases according to construction entrances and regions of the site. Contractor shall not start construction on one phase and move to another phase before stabilizing the first, unless a crew is continuing to work on the initial phase.
2. Construction sequencing shall be determined by the Contractor and the Contractor shall provide a schedule to the Engineer prior to commencement.
3. Install temporary livestock fencing, as necessary, to secure the project area prior to construction. Conservation easement fencing may be installed prior to construction to reduce or eliminate the need for temporary fencing.
4. Perform any necessary clearing and grubbing in phases as work progresses. Stream bank vegetation and floodplain vegetation immediately adjacent to live channels shall be left undisturbed as long as possible. Remove all non-native and invasive vegetation prior to beginning channel construction. Take care with vegetation marked for transplant from the old channel to the new channel. Do not disturb transplant vegetation until time of transplant.
5. Construction of all channels is to be done in the dry. Construction should generally progress from upstream to downstream to prevent sediment runoff from upstream construction affecting completed downstream reaches. Use a pump-around system as shown on the plans and discussed in the General Notes.
6. Where feasible, multiple off-line sections may be constructed concurrently. Off-line sections shall be tied on-line sequentially from downstream to upstream.
7. As work progresses, remove and stockpile the top three (3) inches of soil from the active grading area. Stockpiled topsoil shall be kept separate for on-site replacement prior to floodplain seeding.
8. Construct the proposed stream channel to the grade specified in the cross sections and profiles. Transfer coarse material from abandoned channel riffles to new channel riffles utilizing a pump-around system when doing so.
9. Install permanent stream crossings according to the details and specifications.
10. Sod mats can be used in lieu of coir fiber matting, where available, to stabilize all stream banks on site as the preferred stabilization method. Coir fiber matting may be used where sod mats are not available or if coir fiber matting is preferred at the discretion of the Designer. Material used for sod mats must be approved by the Engineer.
11. Install in-stream structures (constructed riffles, log sills, log J-hooks, lunker logs, log vanes, and boulder sills) and bank revetments such as brush toe and sod mats after channel grading is completed according to the details and specifications.
12. Pond BMPs located above UT3 and UT4 shall be installed per the elevations defined in the plans. Outlet swale material is defined in the plans and shall be installed and stabilized as specified.
13. Seed (with specified temporary and permanent seed mix) and straw mulch areas where coir fiber matting is to be installed.
14. Grade the adjacent floodplain areas according to the plans.
15. Backfill abandoned channel sections with stockpiled soil according to the grades shown on the plans. Non-native and invasive vegetation (e.g. Chinese privet and multiflora rose) shall be removed from the existing channel prior to backfilling.
16. Prepare the floodplain for seeding by applying stockpiled topsoil to the floodplain between bankfull elevation and the grading limits, ripping, and raking/smoothing. All haul roads and other areas of compacted soil must be thoroughly ripped or disked. Seed with specified temporary and permanent seed mix and mulch. Any areas within the conservation easement that have not been graded shall be treated according to the planting plan.
17. If at any time circumstances should arise where water has been turned into newly-constructed channel and additional work must be done on the floodplain, erosion control devices will be installed to protect the newly-constructed channel from sedimentation.
18. Once all phases of channel and floodplain construction are complete, any remaining fence lines shall be staked according to fencing plan. Install fence outside of the conservation easement according to the fencing plan, details, and specifications.
19. Prepare the floodplain areas for planting per the specifications.
20. Install bare root plants on the floodplain and live stakes and herbaceous plugs along the stream banks according to the planting plan, details, and specifications.

Construction Demobilization

1. Remove temporary stream crossings, stockpile areas, and erosion and sediment control devices. Note: Permanent vegetation must be established before measures can be removed.
2. The Contractor shall ensure that the site is free of trash and leftover materials prior to demobilization of equipment from the site.
3. Complete the removal of any additional stockpiled material from the site.
4. Demobilize grading equipment from the site.
5. All rock and other stockpiled materials must be removed from the limits of disturbance and conservation easement unless otherwise directed by the Engineer.
6. All areas, including but not limited to pasture areas, roads, and entrances outside the conservation easement shall be returned to pre-project conditions or better.
7. Seed, mulch, and stabilize staging areas, stockpile areas, haul roads, and construction entrances. Pasture seed mix is to be applied to areas of disturbance outside of the conservation easement and where shown on the planting plan.

Existing Features

- SFHA — SPECIAL FLOOD HAZARD AREA
- FEMA-XS — FEMA CROSS SECTIONS
- EXISTING THALWEG
- X — X — EXISTING FENCE
- EXISTING STORM PIPE
- 100 — EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EXISTING PROPERTY LINE
- EXISTING BEDROCK
- EXISTING FARM PATH
- EXISTING WETLAND
- EXISTING POND
- EXISTING DEBRIS AREA
- EXISTING SPRING
- E — EXISTING ELECTRIC BOX
- EXISTING CONIFEROUS TREE
- EXISTING DECIDUOUS TREE

Proposed Features

- PROPOSED THALWEG
- PROPOSED BANKFULL
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- CE — CE — PROPOSED CONSERVATION EASEMENT
- CE-IX — CE-IX — PROPOSED CONSERVATION EASEMENT INTERNAL CROSSING
- LOG VANE
- LOG SILL
- BOULDER SILL
- LOG J-HOOK
- ROCK VANE
- ROCK STEP POOLS
- ROCK CASCADE
- FLOODPLAIN OUTLET
- PROPOSED BOULDER TOE
- CR-ALR — PROPOSED ANGLED LOG RIFFLE
- CR-CH — PROPOSED CHUNKY RIFFLE
- CR-LRC — PROPOSED LOG-ROCK CASCADE RIFFLE
- CR-NM — PROPOSED NATIVE MATERIAL RIFFLE
- CR-WD — PROPOSED WOODY RIFFLE
- PROPOSED STREAM BANK GRADING
- PROPOSED FORD CROSSING
- PROPOSED CHANNEL INFILL
- PROPOSED FARM ROAD
- PROPOSED BRUSH TOE
- PROPOSED TRANSPLANTED SOD MAT
- PROPOSED VEGETATED SOIL LIFT

Erosion Control Features

- LOD — LOD — LIMITS OF DISTURBANCE
- SAF — SAF — SAFETY FENCE
- [X] — [X] — SILT FENCE
- SILT FENCE OUTLET
- PUMP
- TEMPORARY CROSSING
- STAGING/STOCKPILE AREA
- PROPOSED CONSTRUCTION ACCESS
- PROPOSED HAUL ROAD

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General Notes and Symbols

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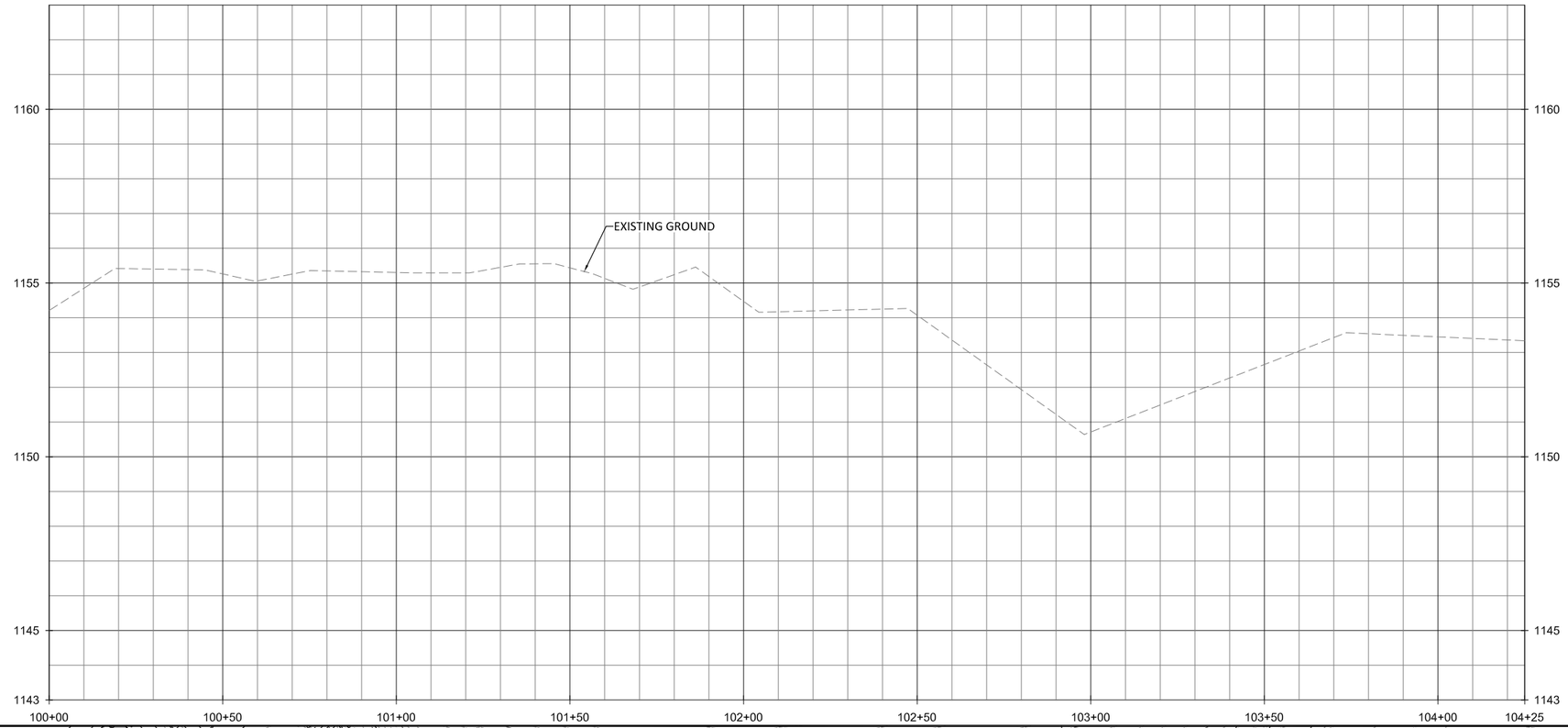

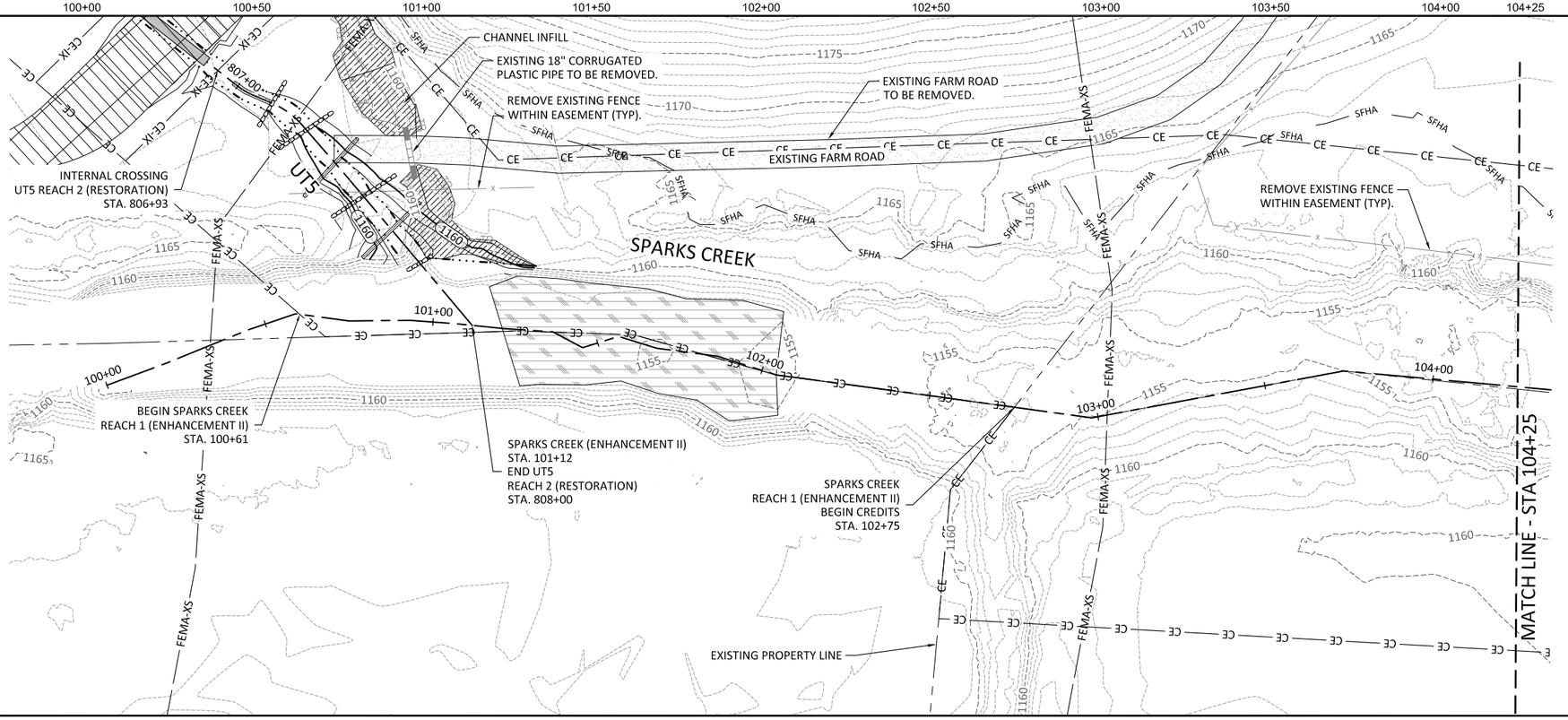

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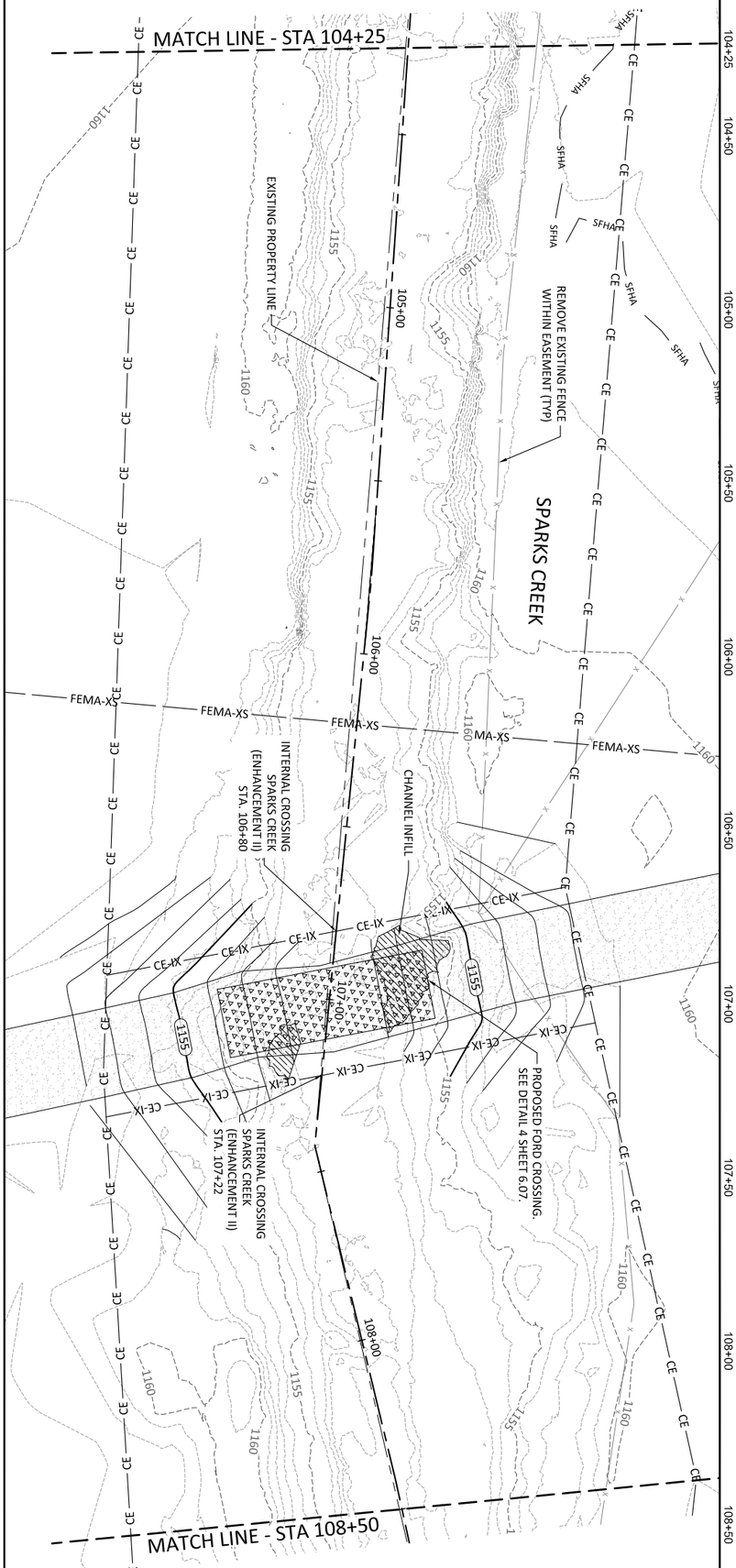

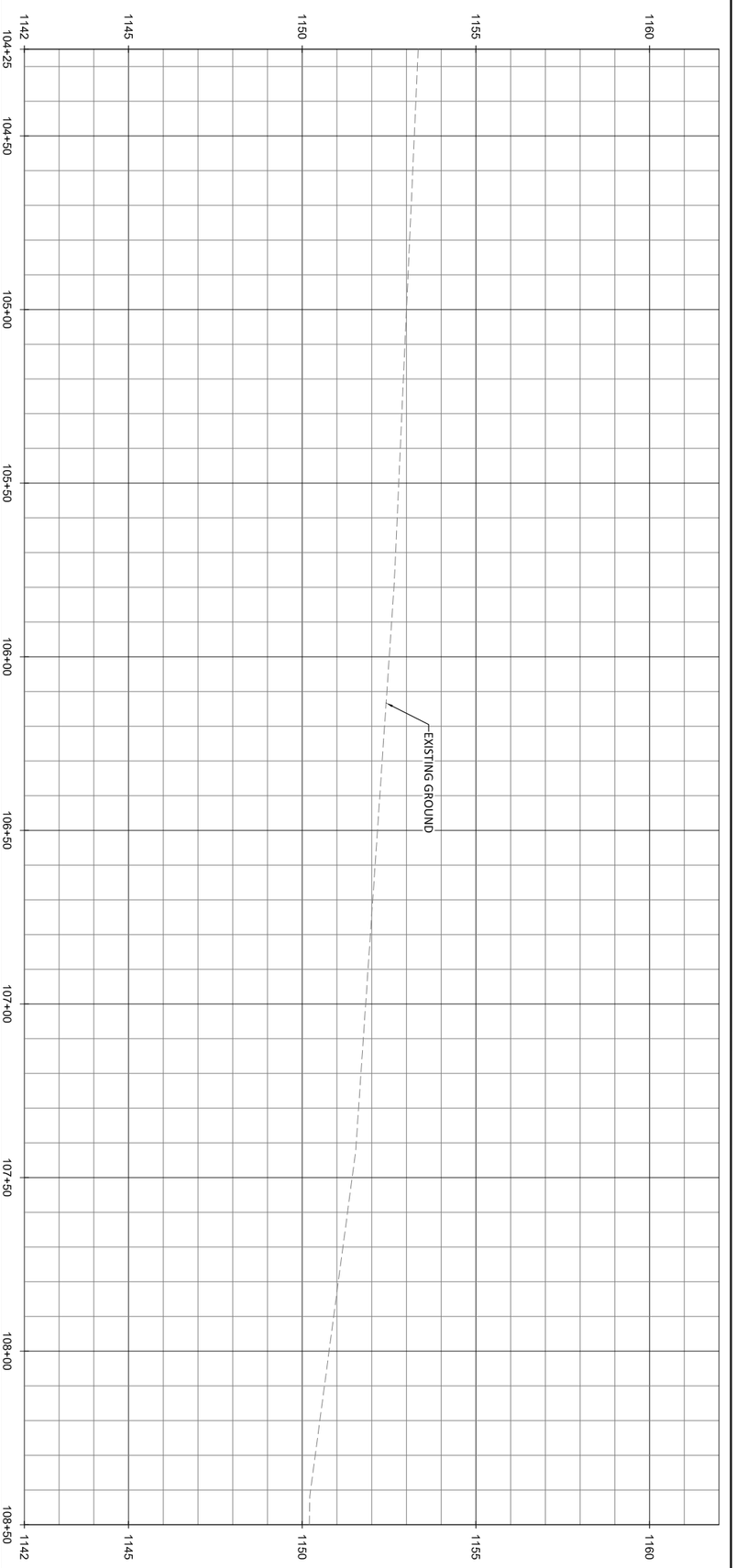

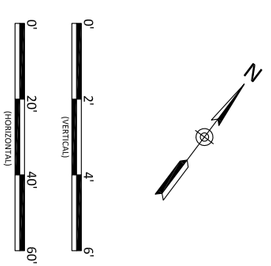

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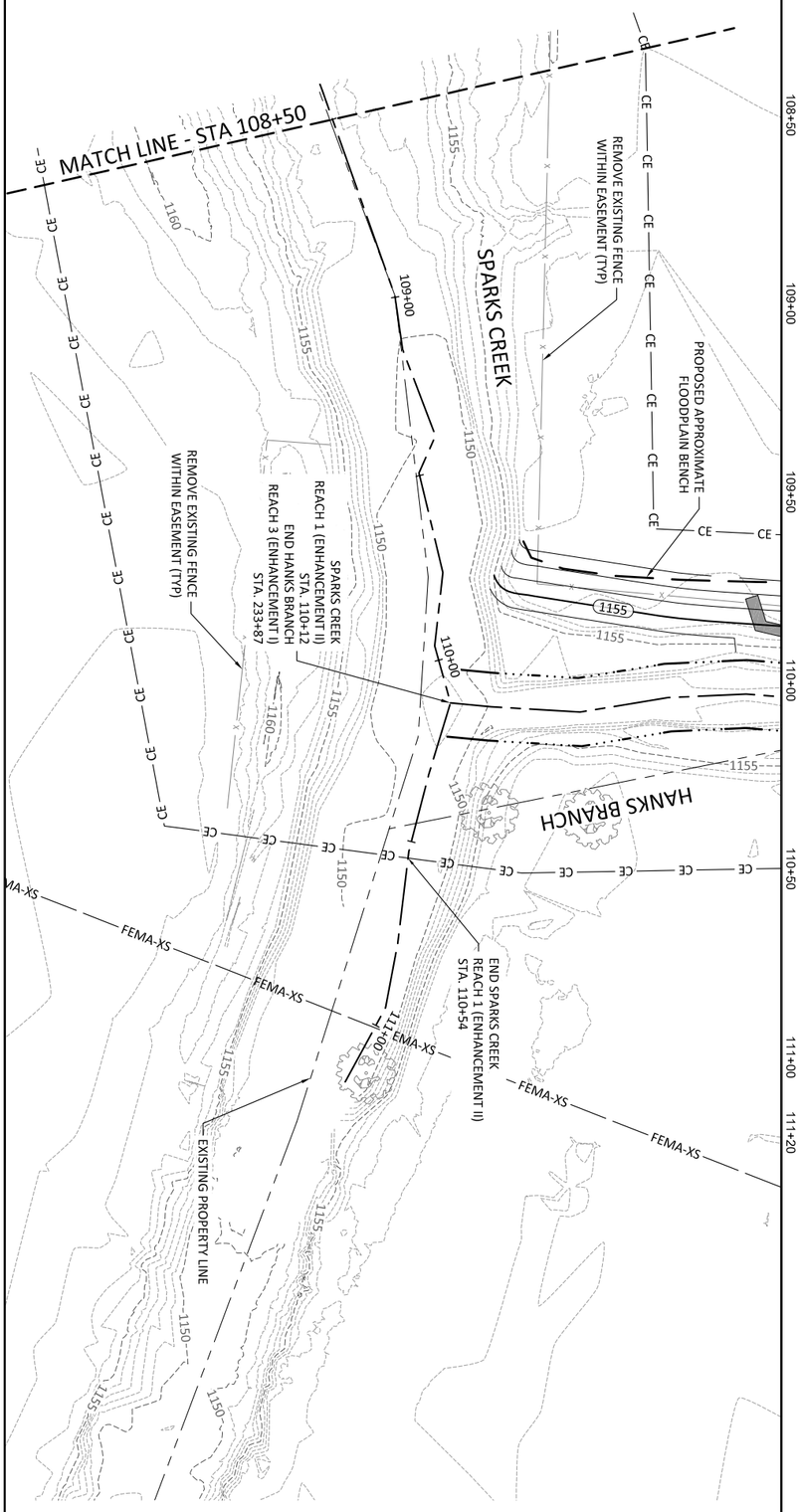

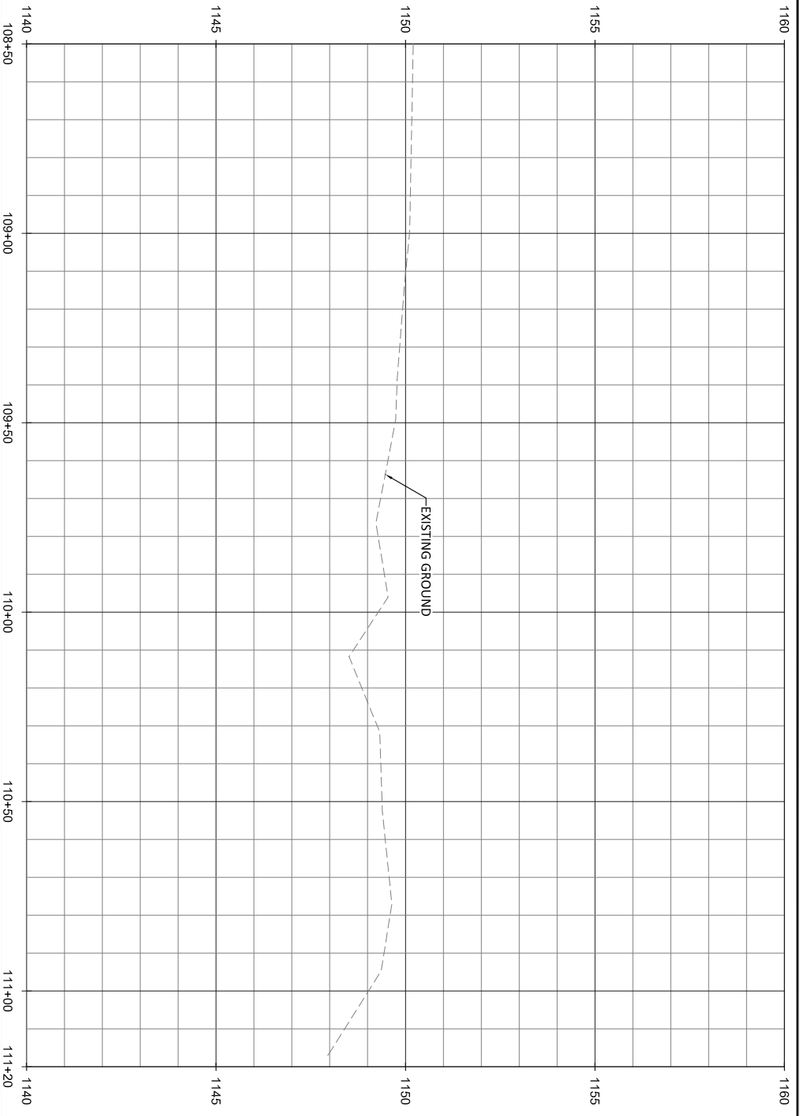

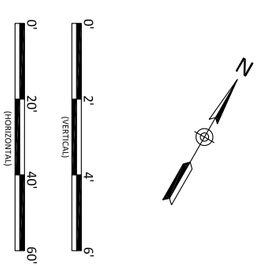

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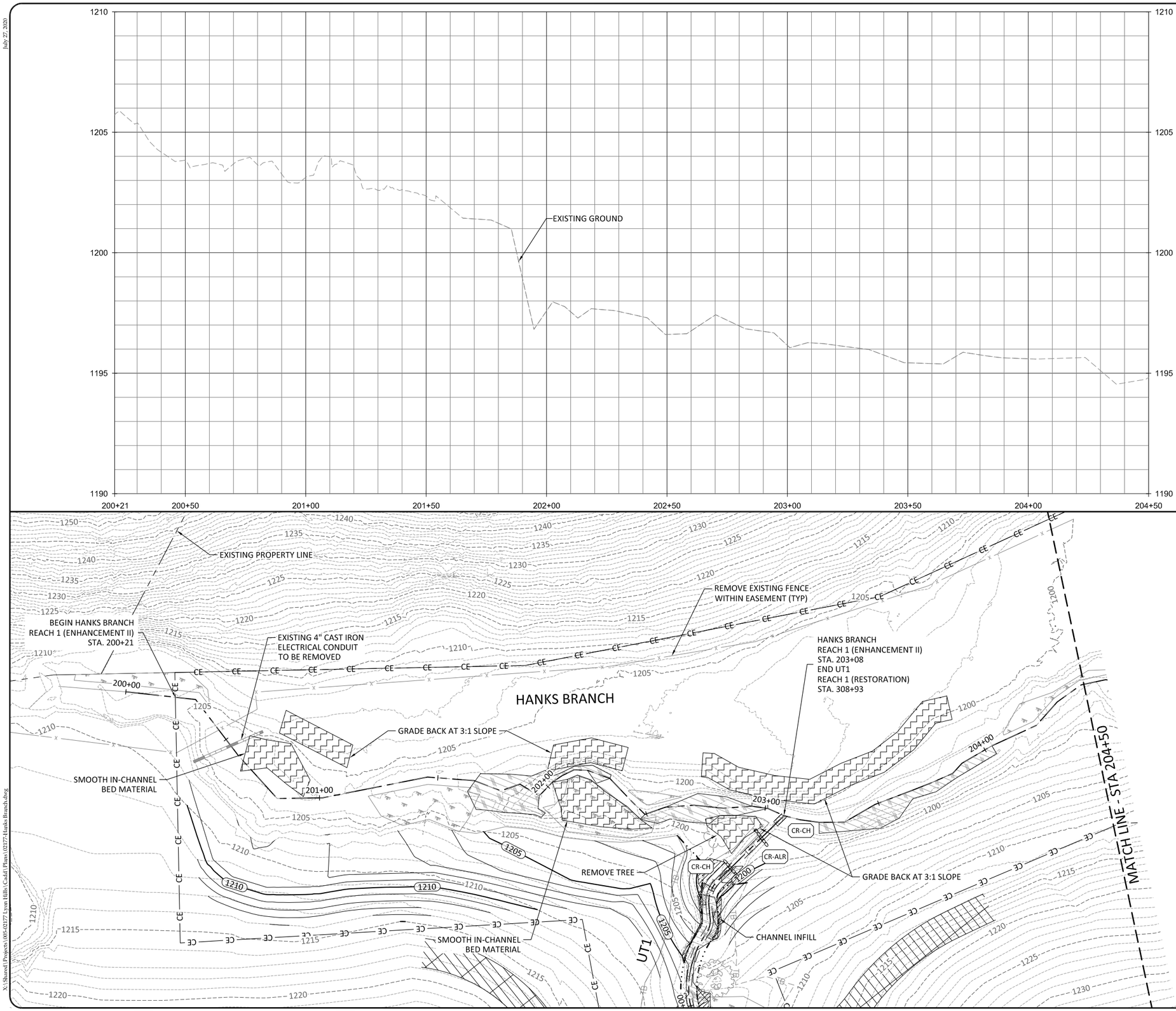

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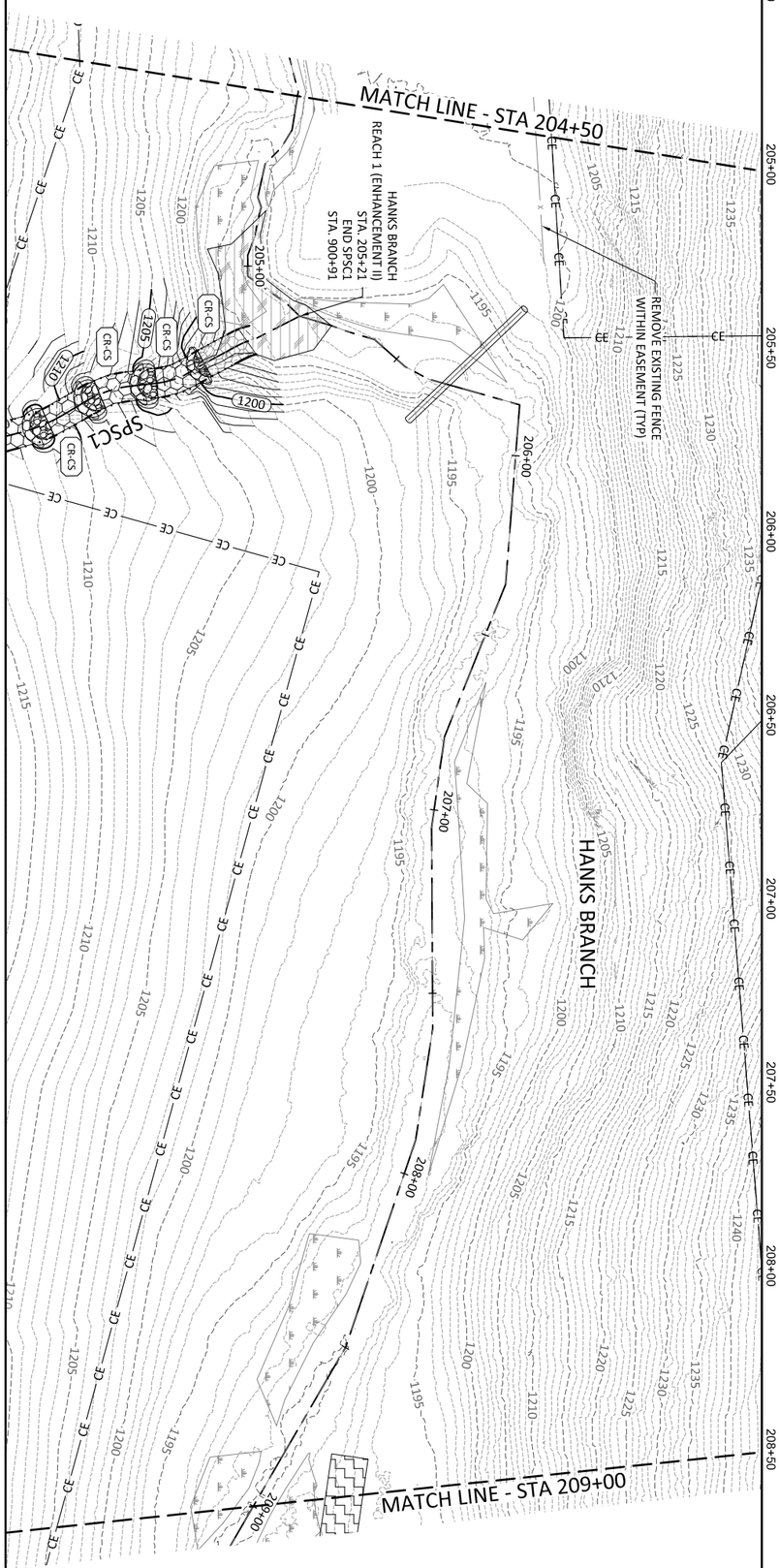

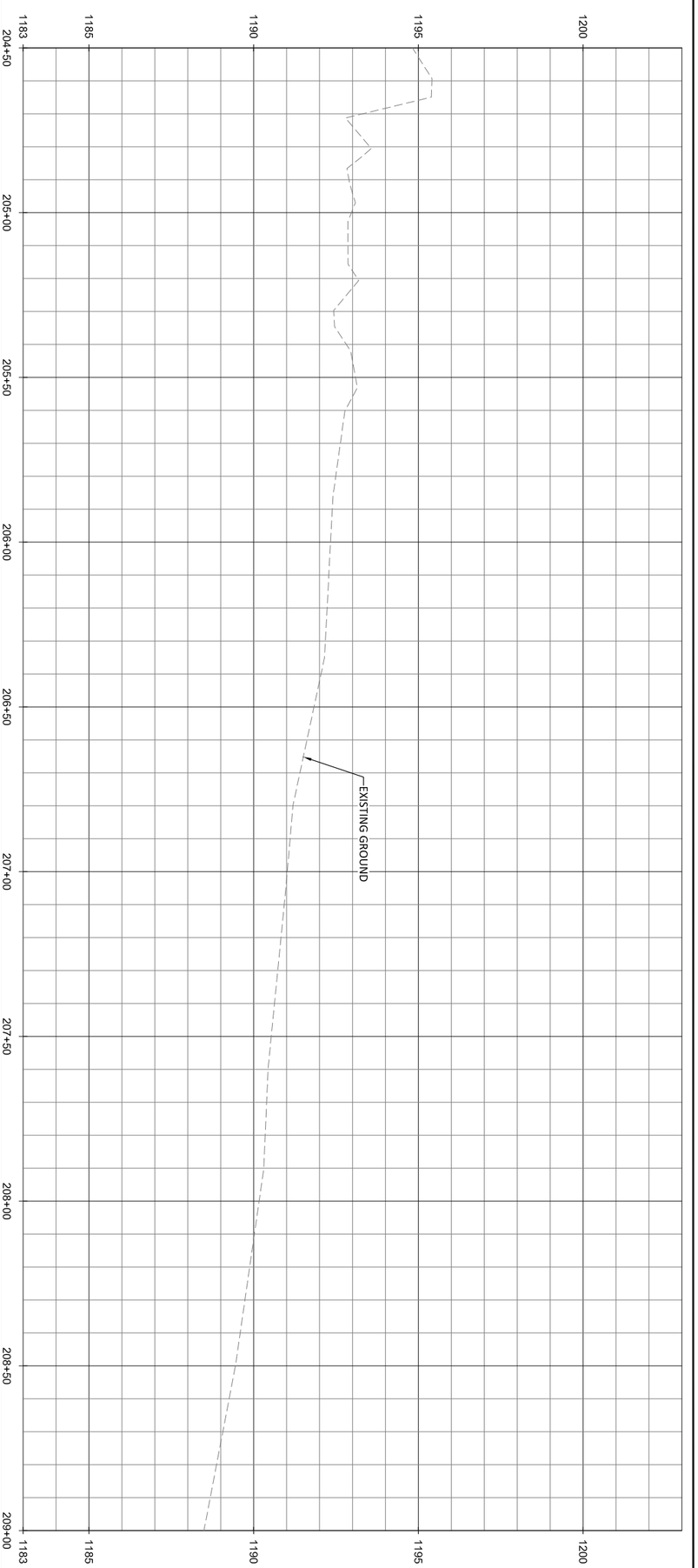

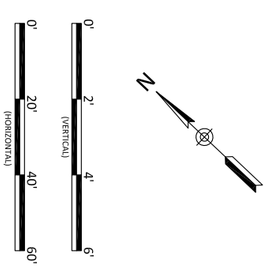

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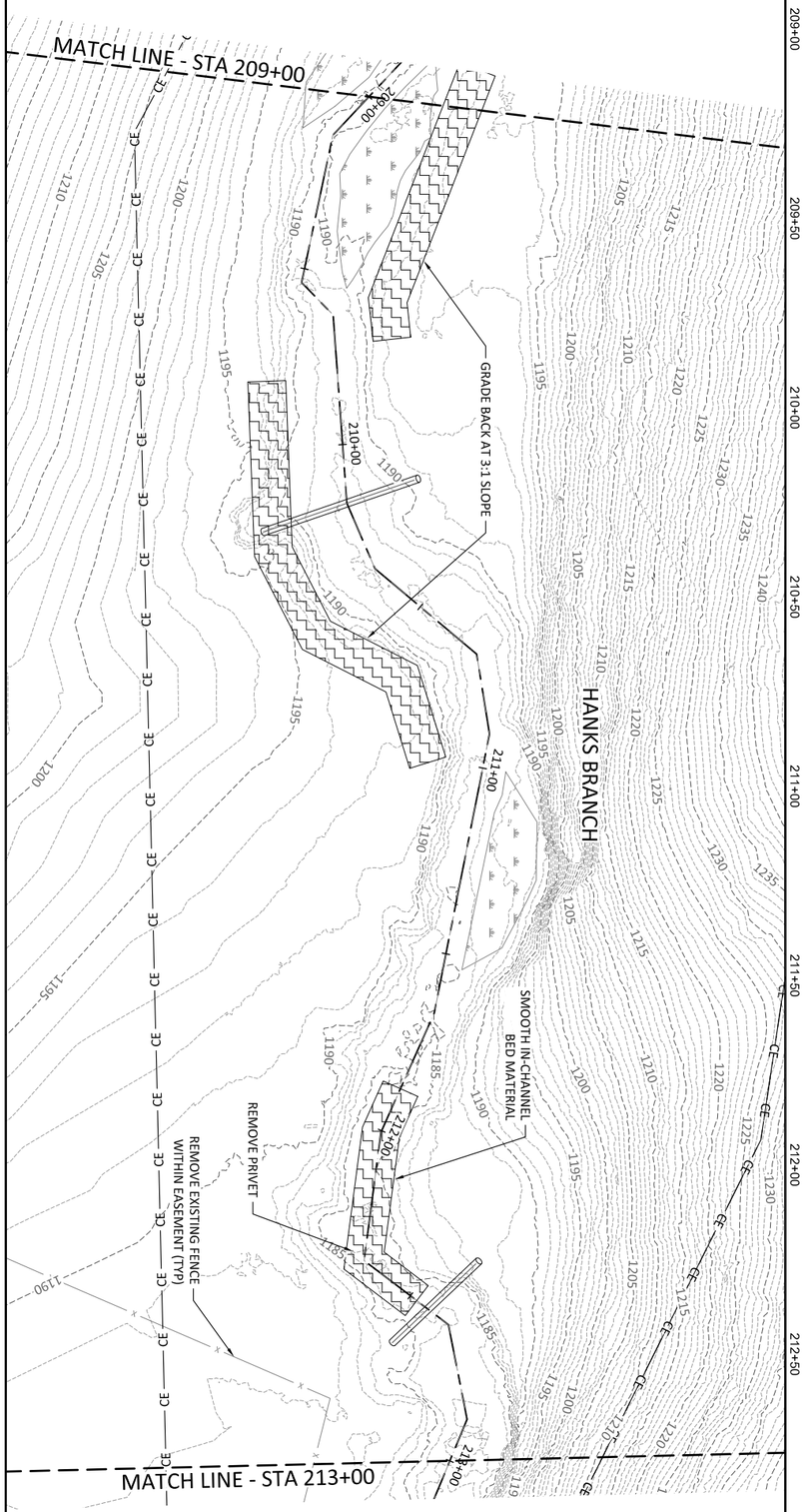

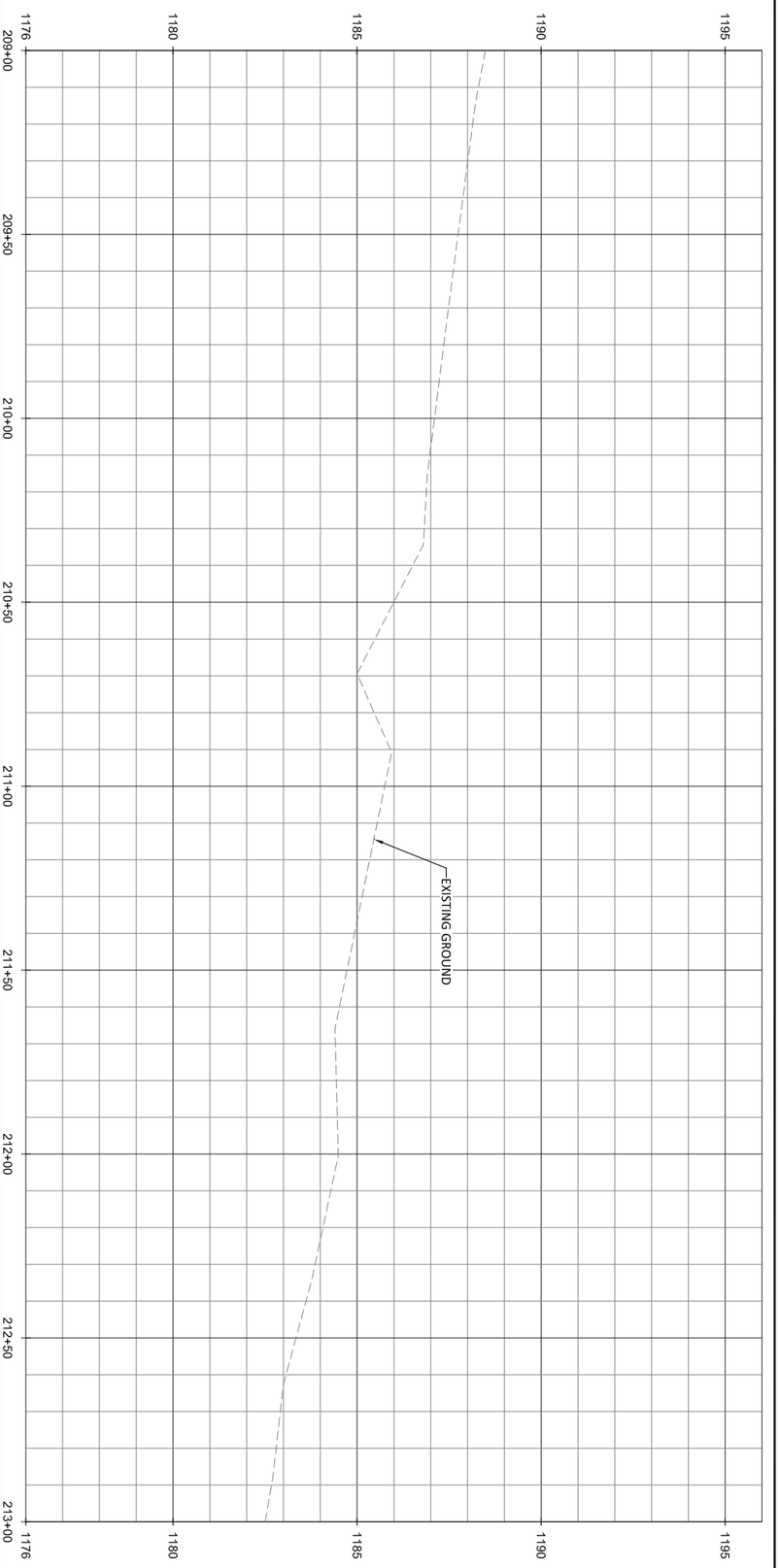

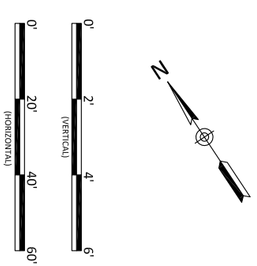

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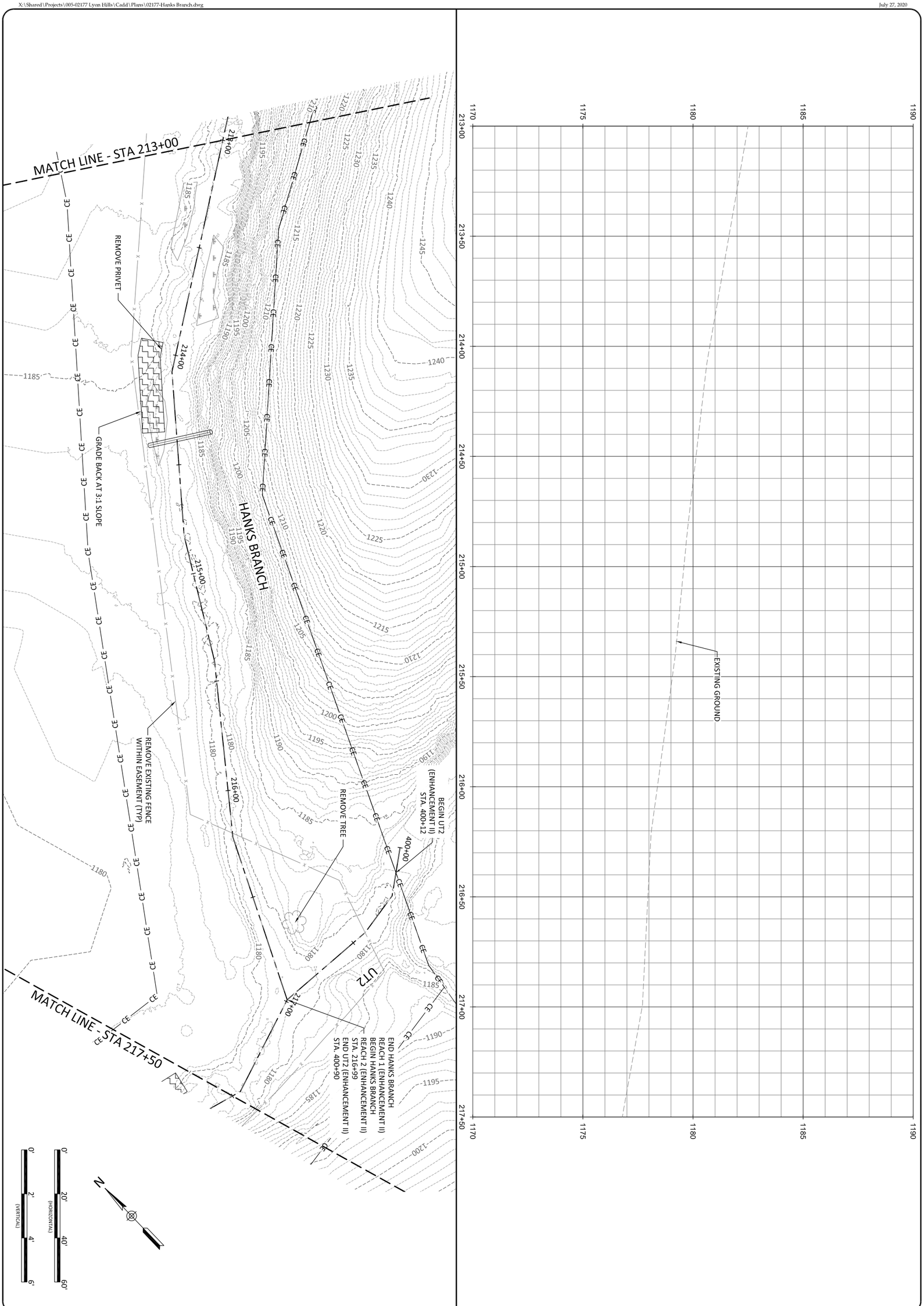

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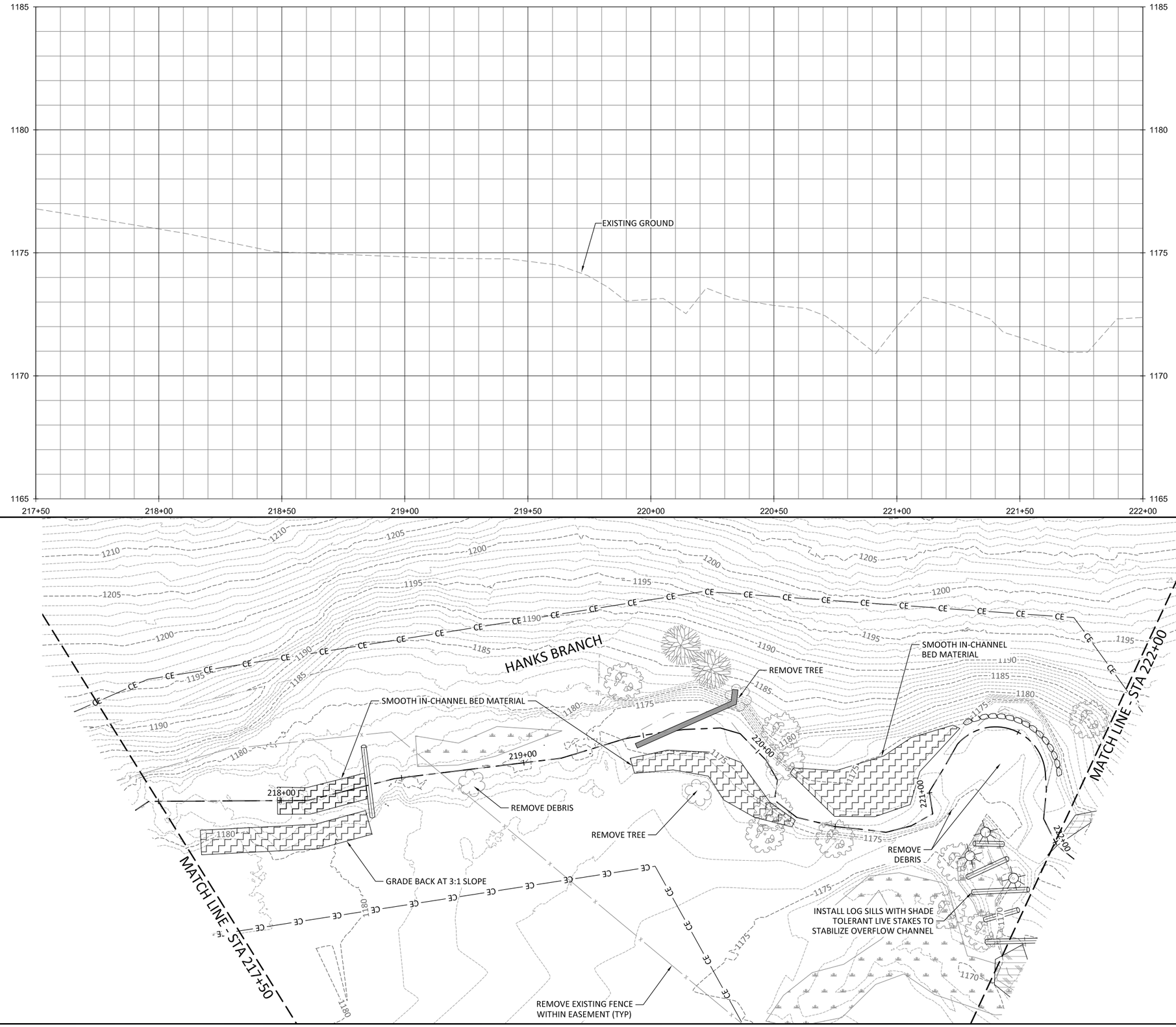

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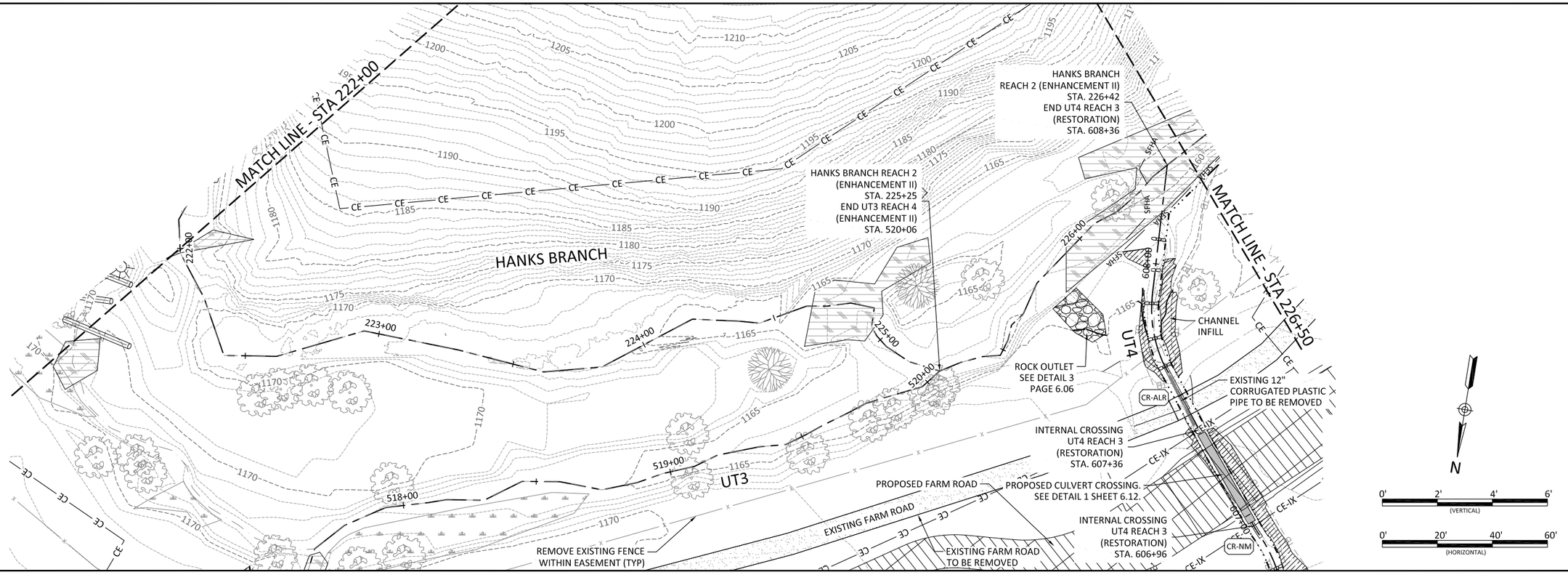

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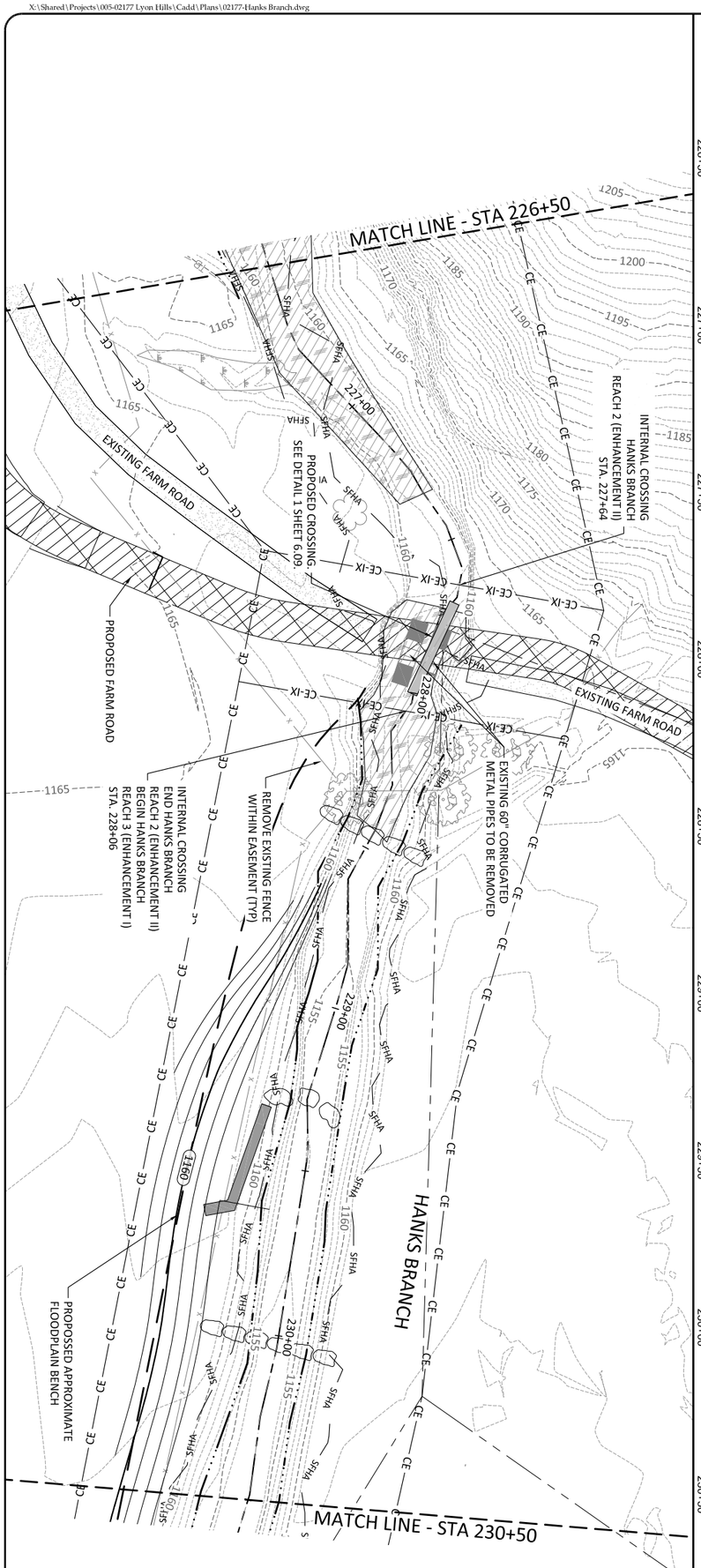

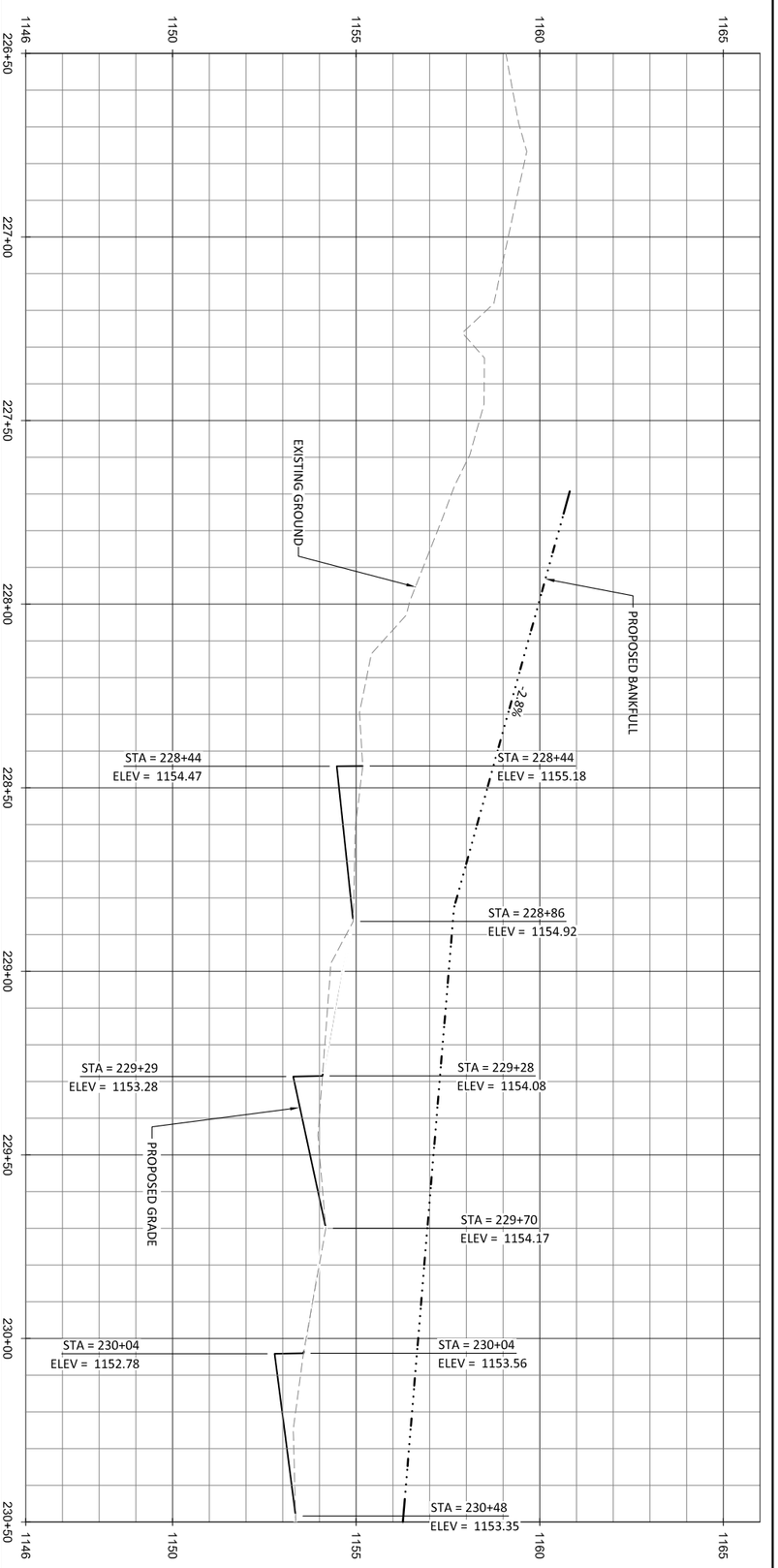

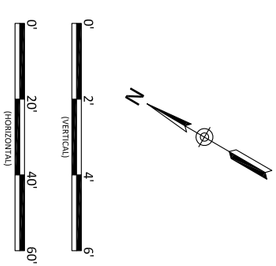

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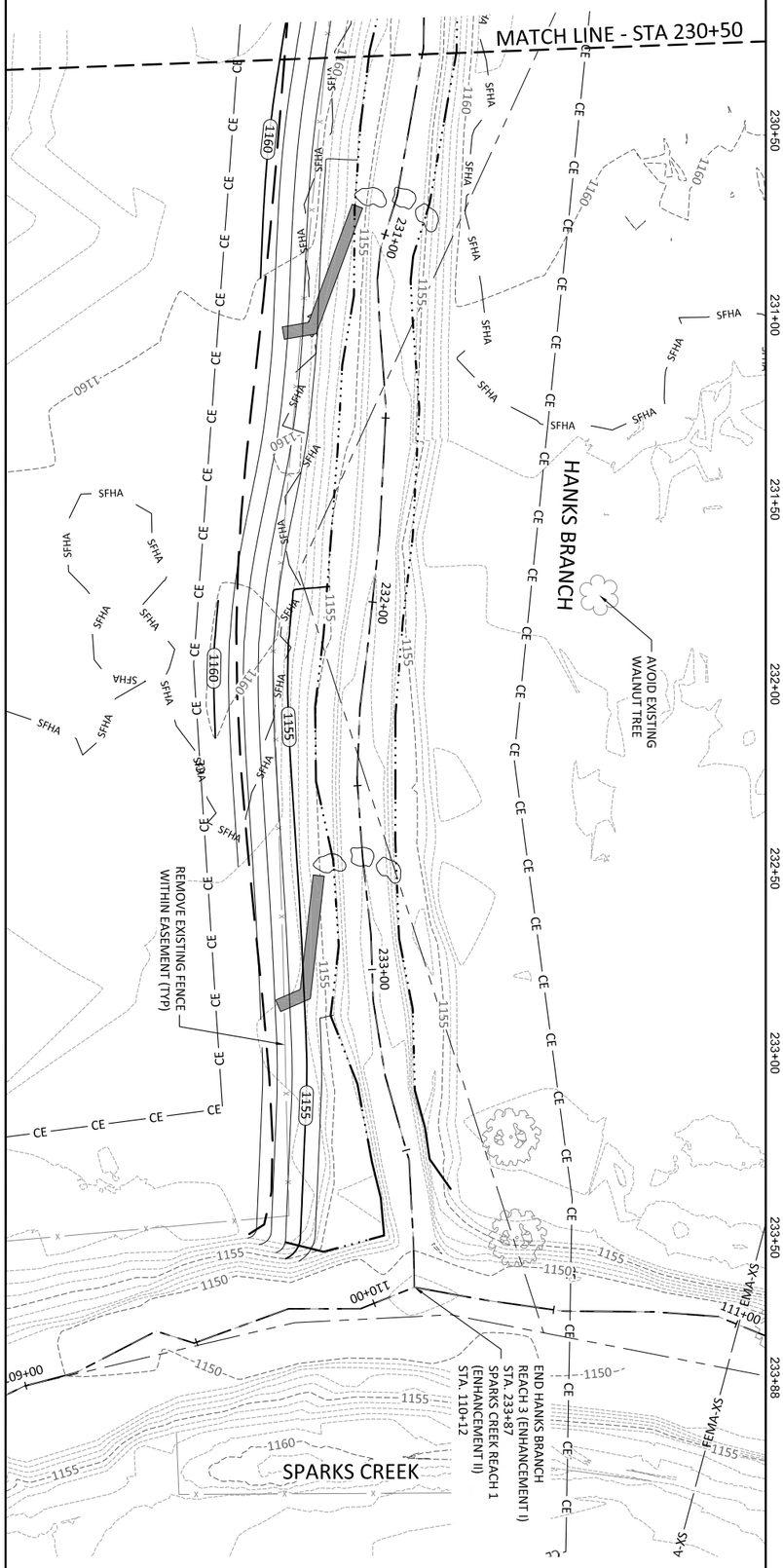

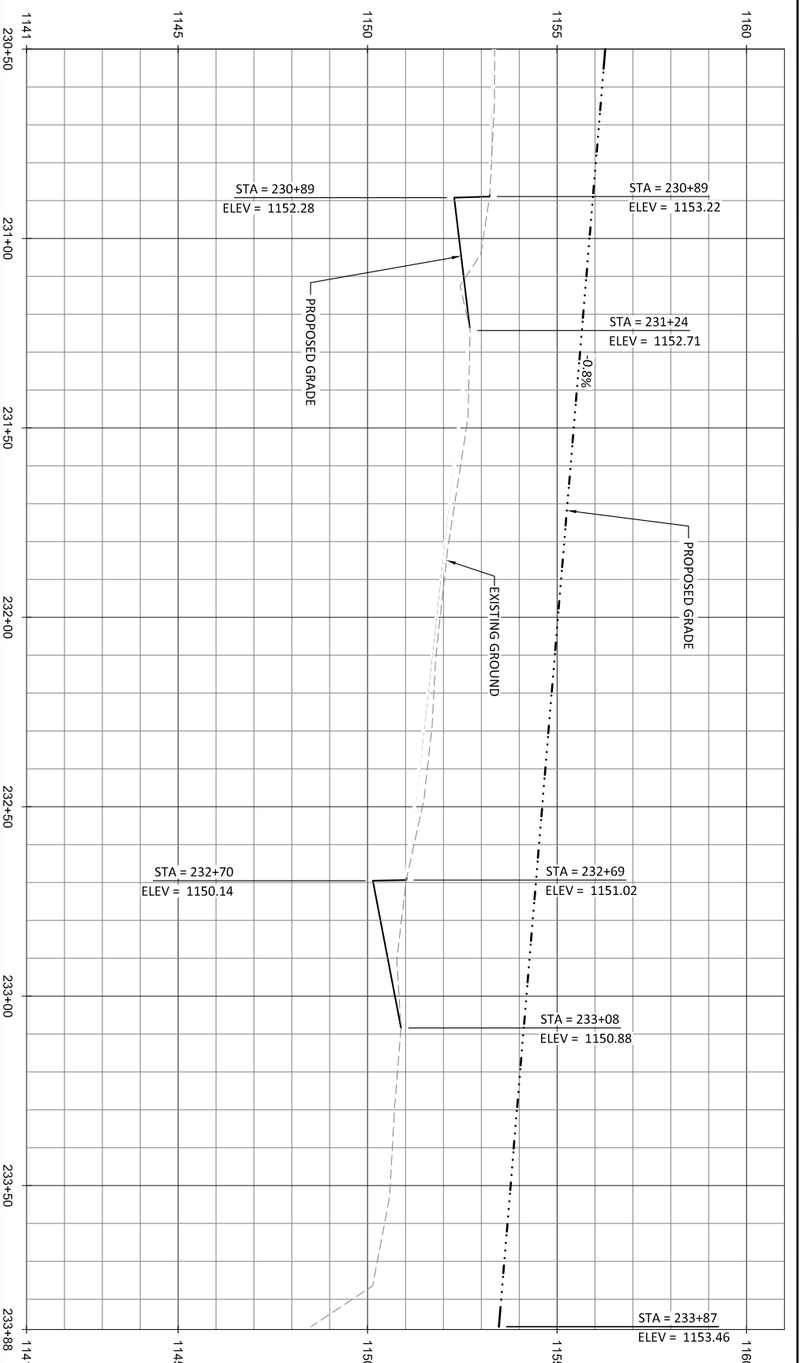

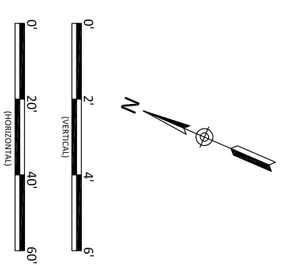

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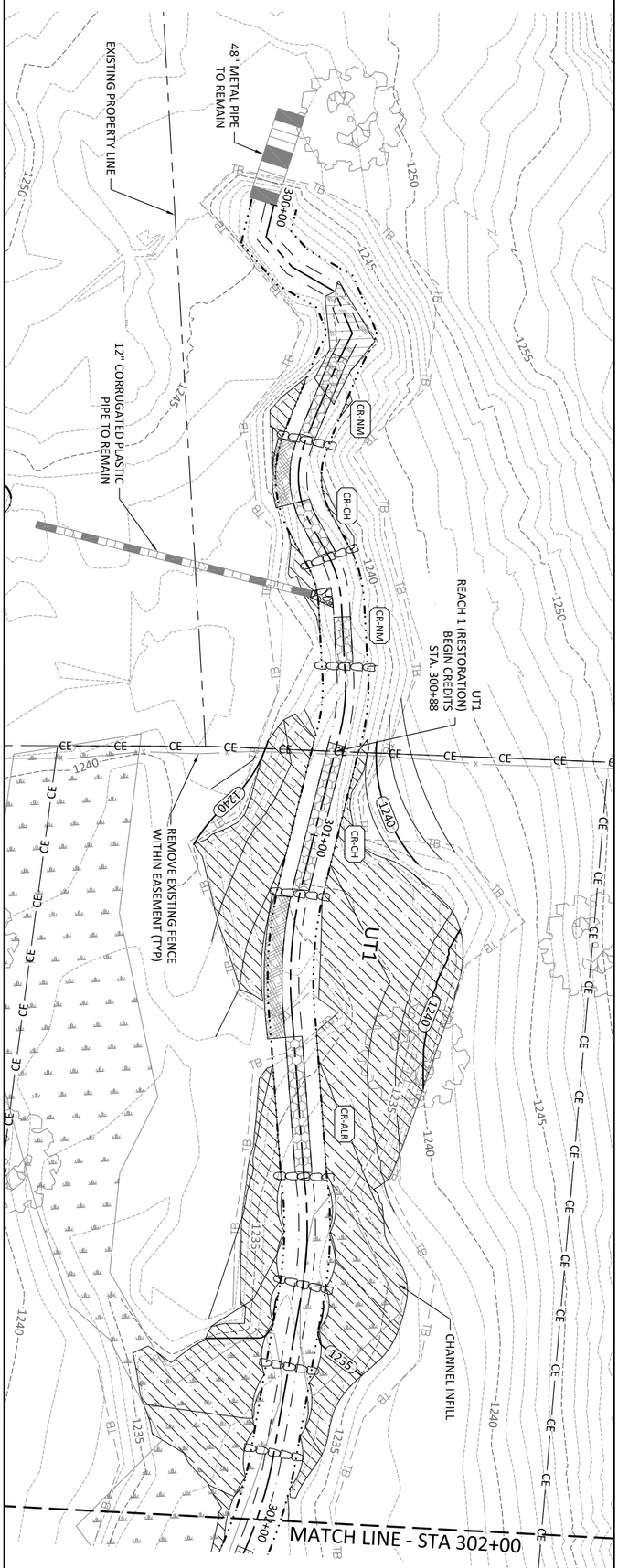

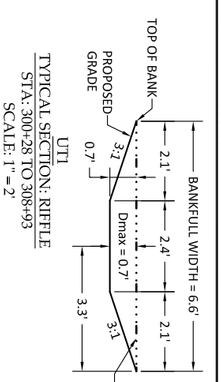

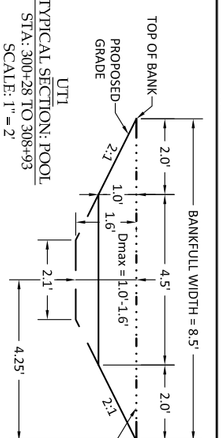

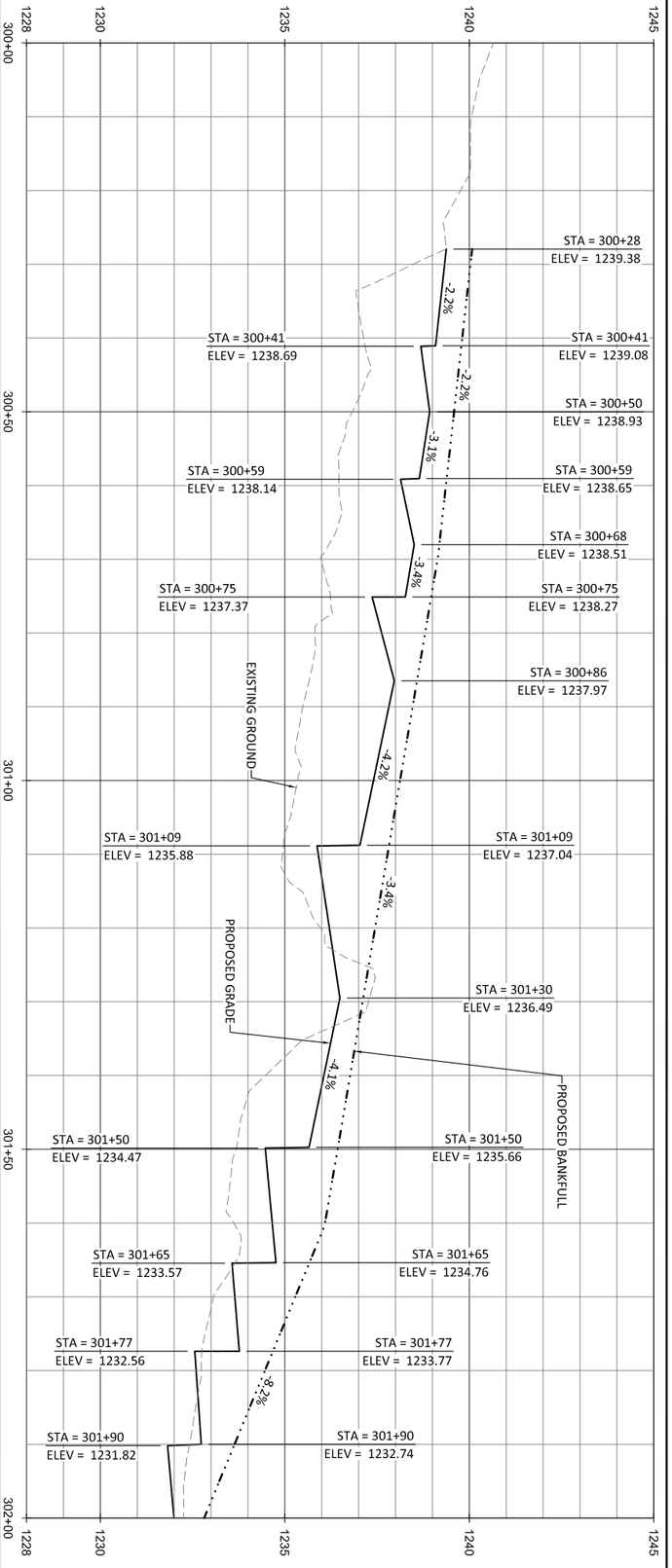

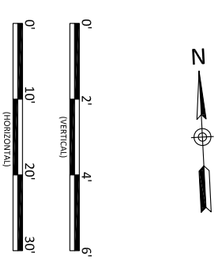

Date:	06.05.20
Job Number:	005-02177
Project Engineer:	NMM
Drawn By:	CAW
Checked By:	GAT

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Lyon Hills Mitigation Site
Wilkes County, North Carolina

UT1
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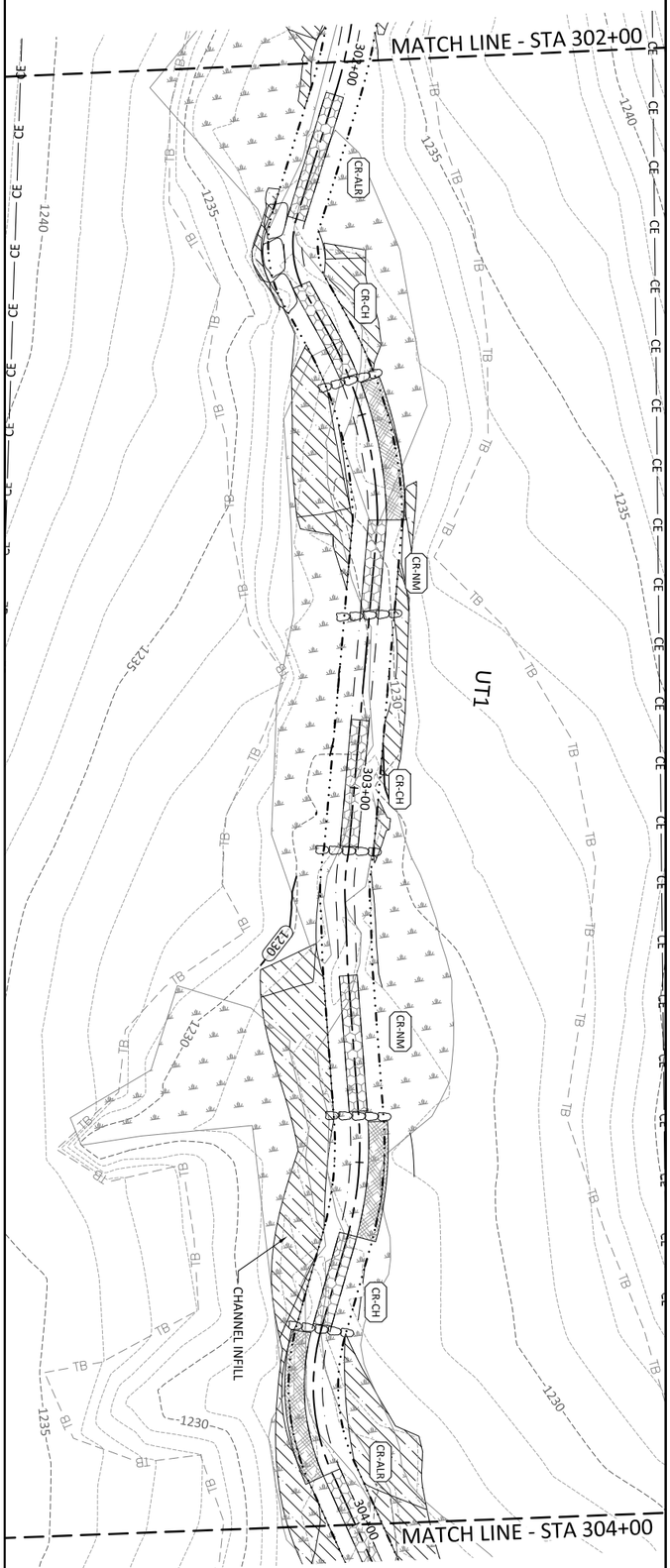

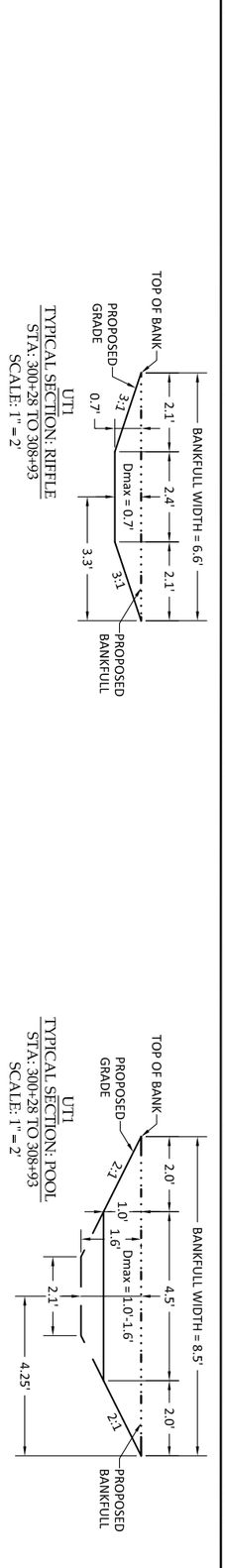

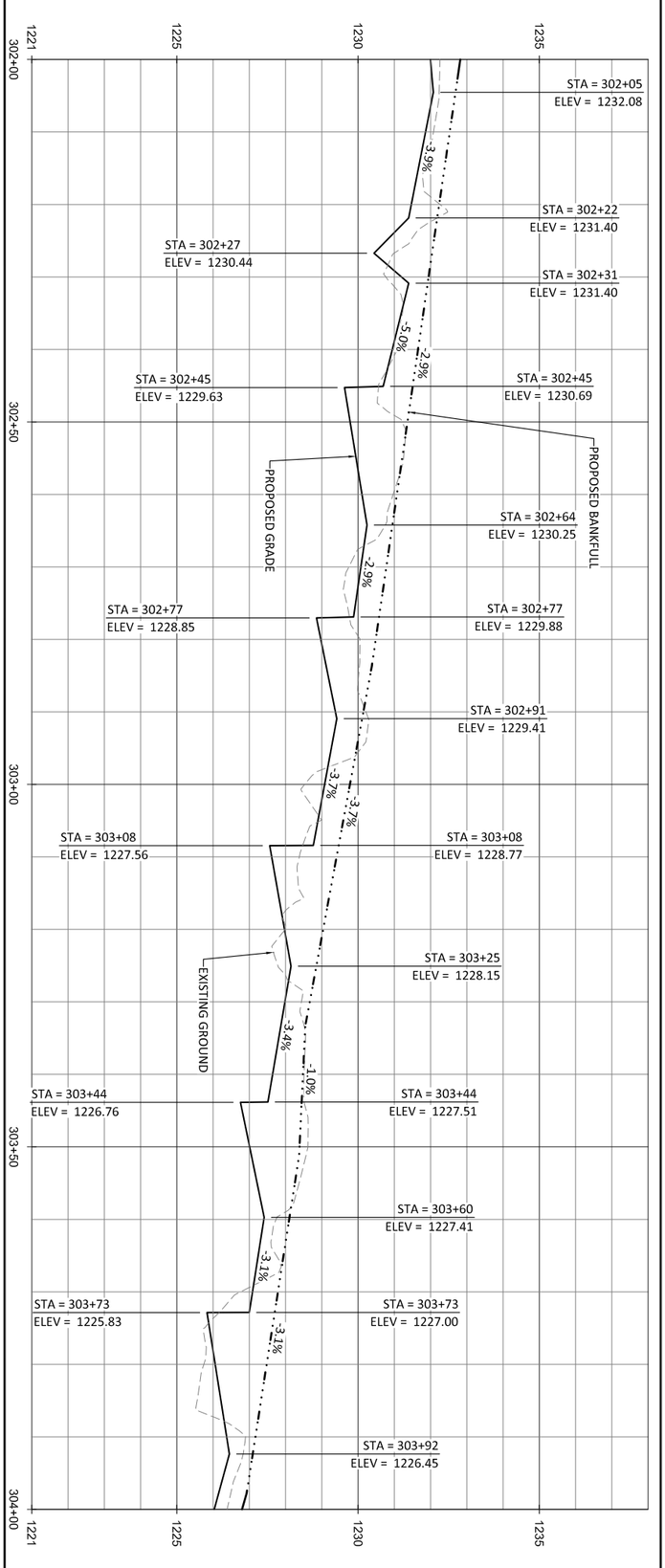

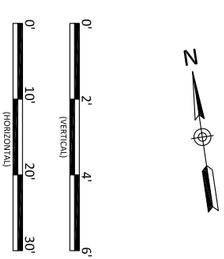

Date: 06.05.20
Job Number: 005-02177
Project Engineer: NMM
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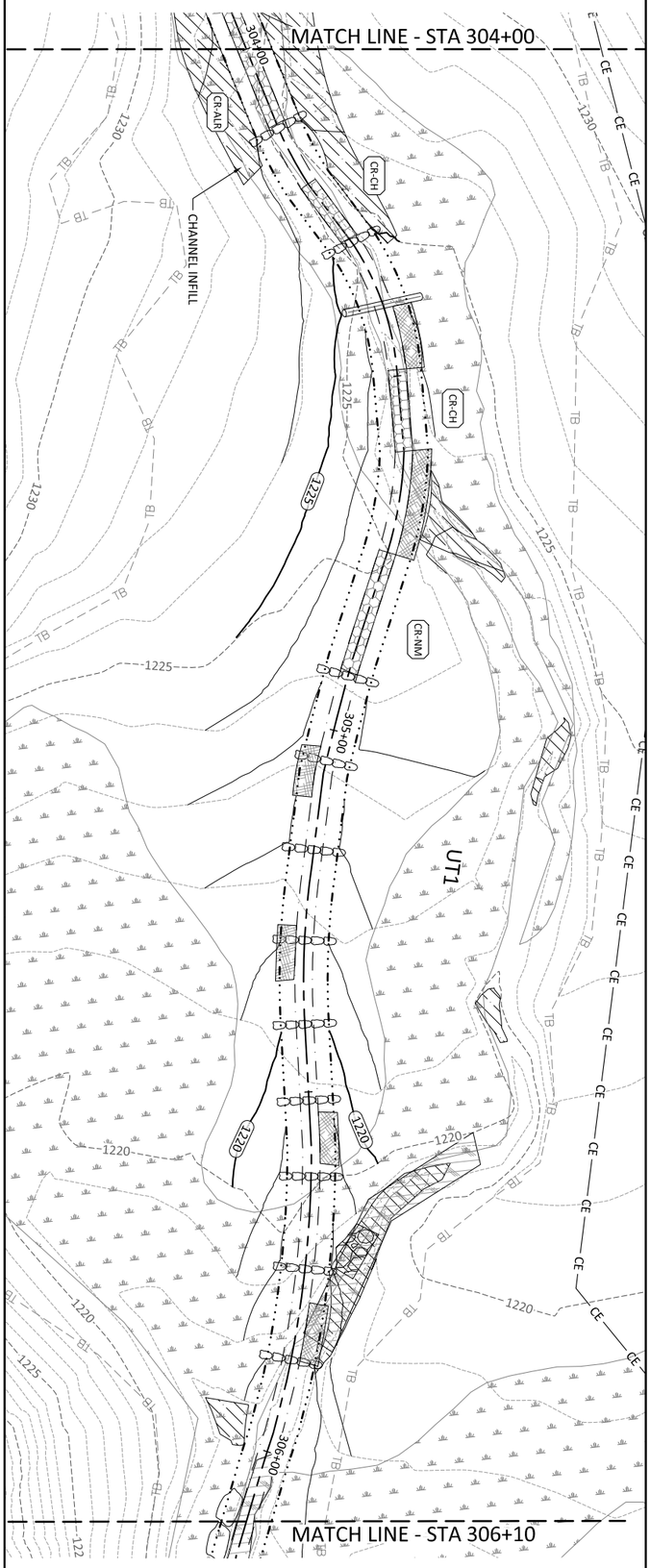

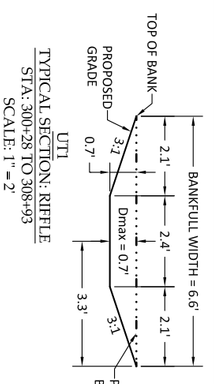

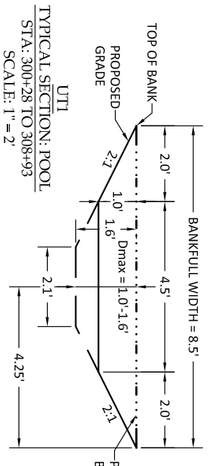

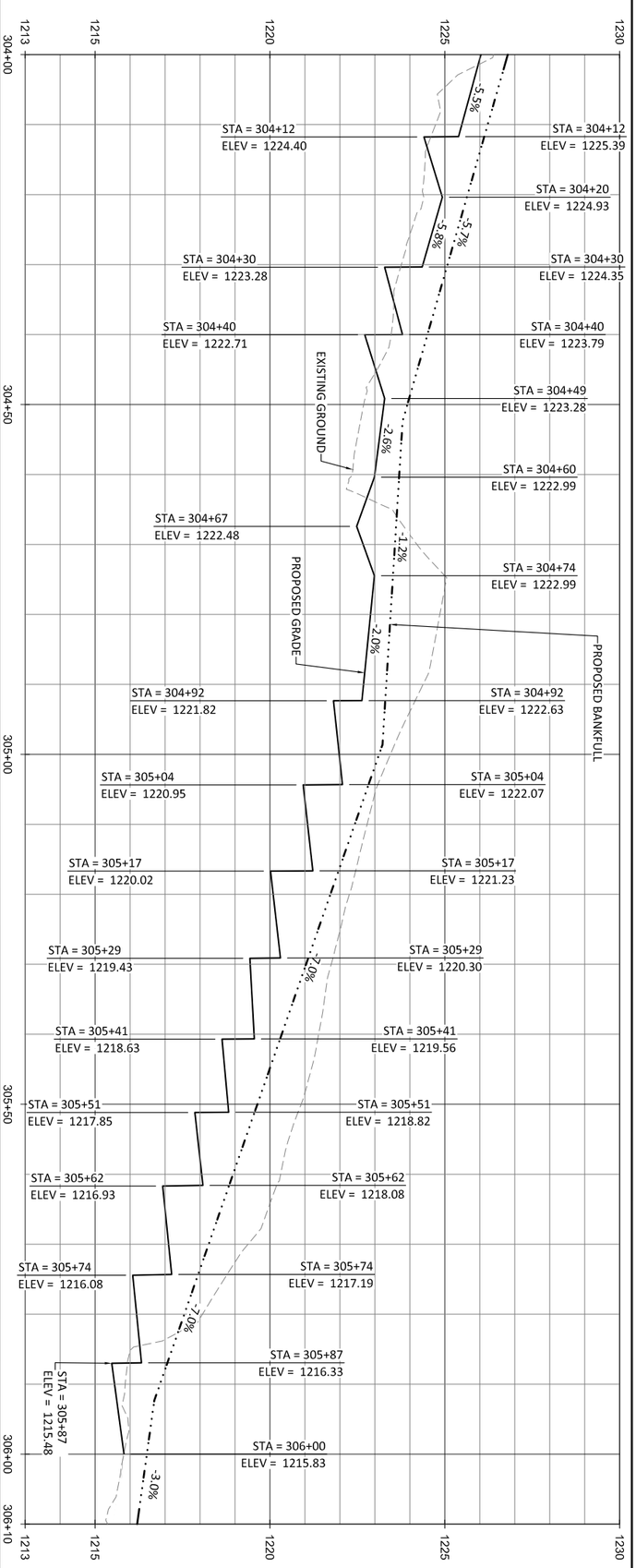

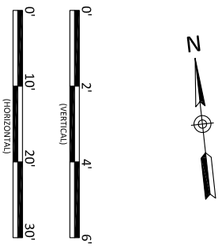

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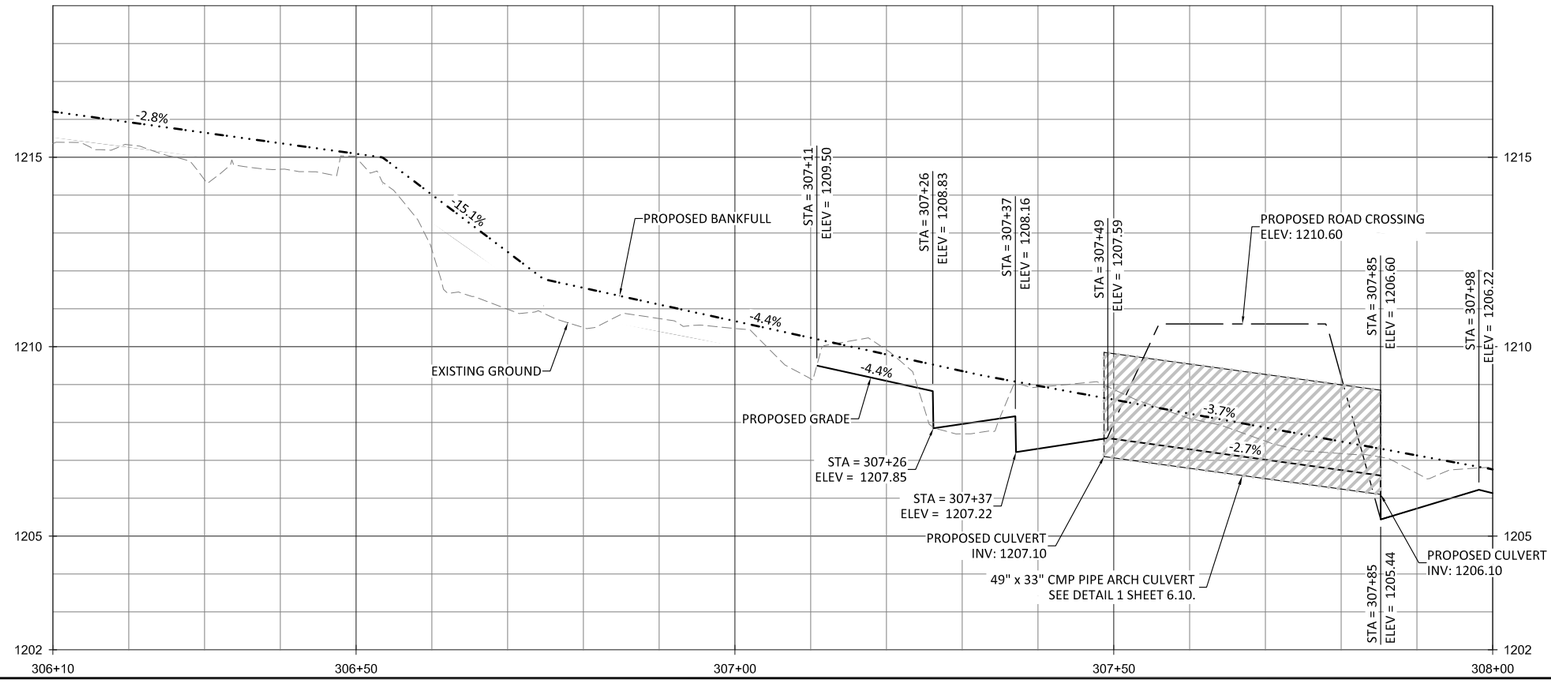

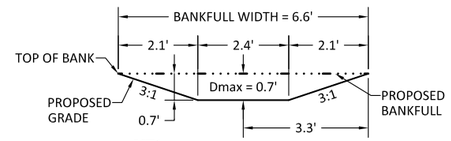

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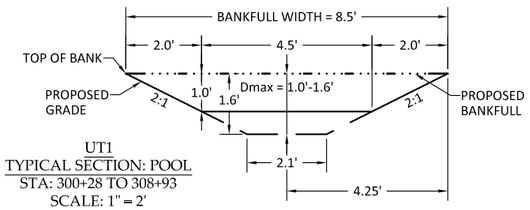
TYPICAL SECTION: RIFFLE
STA: 300+28 TO 308+93
SCALE: 1" = 2'



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STA: 300+28 TO 308+93
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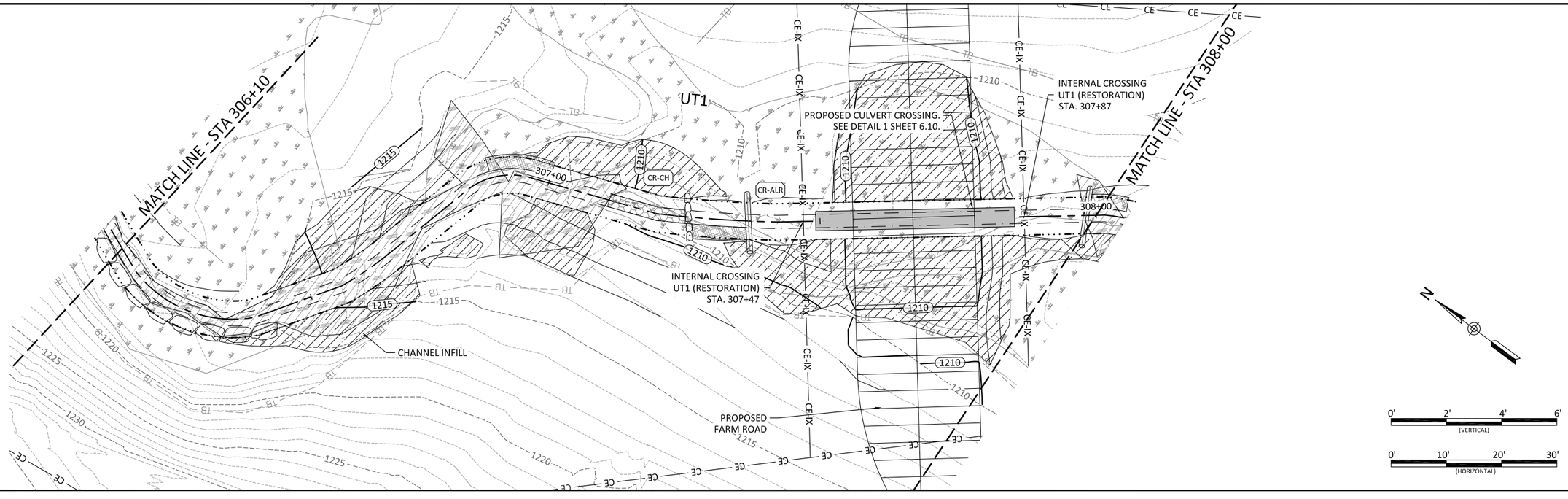

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Drawn By:	CAW
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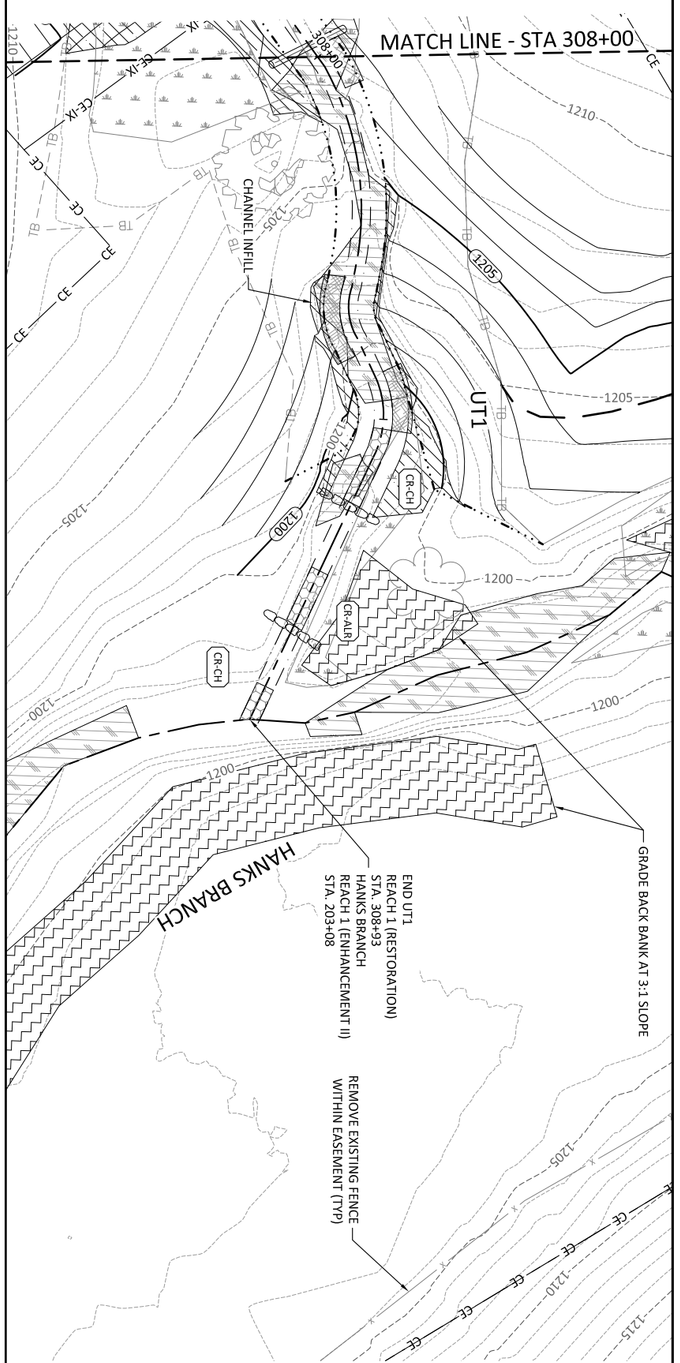

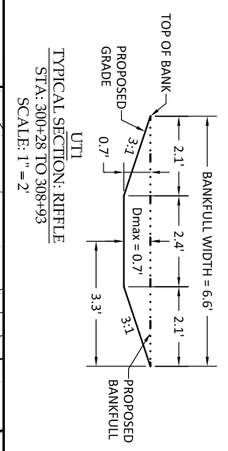

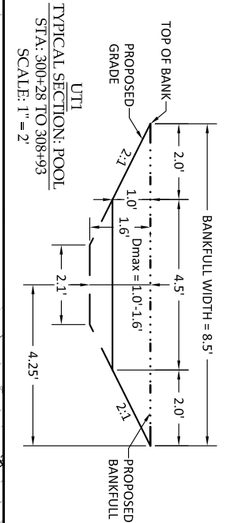

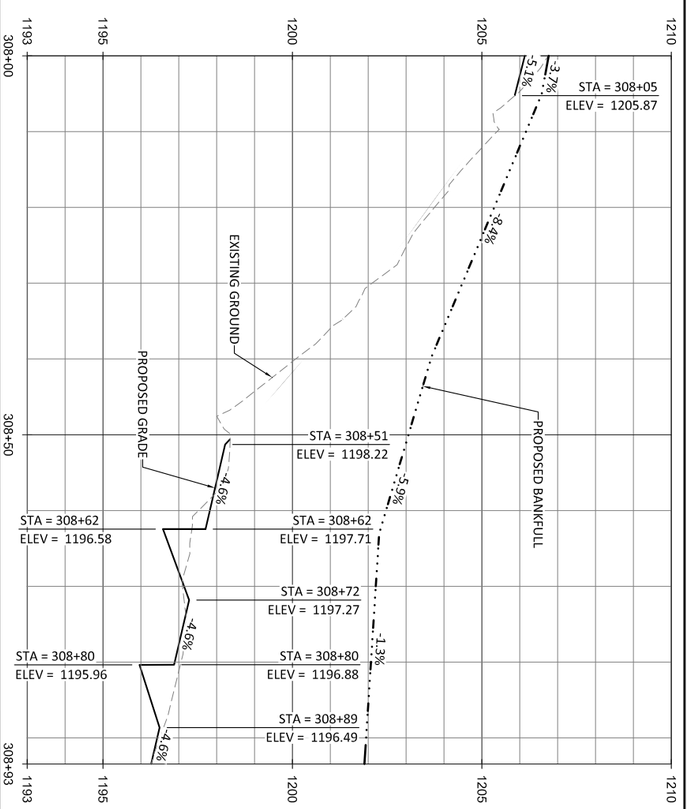

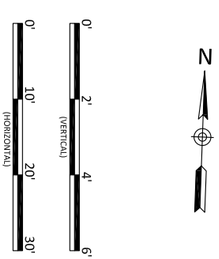

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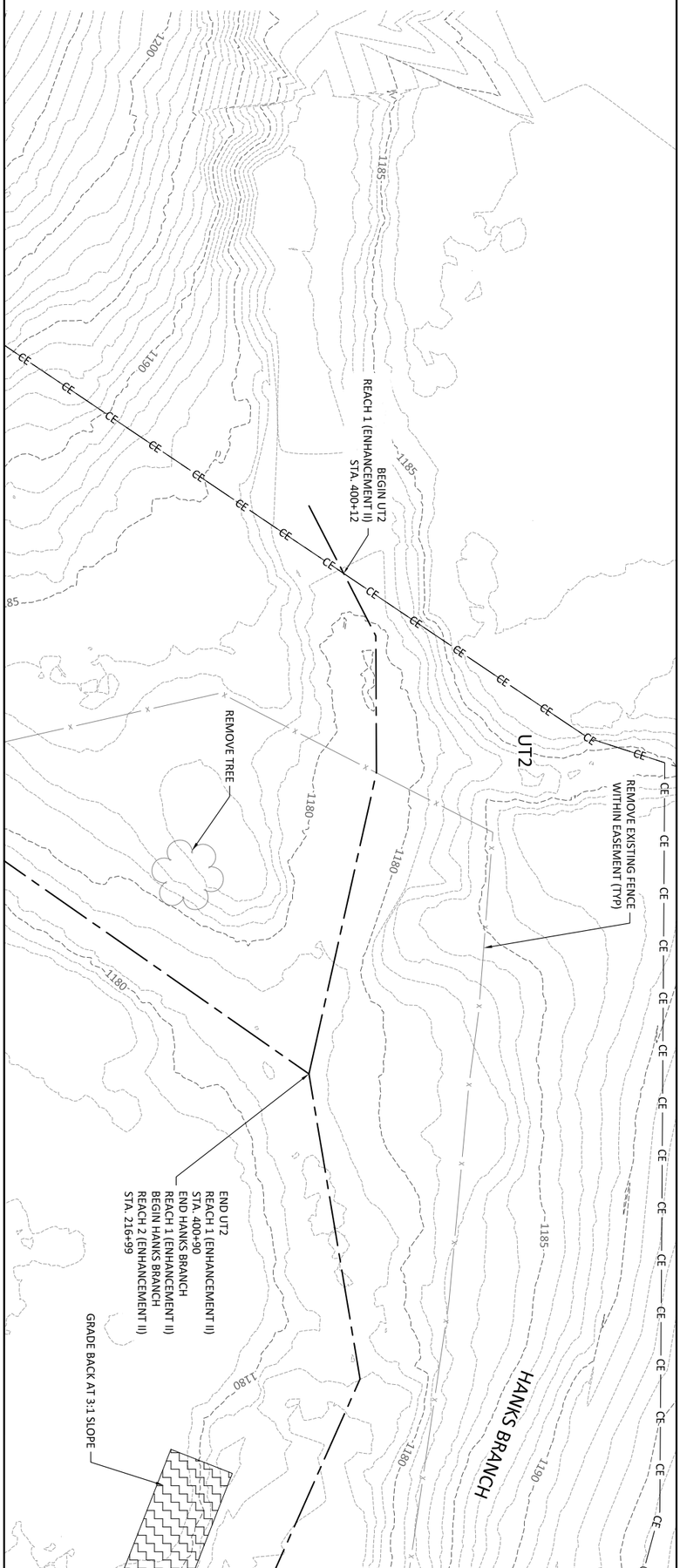

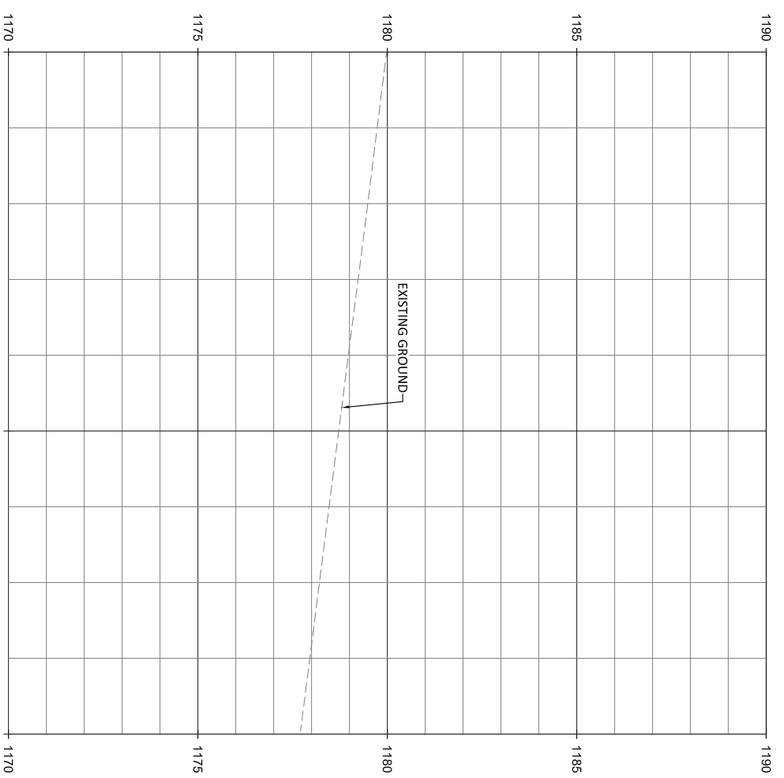

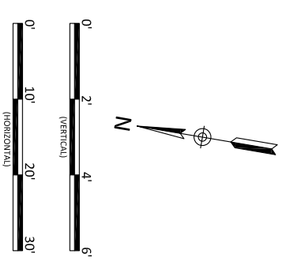

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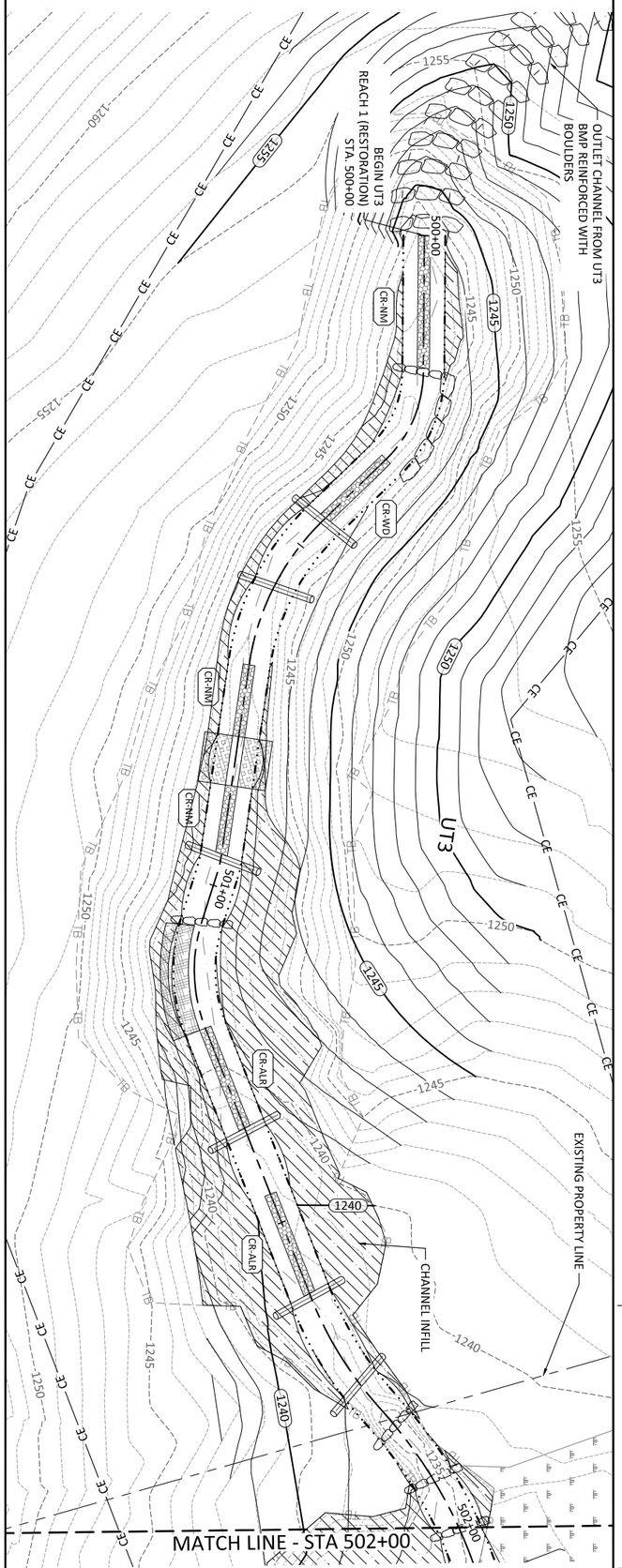

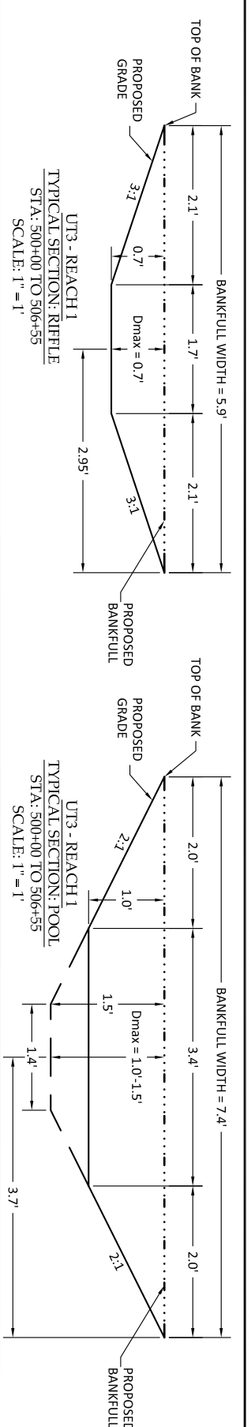

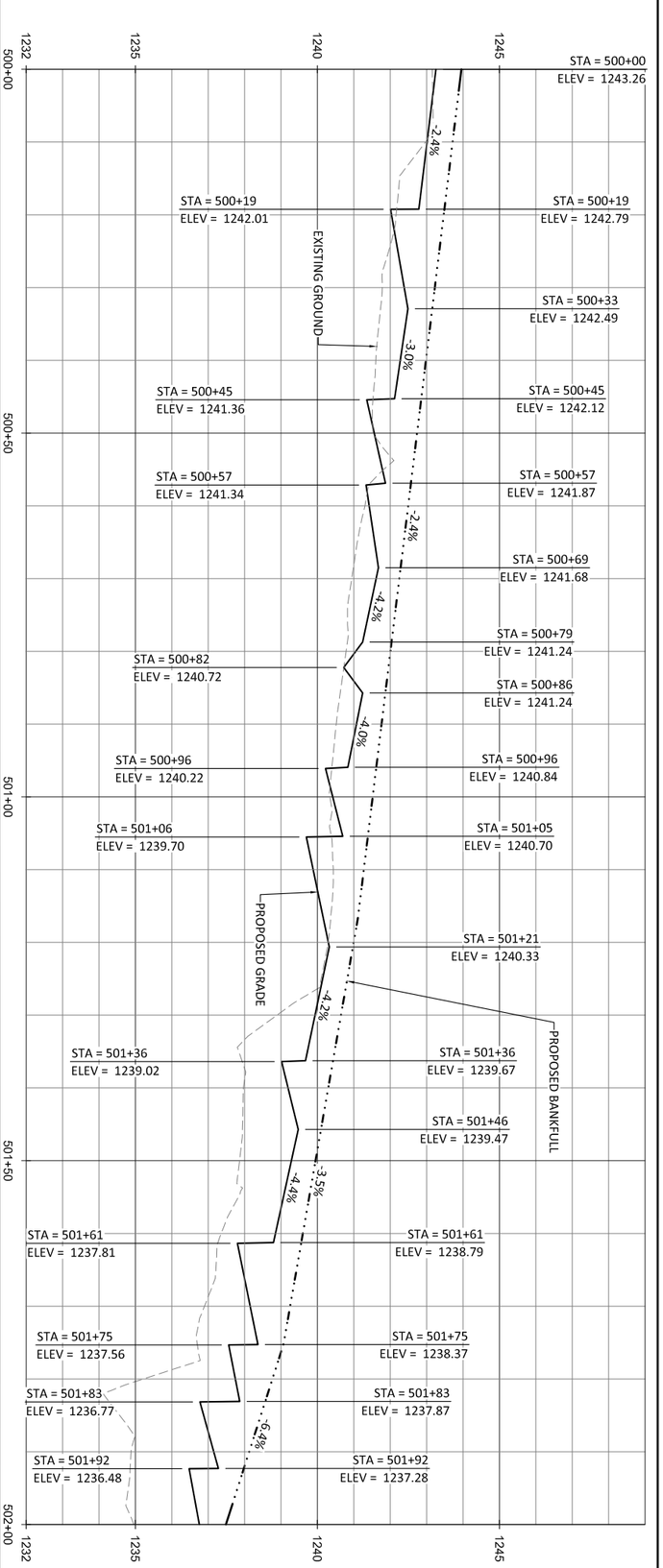

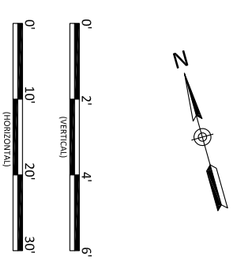

Date:	06.05.20
Job Number:	005-02177
Project Engineer:	NMM
Drawn By:	CAW
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Lyon Hills Mitigation Site
Wilkes County, North Carolina

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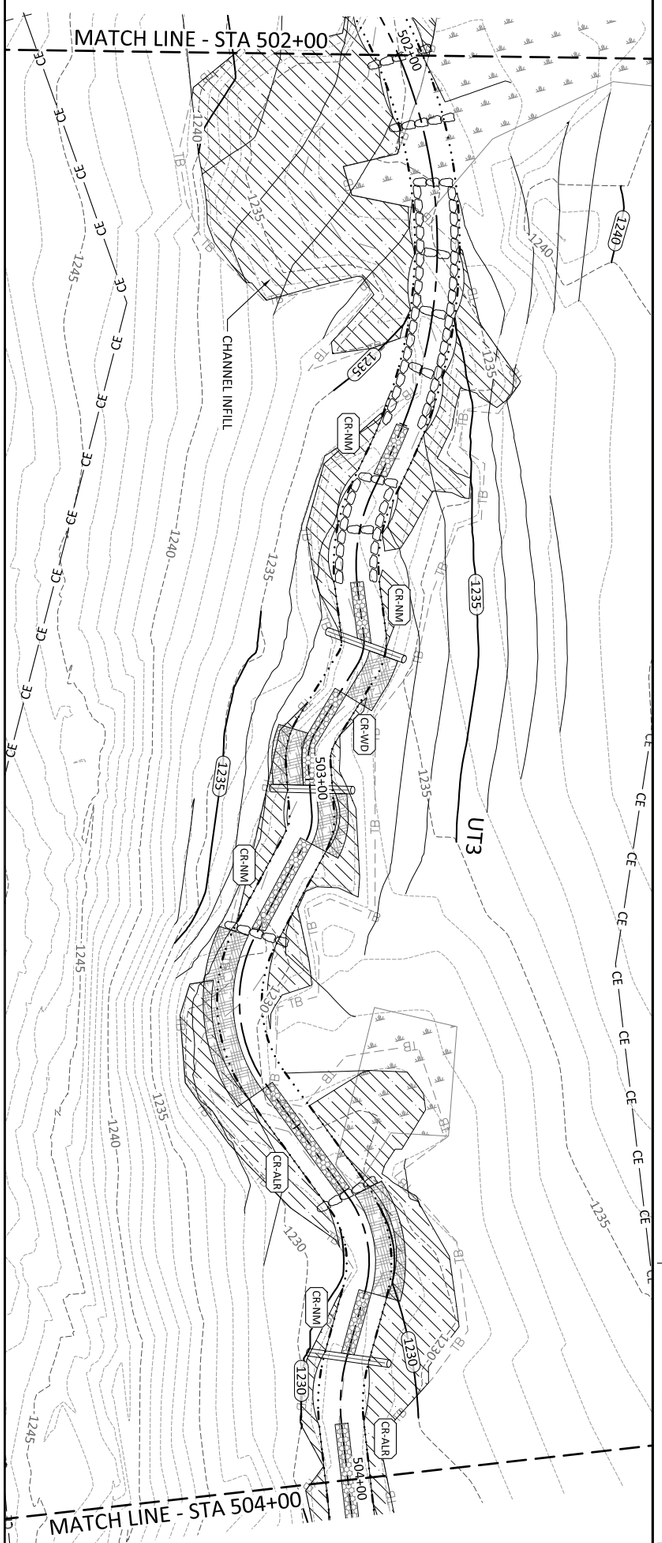

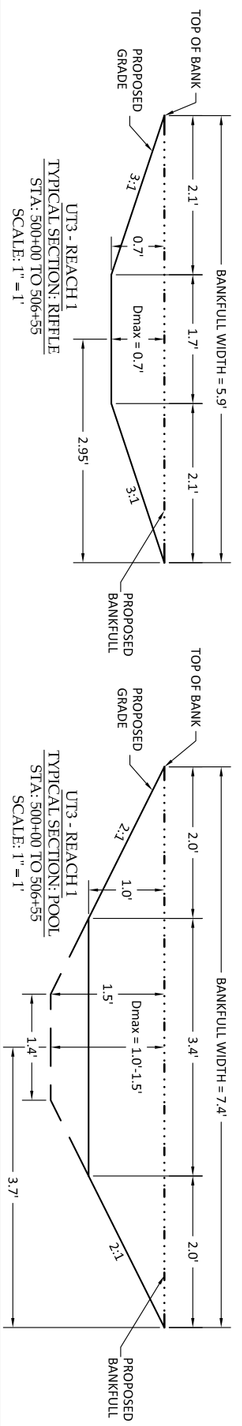

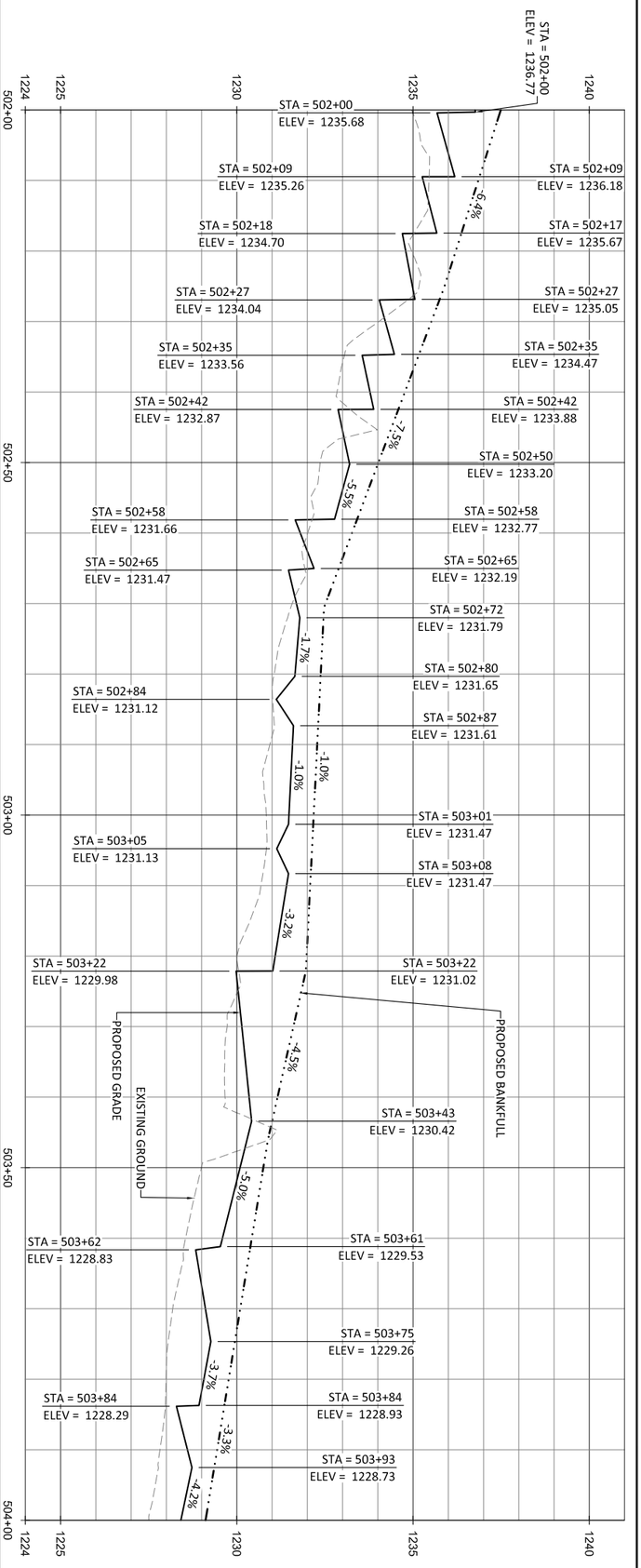

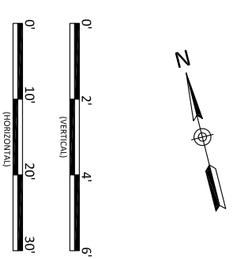

Date:	06.05.20
Job Number:	005-02177
Project Engineer:	NMM
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Lyon Hills Mitigation Site
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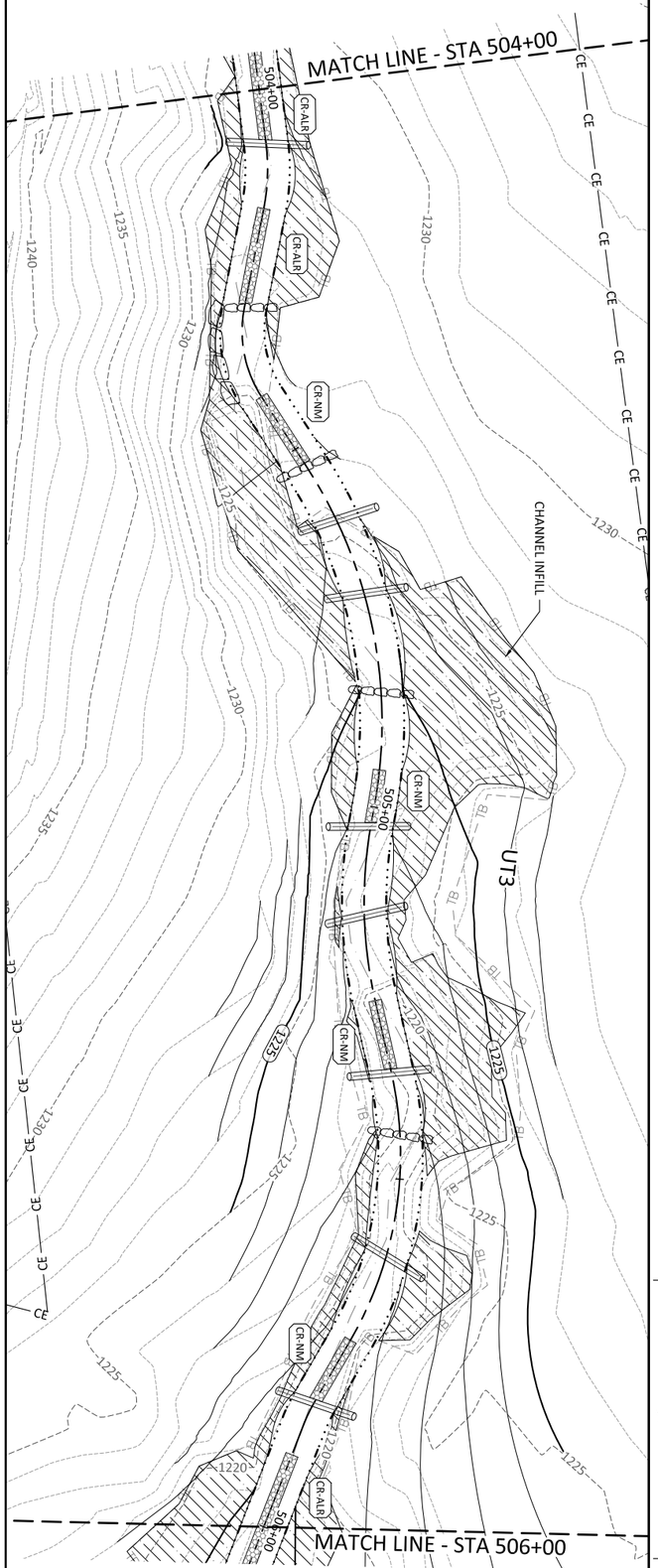

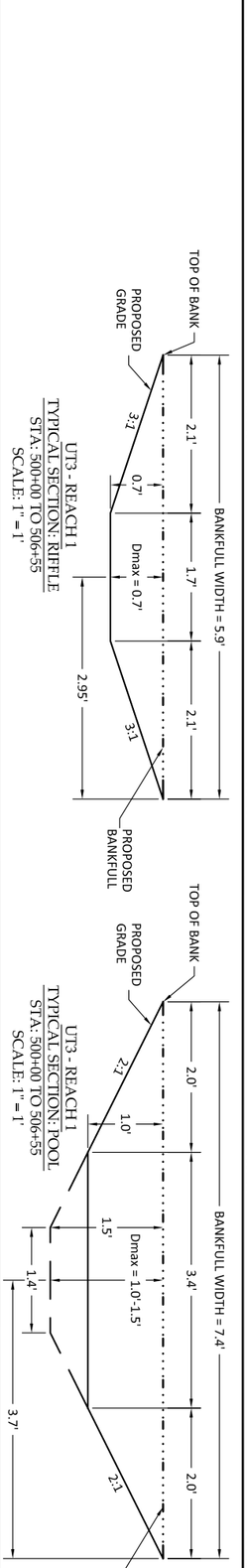

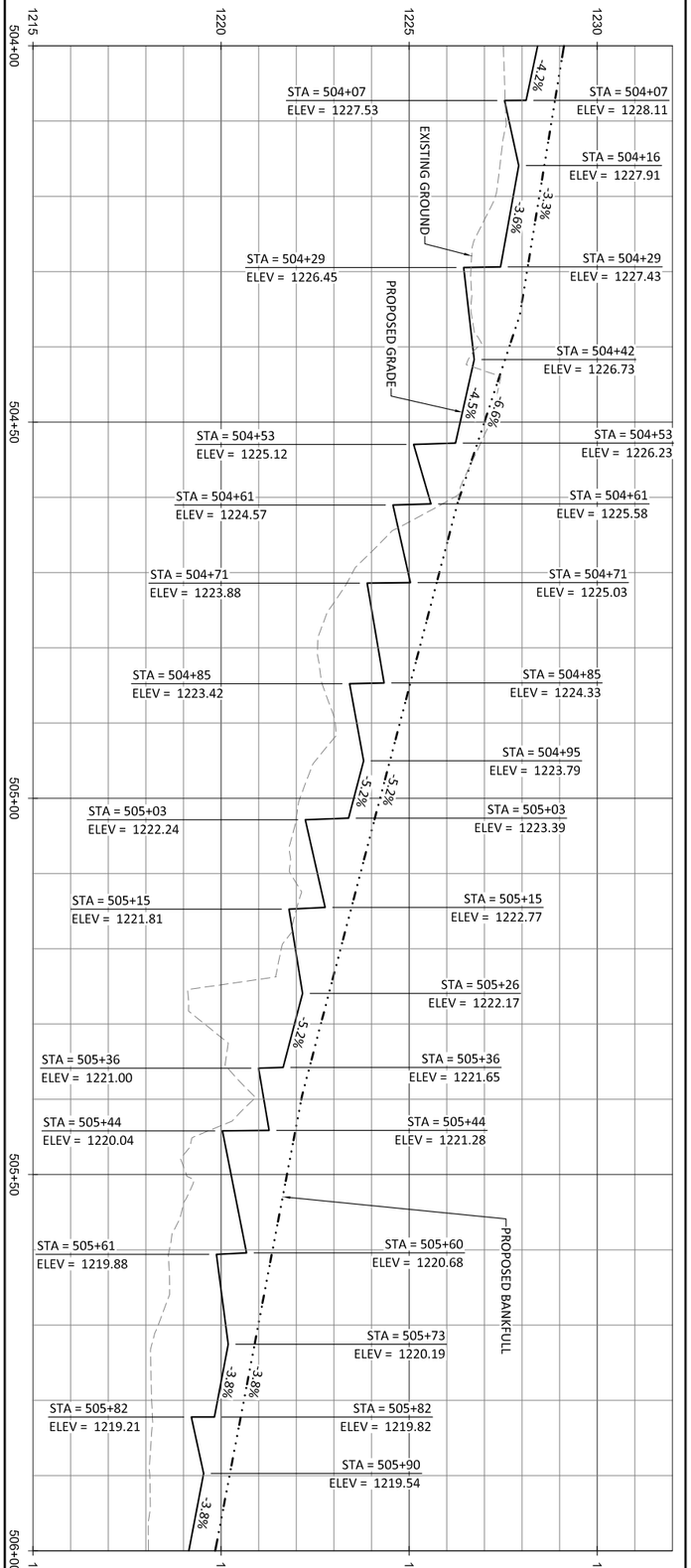

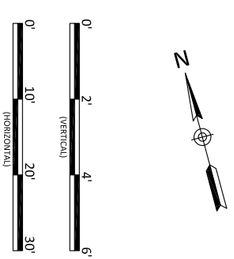

Date:	06.05.20
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Lyon Hills Mitigation Site
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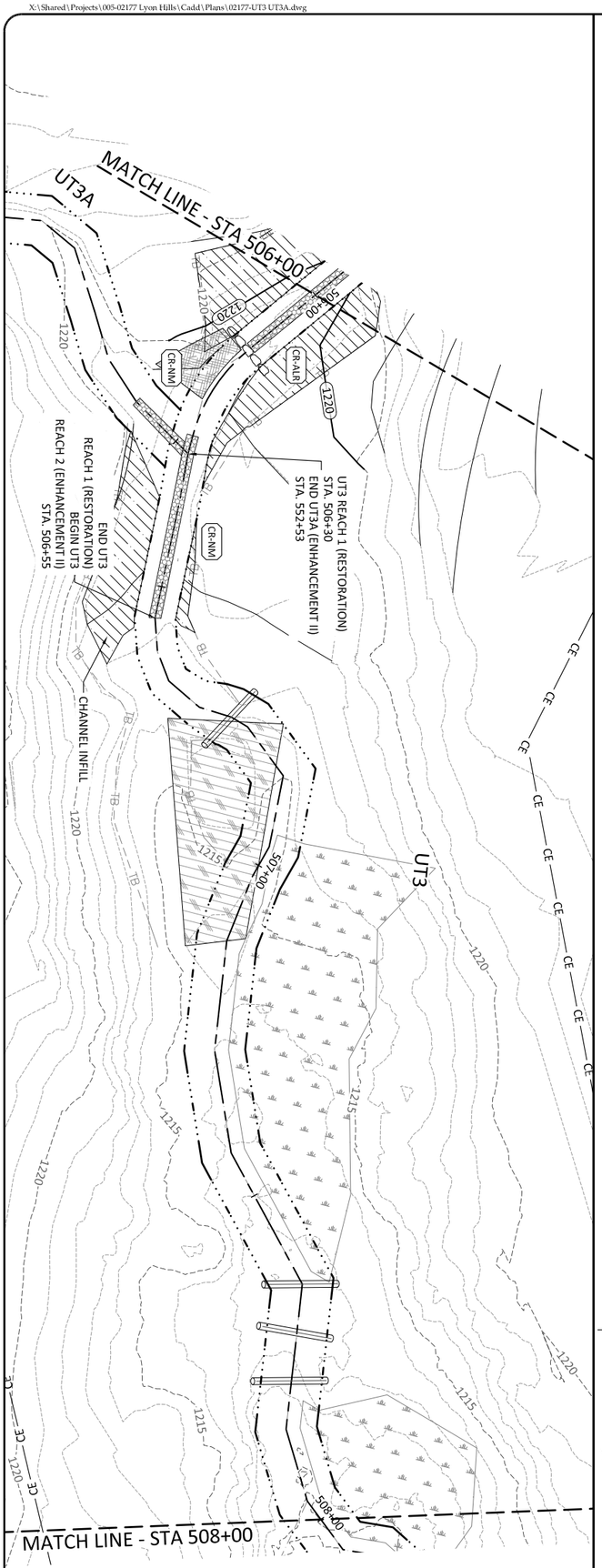

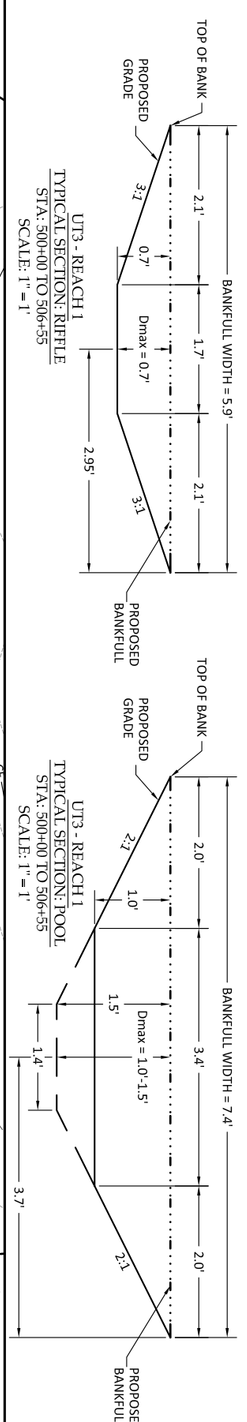

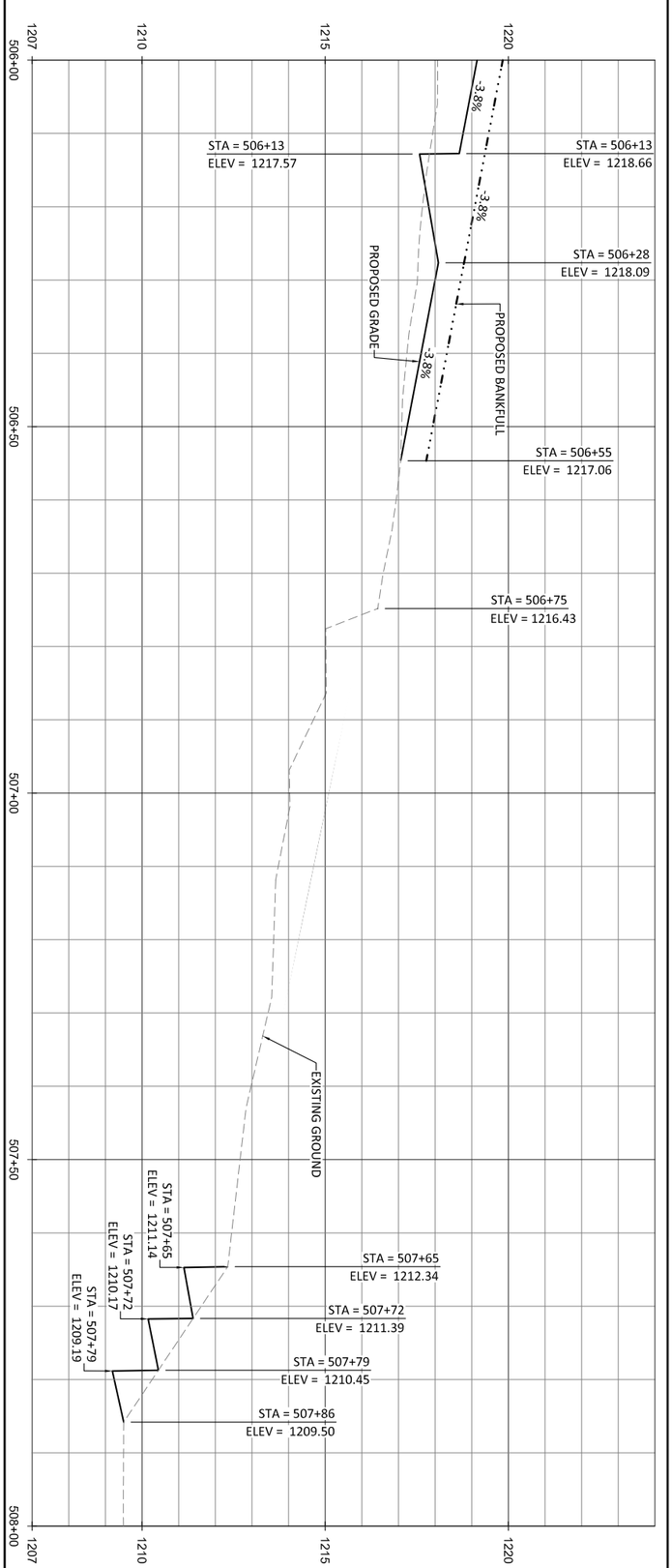

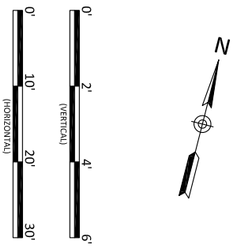

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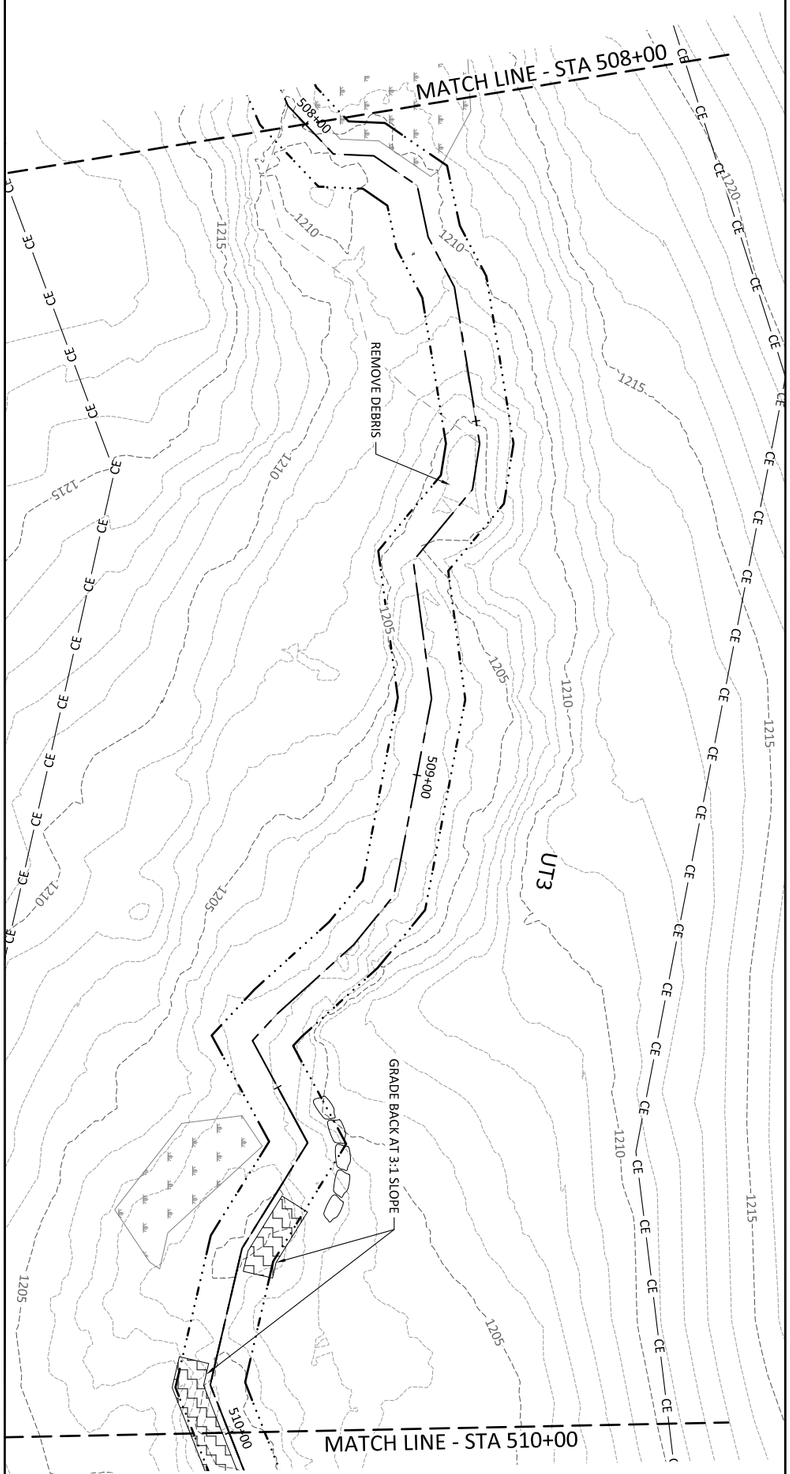

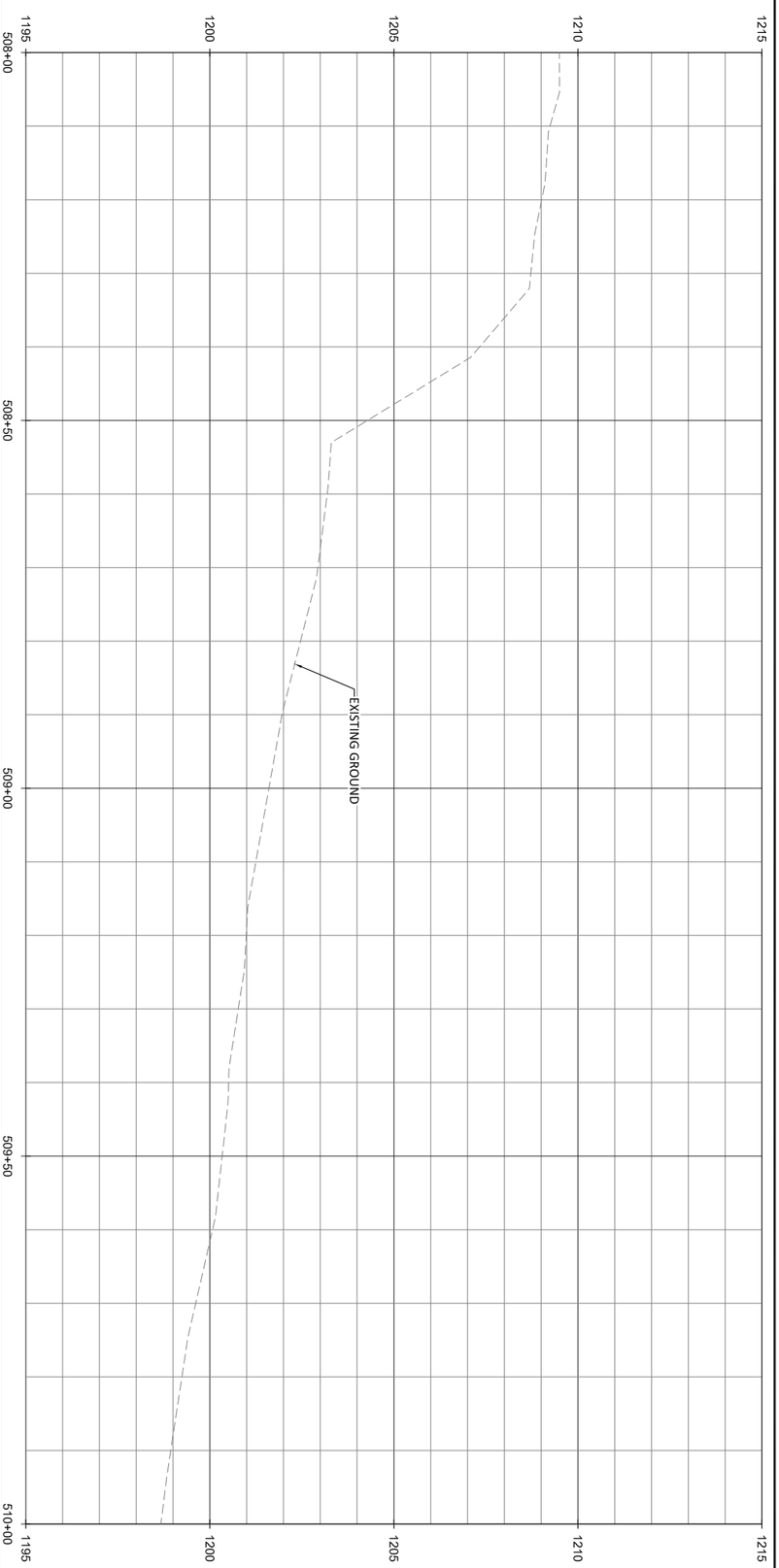

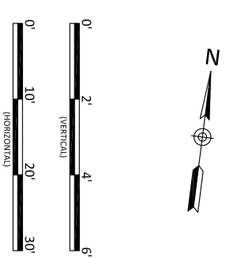

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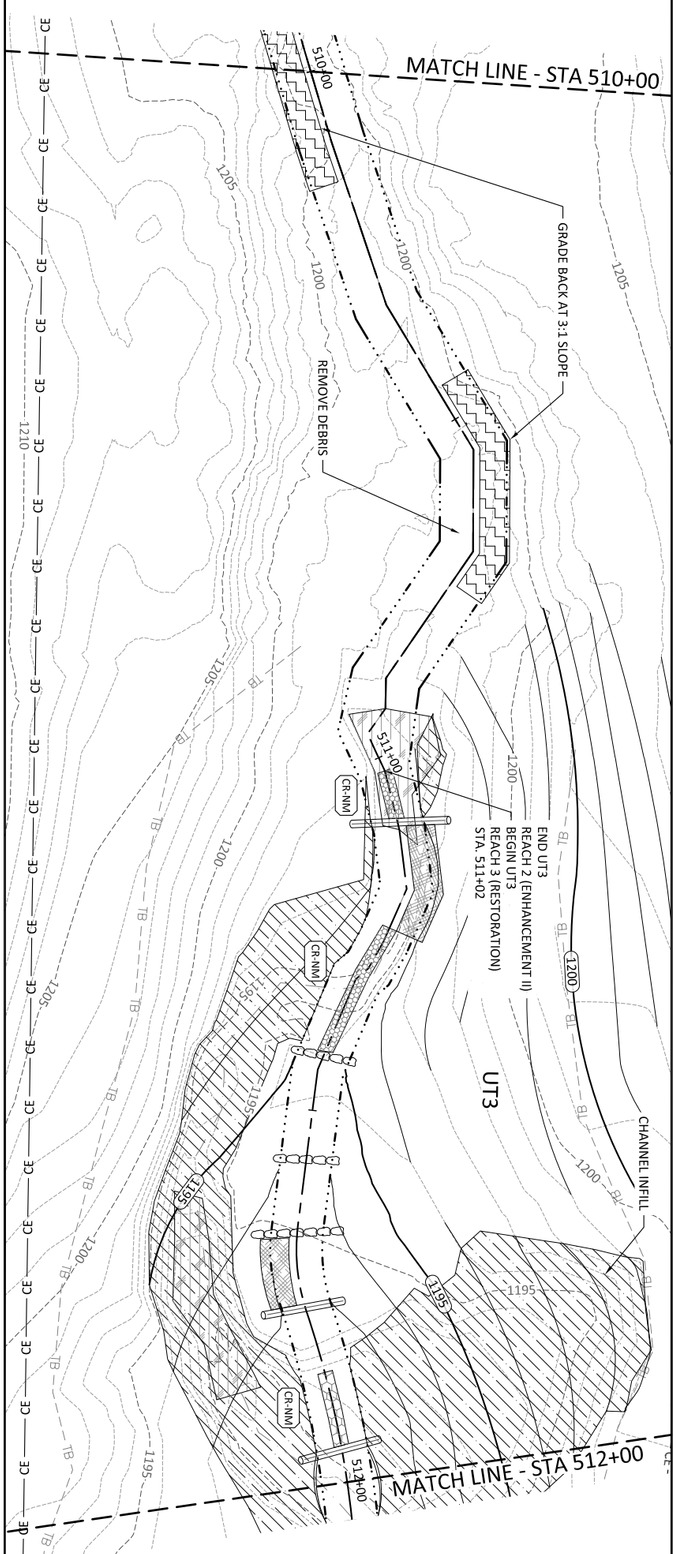

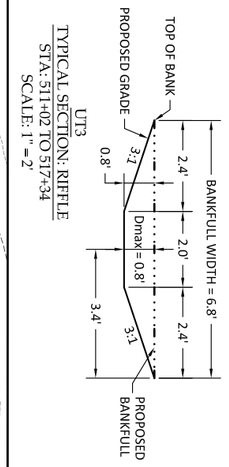

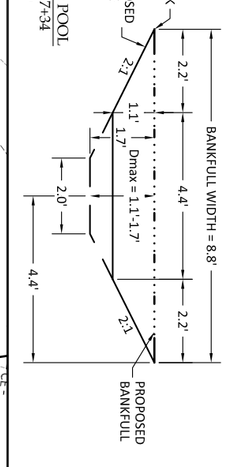

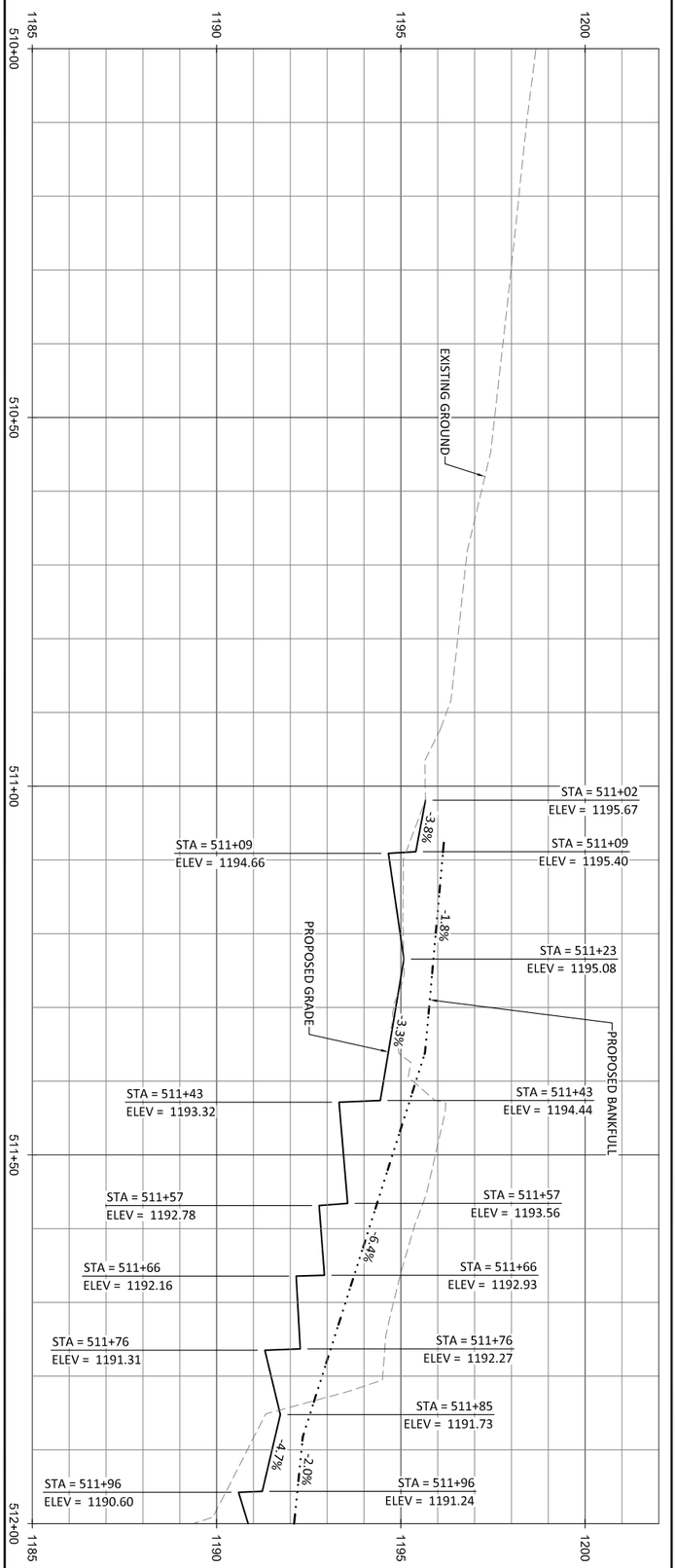

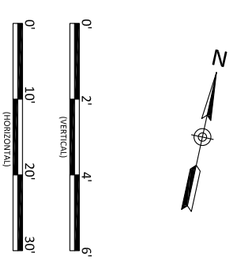

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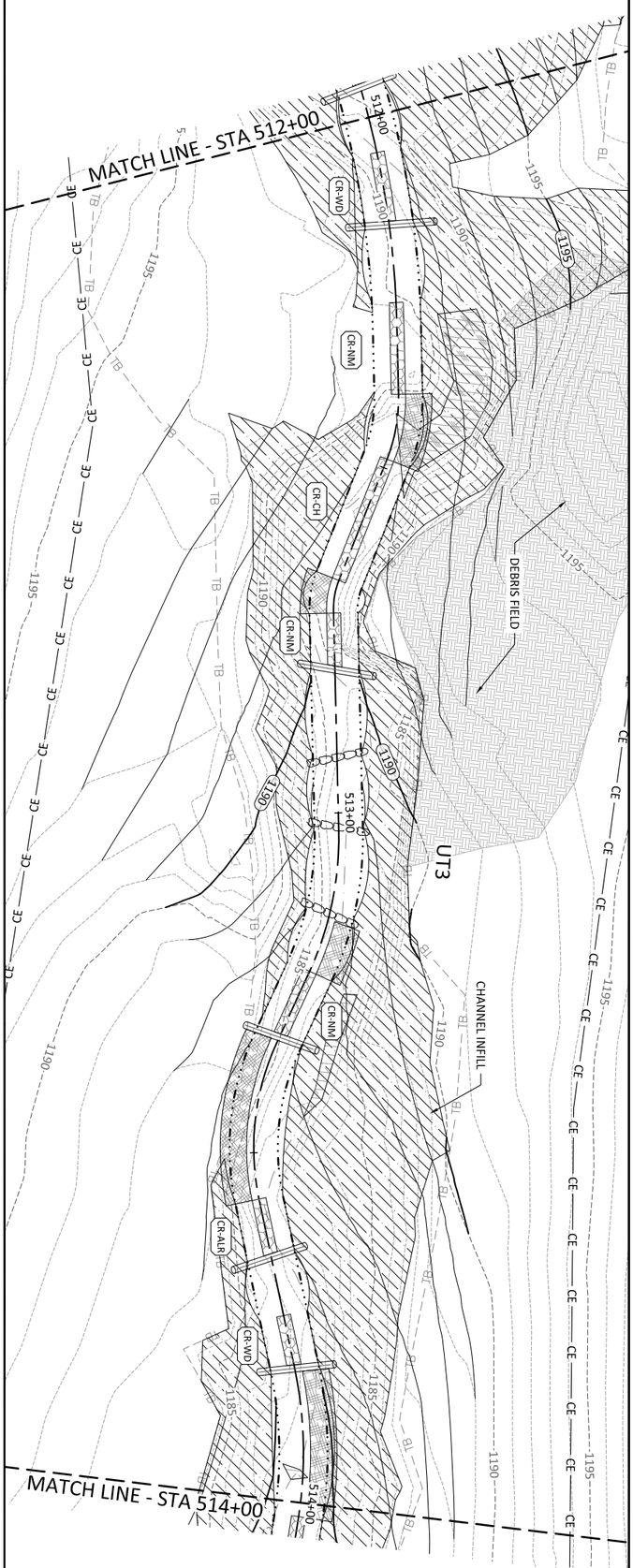

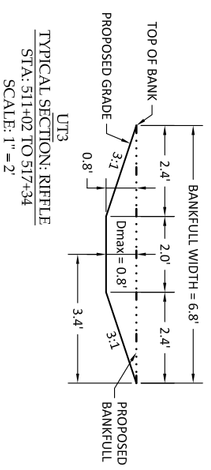

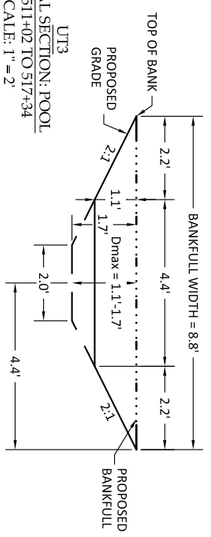

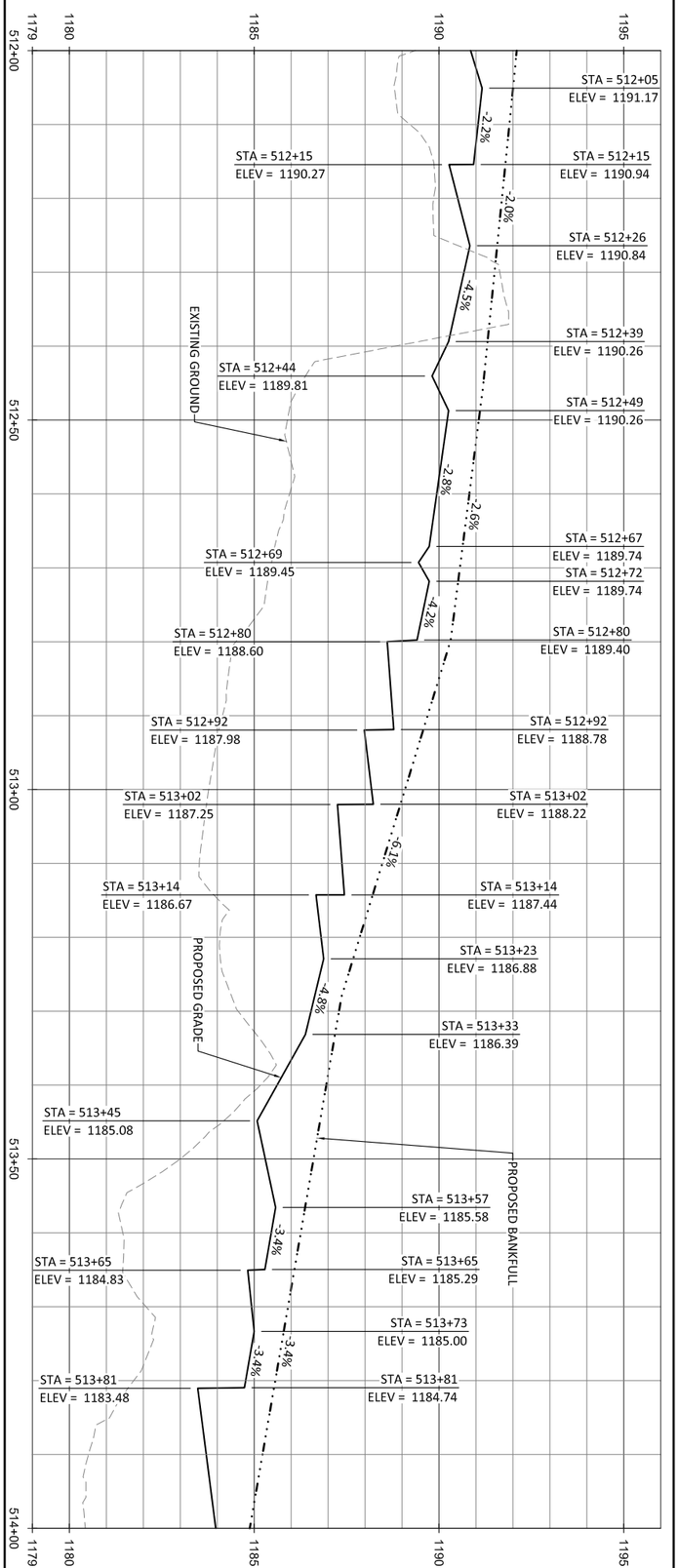

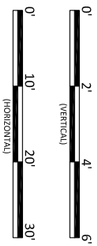

Date:	06.05.20
Job Number:	005-02177
Project Engineer:	NMM
Drawn By:	CAW
Checked By:	GAT

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Lyon Hills Mitigation Site
Wilkes County, North Carolina

UT3
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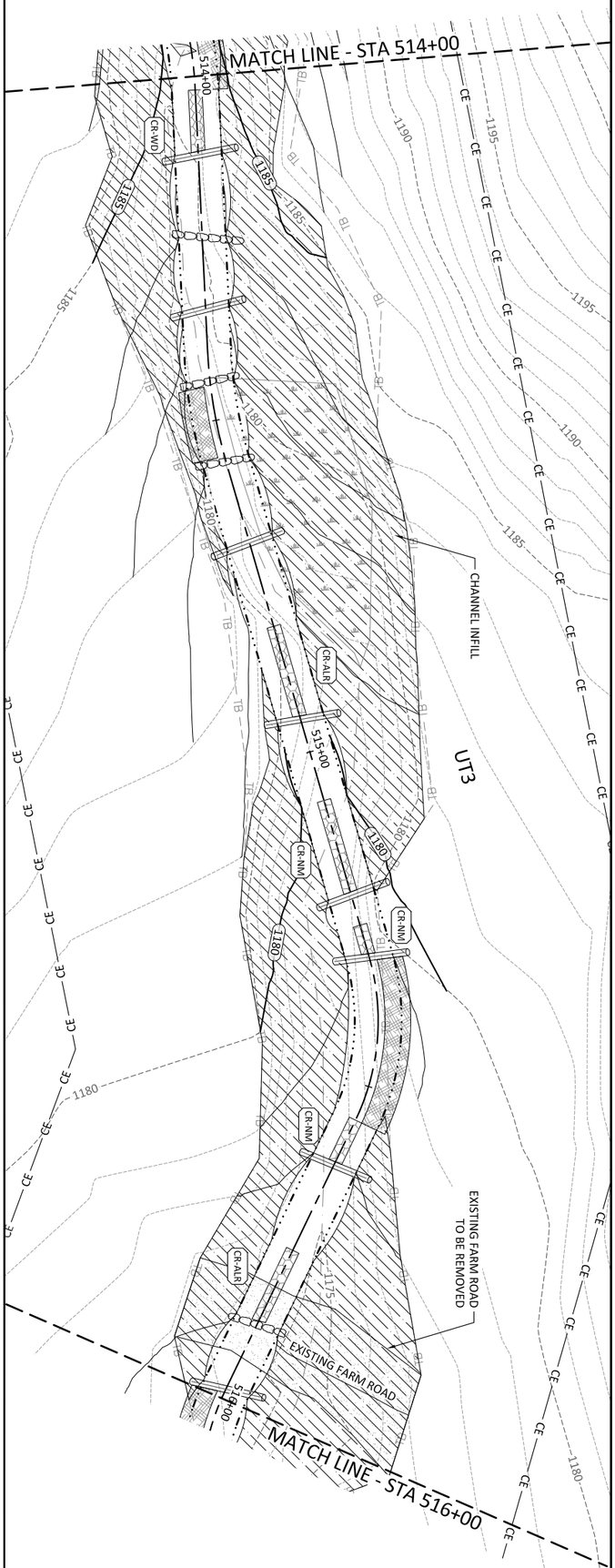

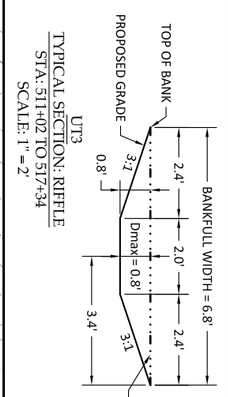

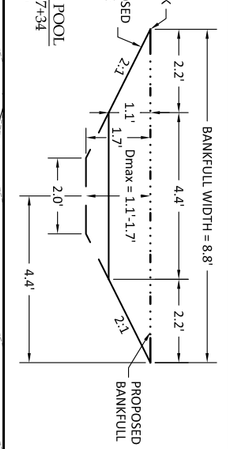

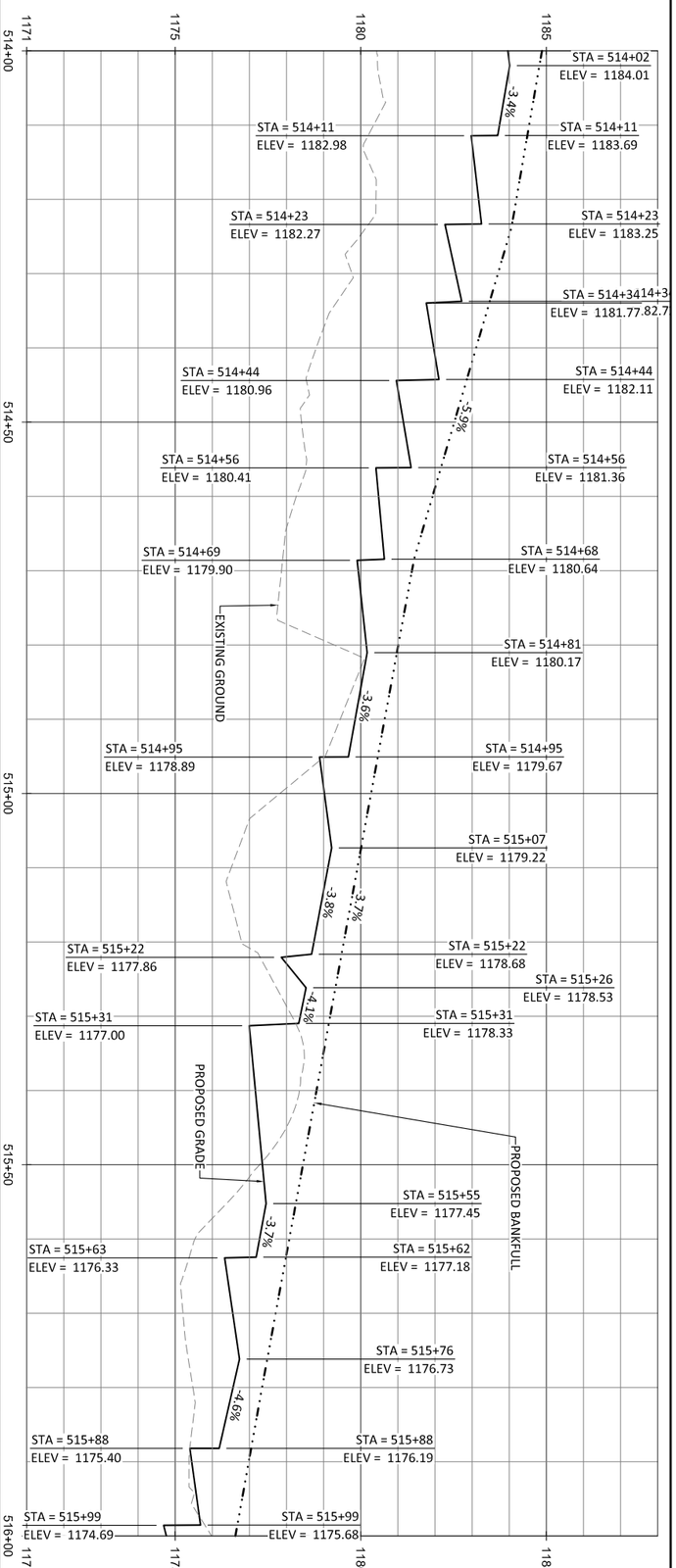

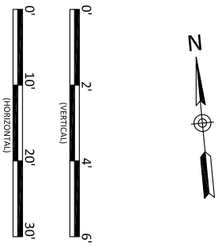

Date: 06.05.20
Job Number: 005-02177
Project Engineer: NMM
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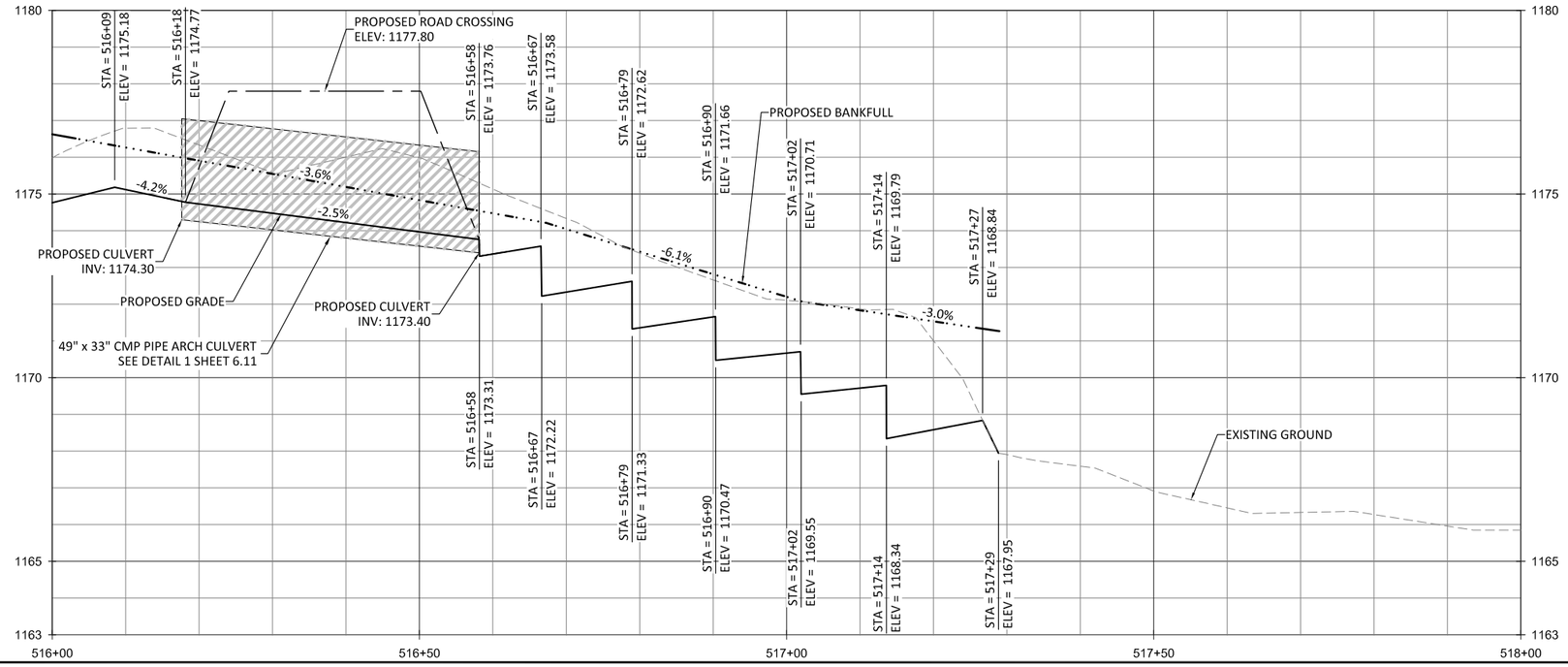

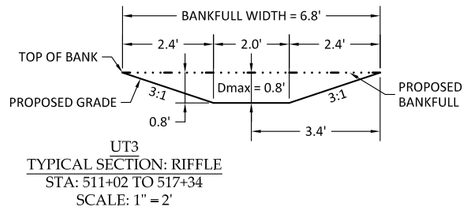

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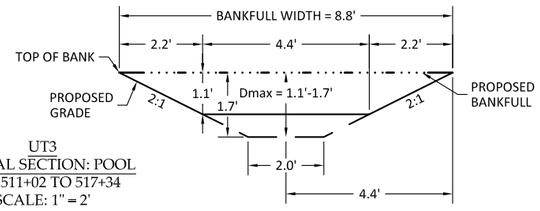
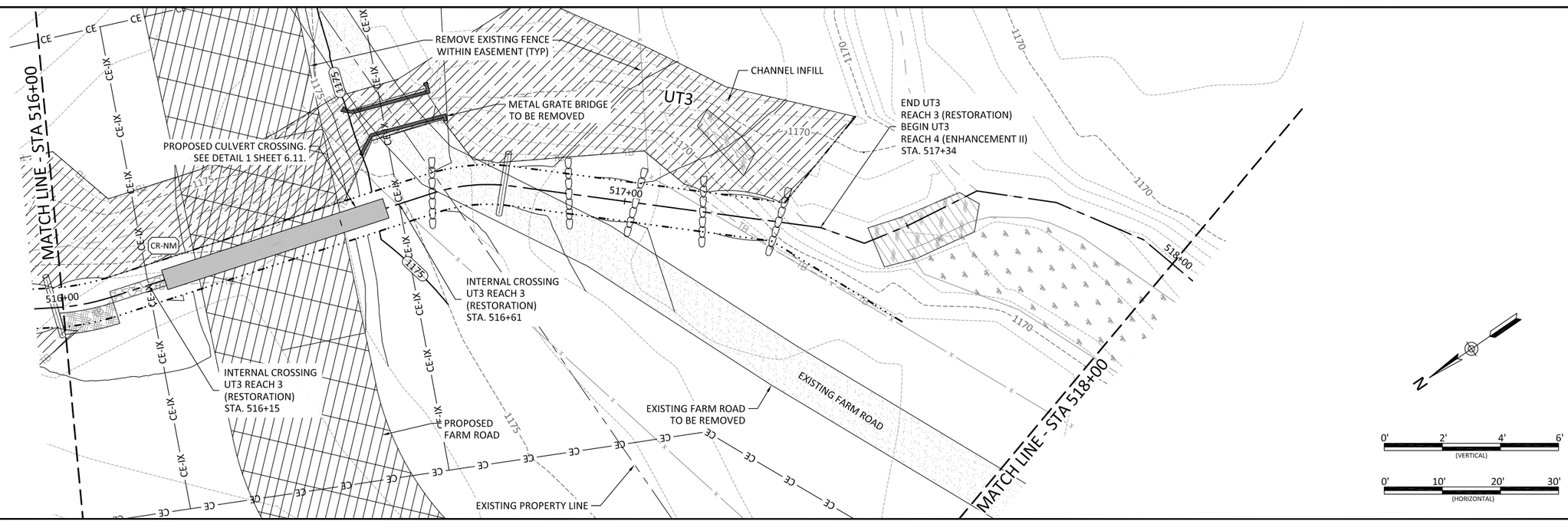
TYPICAL SECTION: RIFFLE
STA: 511+02 TO 517+34
SCALE: 1" = 2'



UT3
TYPICAL SECTION: POOL
STA: 511+02 TO 517+34
SCALE: 1" = 2'



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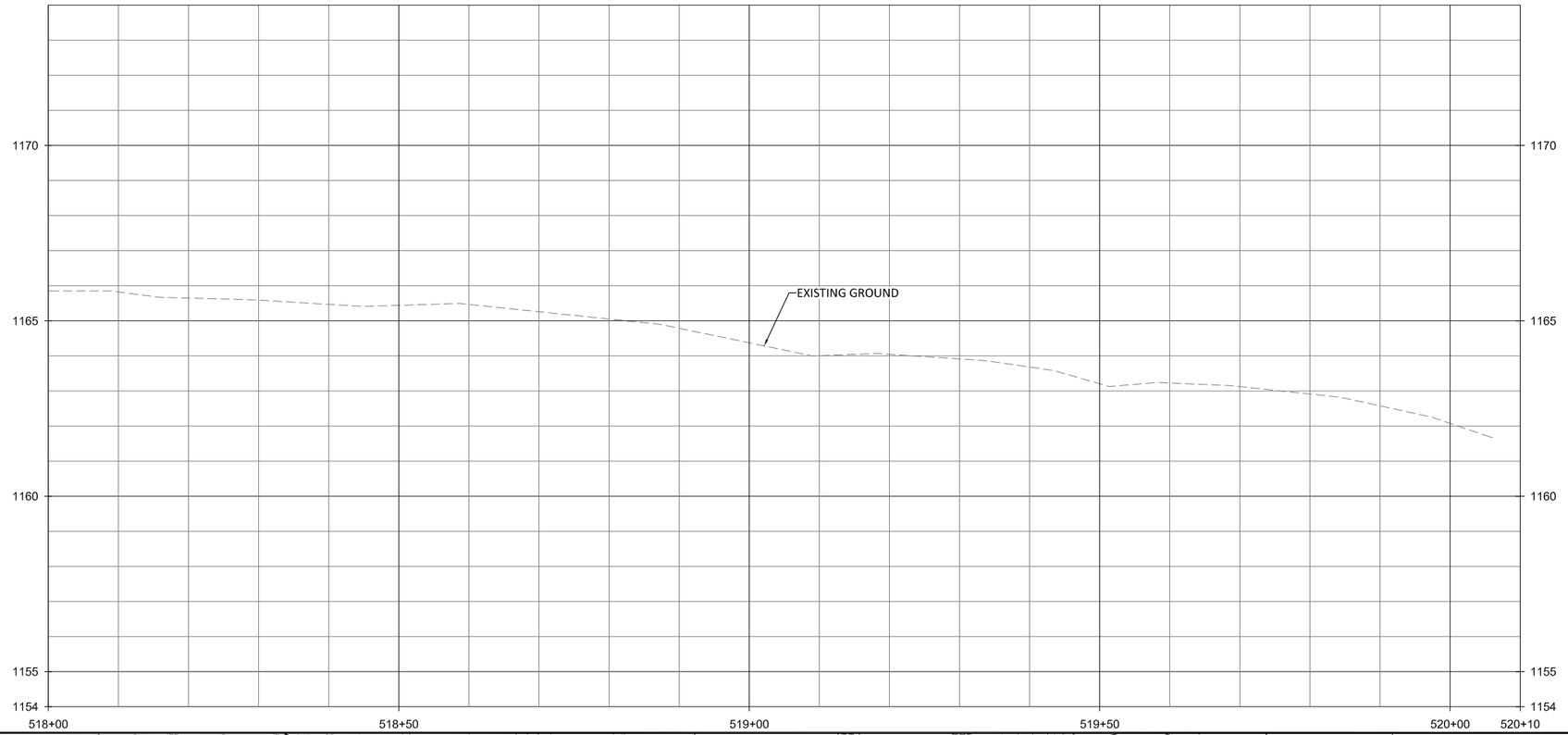

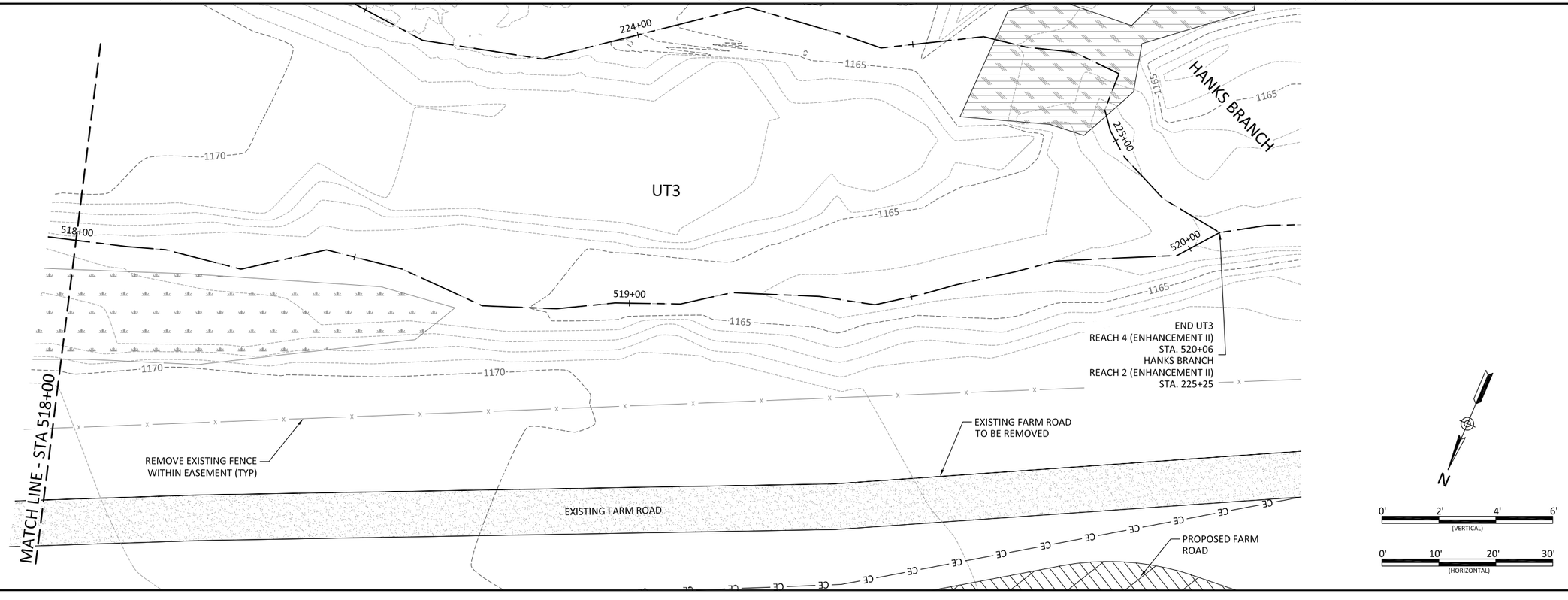

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Job Number: 005-02177
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Drawn By: CAW
Checked By: GAT

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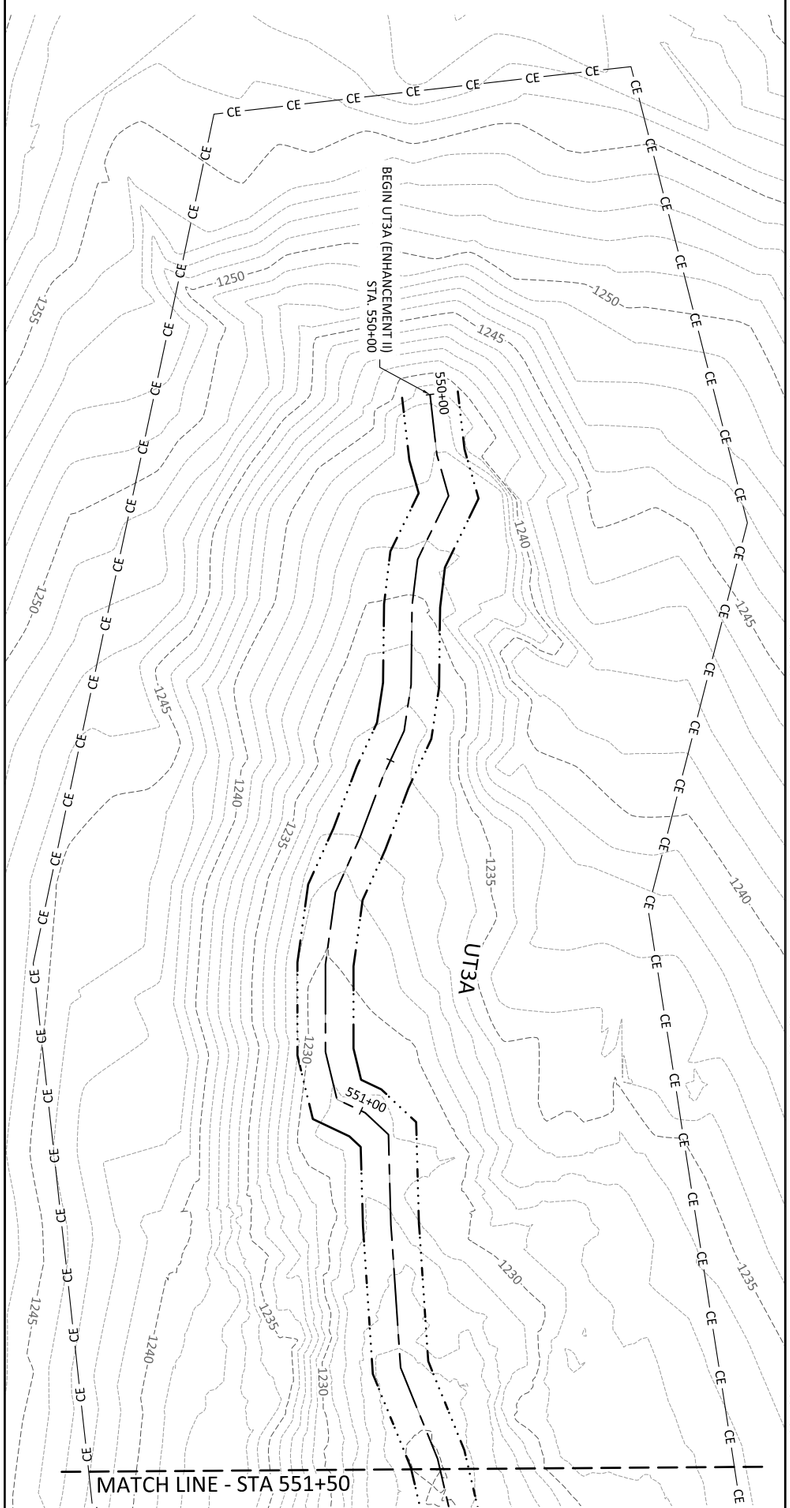

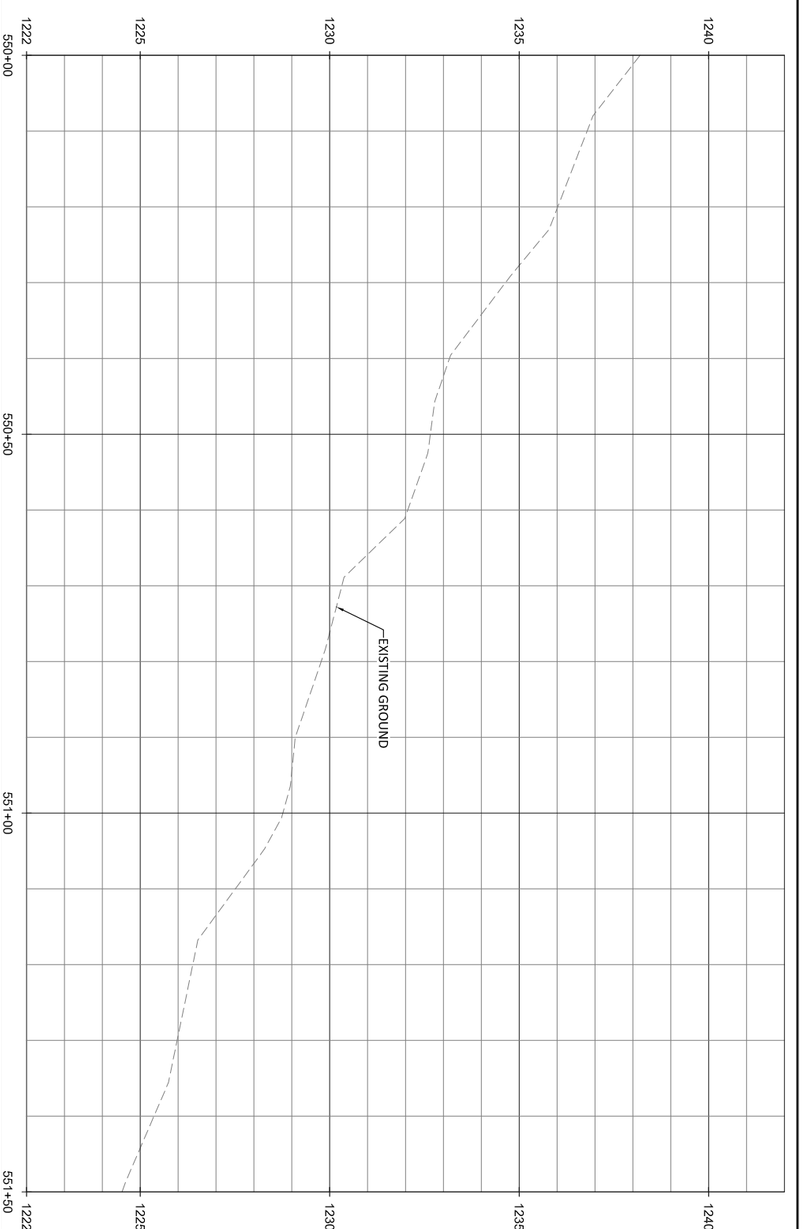

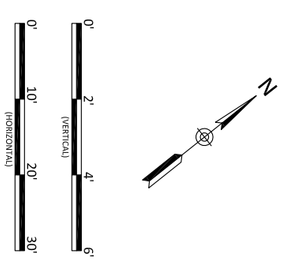

Date: 06.05.20
Job Number: 005-02177
Project Engineer: NMM
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Lyon Hills Mitigation Site
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UT3A
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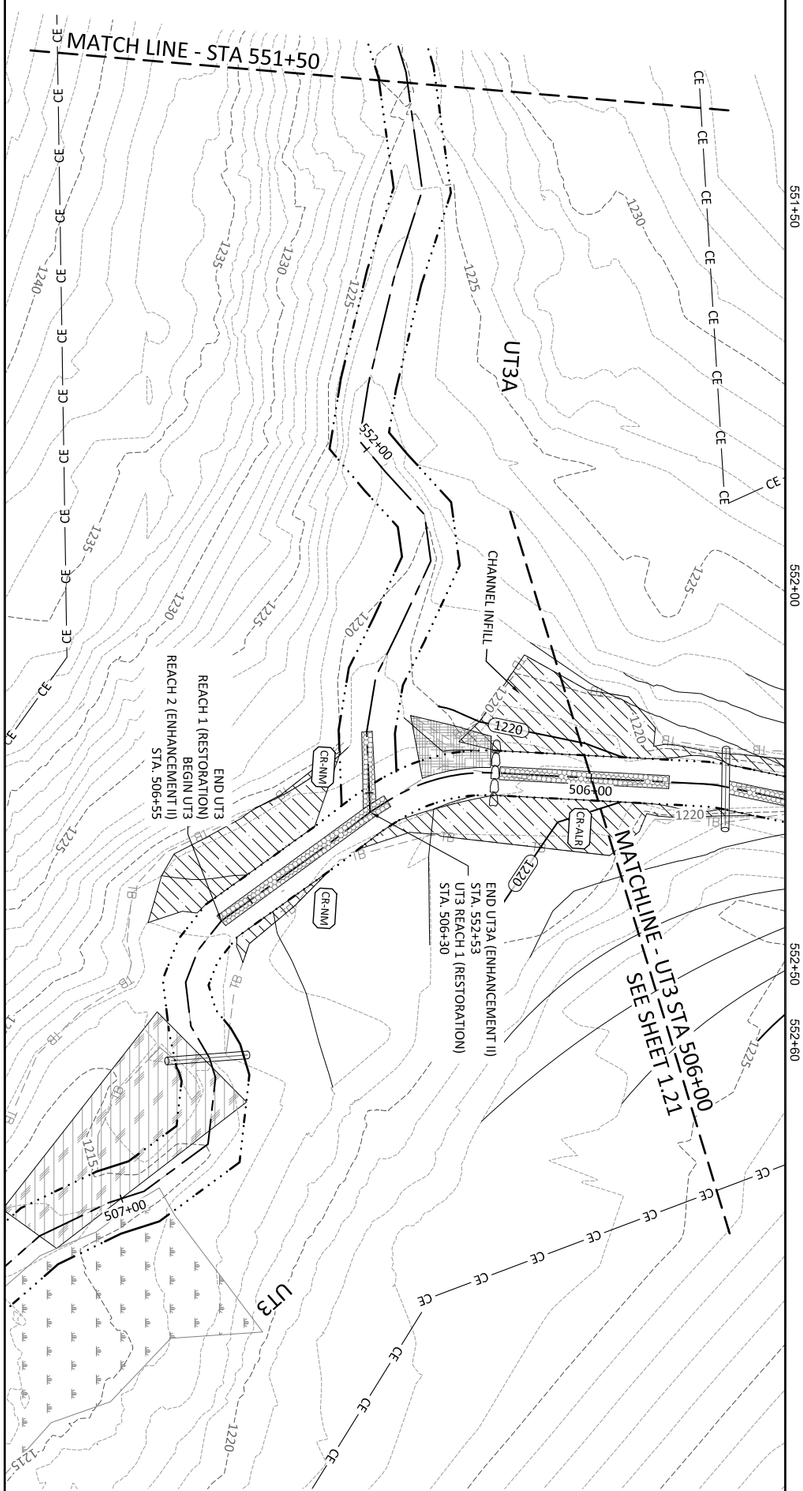

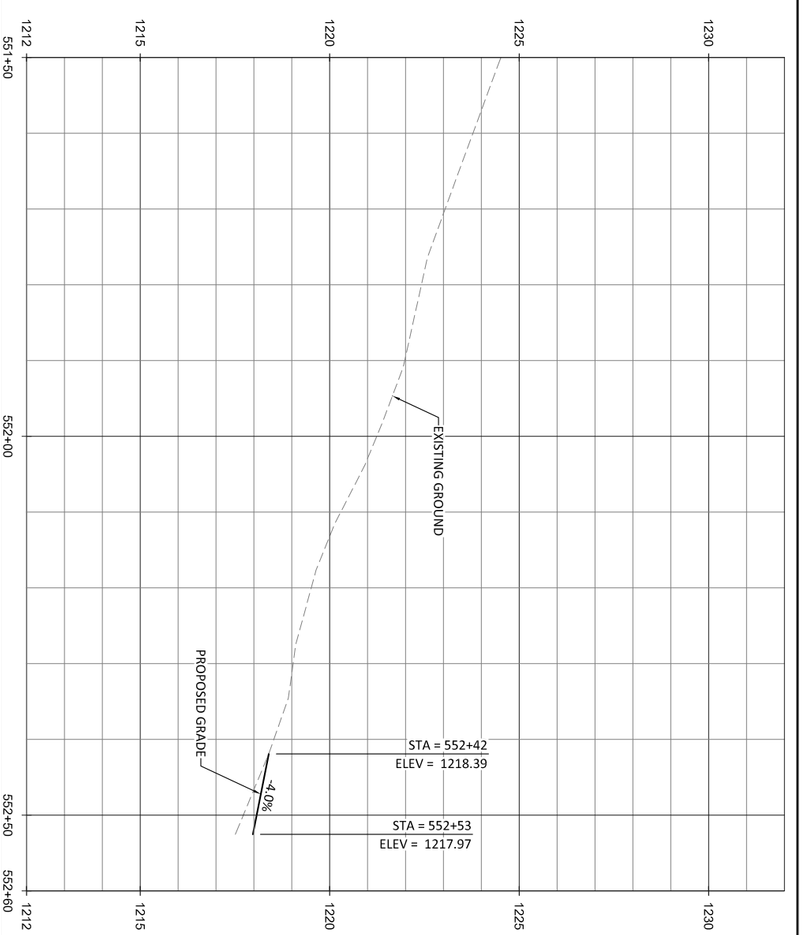

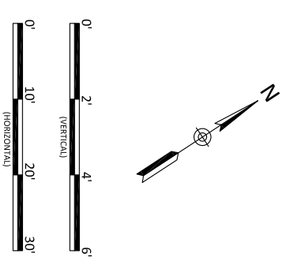

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Job Number:	005-02177
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Lyon Hills Mitigation Site
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UT3A
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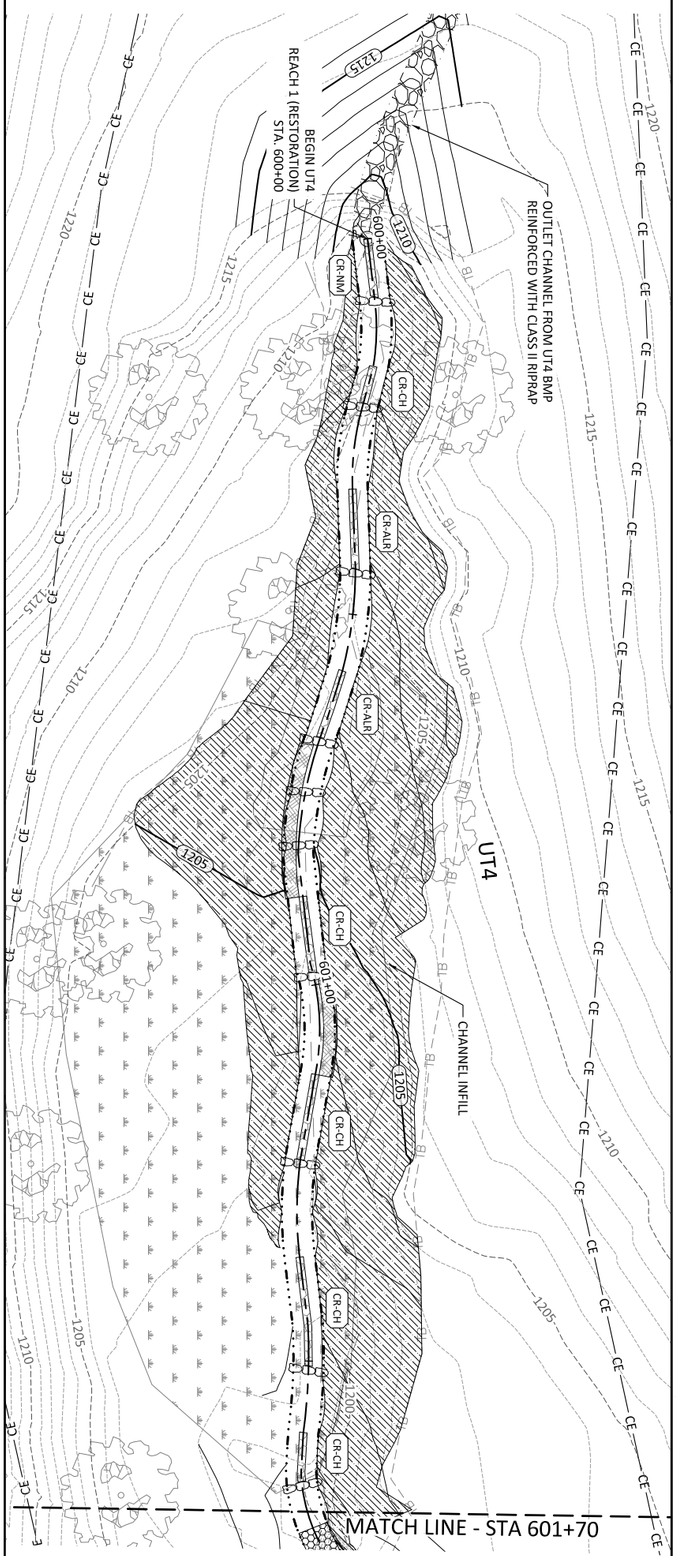

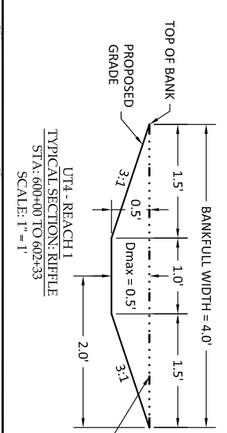

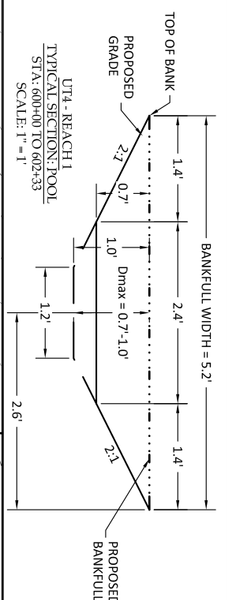

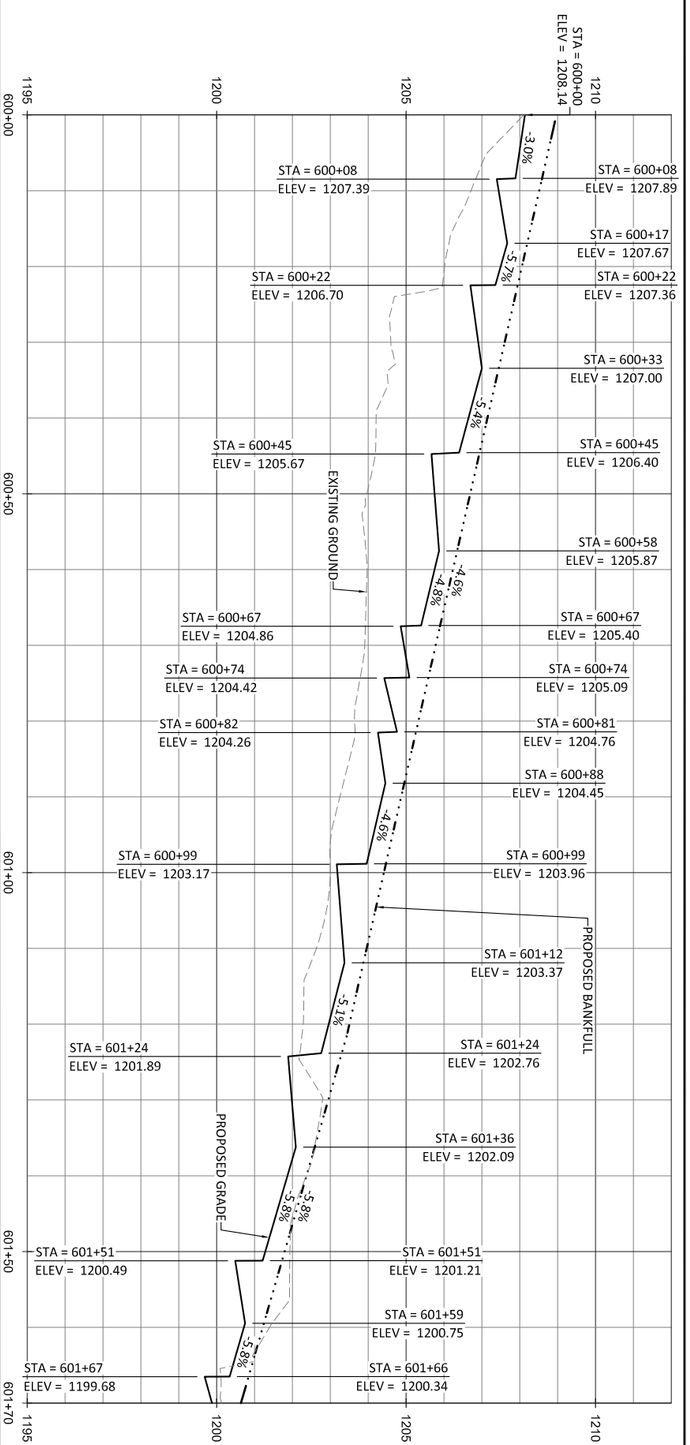

0' 10' 20' 30' (HORIZONTAL)
0' 2' 4' 6' (VERTICAL)

N

Date:	06.05.20
Job Number:	005-02177
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Lyon Hills Mitigation Site
Wilkes County, North Carolina

UT4
Stream Plan and Profile

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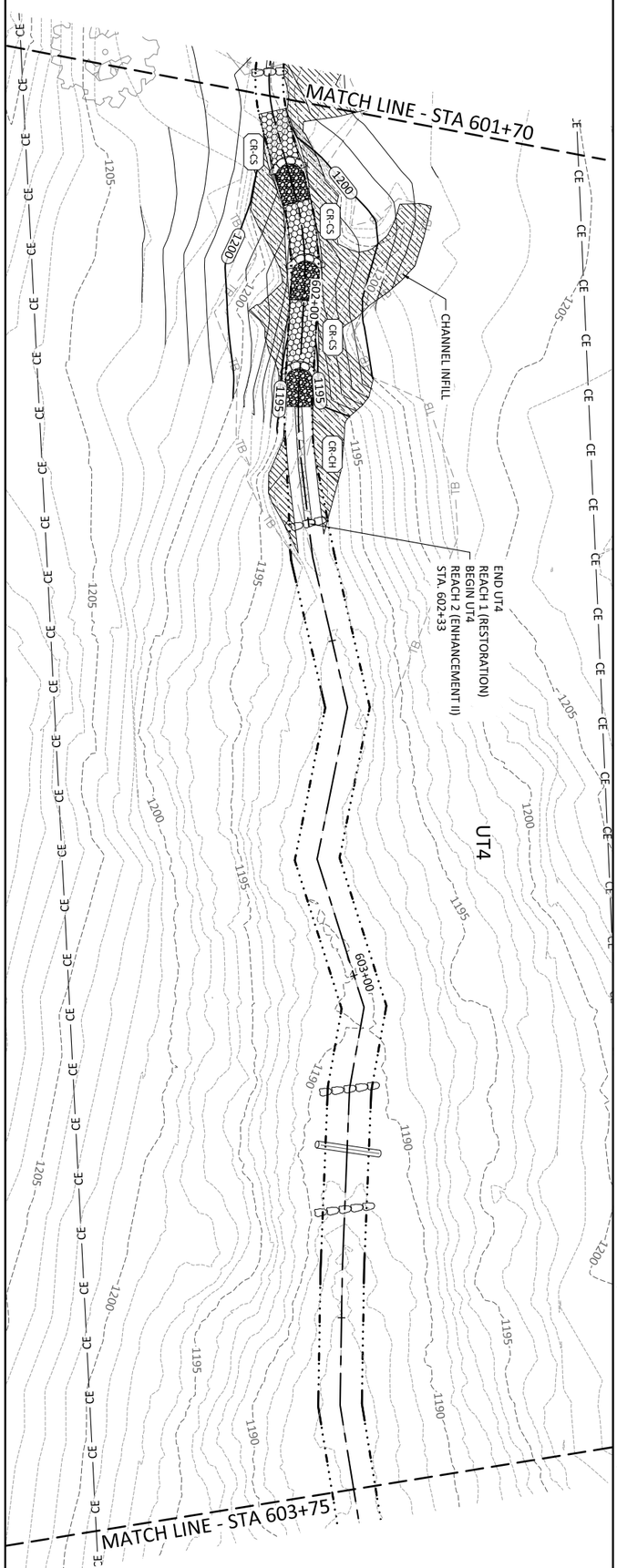

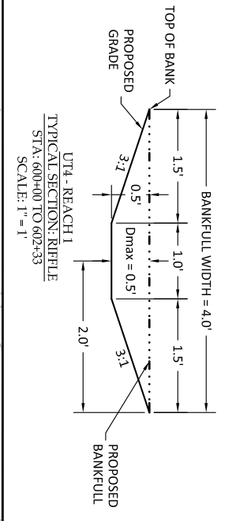

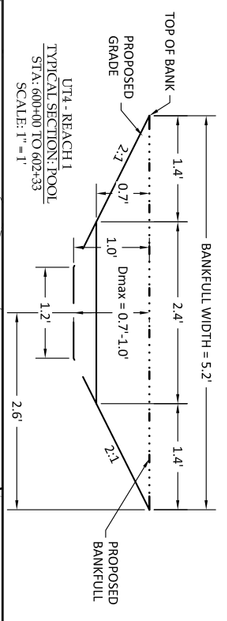

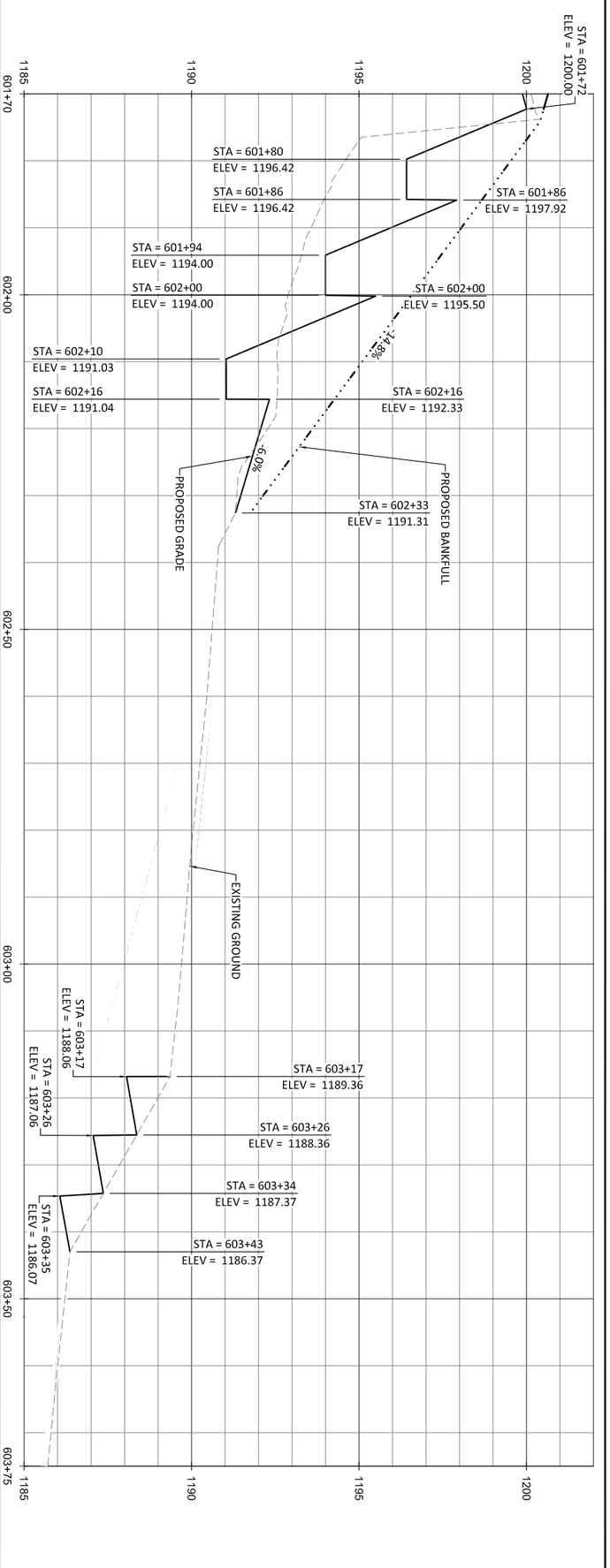

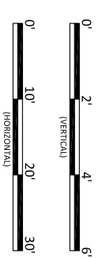

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Job Number:	005-02177
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Lyon Hills Mitigation Site
Wilkes County, North Carolina

UT4
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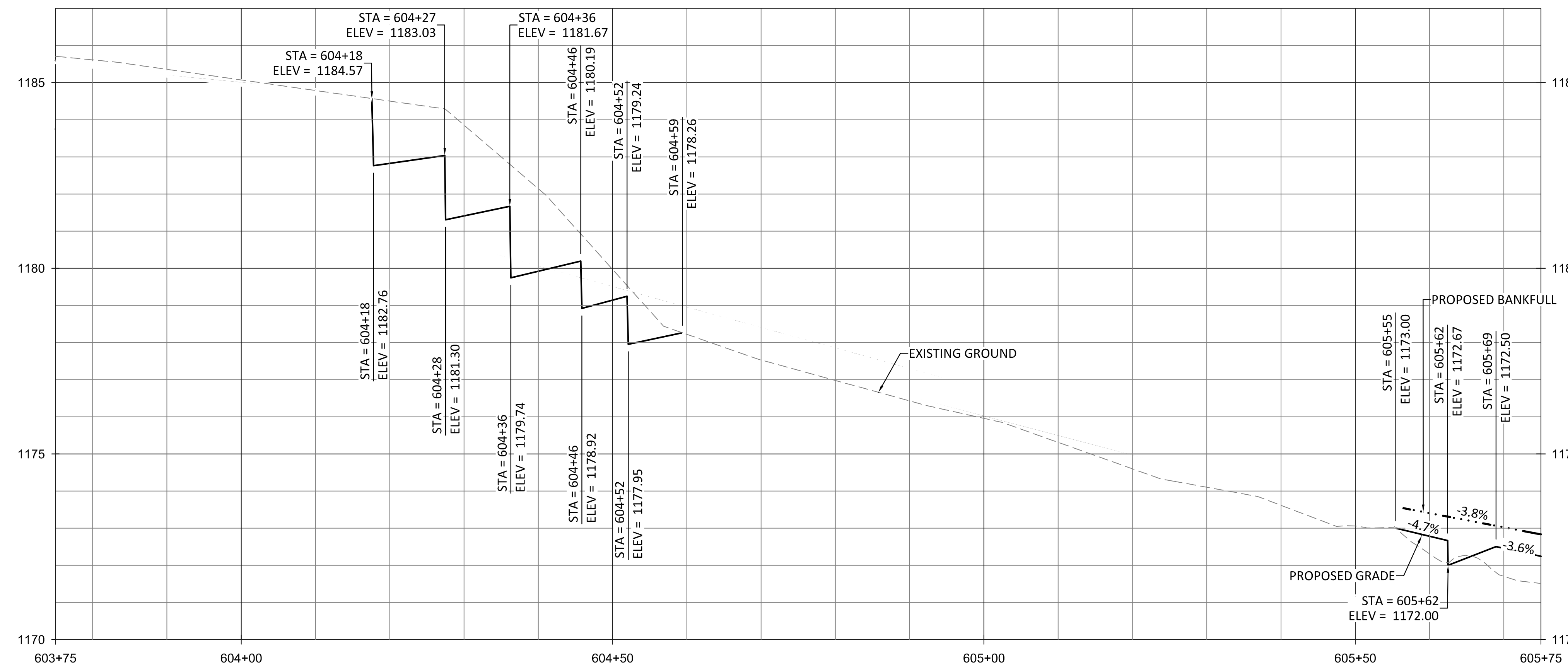

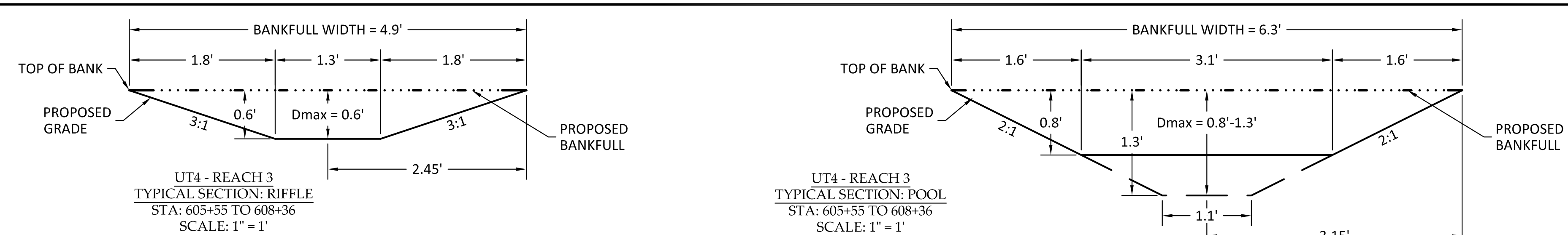

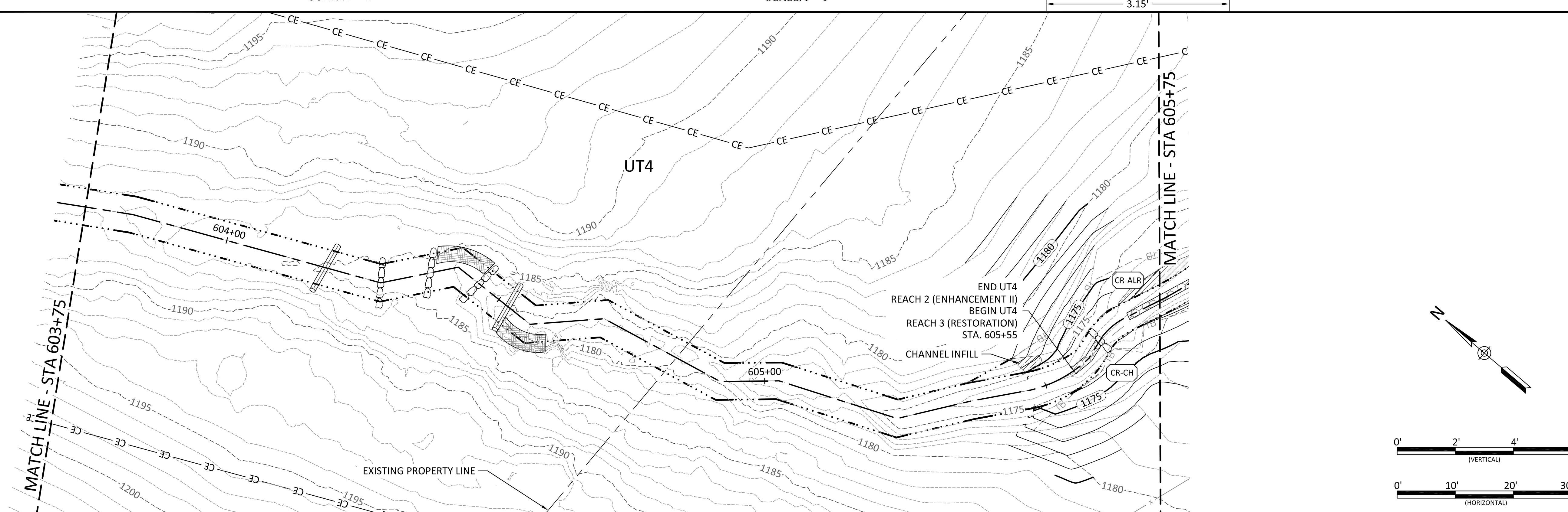

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Wilkes County, North Carolina

UT4
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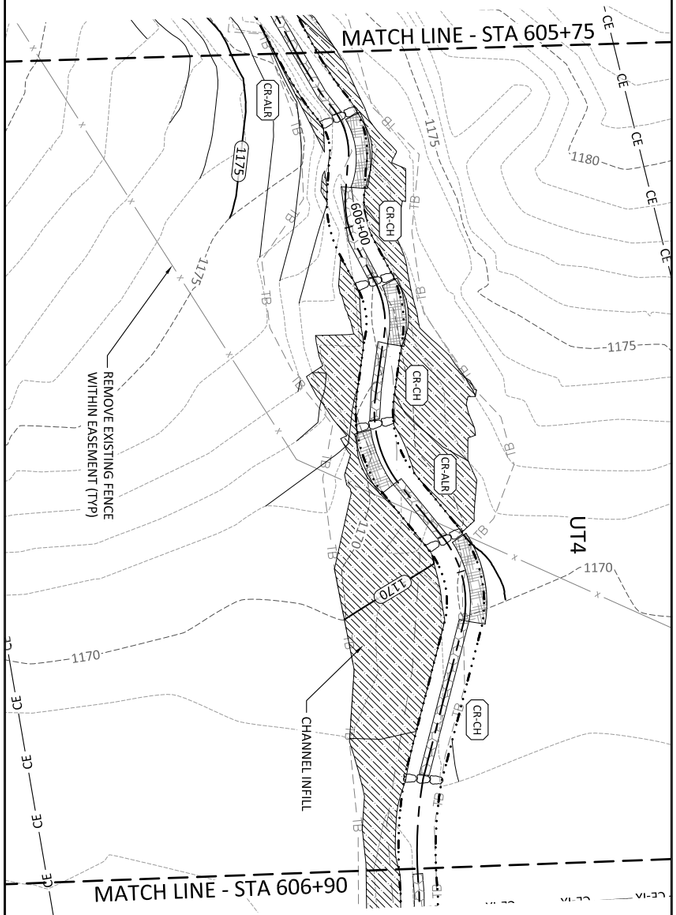

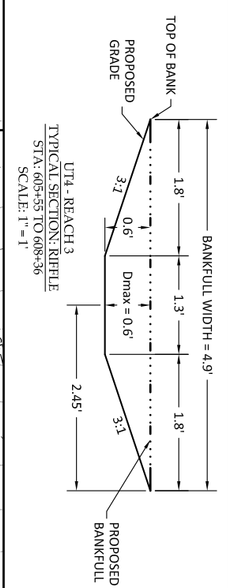

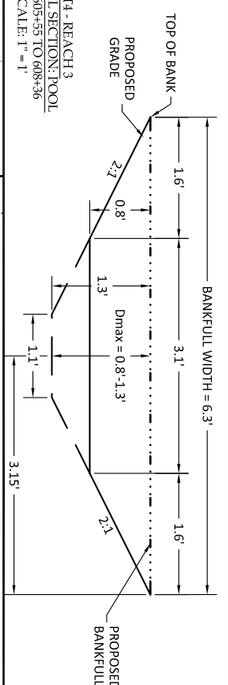

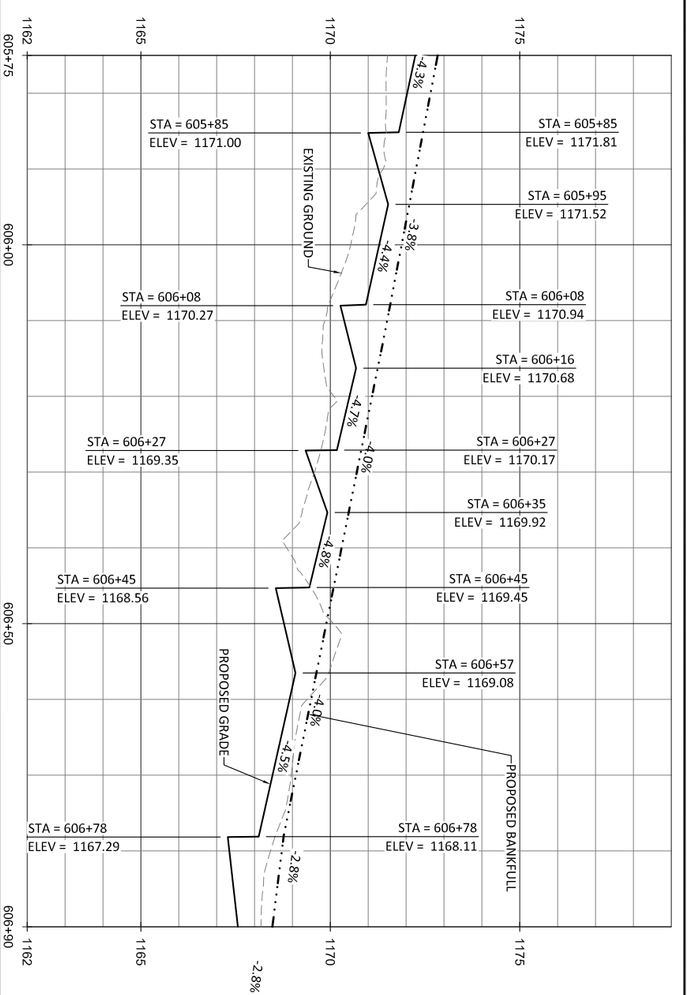

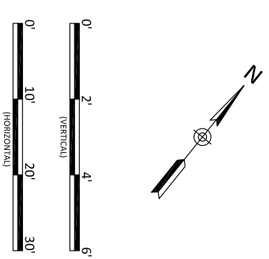

Date: 06.05.20
Job Number: 005-02177
Project Engineer: NMM
Drawn By: CAW
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Lyon Hills Mitigation Site
Wilkes County, North Carolina

UT4
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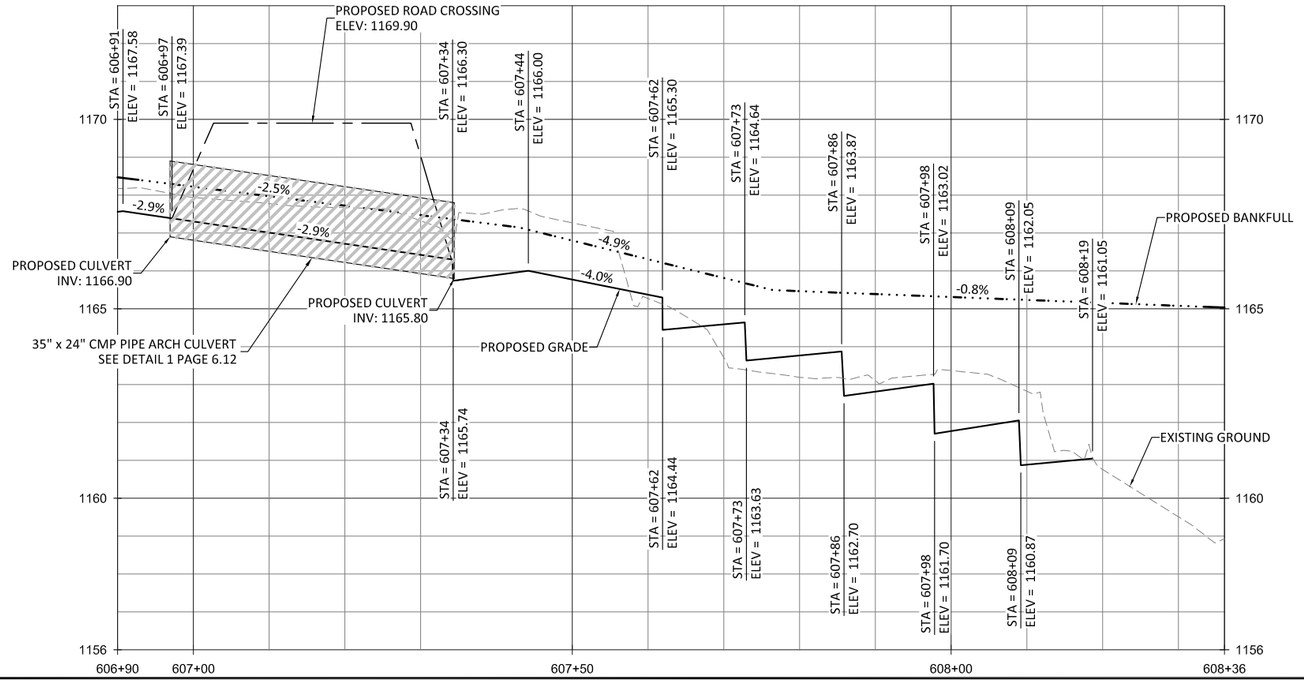
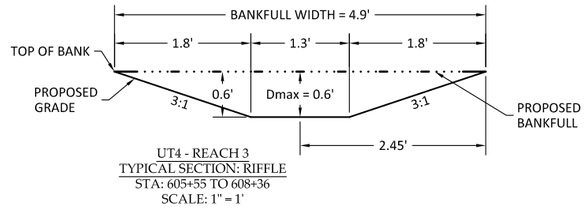
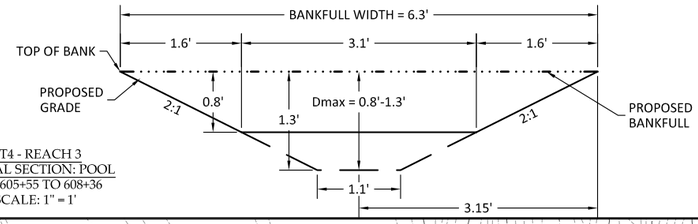
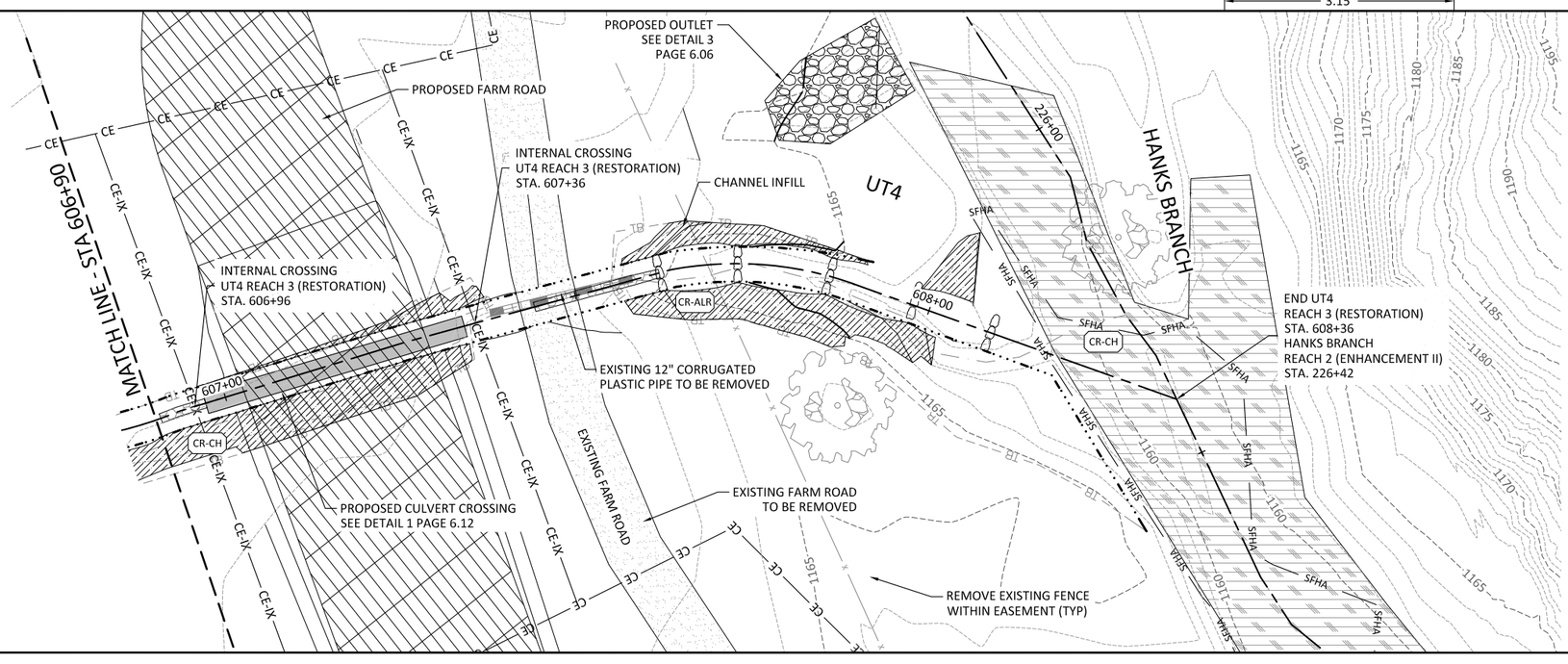




UT4 - REACH 3
TYPICAL SECTION: RIFFLE
STA: 605+55 TO 608+36
SCALE: 1" = 1'



UT4 - REACH 3
TYPICAL SECTION: POOL
STA: 605+55 TO 608+36
SCALE: 1" = 1'



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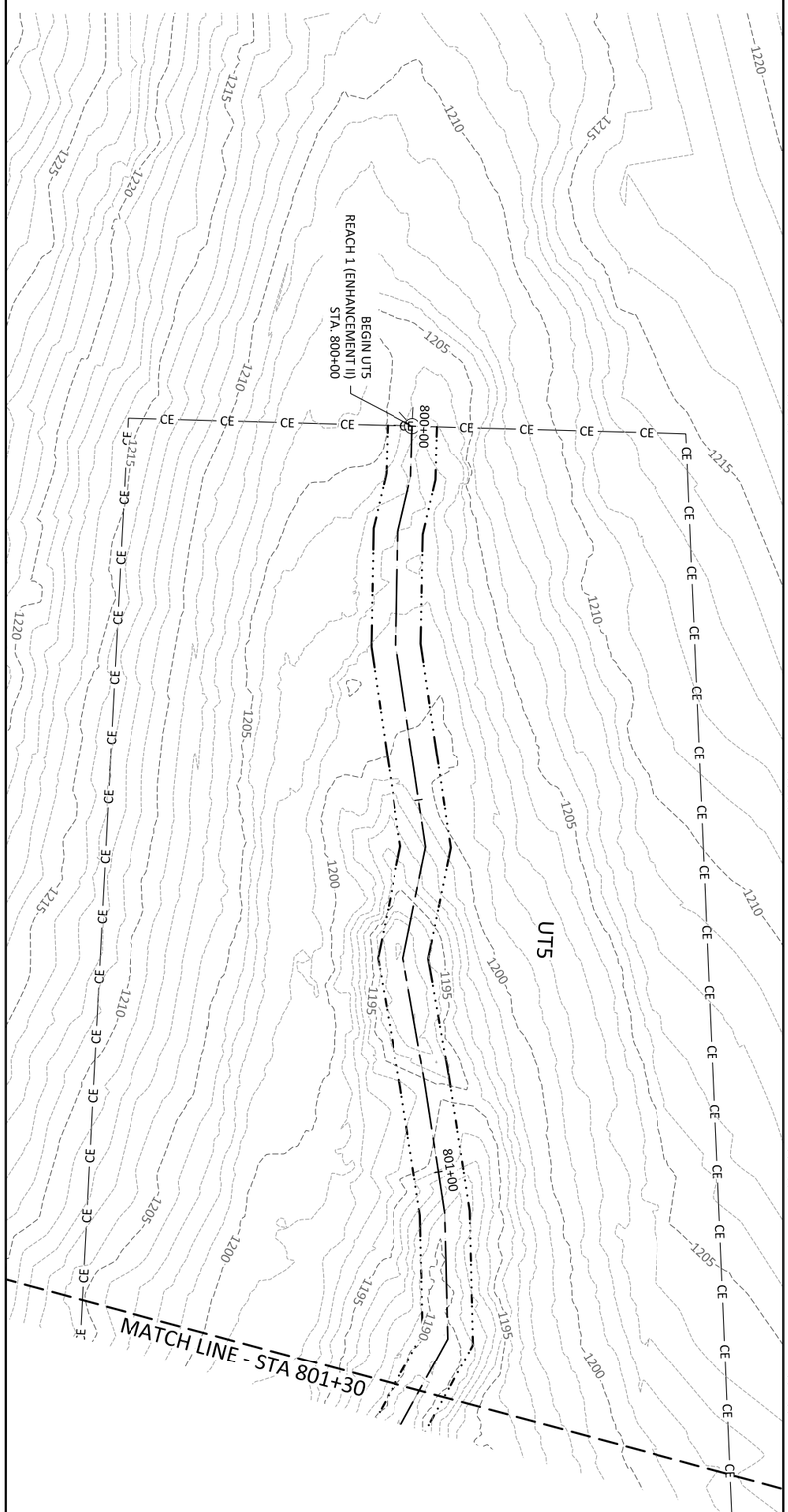

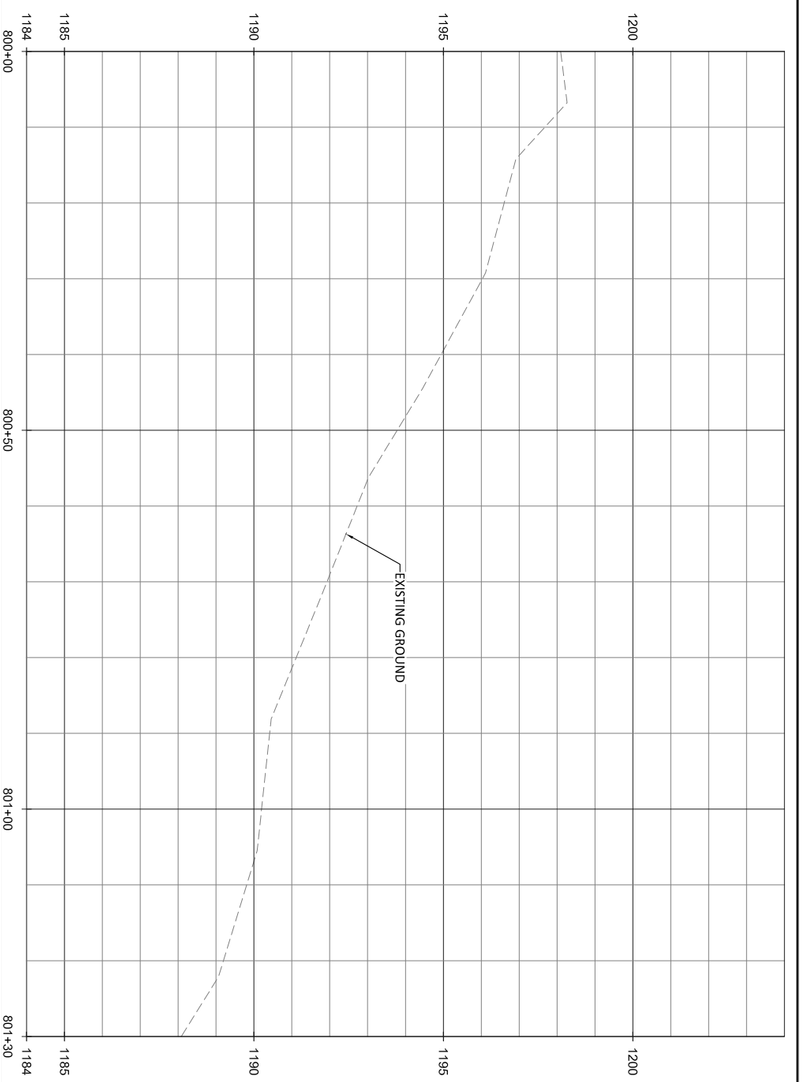

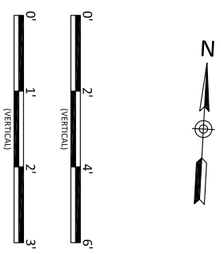

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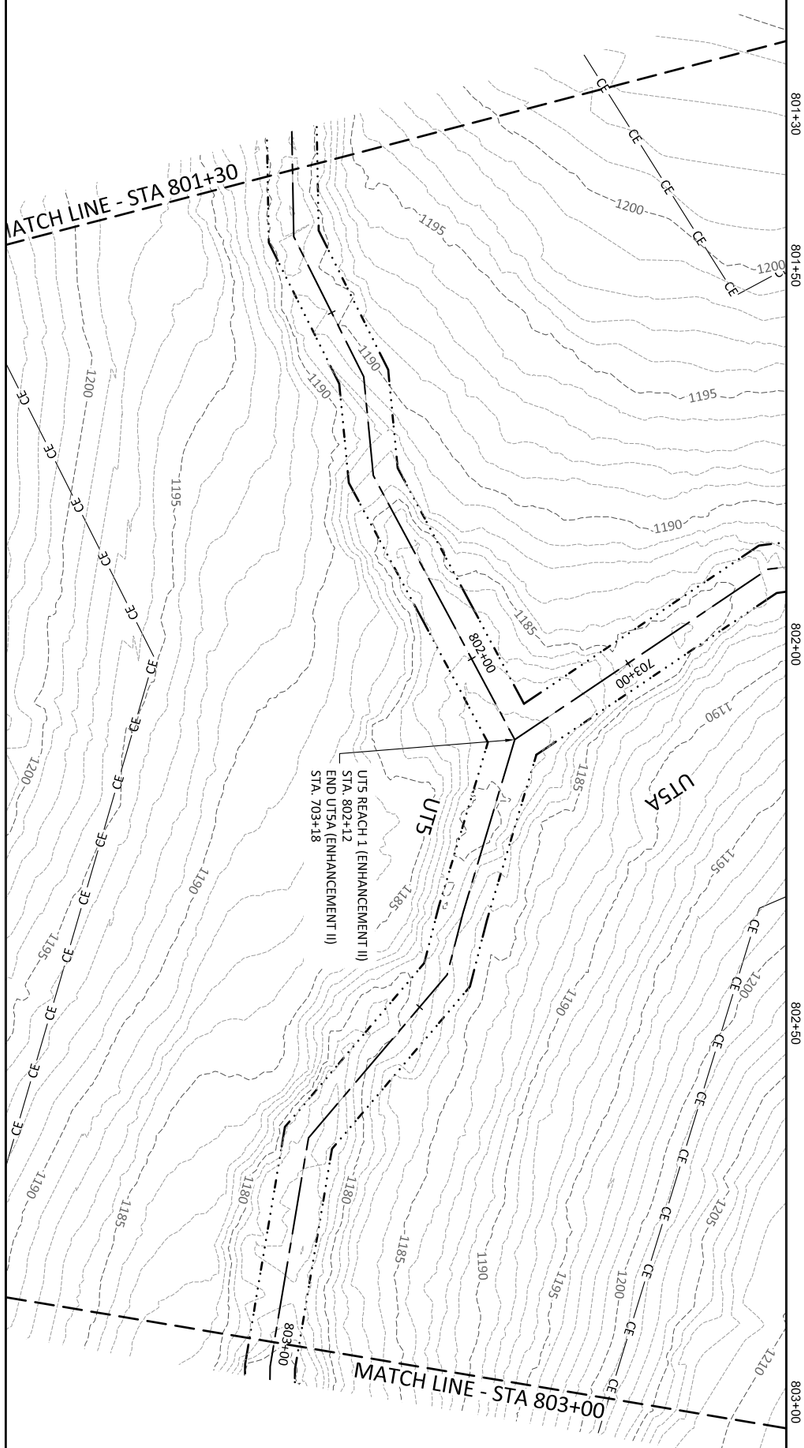

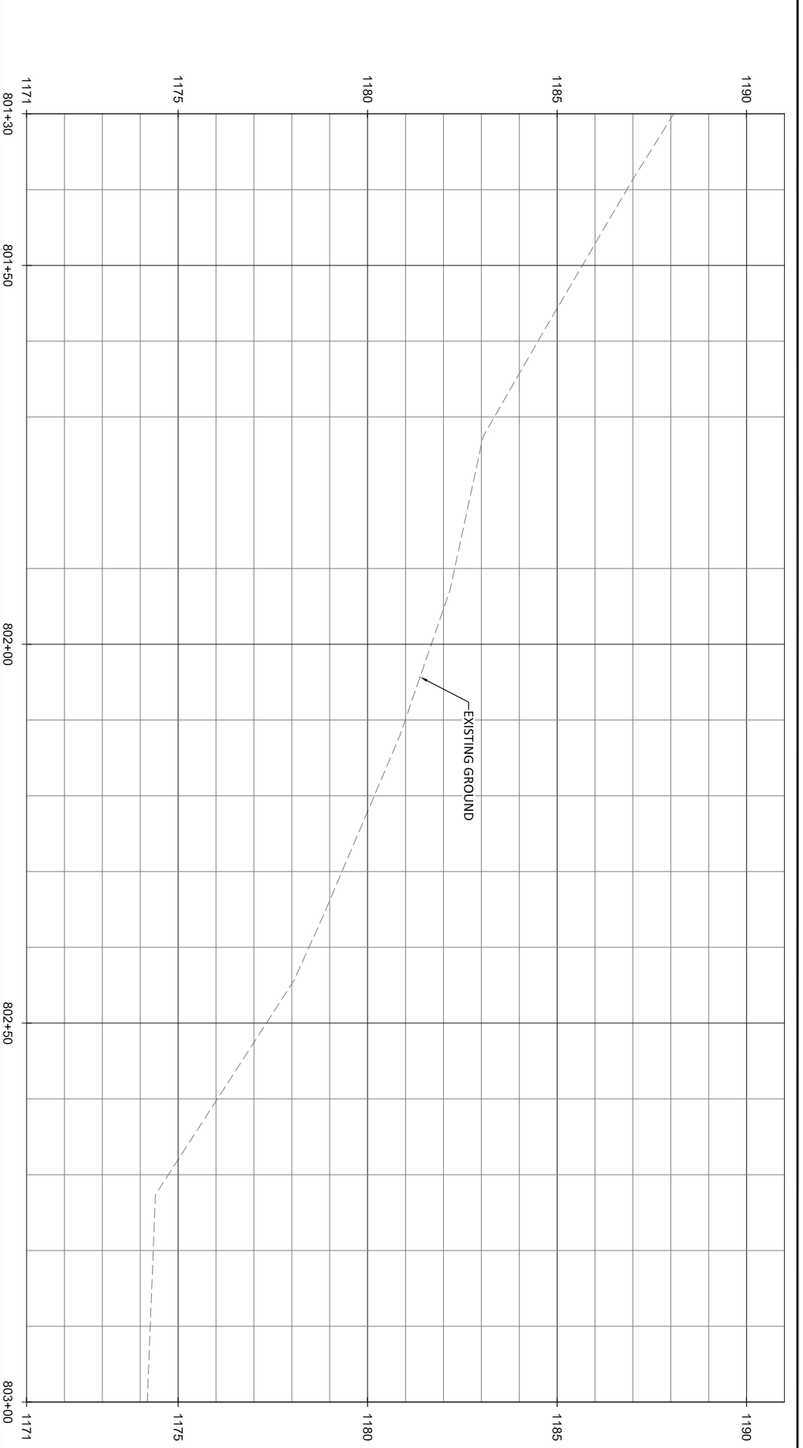

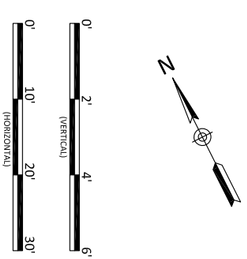

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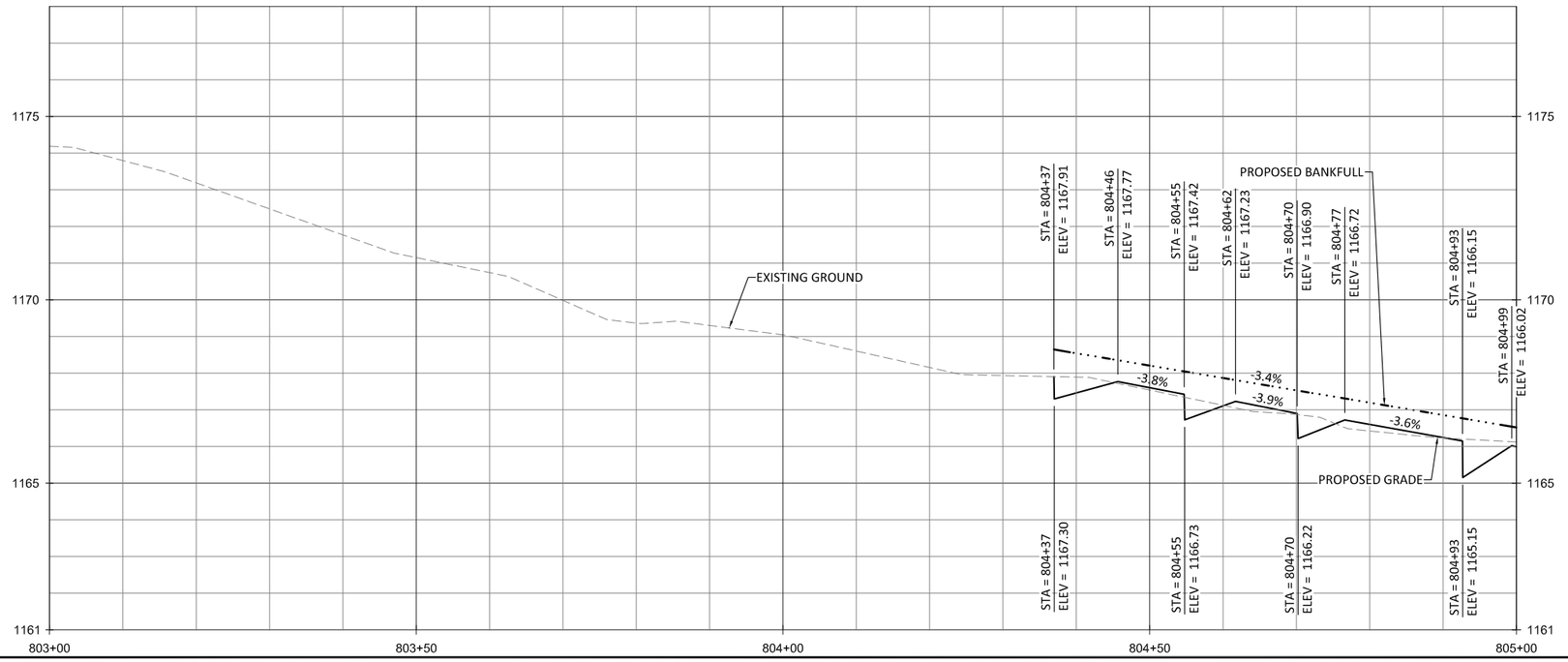

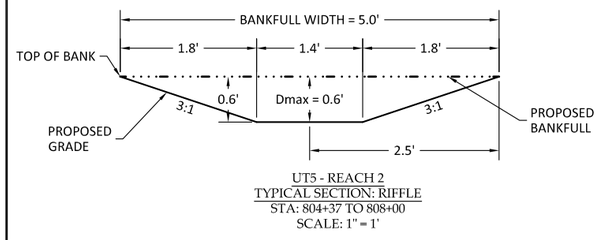

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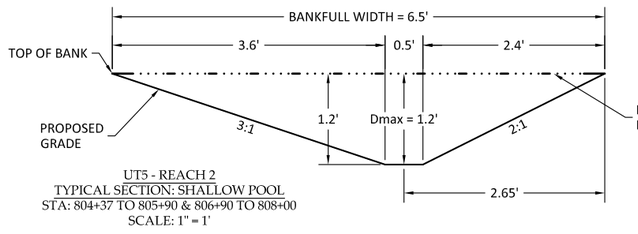

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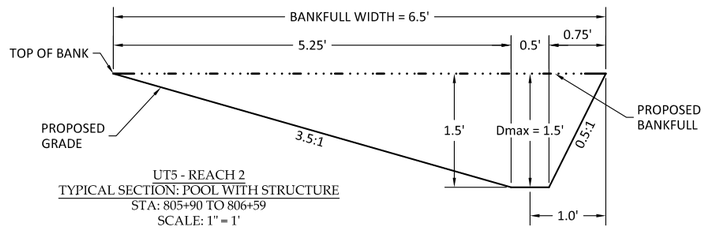

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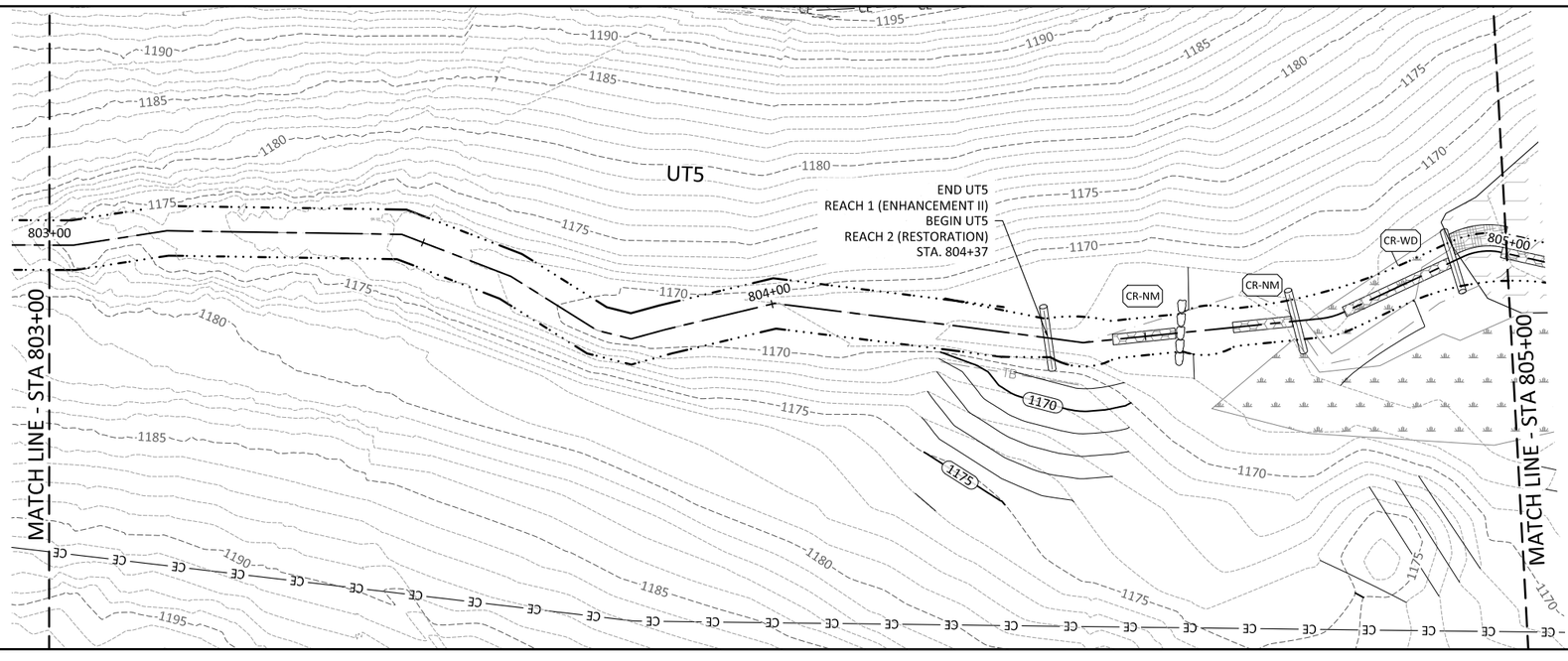

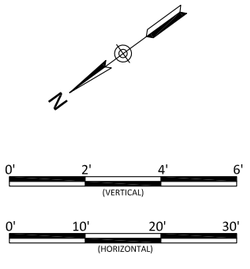

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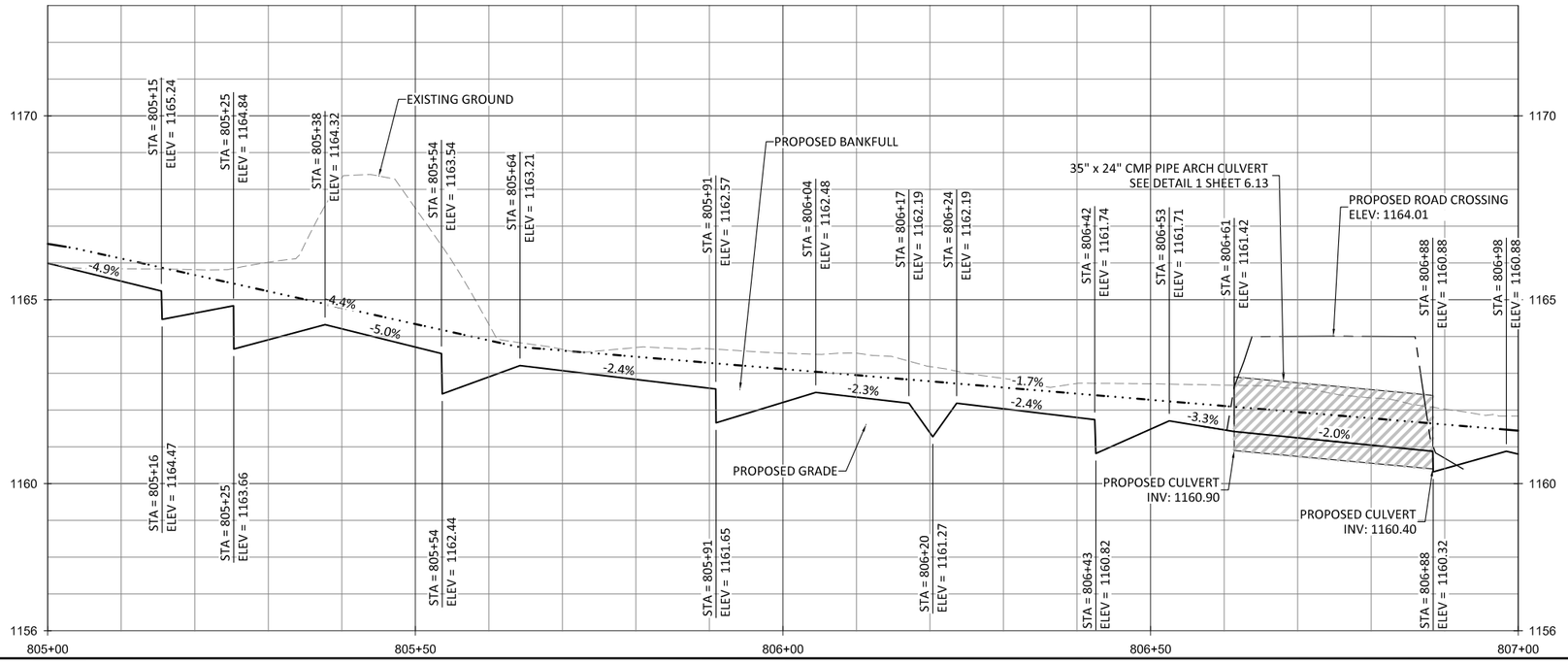

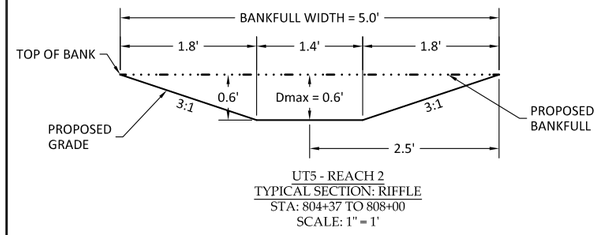

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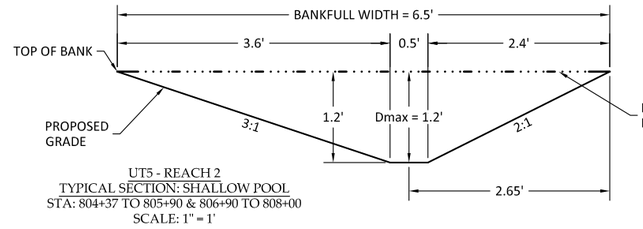

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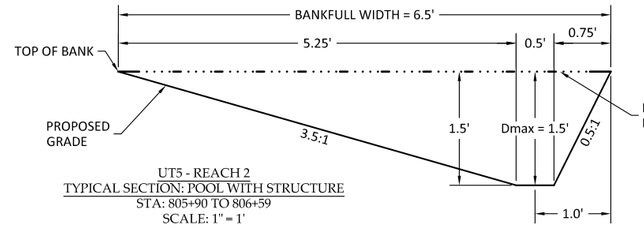

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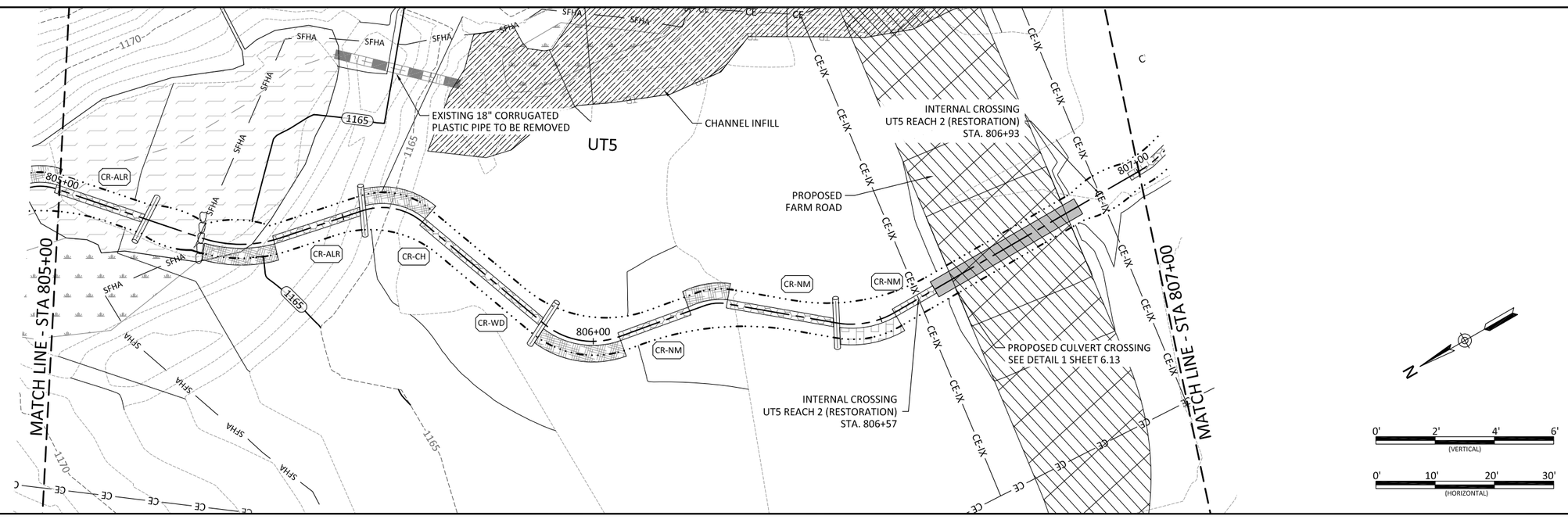

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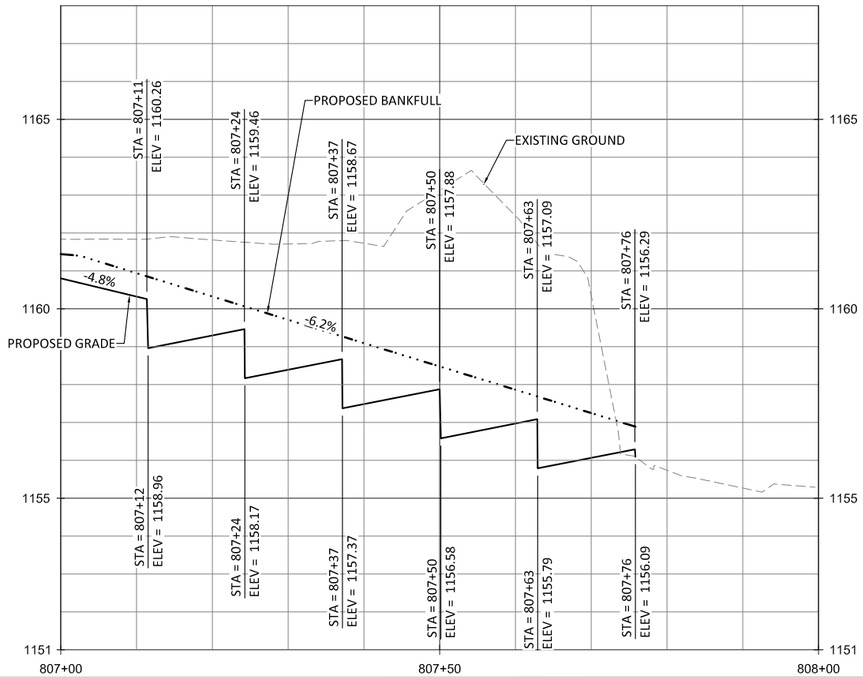

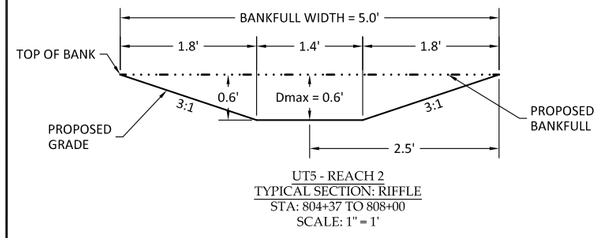

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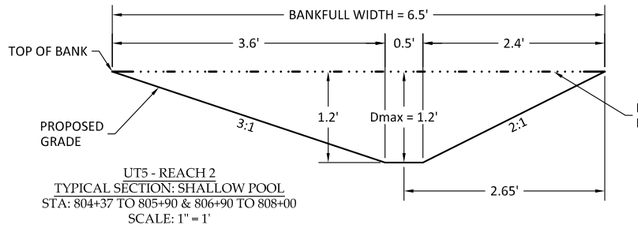

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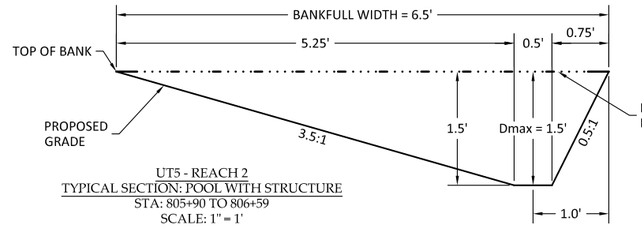

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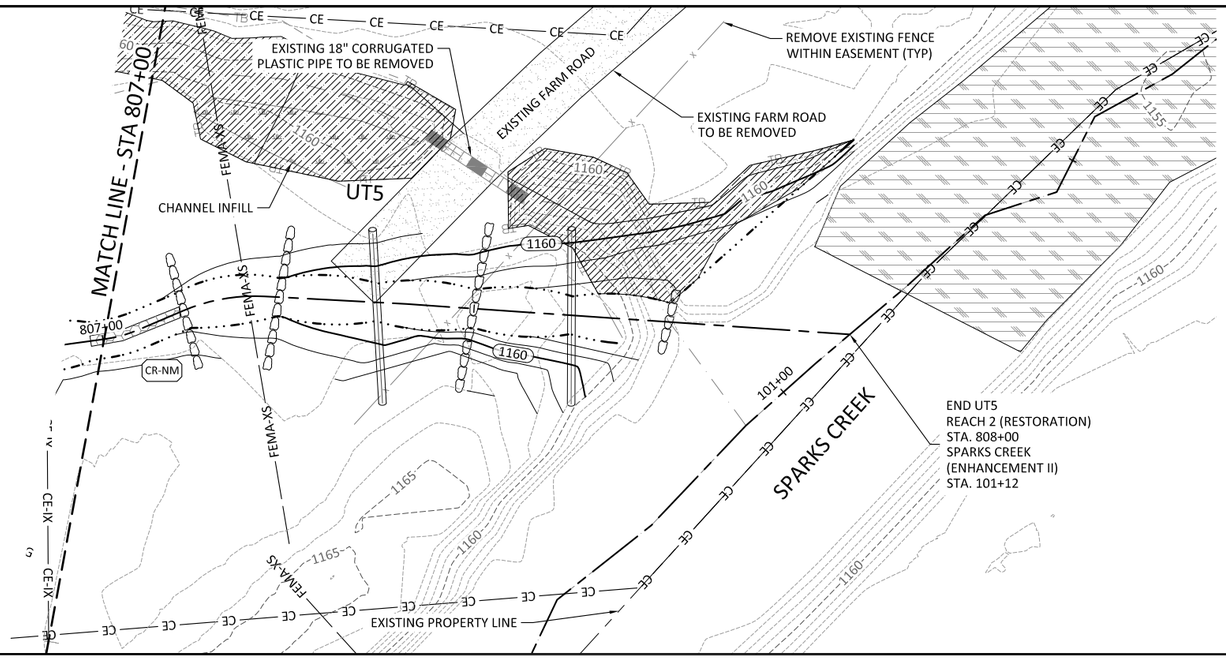

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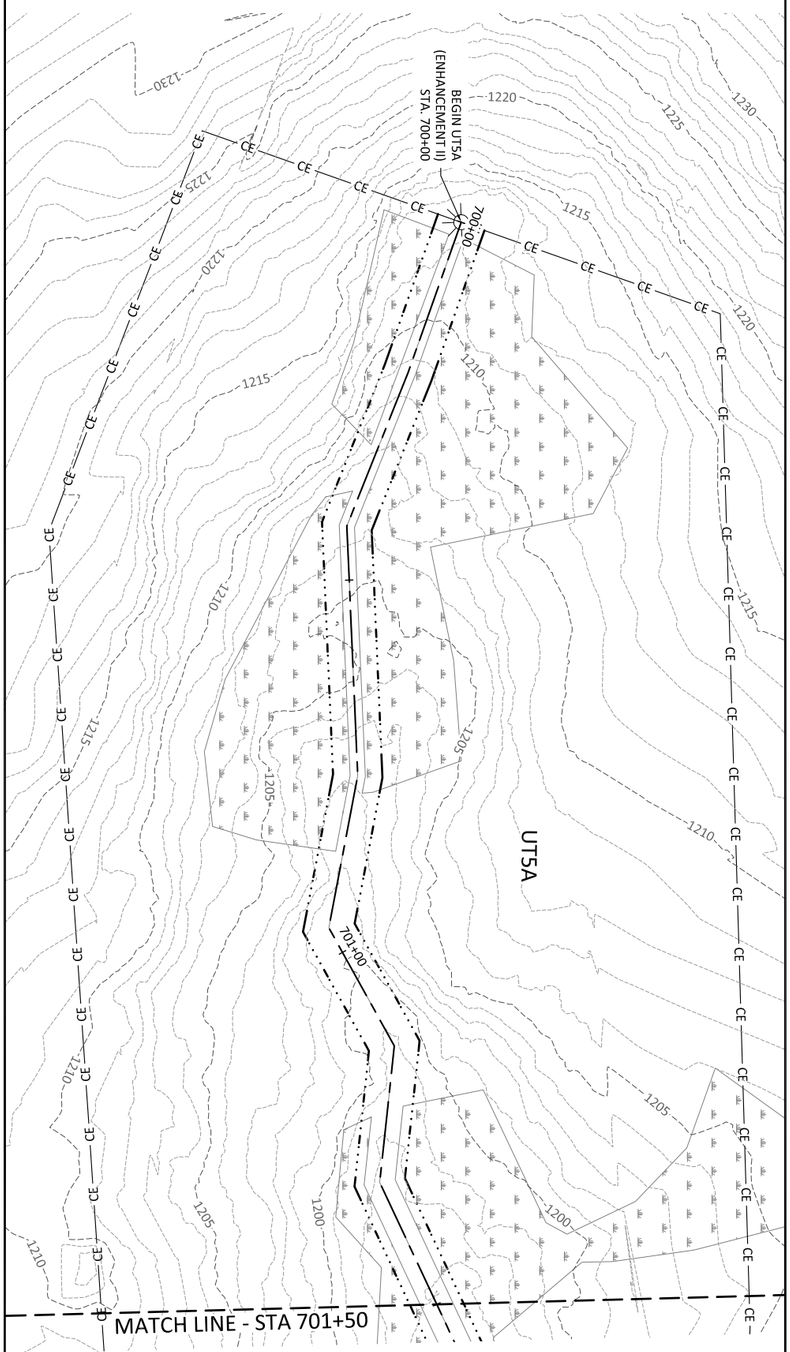

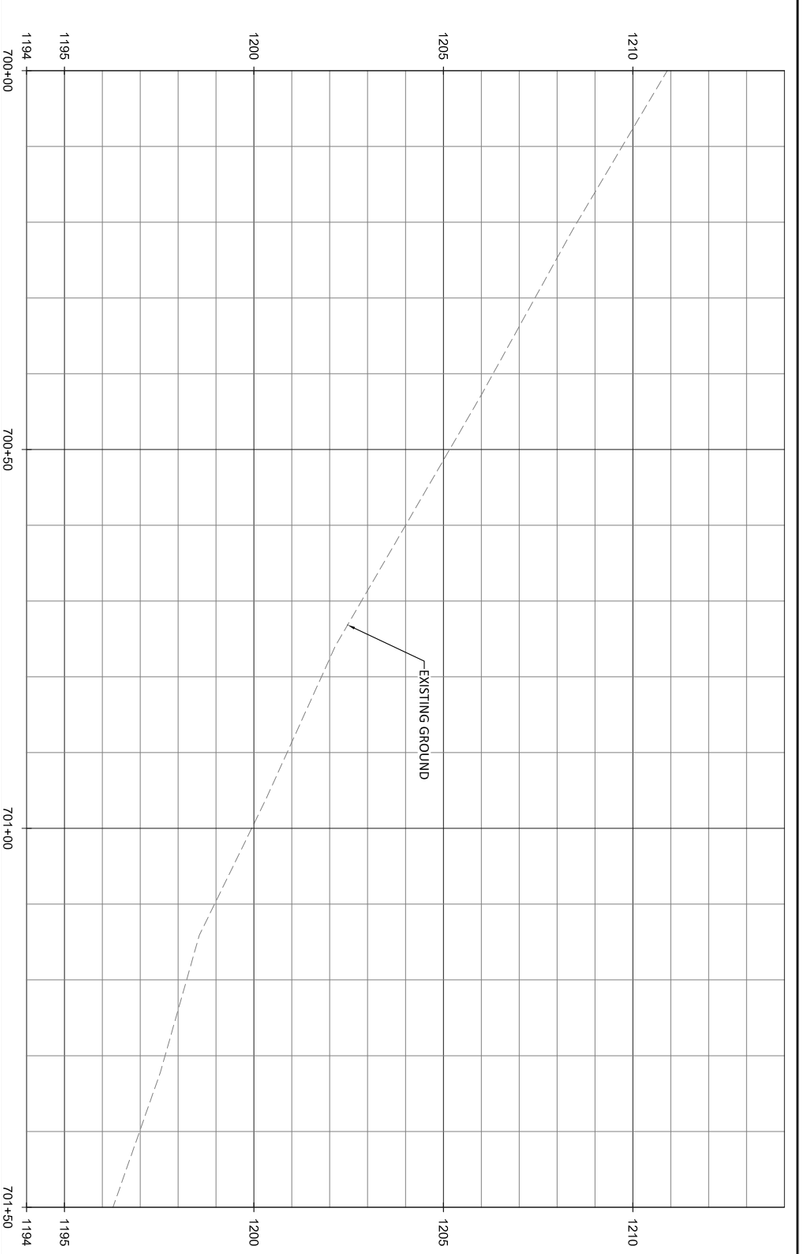

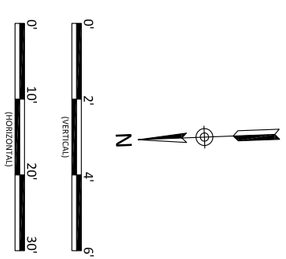

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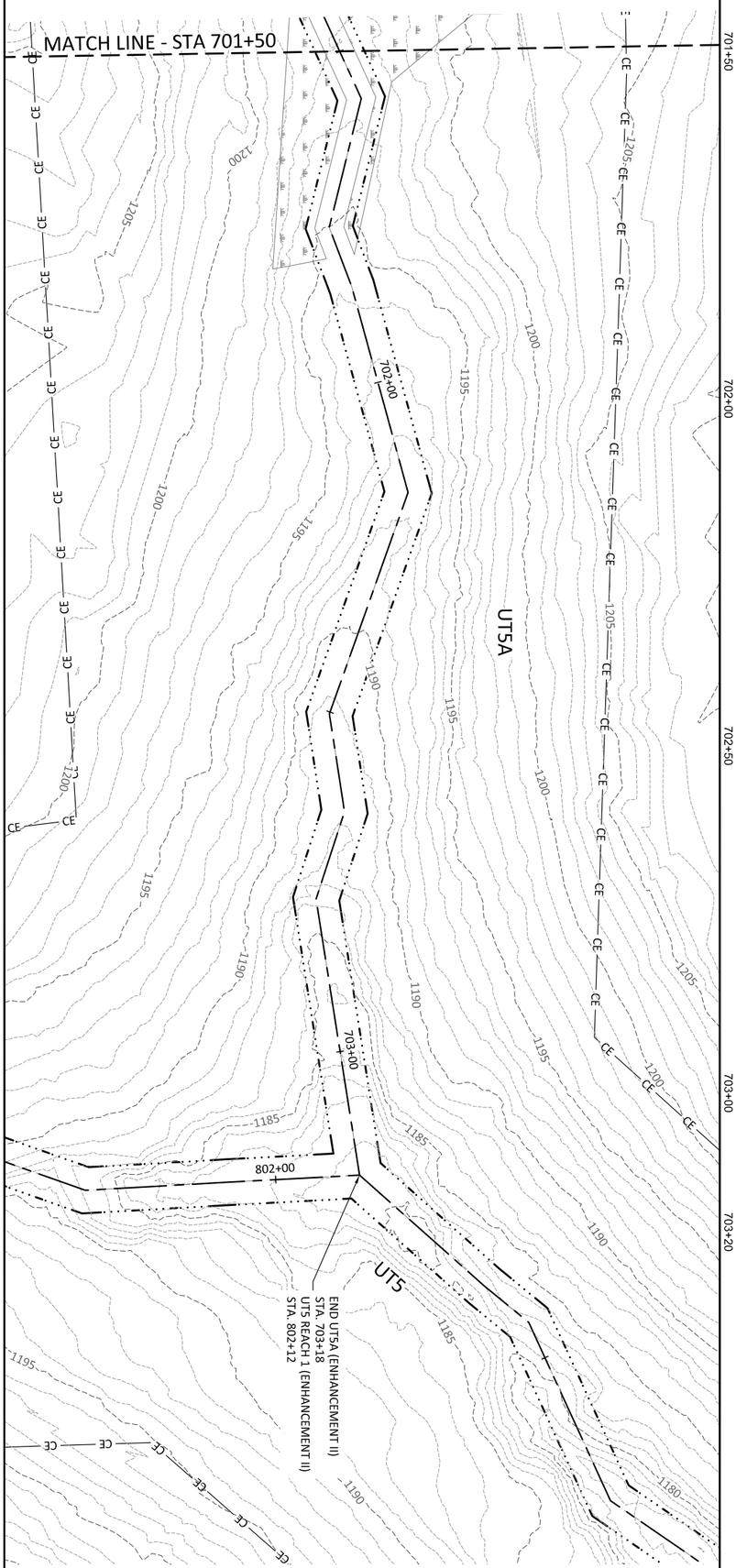

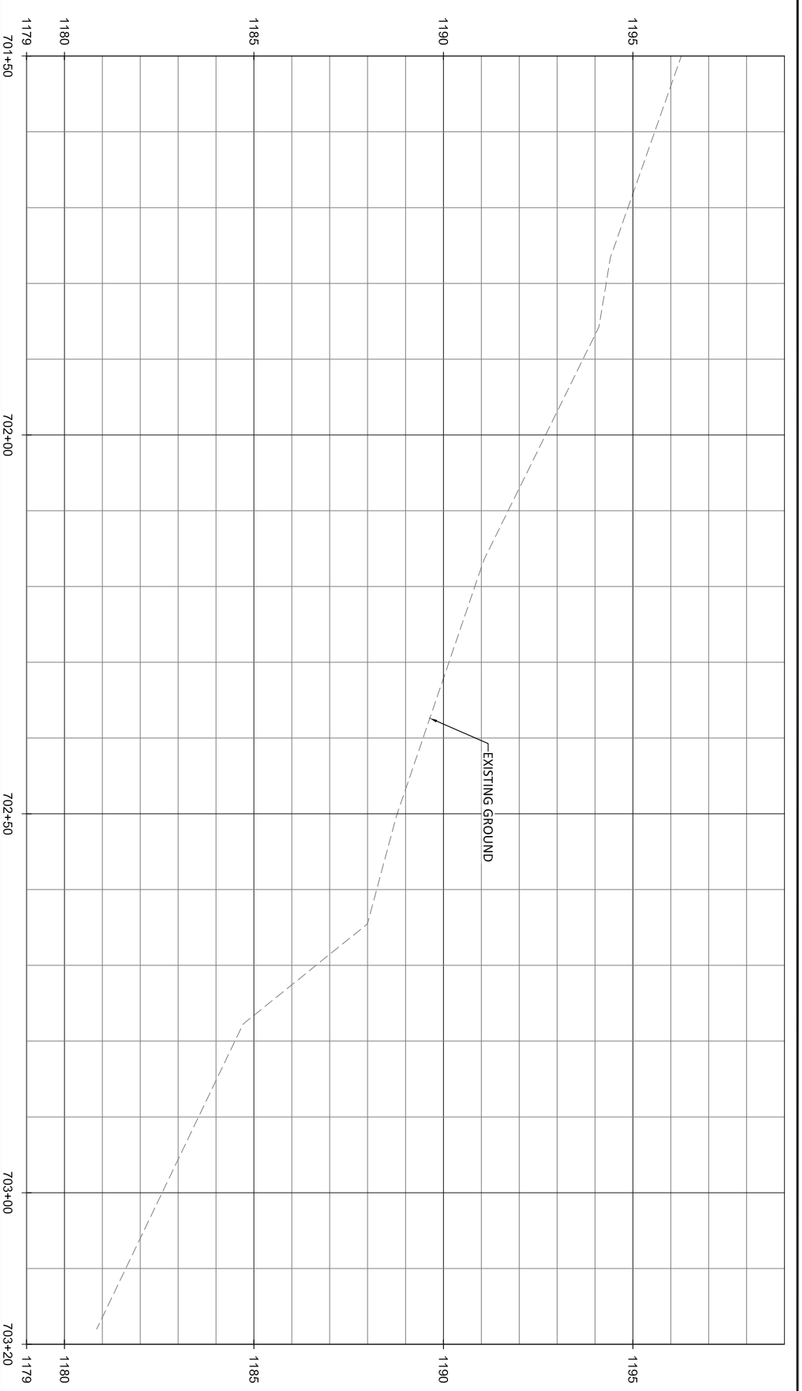

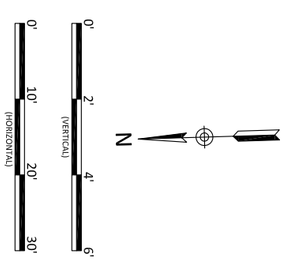

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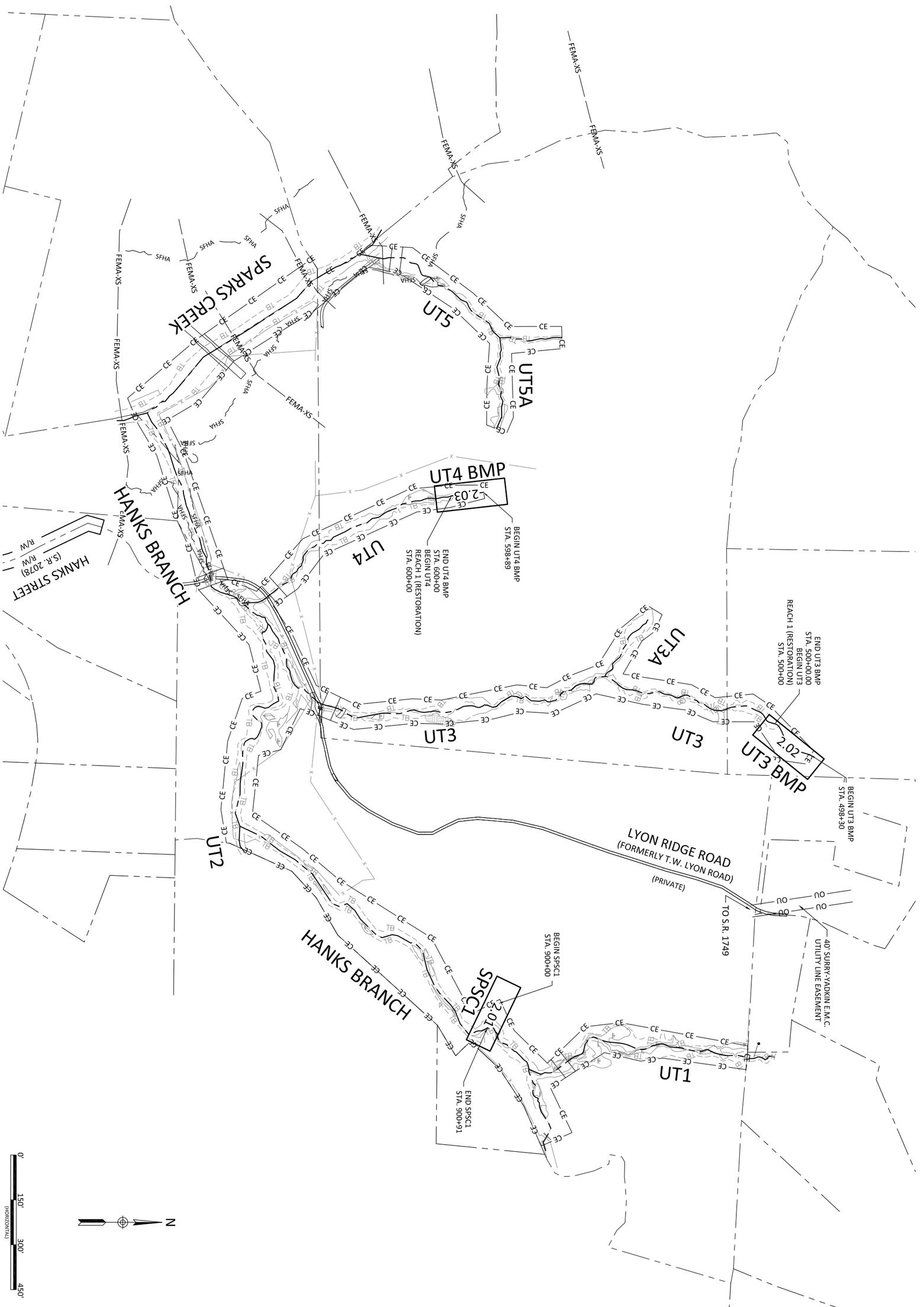

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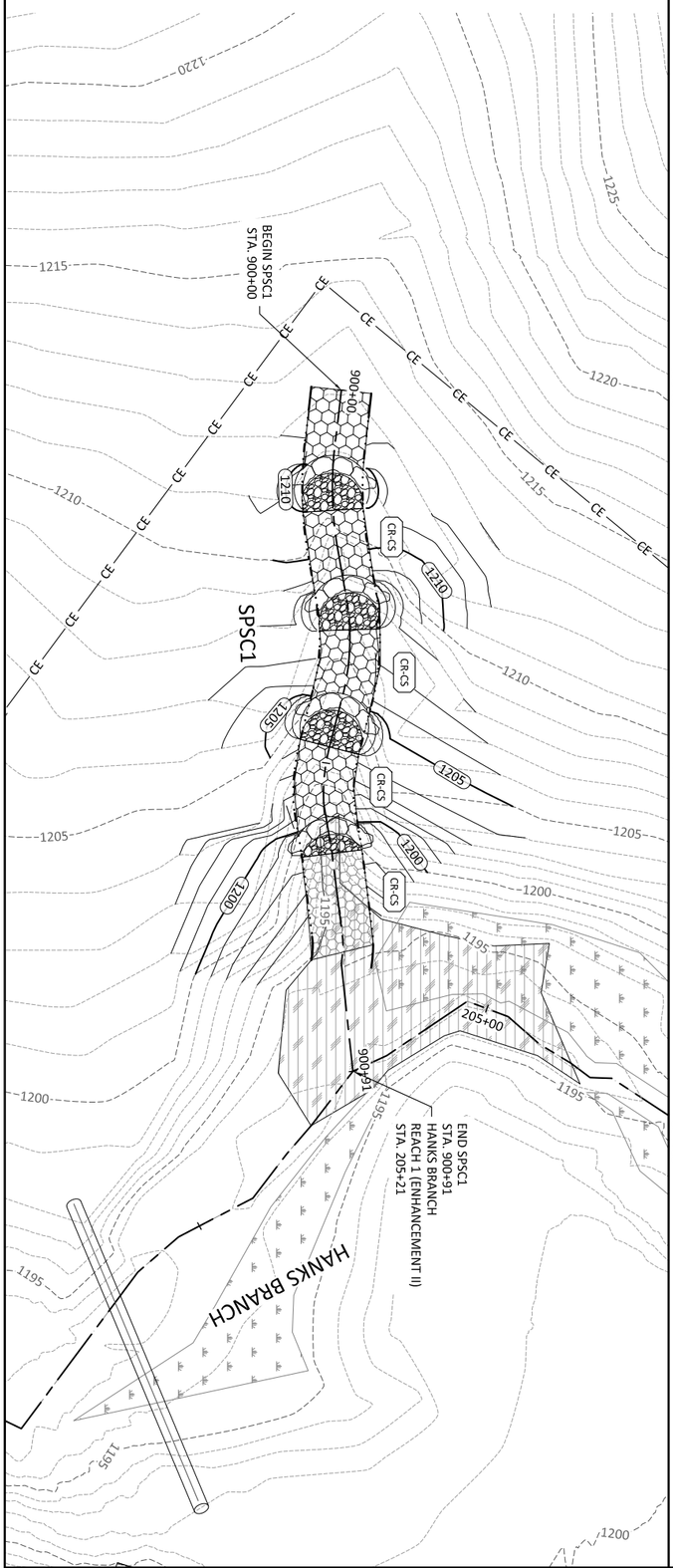

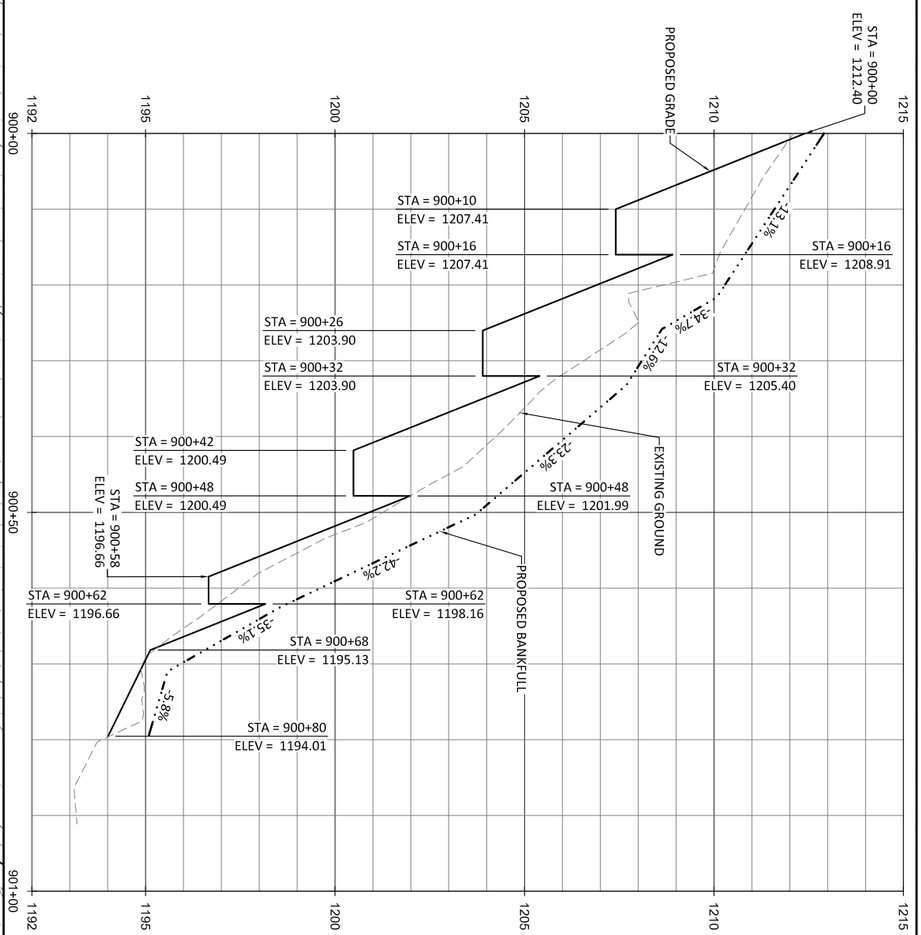

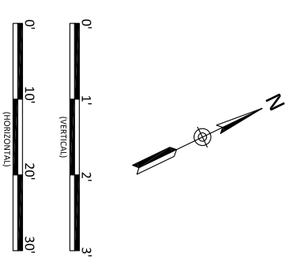

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SPSC1
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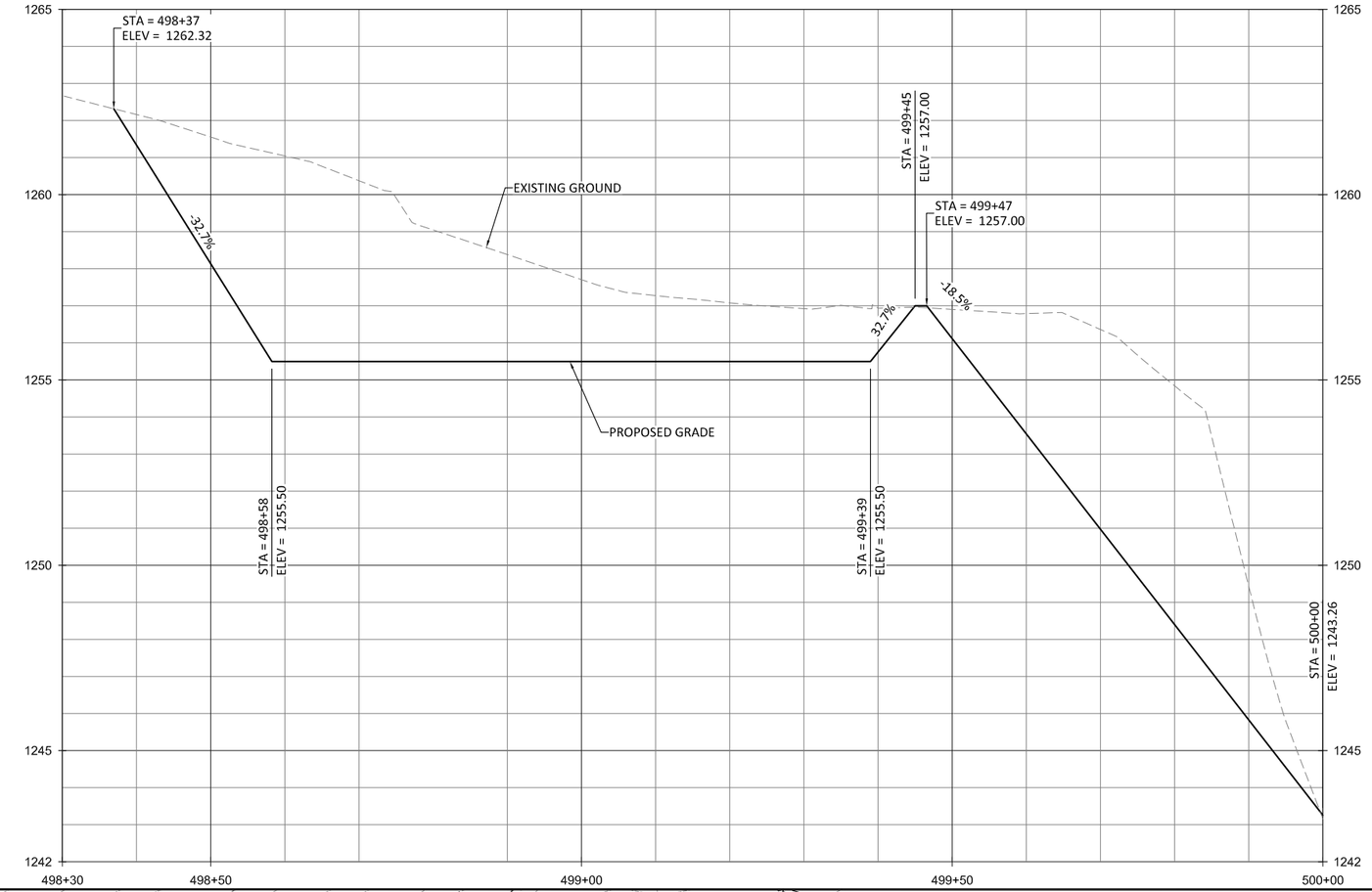

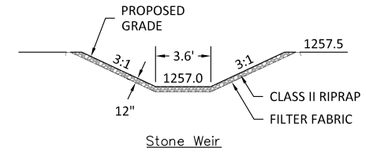

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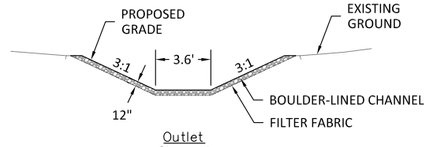

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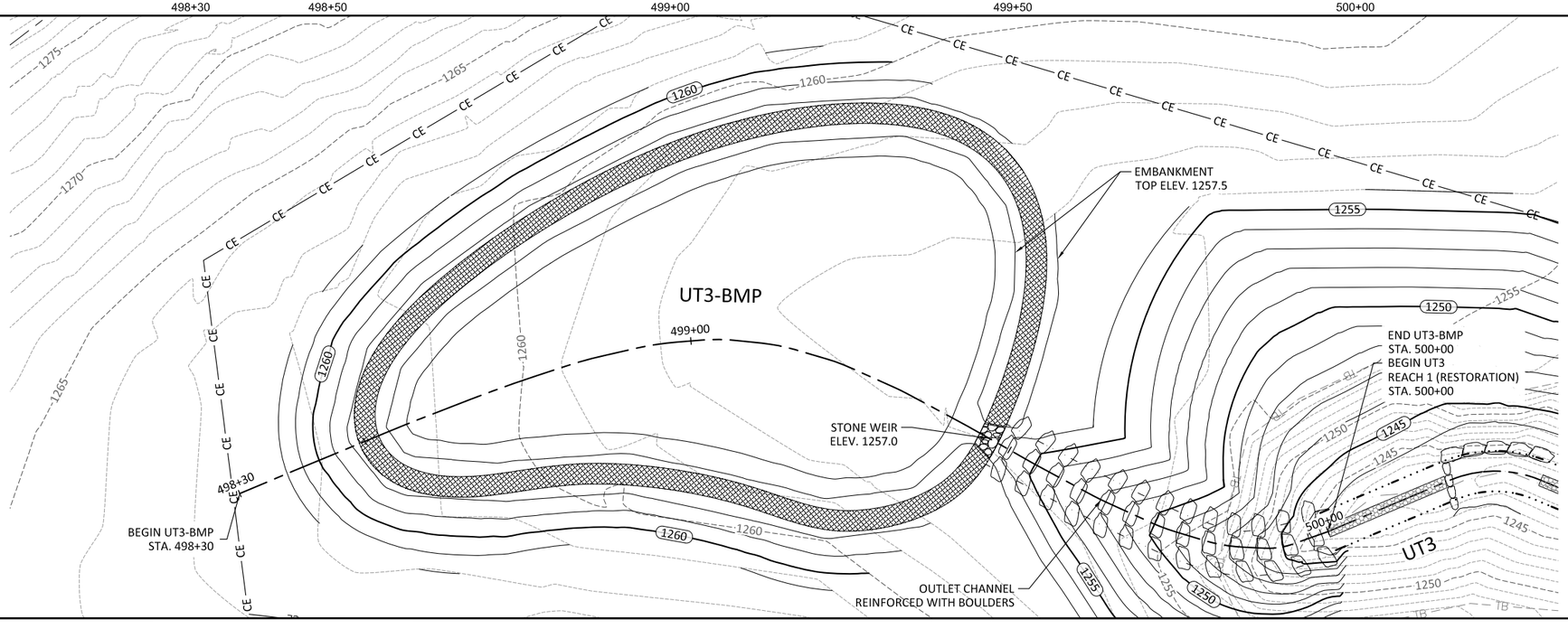

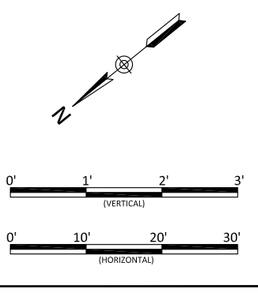

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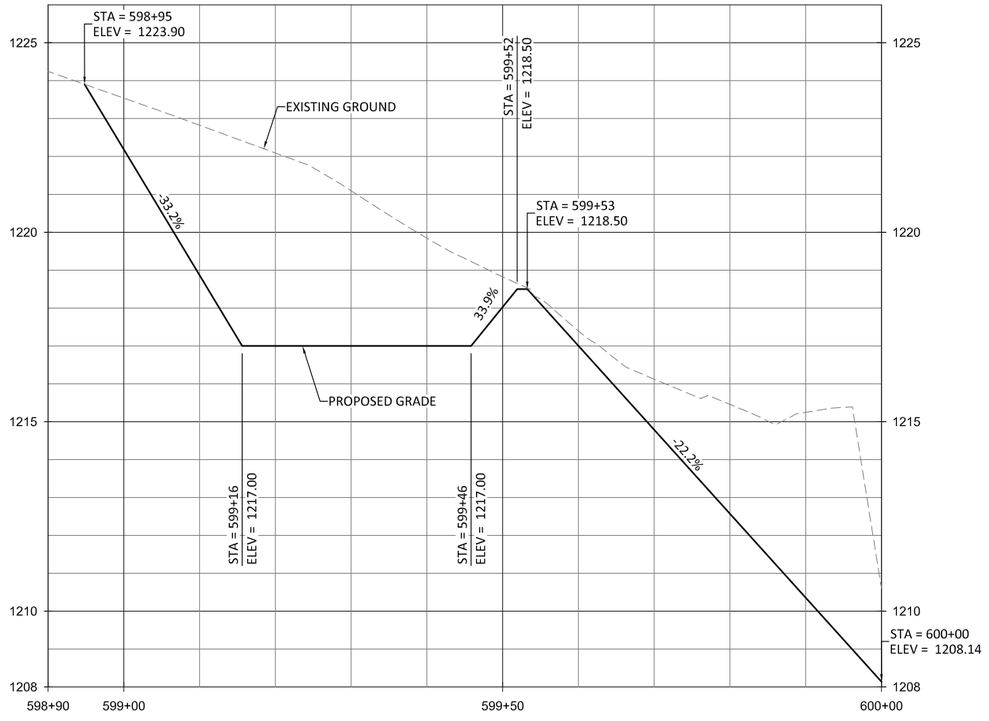

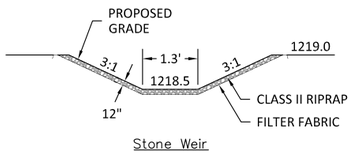

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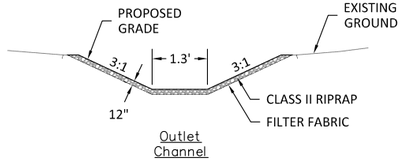

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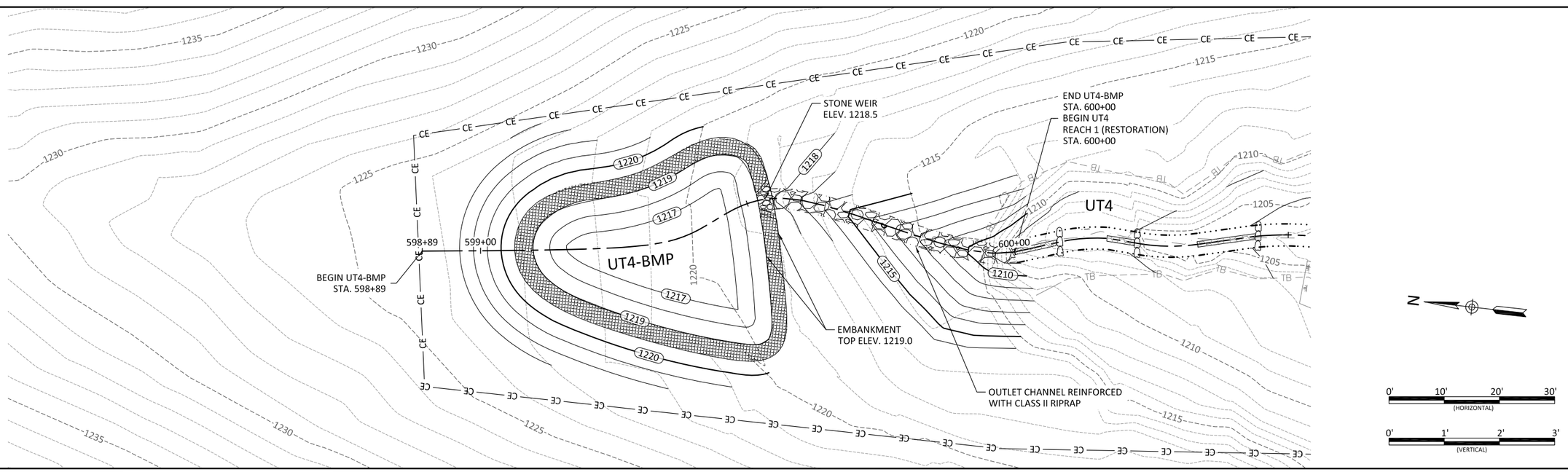

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Sheet 2.03

July 27, 2020

Buffer Planting Zone (8.8 acres)

Bare Root

Species	Common Name	Indiv. Spacing	Caliper Size	Stratum	Wetland Indicator Status	% of Stems
Platanus occidentalis	Sycamore	6-12 ft.	0.25"-1.0"	Canopy	FACW	20%
Quercus rubra	Northern Red Oak	6-12 ft.	0.25"-1.0"	Canopy	FACU	10%
Betula nigra	River Birch	6-12 ft.	0.25"-1.0"	Canopy	FACW	15%
Morus rubra	Red Mullberry	6-12 ft.	0.25"-1.0"	Canopy	FACU	5%
Nyssa sylvatica	Blackgum	6-12 ft.	0.25"-1.0"	Canopy	FAC	10%
Ulmus americana	American Elm	6-12 ft.	0.25"-1.0"	Canopy	FACW	10%
Liriodendron tulipifera	Tulip Poplar	6-12 ft.	0.25"-1.0"	Canopy	FACU	3%
Quercus alba	White Oak	6-12 ft.	0.25"-1.0"	Canopy	FACU	10%
Diospyros virginiana	Common Persimmon	6-12 ft.	0.25"-1.0"	Canopy	FAC	7%
Acer negundo	Boxelder	6-12 ft.	0.25"-1.0"	Canopy	FAC	5%
Prunus serotina	Black Cherry	6-12 ft.	0.25"-1.0"	Canopy	FACU	5%
						100%

Note: Buffer zone species to be planted on 6' spacing in rows spaced 12' apart.

Note: Wetland Indicator Status data sourced from USDA Plant Database

Permanent Seeding Outside Easement (0.6 acres)

Approved Dates	Species Name	Common Name	Stratum	Density (lbs/acre)	Percentage
All Year	*Festuca arundinacea*	Tall Fescue	Herb	40	70%
All Year	*Festuca rubra*	Creeping Red Fescue	Herb	40	10%
All Year	*Dactylis glomerata*	Orchardgrass	Herb	40	20%
					100%

Permanent Wetland Seeding (0.5 acres)

Pure Live Seed (20 lbs/acre)

Approved Dates	Species Name	Common Name	Stratum	Wetland Indicator Status	Density (lbs/acre)
All Year	*Panicum rigidulum*	Redtop Panicgrass	Herb	FACW	1.2
All Year	*Agrostis hyemalis*	Winter Bentgrass	Herb	FAC	1.0
All Year	*Elymus virginicus*	Virginia Wild Rye	Herb	FACW	2.0
All Year	*Sparganium americanum*	Eastern Bur Reed	Herb	OBL	0.1
All Year	*Panicum virgatum*	Switchgrass	Herb	FAC	2.0
All Year	*Tripsacum dactyloides*	Eastern Gamagrass	Herb	FACW	2.5
All Year	*Panicum clandestinum*	Deertongue	Herb	FAC	3.0
All Year	*Caex lurida*	Lurid Sedge	Herb	OBL	0.5
All Year	*Carex vulpinoidea*	Fox Sedge	Herb	OBL	2.0
All Year	*Carex lupulina*	Hop Sedge	Herb	OBL	0.5
All Year	*Juncus effusus*	Common Rush	Herb	FACW	2.0
All Year	*Carex frankii*	Frank's Sedge	Herb	41.0	1.0
All Year	*Scirpus cyperinus*	Woolgrass	Herb	OBL	0.2
All Year	*Peltandra virginica*	Arrow Arum	Herb	OBL	0.4
All Year	*Bidens aristosa*	Bur-Marigold	Herb	FACW	1.6
					20.0

Streambank Planting Zone 1 - Hanks Branch (0.3 acres)

Live Stakes

Species	Common Name	Indiv. Spacing	Size	Stratum	Wetland Indicator Status	% of Stems
Salix nigra	Black Willow	3-6 ft.	0.5"-1.5" cal.	Shrub	OBL	35%
Cornus ammomum	Silky Dogwood	3-6 ft.	0.5"-1.5" cal.	Shrub	FACW	20%
Salix sericea	Silky Willow	3-6 ft.	0.5"-1.5" cal.	Shrub	OBL	25%
Sambucus canadensis	Elderberry	3-6 ft.	0.5"-1.5" cal.	Shrub	FACW	10%
Cephalanthus occidentalis	Buttonbush	3-6 ft.	0.5"-1.5" cal.	Shrub	OBL	10%
						100%
Herbaceous Plugs						
Juncus effusus	Common Rush	4 ft.	1.0"- 2.0" plug	Herb	FACW	40%
Cyperus strigosus	False Nutsedge	4 ft.	1.0"- 2.0" plug	Herb	FACW	15%
Carex lurida	Lurid Sedge	4 ft.	1.0"- 2.0" plug	Herb	OBL	15%
Carex crinita	Fringed Sedge	4 ft.	1.0"- 2.0" plug	Herb	OBL	15%
Scirpus cyperinus	Woolgrass	4 ft.	1.0"- 2.0" plug	Herb	OBL	15%
						100%

Streambank Planting Zone 2 - UT1-UT5 (0.5 acres)

Live Stakes

Species	Common Name	Indiv. Spacing	Min. Size	Stratum	Wetland Indicator Status	% of Stems
Cornus ammomum	Silky Dogwood	3-6 ft.	0.5"-1.5" cal.	Shrub	FACW	30%
Salix sericea	Silky Willow	3-6 ft.	0.5"-1.5" cal.	Shrub	OBL	30%
Sambucus canadensis	Elderberry	3-6 ft.	0.5"-1.5" cal.	Shrub	FACW	15%
Cephalanthus occidentalis	Buttonbush	3-6 ft.	0.5"-1.5" cal.	Shrub	OBL	15%
Physocarpus opulifloium	Ninebark	3-6 ft.	0.5"-1.5" cal.	Shrub	FACW	10%
						100%
Herbaceous Plugs						
Juncus effusus	Common Rush	4 ft.	1.0"- 2.0" plug	Herb	FACW	40%
Cyperus strigosus	False Nutsedge	4 ft.	1.0"- 2.0" plug	Herb	FACW	15%
Carex lurida	Lurid Sedge	4 ft.	1.0"- 2.0" plug	Herb	OBL	15%
Carex crinita	Fringed Sedge	4 ft.	1.0"- 2.0" plug	Herb	OBL	15%
Scirpus cyperinus	Woolgrass	4 ft.	1.0"- 2.0" plug	Herb	OBL	15%
						100%

Zone 1 - Streambank Planting - Hanks Branch
(See Detail 2, Sheet 6.07)

Zone 2 - Streambank Planting - UT1-UT5
(See Detail 3, Sheet 6.07)

Zone 3 - Buffer Planting Zone
(See Detail 1, Sheet 6.07)

Zone 4 - Wetland Planting Zone
(See Detail 1, Sheet 6.07)

Zone 5 - Permanent Seeding Outside Easement

Note: Non-hatched areas within easement are currently vegetated and will be planted as needed to achieve target density. Buffer planting will occur within the Limits of Disturbance

Permanent Riparian Seeding (8.8 acres)

Pure Live Seed (20 lbs/acre)

Approved Dates	Species Name	Common Name	Stratum	Wetland Indicator Status	lbs/acre
All Year	*Panicum rigidulum*	Redtop Panicgrass	Herb	FACW	2.0
All Year	*Schizachyrium scoparium*	Little Bluestem	Herb	FACU	1.8
All Year	*Sorghastrum nutans*	Indian Grass	Herb	FACU	2.0
All Year	*Chasmanthium latifolium*	River Oats	Herb	FACU	1.0
All Year	*Elymus virginicus*	Virginia Wild Rye	Herb	FACW	3.0
All Year	*Panicum clandestinum*	Deertongue	Herb	FAC	2.5
All Year	*Carex vulpinoidea*	Fox Sedge	Herb	OBL	2.0
All Year	*Rudbeckia hirta*	Blackeyed Susan	Herb	FACU	1.0
All Year	*Coreopsis lanceolata*	Lanceleaf Coreopsis	Herb	FACU	1.0
All Year	*Bidens aristosa*	Bur-marigold	Herb	FACW	1.0
All Year	*Chamaecrista fasciculata var. fasciculata*	Partridge Pea	Herb	FACU	1.0
All Year	*Achillea millefolium*	Yarrow	Herb	FACU	0.5
All Year	*Juncus coriaceous*	Leathery Rush	Herb	FACW	0.5
All Year	*Juncus tenuis*	Path Rush	Herb	FAC	0.5
All Year	*Pycnanthemum tenuifolium*	Slender Mountain Mint	Herb	FACW	0.2
					20.0

Wetland Planting Zone Obligate Species Planting (0.5 acres)

Herbaceous Plugs

Species	Common Name	Indiv. Spacing	Size	Stratum	Wetland Indicator Status	% of Stems
Juncus effusus	Common Rush	4 ft.	1.0"- 2.0" plug	Herb	FACW	30%
Sparganium americanum	Eastern Bur Reed	4 ft.	1.0"- 2.0" plug	Herb	OBL	10%
Sagittaria latifolia	Duck Potato	4 ft.	1.0"- 2.0" plug	Herb	OBL	30%
Scirpus cyperinus	Woolgrass	4 ft.	1.0"- 2.0" plug	Herb	OBL	10%
Carex lurida	Lurid Sedge	4 ft.	1.0"- 2.0" plug	Herb	OBL	20%
						100%

Note: to be planted in area of lowest elevation where water may collect. Flood tolerant emergent aquatics.

Wetland Planting Zone Woody Species (0.5 acres)

Species	Common Name	Indiv. Spacing	Caliper Size	Stratum	Wetland Indicator Status	% of Stems
Bare Root						
Platanus occidentalis	Sycamore	6-12 ft.	0.25"-1.0"	Canopy	FACW	22%
Ulmus americana	American Elm	6-12 ft.	0.25"-1.0"	Canopy	FACW	10%
Betula nigra	River Birch	6-12 ft.	0.25"-1.0"	Canopy	FACW	20%
Acer negundo	Boxelder	6-12 ft.	0.25"-1.0"	Canopy	FAC	10%
Ulmus rubra	Slippery Elm	6-12 ft.	0.25"-1.0"	Canopy	FAC	5%
Alnus serrulata	Tag Alder	6-12 ft.	0.25"-1.0"	Shrub	OBL	10%
Rosa palustris	Swamp Rose	6-12 ft.	0.25"-1.0"	Shrub	OBL	3%
Live Stake						
Salix nigra	Black Willow	6-12 ft.	0.25"-1.0"	Midstory	OBL	20%
						100%

Note: Wetland zone species to be planted on 6' spacing in rows spaced 12' apart.

Temporary Seeding (9.9 acres)

Pure Live Seed

Approved Dates	Species Name	Common Name	Stratum	Density (lbs/acre)
Aug 15 - May 1	*Secale cereale*	Rye Grain	Herb	80
May 1 - Aug 15	*Setaria italica*	German Millet	Herb	50

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Wilkes County, North Carolina

Planting Tables

Revisions:

Date: 06.05.20
Job Number: 005-02177
Project Engineer: NMM
Drawn By: CAW
Checked By: GAT

Sheet 3.00

X:\Shared\Projects\005-02177 Lyon Hills\Cadd\Plans\02177 Planting Tables.dwg

July 27, 2020

Zone 1 - Streambank Planting - Hanks Branch
(See Detail 2, Sheet 6.07)

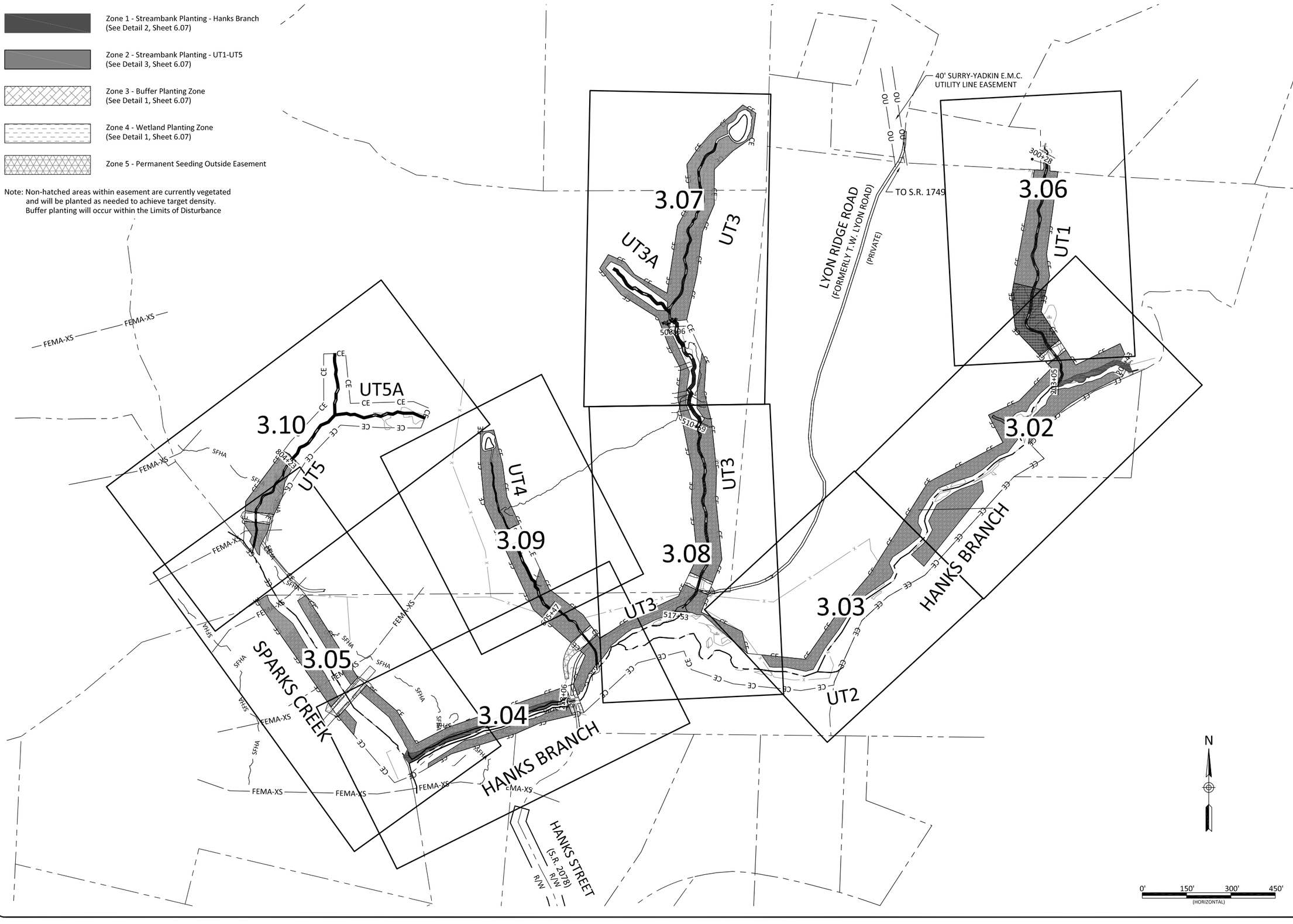
Zone 2 - Streambank Planting - UT1-UT5
(See Detail 3, Sheet 6.07)

Zone 3 - Buffer Planting Zone
(See Detail 1, Sheet 6.07)

Zone 4 - Wetland Planting Zone
(See Detail 1, Sheet 6.07)

Zone 5 - Permanent Seeding Outside Easement

Note: Non-hatched areas within easement are currently vegetated and will be planted as needed to achieve target density. Buffer planting will occur within the Limits of Disturbance



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Planting Overview

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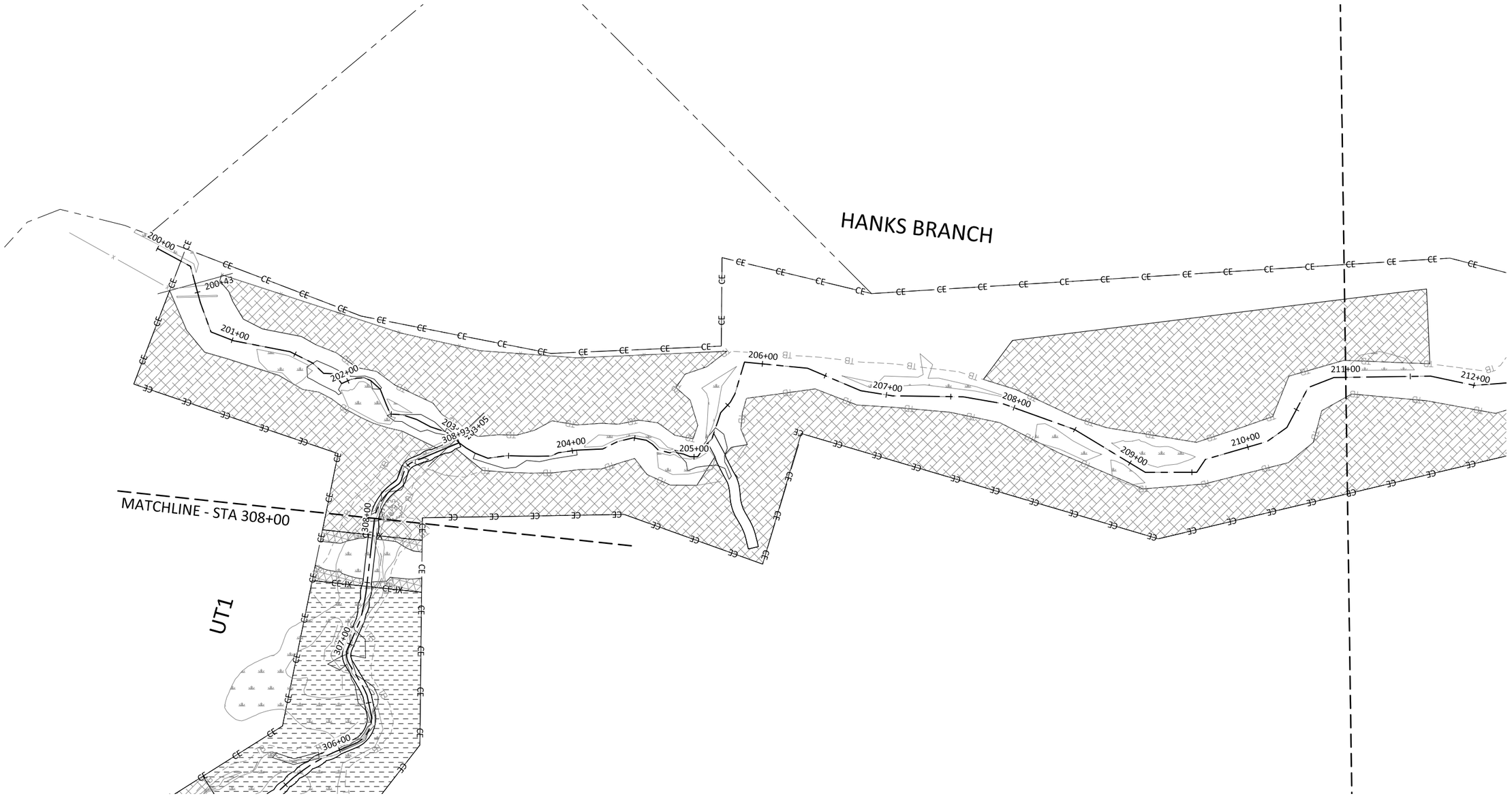
Checked By:	GAT

Sheet 3.01



Zone 1 - Streambank Planting - Hanks Branch
(See Detail 2, Sheet 6.07)

Zone 2 - Streambank Planting - UT1-UT5
(See Detail 3, Sheet 6.07)

Zone 3 - Buffer Planting Zone
(See Detail 1, Sheet 6.07)

Zone 4 - Wetland Planting Zone
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Zone 5 - Permanent Seeding Outside Easement

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N

0' 40' 80' 120'
(HORIZONTAL)

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Hanks Branch
Planting Plan

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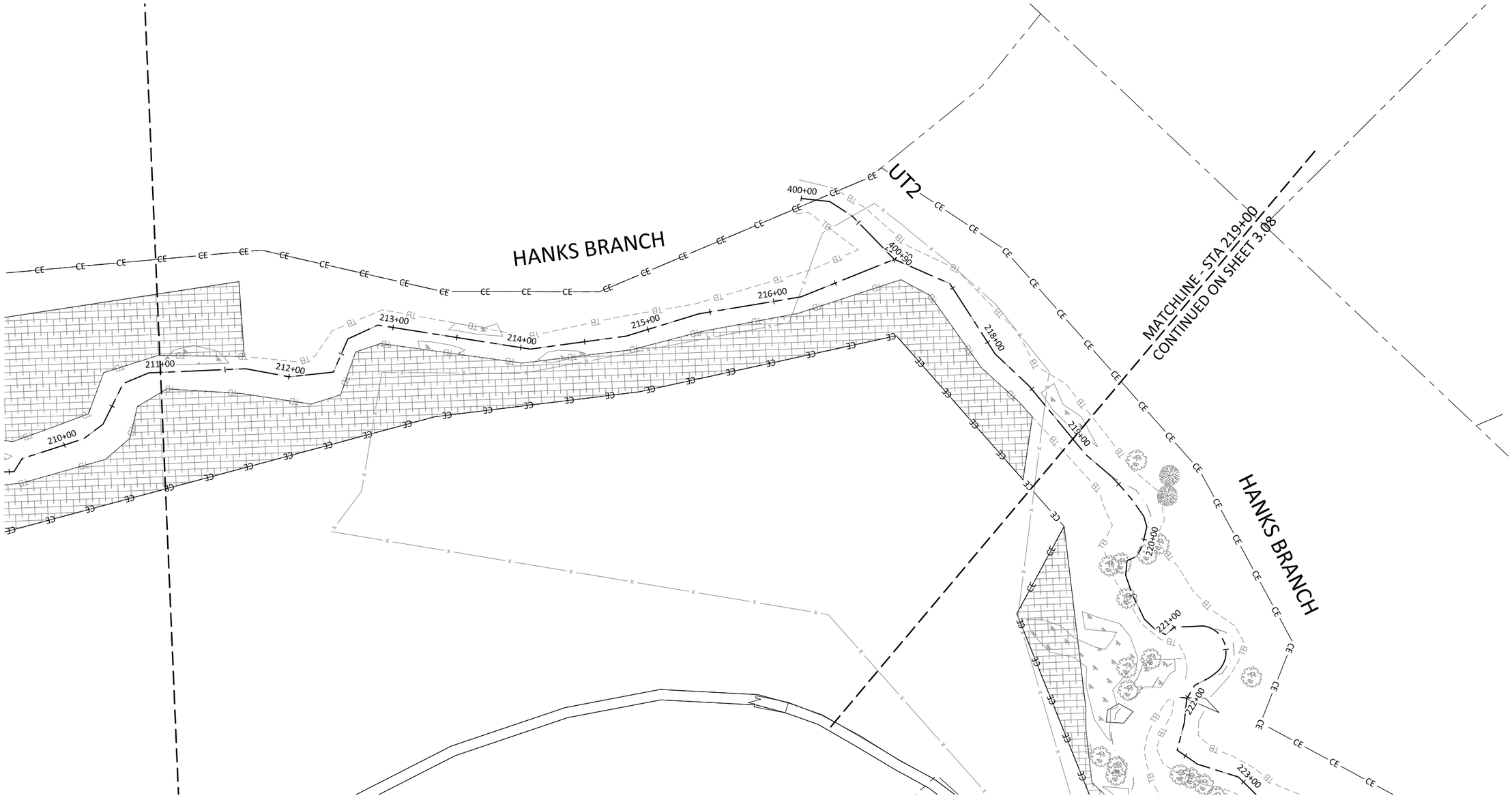
Sheet 3.02

July 27, 2020



Zone 1 - Streambank Planting - Hanks Branch
(See Detail 2, Sheet 6.07)

Zone 2 - Streambank Planting - UT1-UT5
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Zone 5 - Permanent Seeding Outside Easement

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N

0' 40' 80' 120'
(HORIZONTAL)

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Hanks Branch
Planting Plan

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Sheet 3.03

July 27, 2020

MATCHLINE - STA 224+00
CONTINUED ON SHEET 3.08

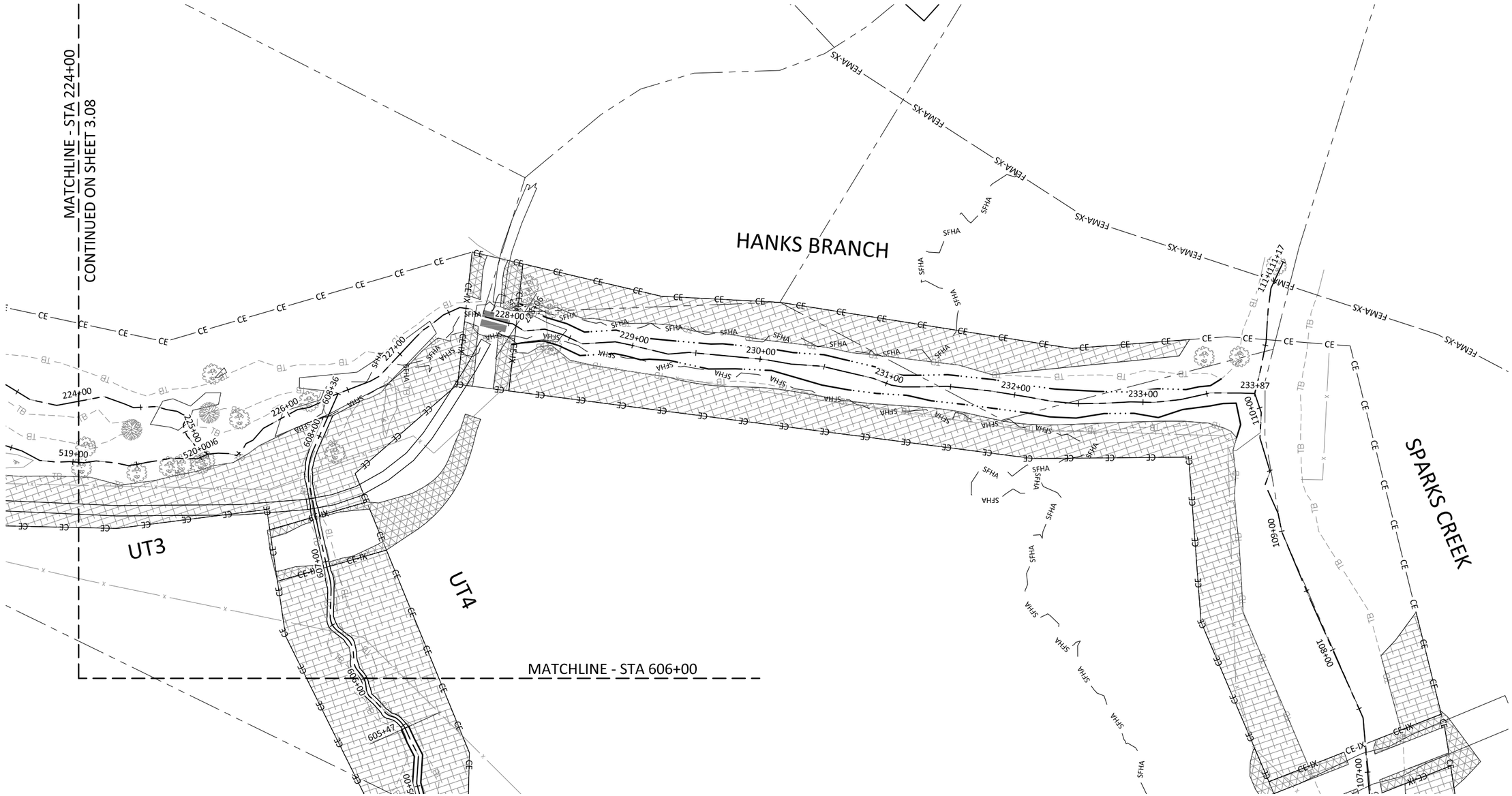
HANKS BRANCH

SPARKS CREEK

UT3

UT4

MATCHLINE - STA 606+00



Zone 1 - Streambank Planting - Hanks Branch
(See Detail 2, Sheet 6.07)

Zone 2 - Streambank Planting - UT1-UT5
(See Detail 3, Sheet 6.07)

Zone 3 - Buffer Planting Zone
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Zone 5 - Permanent Seeding Outside Easement

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N

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Hanks Branch
Planting Plan

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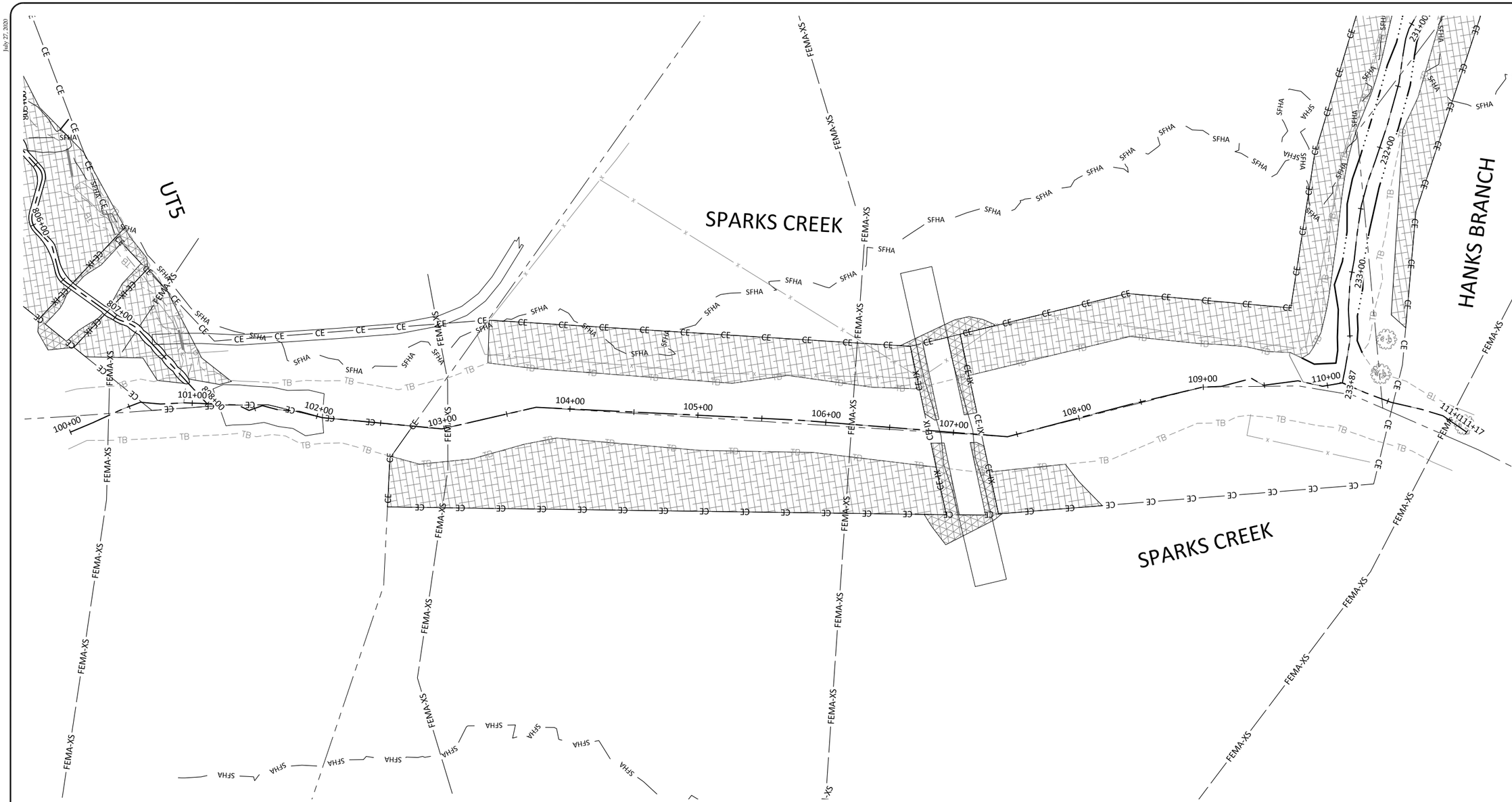
Sheet 3.04



Zone 1 - Streambank Planting - Hanks Branch
(See Detail 2, Sheet 6.07)

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Sparks Creek
Planting Plan

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Sheet 3.05

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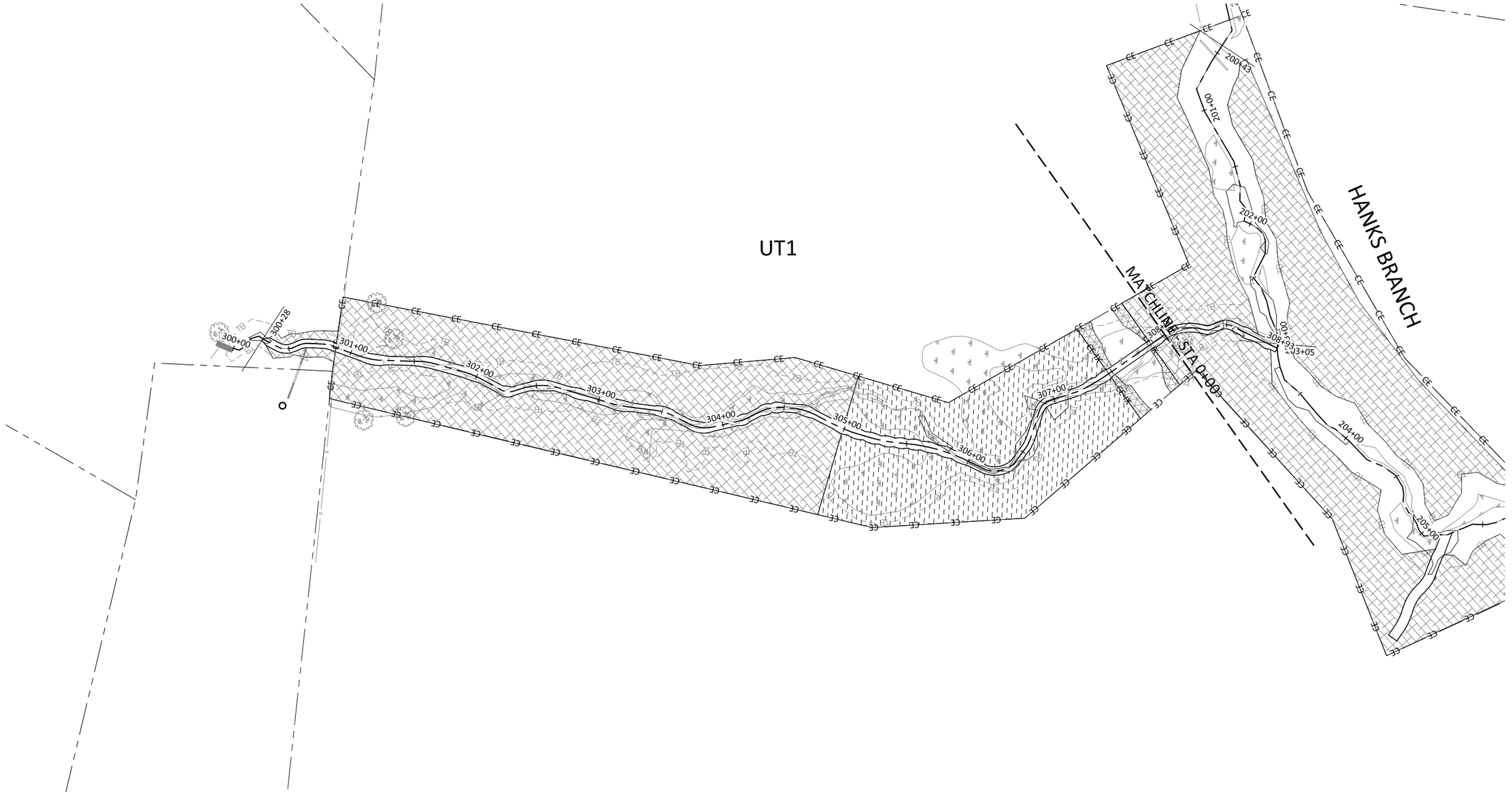
July 27, 2020



Zone 1 - Streambank Planting - Hanks Branch
(See Detail 2, Sheet 6.07)

Zone 2 - Streambank Planting - UT1-UT5
(See Detail 3, Sheet 6.07)

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Zone 4 - Wetland Planting Zone
(See Detail 1, Sheet 6.07)

Zone 5 - Permanent Seeding Outside Easement

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Buffer planting will occur within the Limits of Disturbance

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UT1
Planting Plan

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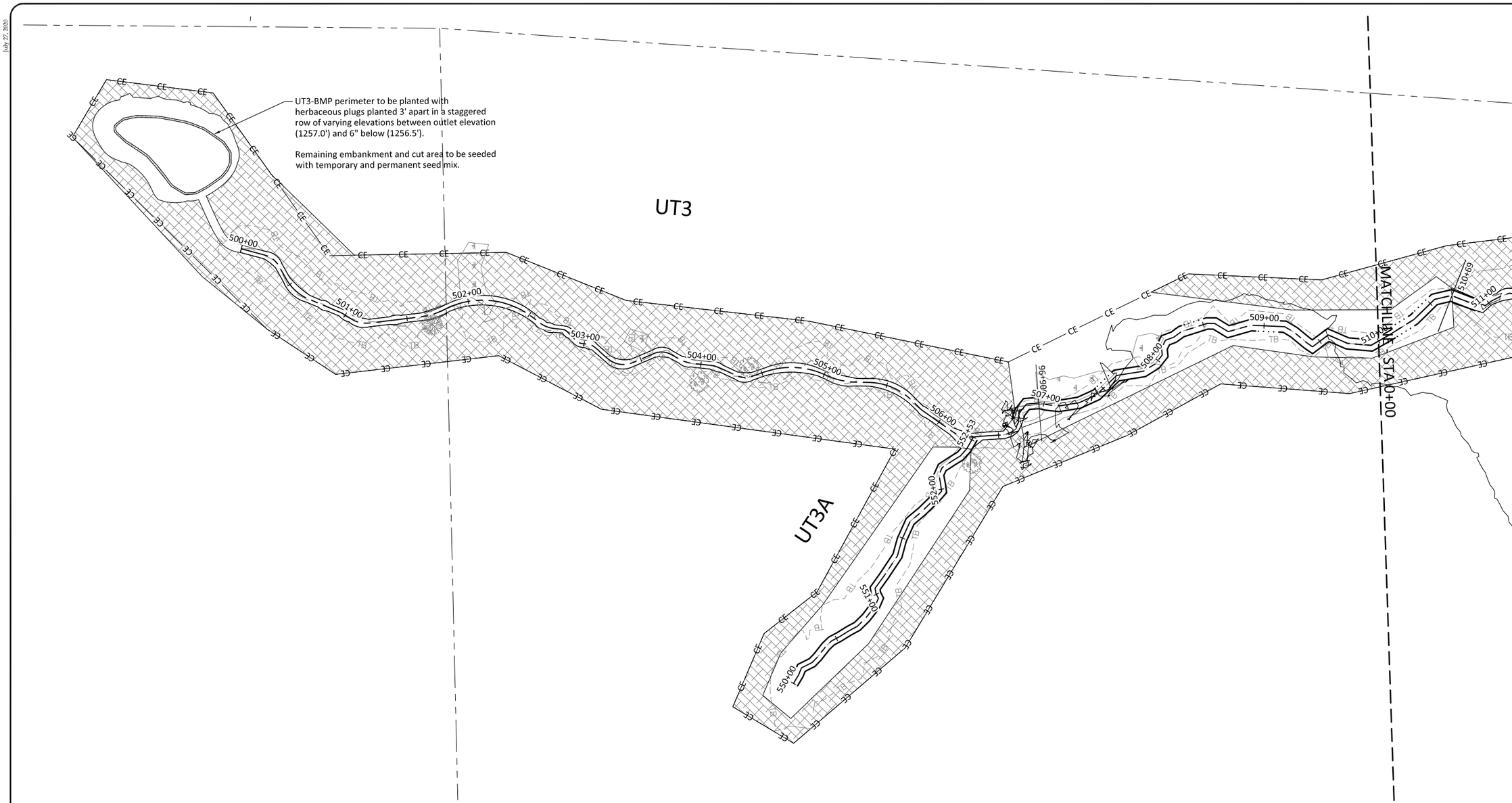
Sheet 3.06

July 27, 2020



Zone 1 - Streambank Planting - Hanks Branch
(See Detail 2, Sheet 6.07)

Zone 2 - Streambank Planting - UT1-UT5
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Zone 5 - Permanent Seeding Outside Easement

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N

0' 40' 80' 120'
(HORIZONTAL)

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UT3 & UT3A
Planting Plan

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Sheet 3.07

July 27, 2020

UT3

HANKS BRANCH

MATCHLINE - STA 219+00
CONTINUED ON SHEET 3.03

MATCHLINE - STA 224+00
CONTINUED ON SHEET 3.04

MATCHLINE - STA 510+00

509+00 510+00 510+69 511+00 512+00 513+00 514+00 515+00 516+00 517+00 517+53 518+00 219+00 220+00 221+00 222+00 223+00 224+00 225+00 520+006 226+00

Zone 1 - Streambank Planting - Hanks Branch
(See Detail 2, Sheet 6.07)

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Zone 5 - Permanent Seeding Outside Easement

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N

0' 40' 80' 120'
(HORIZONTAL)

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UT3
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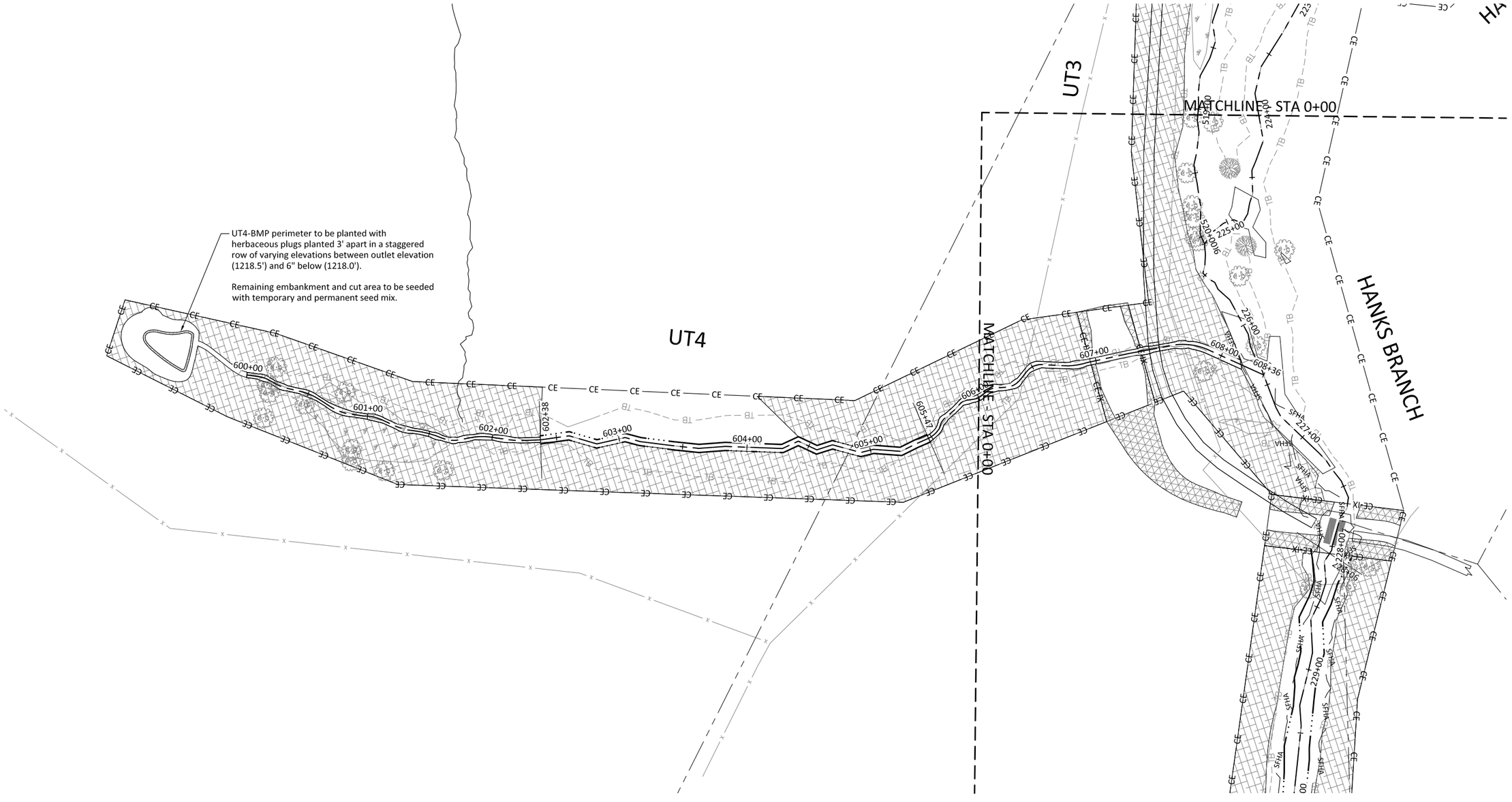
Sheet 3.08

July 27, 2020

UT4-BMP perimeter to be planted with herbaceous plugs planted 3' apart in a staggered row of varying elevations between outlet elevation (1218.5') and 6" below (1218.0').

Remaining embankment and cut area to be seeded with temporary and permanent seed mix.



Zone 1 - Streambank Planting - Hanks Branch
(See Detail 2, Sheet 6.07)

Zone 2 - Streambank Planting - UT1-UT5
(See Detail 3, Sheet 6.07)

Zone 3 - Buffer Planting Zone
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Zone 5 - Permanent Seeding Outside Easement

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(HORIZONTAL)

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UT4
Planting Plan

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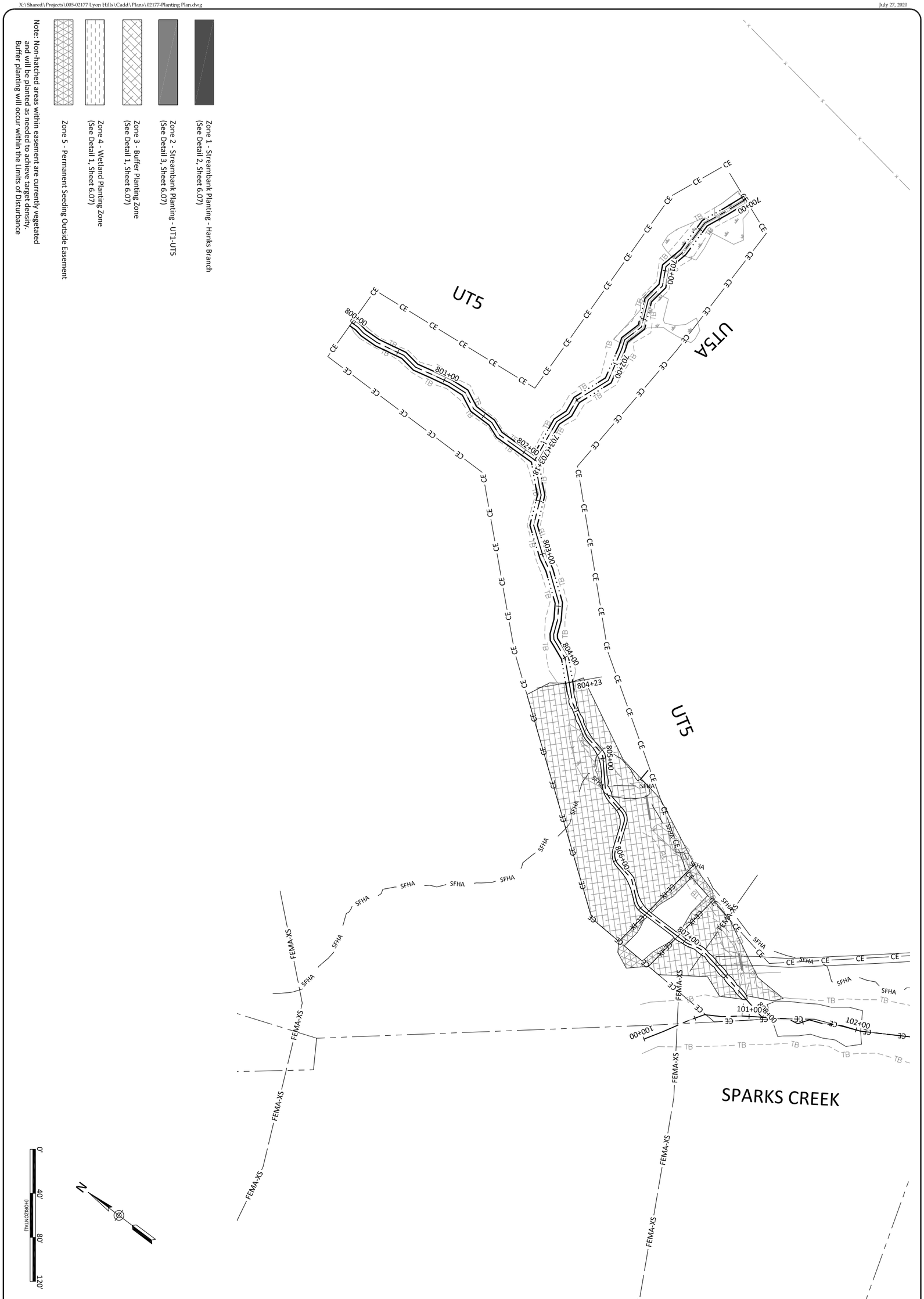
Sheet 3.09



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Lyon Hills Mitigation Site
Wilkes County, North Carolina

UT5 & UT5A
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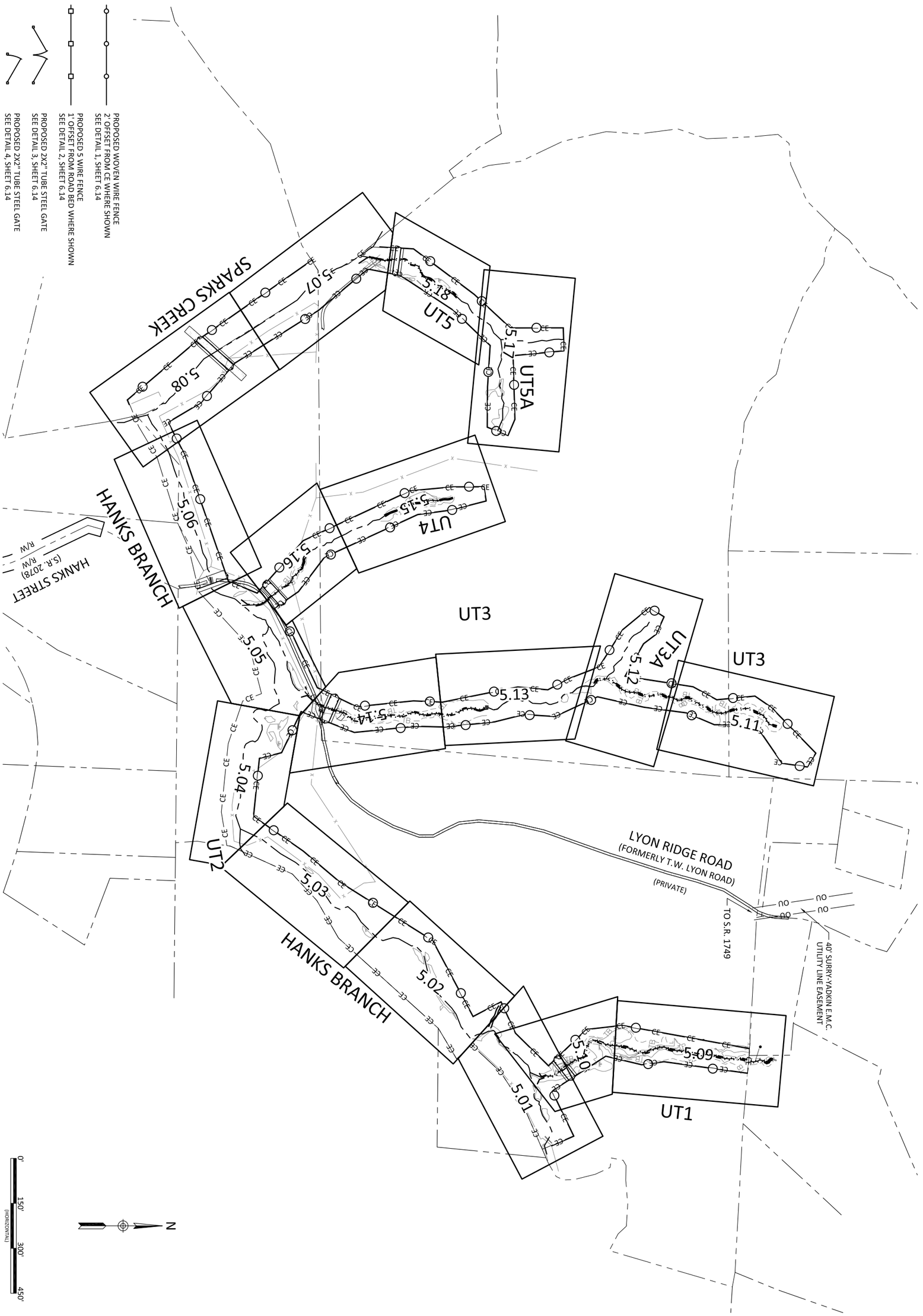

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Lyon Hills Mitigation Site
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Fencing Overview

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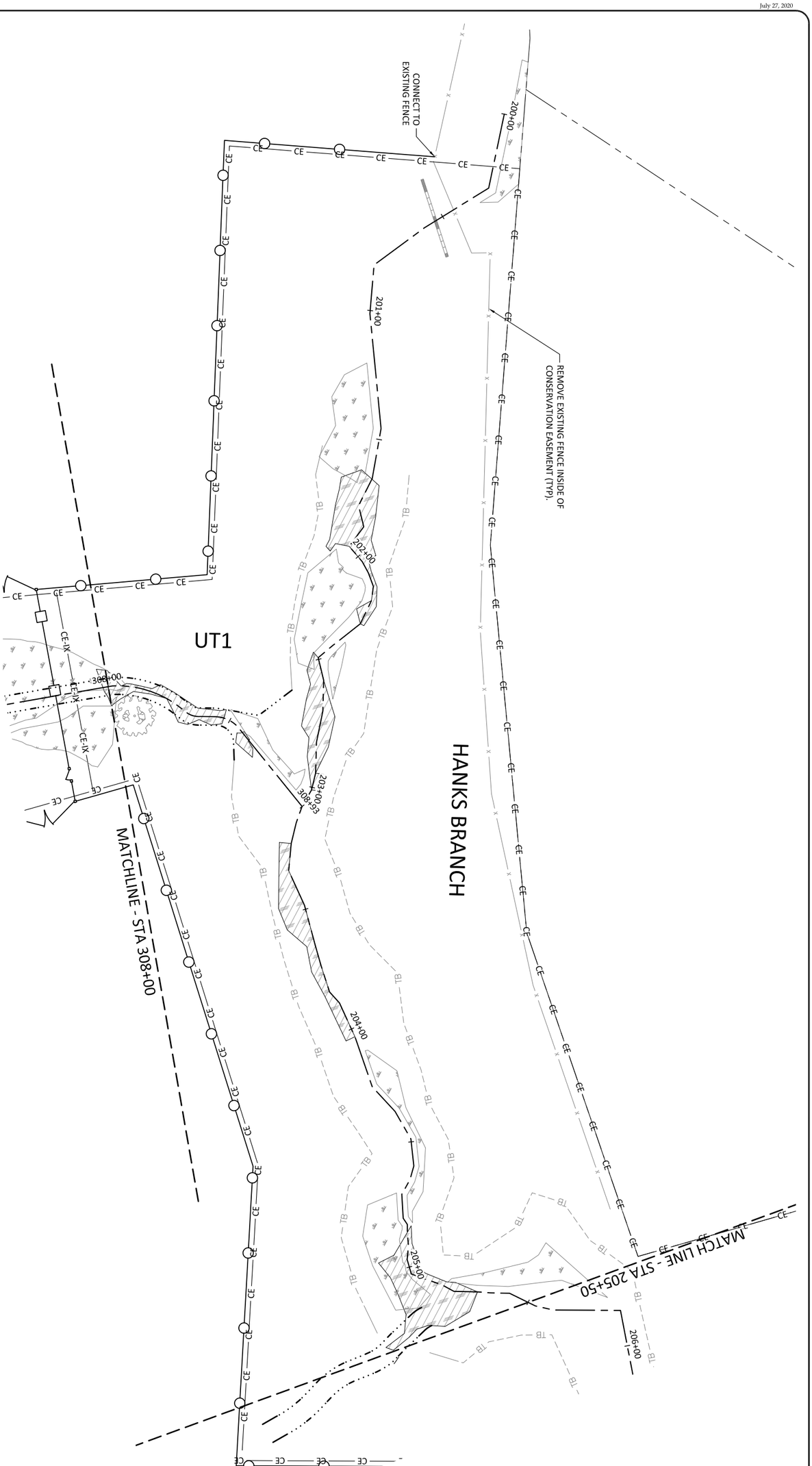
PROPOSED WOVEN WIRE FENCE
2' OFFSET FROM CE WHERE SHOWN
SEE DETAIL 1, SHEET 6.14

PROPOSED 5 WIRE FENCE
1' OFFSET FROM ROAD BED WHERE SHOWN
SEE DETAIL 2, SHEET 6.14

PROPOSED 2X2" TUBE STEEL GATE
SEE DETAIL 3, SHEET 6.14

PROPOSED 2X2" TUBE STEEL GATE
SEE DETAIL 4, SHEET 6.14



0' 20' 40' 60' (HORIZONTAL)

N

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Checked By:	GAT

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Wilkes County, North Carolina

Hanks Branch
Fencing Plan

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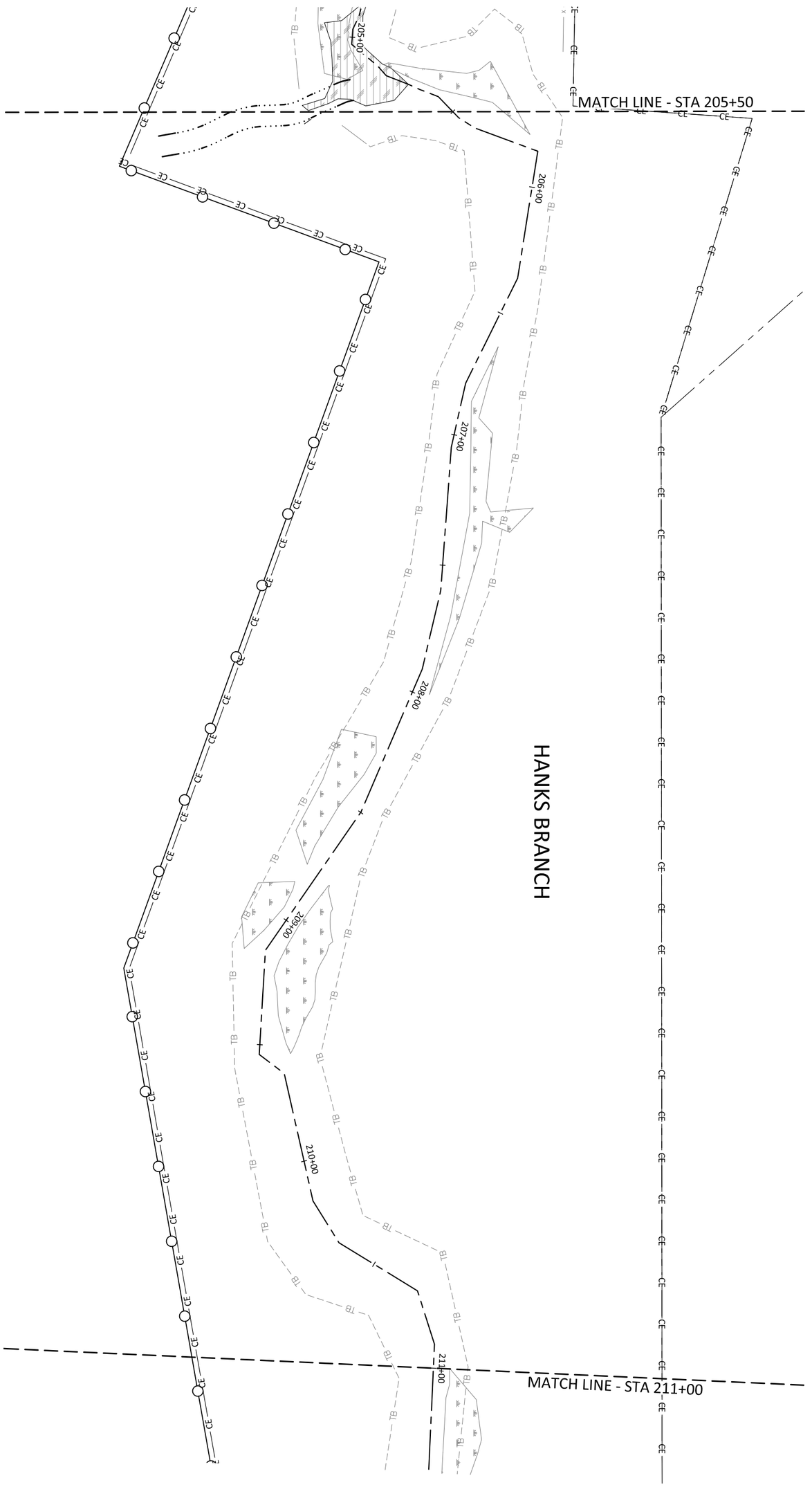
PROPOSED 2X2" TUBE STEEL GATE
SEE DETAIL 4, SHEET 6.14

PROPOSED 2X2" TUBE STEEL GATE
SEE DETAIL 3, SHEET 6.14

PROPOSED 5 WIRE FENCE
1' OFFSET FROM ROAD BED WHERE SHOWN
SEE DETAIL 2, SHEET 6.14

PROPOSED WOVEN WIRE FENCE
2' OFFSET FROM CE WHERE SHOWN
SEE DETAIL 1, SHEET 6.14



0'
20'
40'
60'
(HORIZONTAL)

N

Date: 06.05.20
Job Number: 005-02177
Project Engineer: NMM
Drawn By: CAW
Checked By: GAT

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Wilkes County, North Carolina

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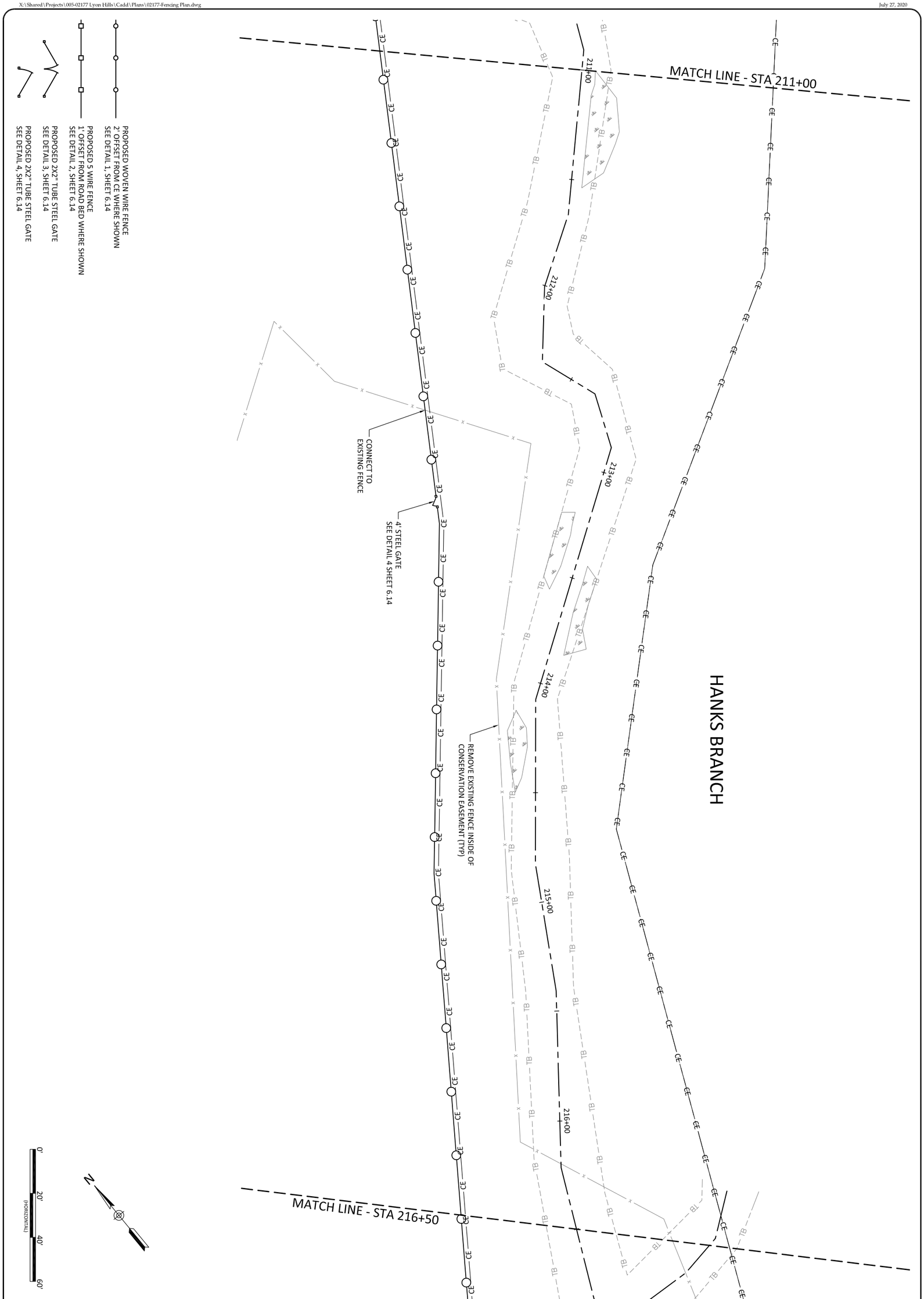

Date:	06.05.20
Job Number:	005-02177
Project Engineer:	NMM
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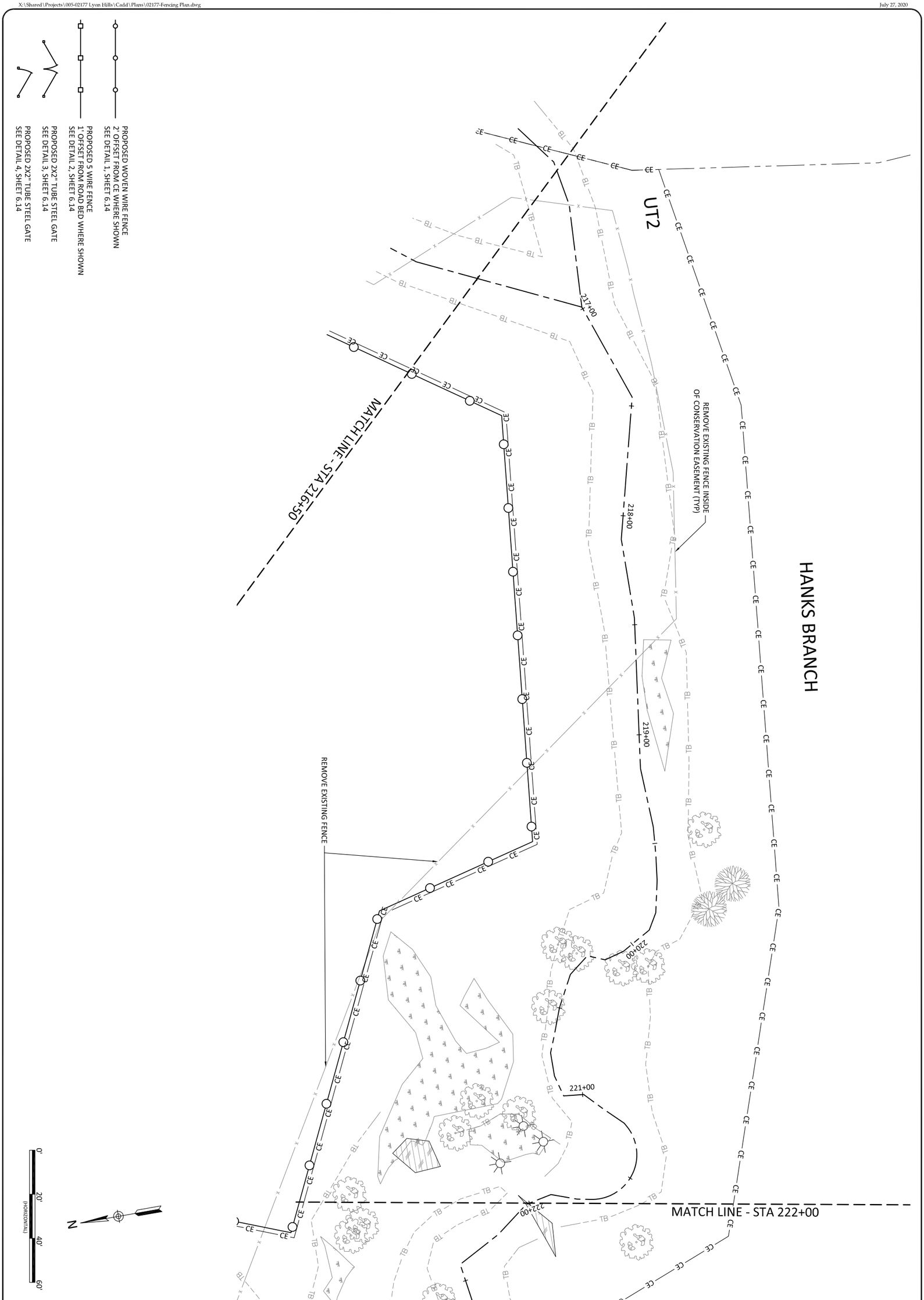

Date:	06.05.20
Job Number:	005-02177
Project Engineer:	NMM
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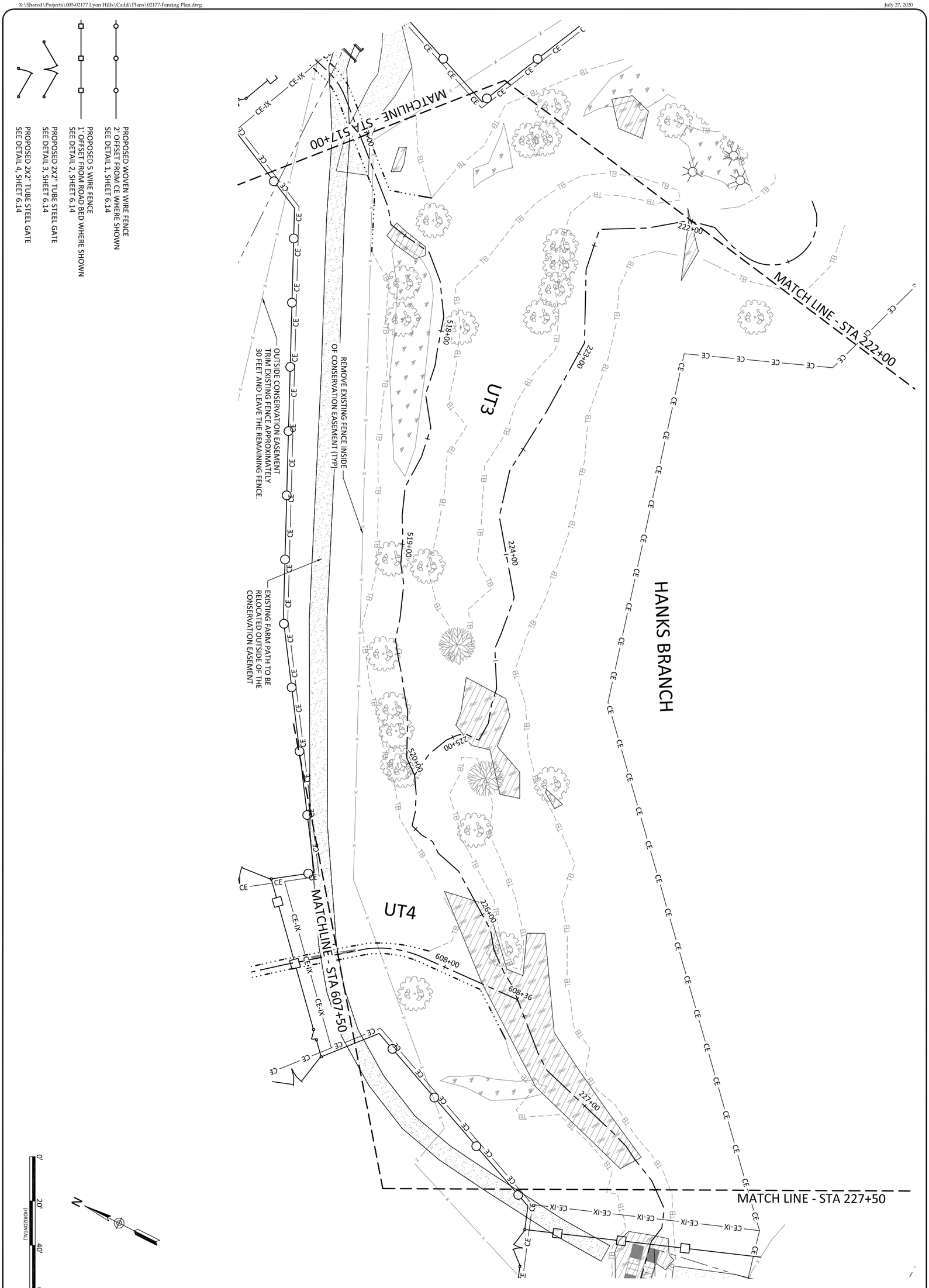

Date:	06.05.20
Job Number:	005-02177
Project Engineer:	NMM
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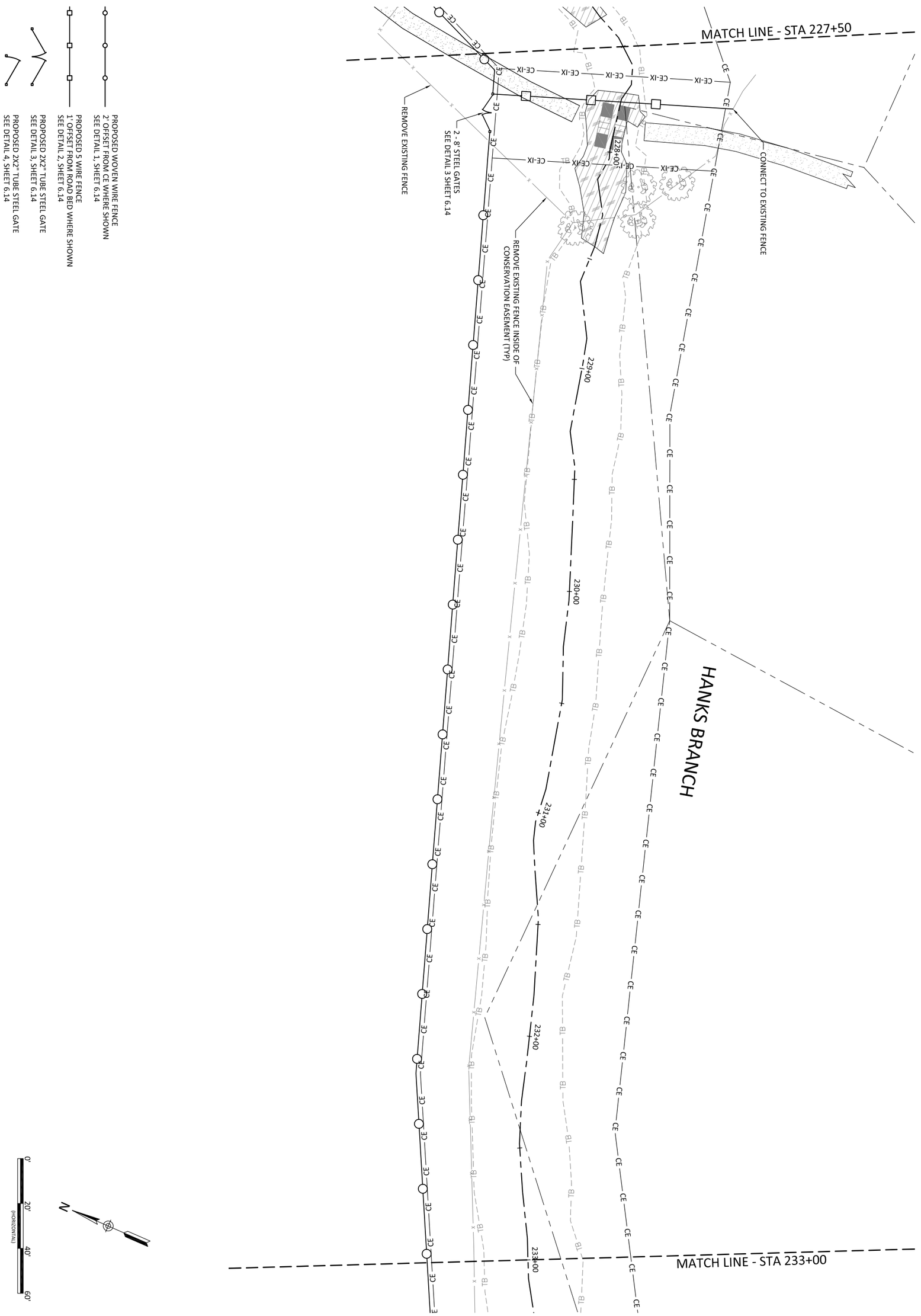

Date:	06.05.20
Job Number:	005-02177
Project Engineer:	NMM
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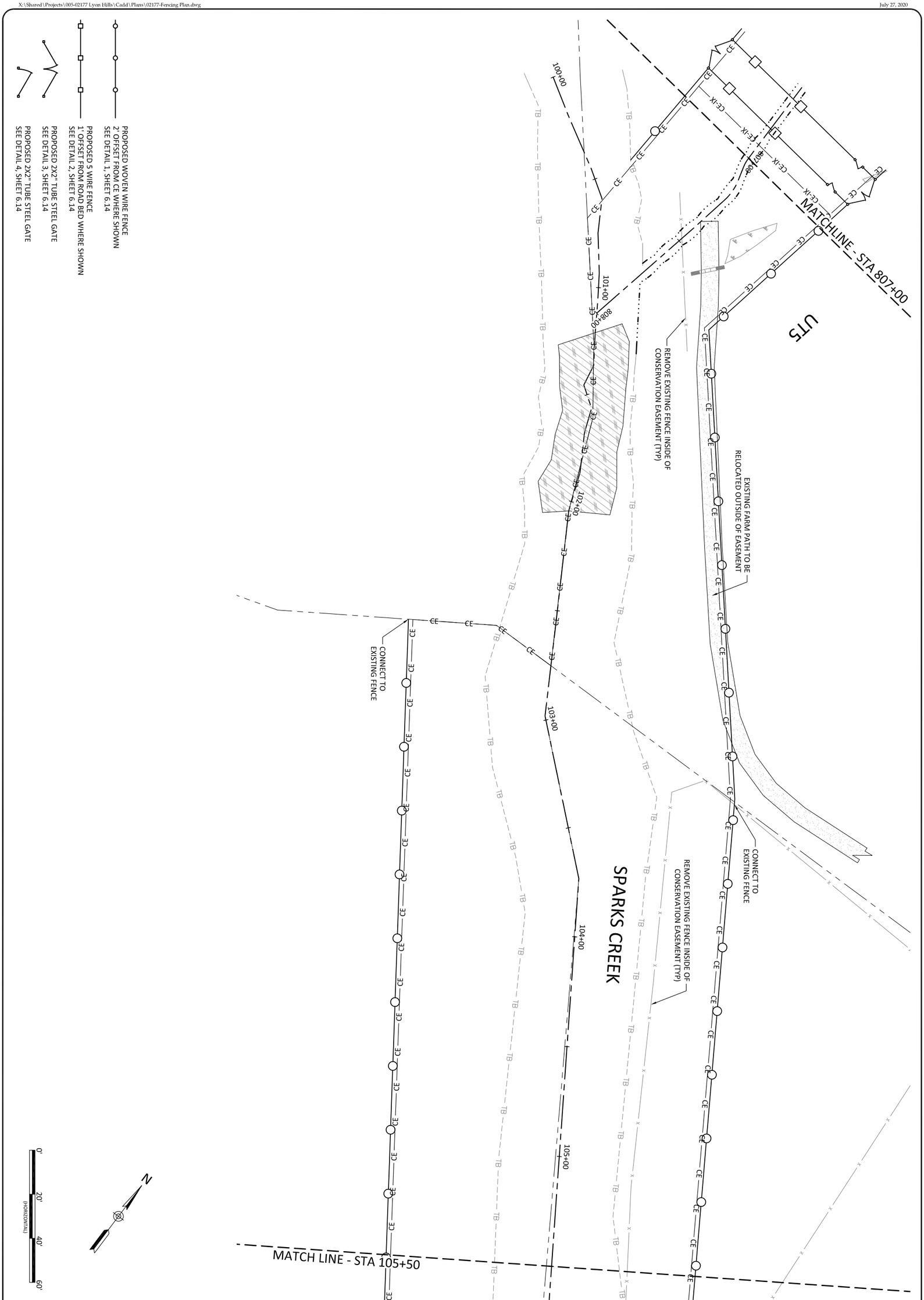

Date:	06.05.20
Job Number:	005-02177
Project Engineer:	NMM
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Sparks Creek
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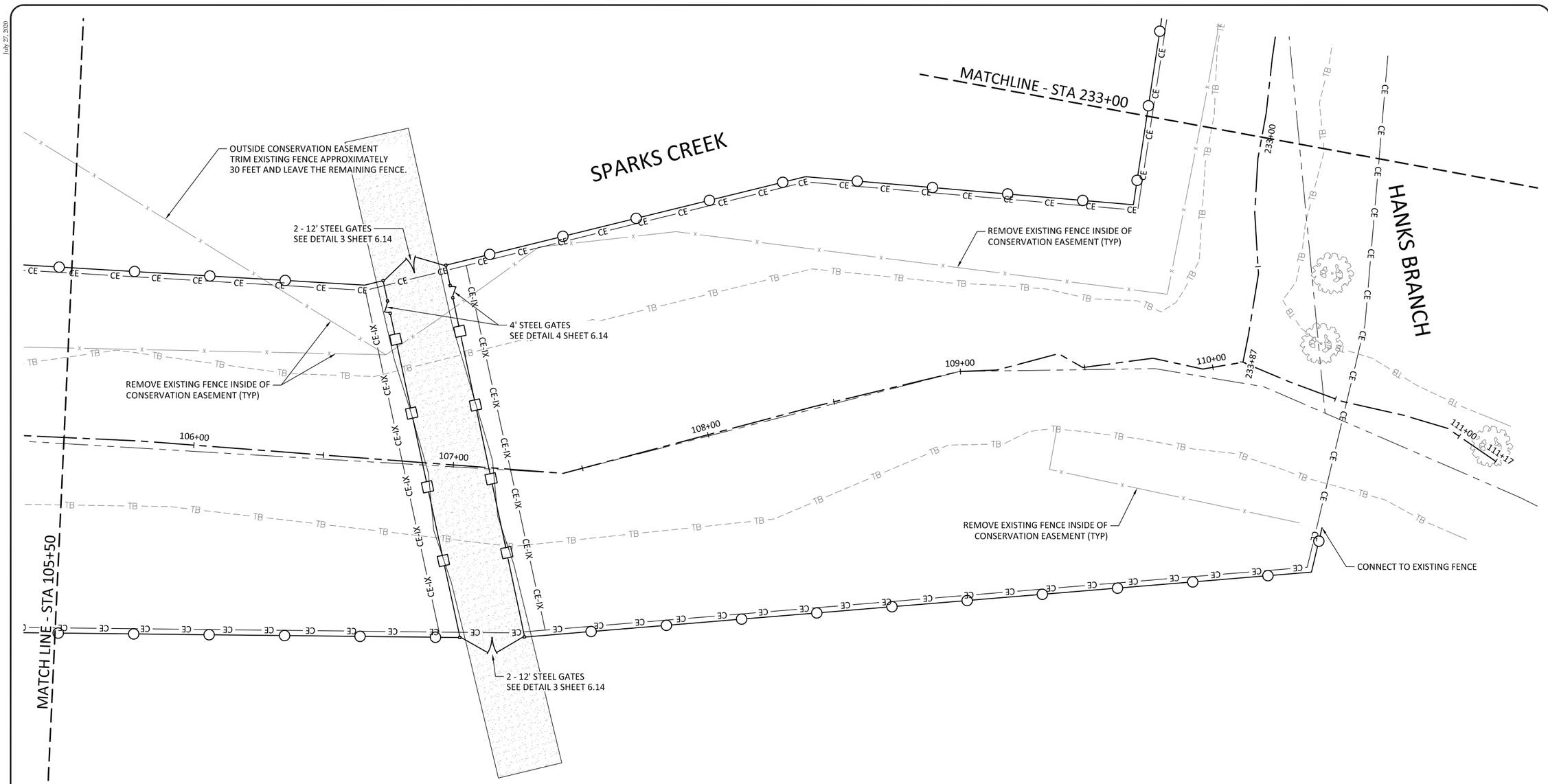

PROPOSED WOVEN WIRE FENCE
2' OFFSET FROM CE WHERE SHOWN
SEE DETAIL 1, SHEET 6.14

PROPOSED 5 WIRE FENCE
1' OFFSET FROM ROAD BED WHERE SHOWN
SEE DETAIL 2, SHEET 6.14

PROPOSED 2X2" TUBE STEEL GATE
SEE DETAIL 3, SHEET 6.14

PROPOSED 2X2" TUBE STEEL GATE
SEE DETAIL 4, SHEET 6.14

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Sparks Creek
Fencing Plan

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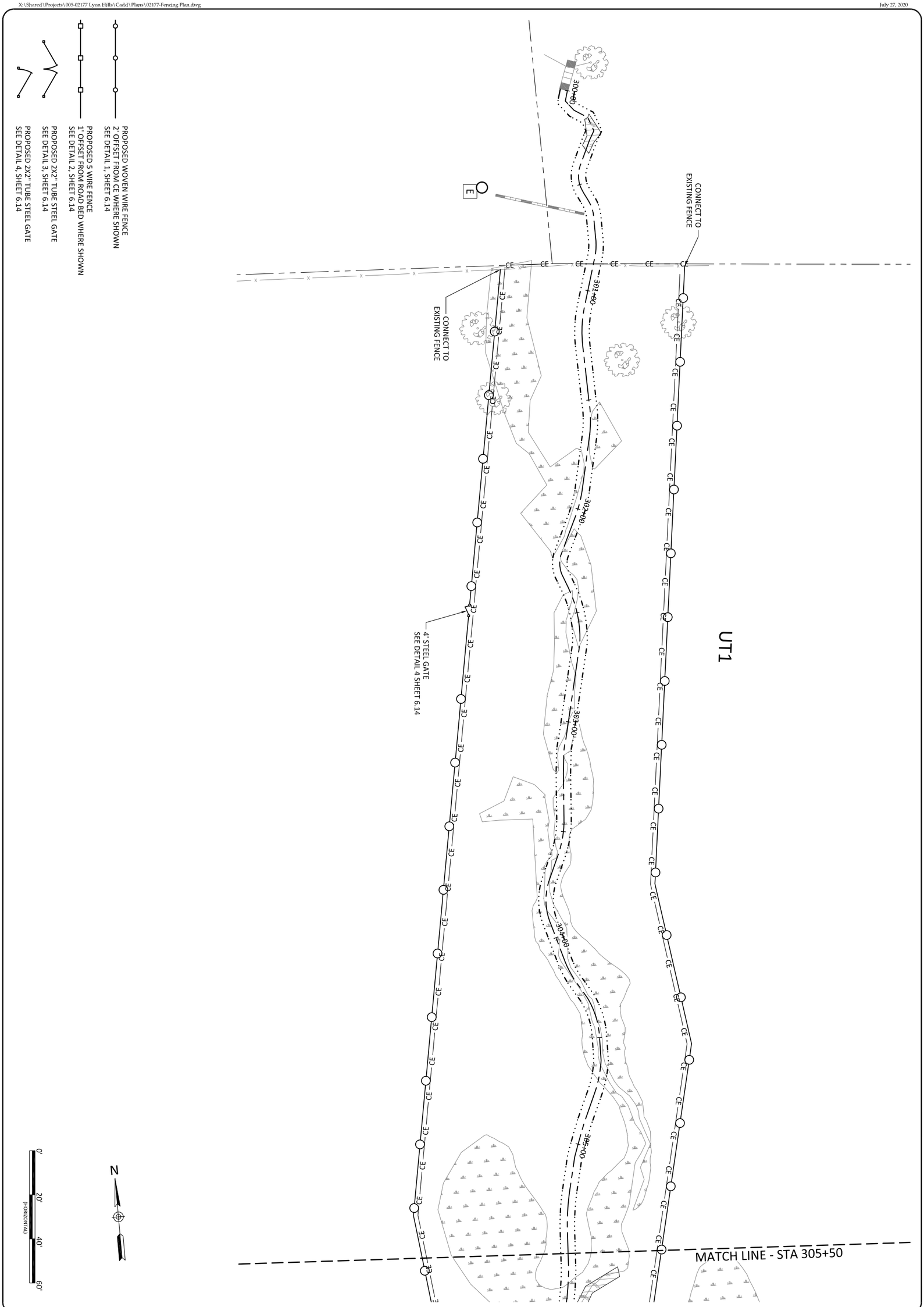

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Job Number:	005-02177
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Wilkes County, North Carolina

UT1
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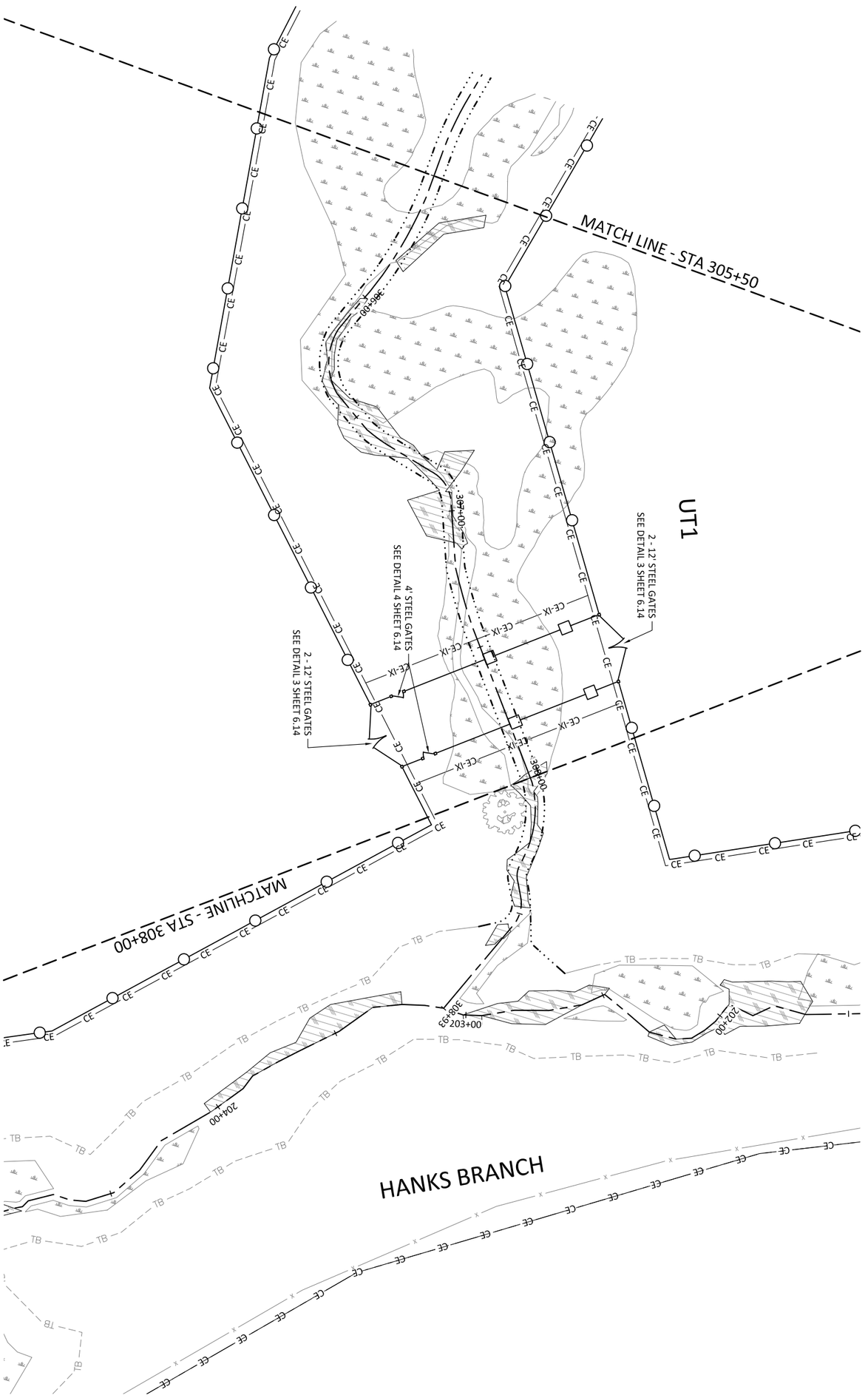
PROPOSED 2X2" TUBE STEEL GATE
SEE DETAIL 4, SHEET 6.14

PROPOSED 2X2" TUBE STEEL GATE
SEE DETAIL 3, SHEET 6.14

PROPOSED 5 WIRE FENCE
1' OFFSET FROM ROAD BED WHERE SHOWN
SEE DETAIL 2, SHEET 6.14

PROPOSED WOVEN WIRE FENCE
2' OFFSET FROM CE WHERE SHOWN
SEE DETAIL 1, SHEET 6.14



0' 20' 40' 60' (HORIZONTAL)

N

Date:	06.05.20
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UT1
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PROPOSED WOVEN WIRE FENCE
2' OFFSET FROM CE WHERE SHOWN
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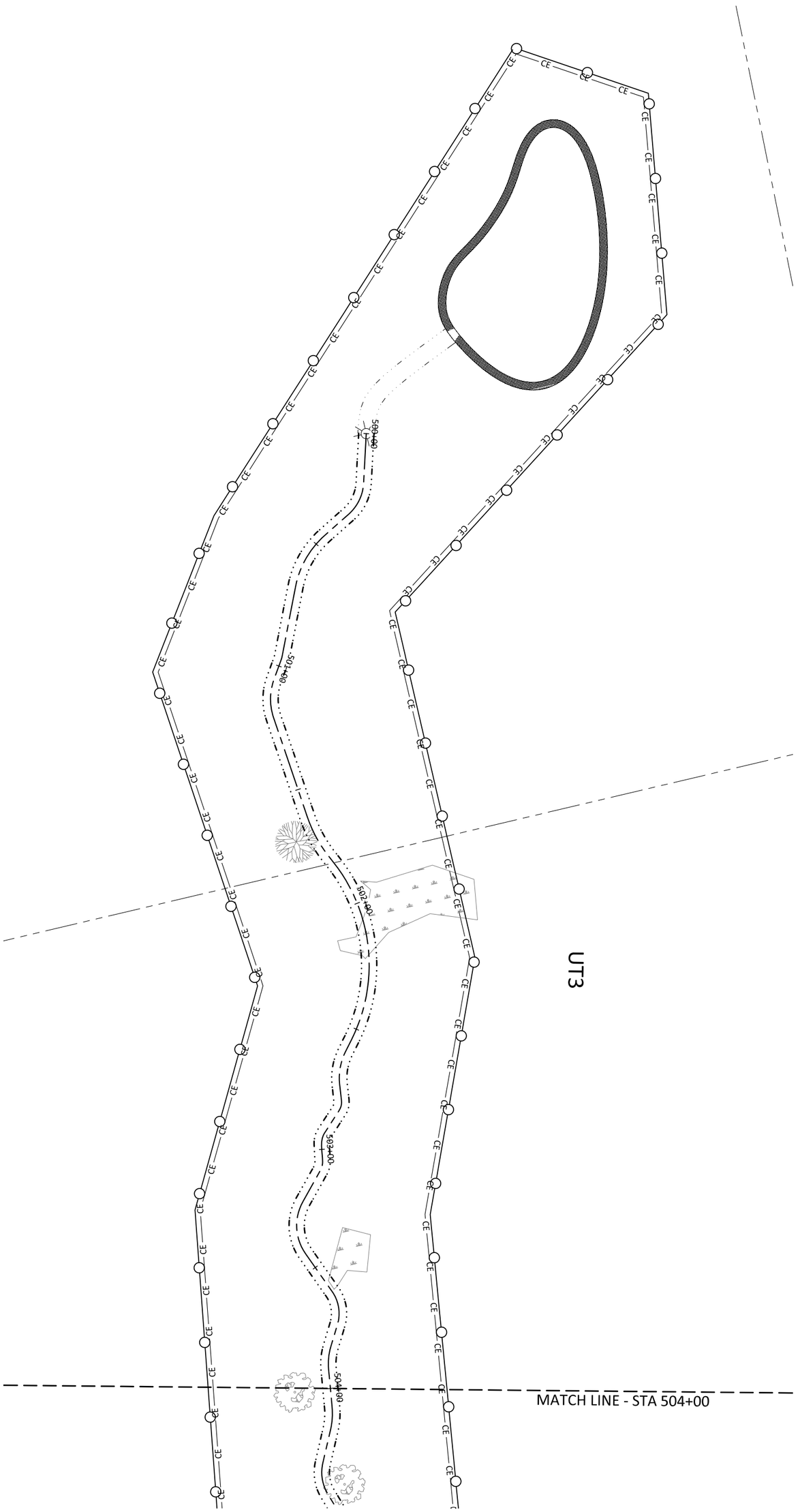
1' OFFSET FROM ROAD BED WHERE SHOWN
SEE DETAIL 2, SHEET 6.14

PROPOSED 2X2" TUBE STEEL GATE
SEE DETAIL 3, SHEET 6.14

PROPOSED 2X2" TUBE STEEL GATE
SEE DETAIL 4, SHEET 6.14



0' 20' 40' 60'
(HORIZONTAL)

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Job Number: 005-02177
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UT3
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PROPOSED 2X2" TUBE STEEL GATE
SEE DETAIL 4, SHEET 6.14

PROPOSED 2X2" TUBE STEEL GATE
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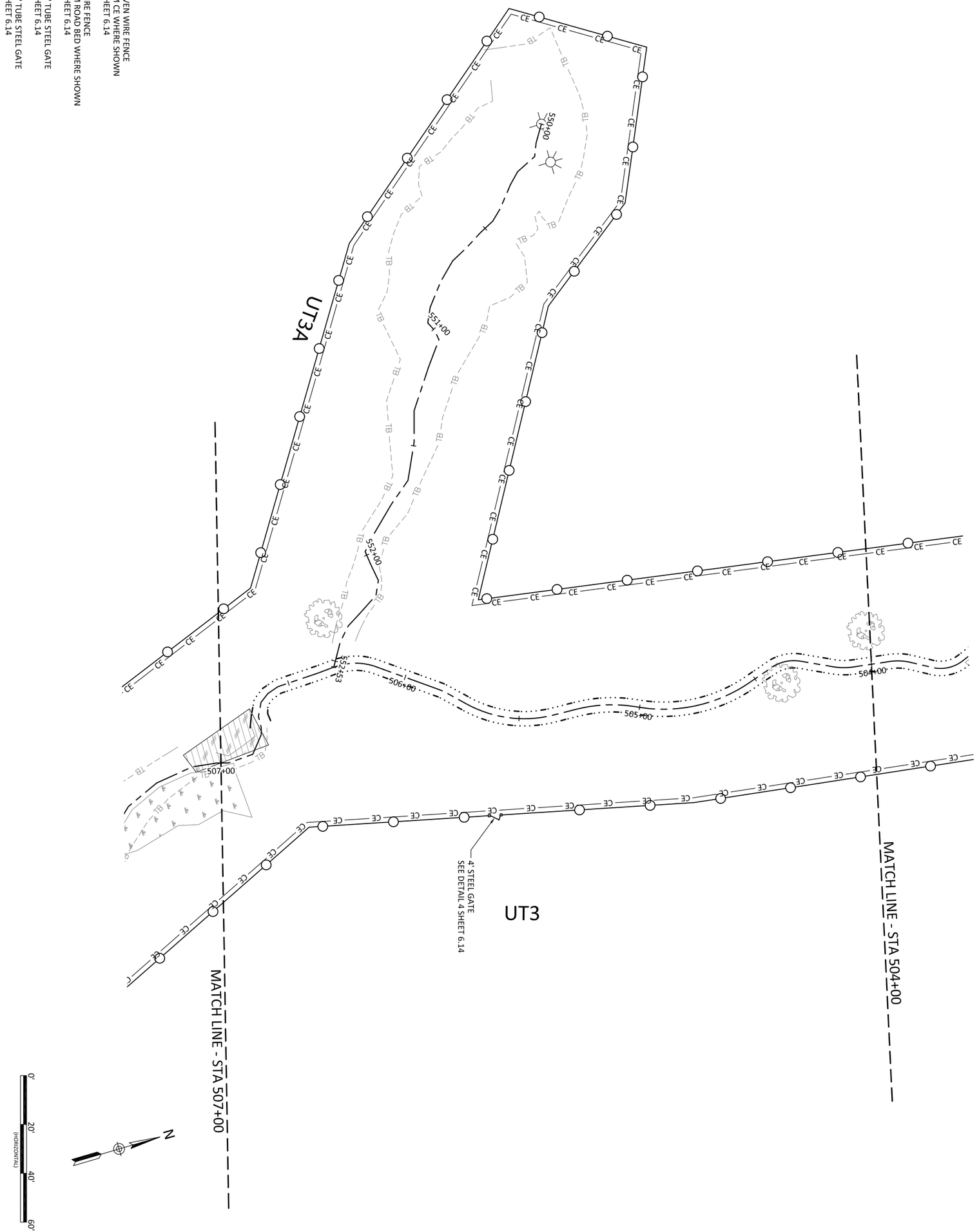
PROPOSED 5 WIRE FENCE
1' OFFSET FROM ROAD BED WHERE SHOWN
SEE DETAIL 2, SHEET 6.14

PROPOSED WOVEN WIRE FENCE
2' OFFSET FROM CE WHERE SHOWN
SEE DETAIL 1, SHEET 6.14



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UT3 & UT3A
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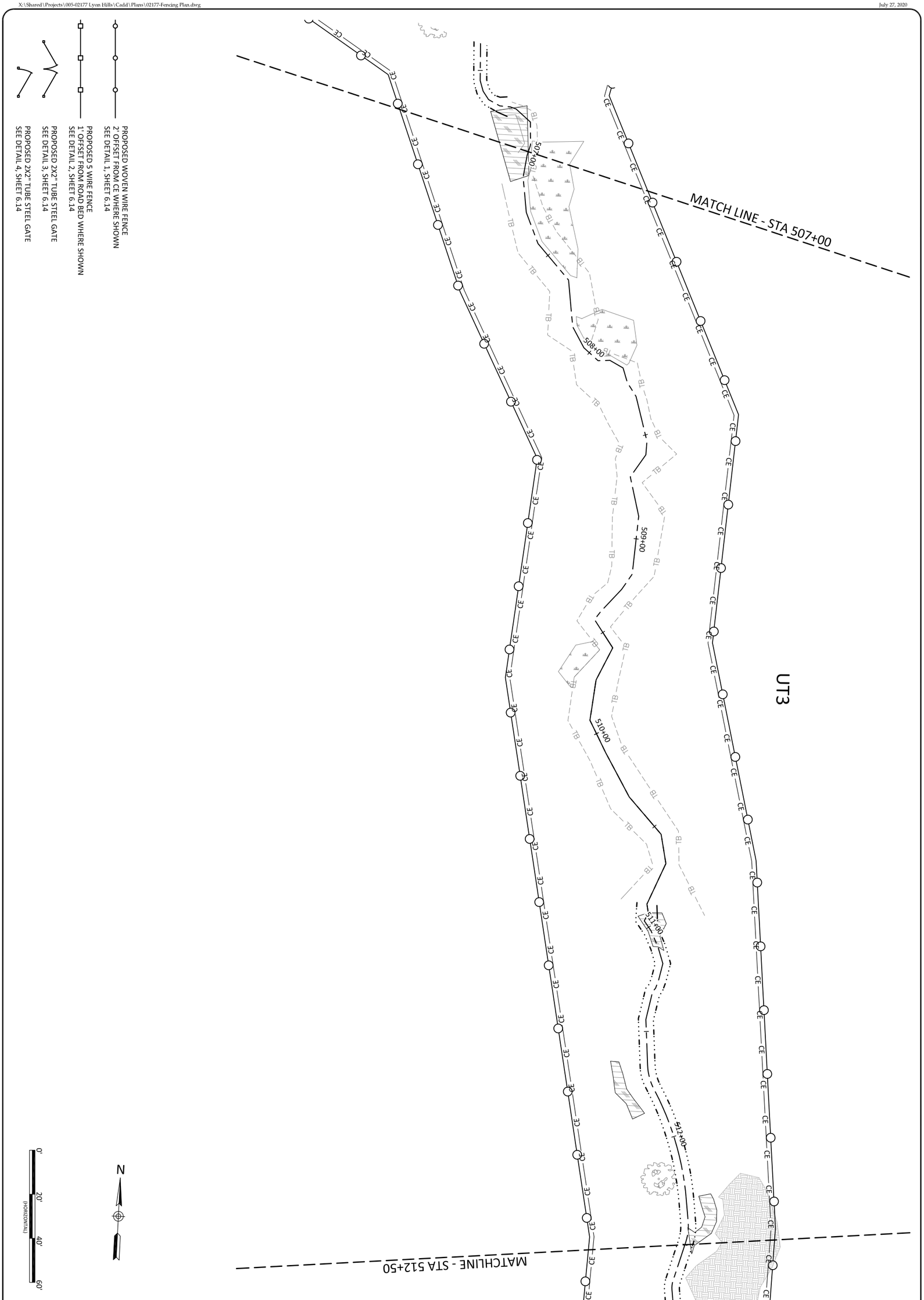

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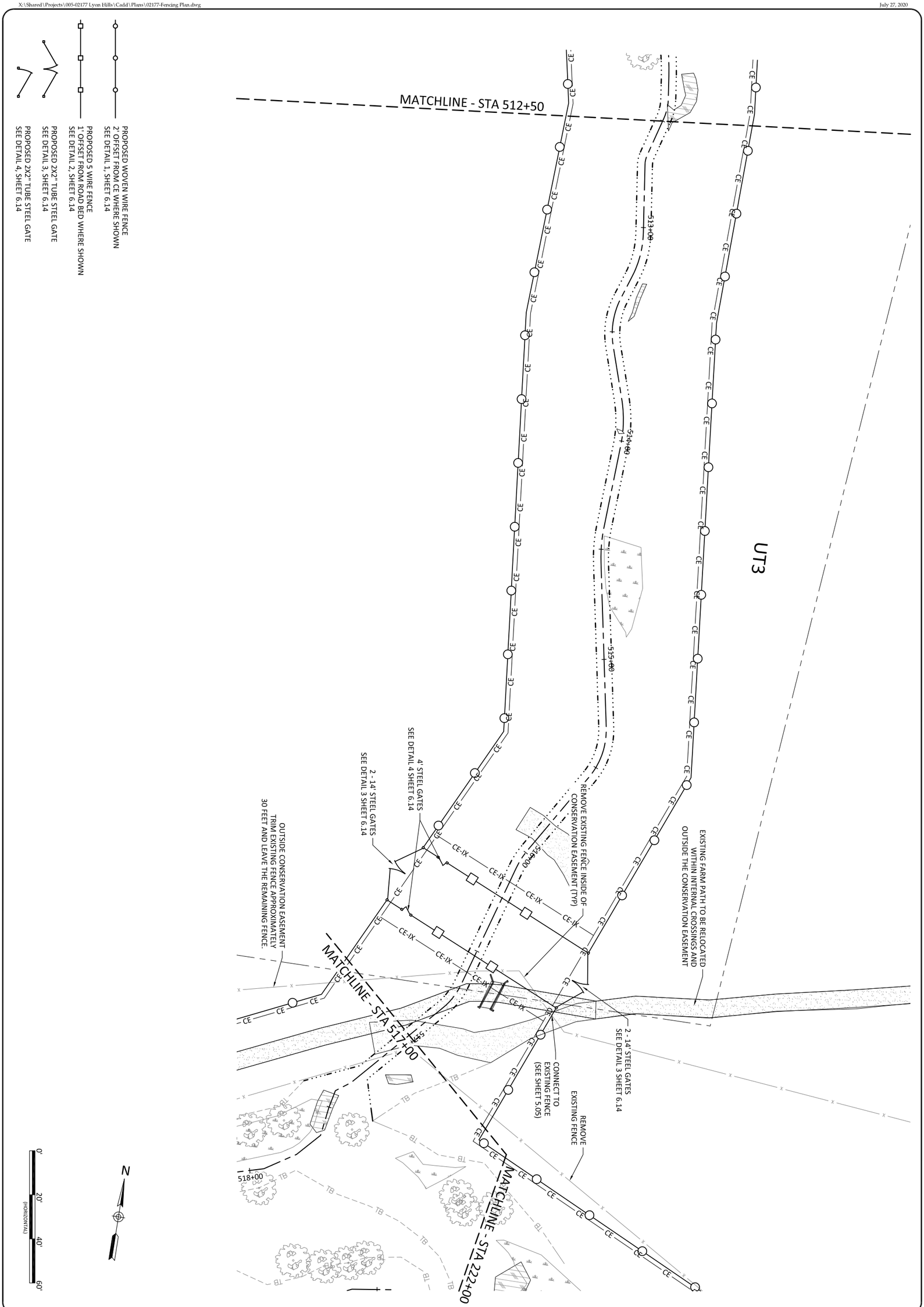

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UT3
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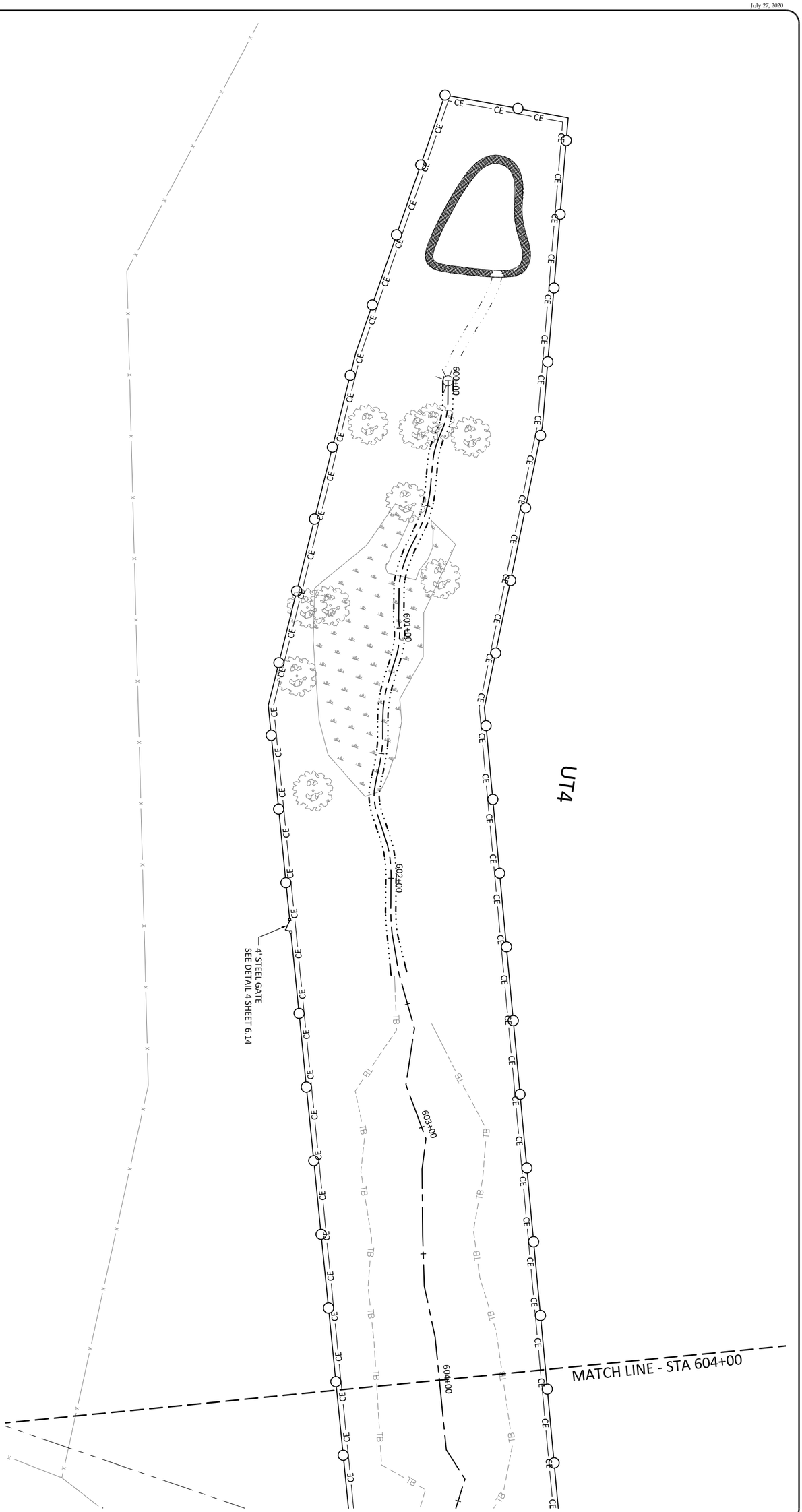
PROPOSED WOVEN WIRE FENCE
2' OFFSET FROM CE WHERE SHOWN
SEE DETAIL 1, SHEET 6.14

PROPOSED 5 WIRE FENCE
1' OFFSET FROM ROAD BED WHERE SHOWN
SEE DETAIL 2, SHEET 6.14

PROPOSED 2X2" TUBE STEEL GATE
SEE DETAIL 3, SHEET 6.14

PROPOSED 2X2" TUBE STEEL GATE
SEE DETAIL 4, SHEET 6.14



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UT4
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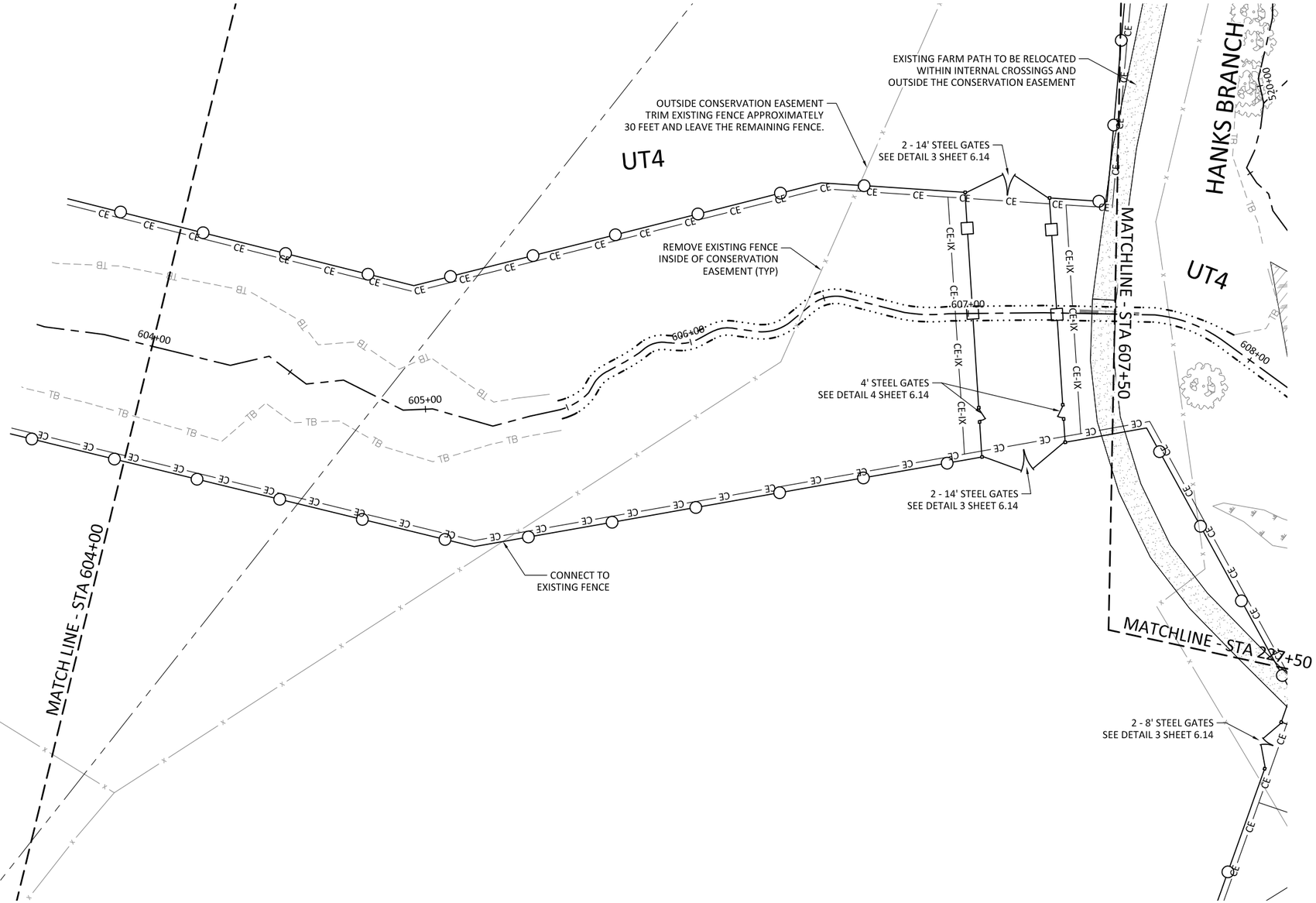

PROPOSED WOVEN WIRE FENCE
2' OFFSET FROM CE WHERE SHOWN
SEE DETAIL 1, SHEET 6.14

PROPOSED 5 WIRE FENCE
1' OFFSET FROM ROAD BED WHERE SHOWN
SEE DETAIL 2, SHEET 6.14

PROPOSED 2X2" TUBE STEEL GATE
SEE DETAIL 3, SHEET 6.14

PROPOSED 2X2" TUBE STEEL GATE
SEE DETAIL 4, SHEET 6.14

N

0' 20' 40' 60'
(HORIZONTAL)

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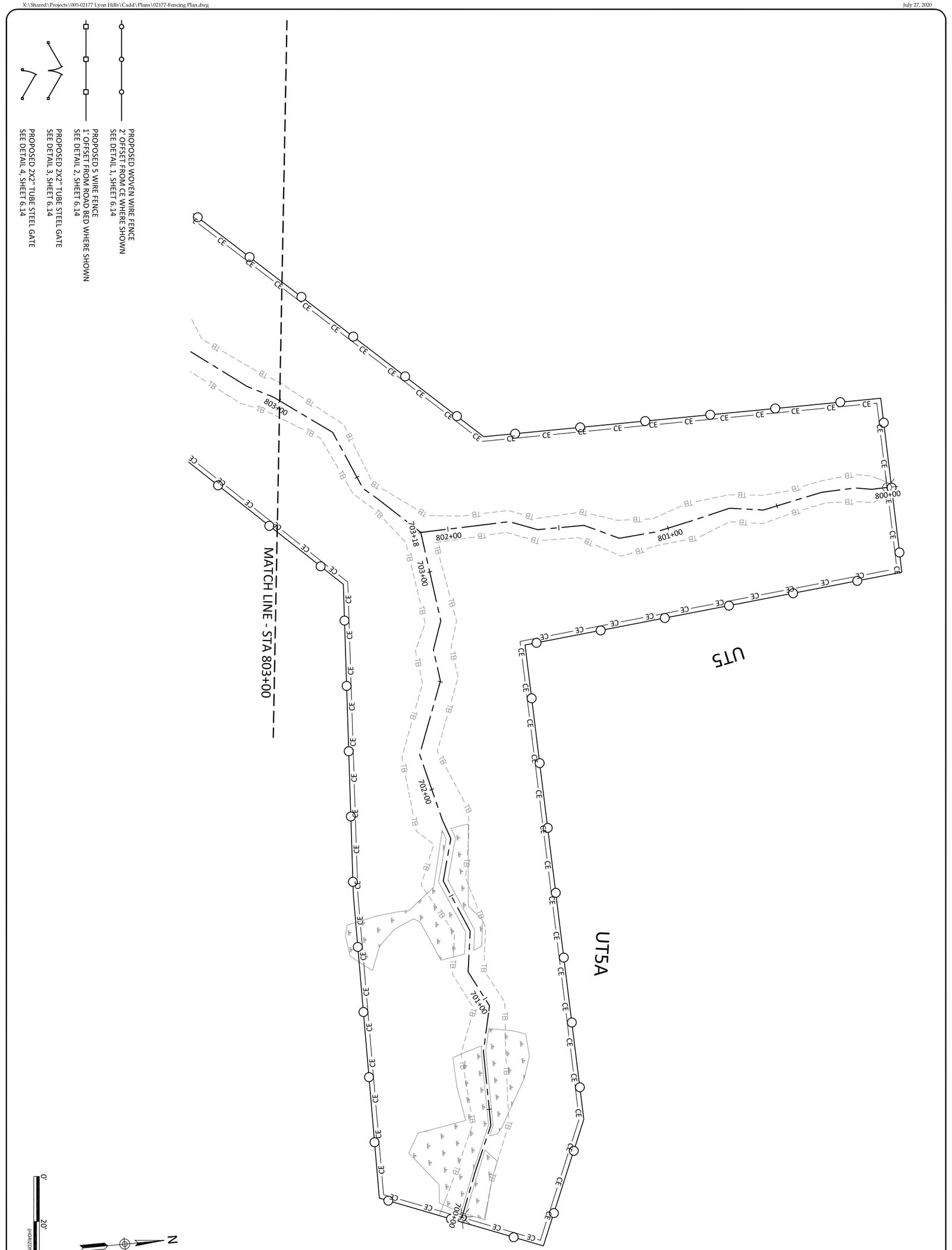

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UT5 & UT5A
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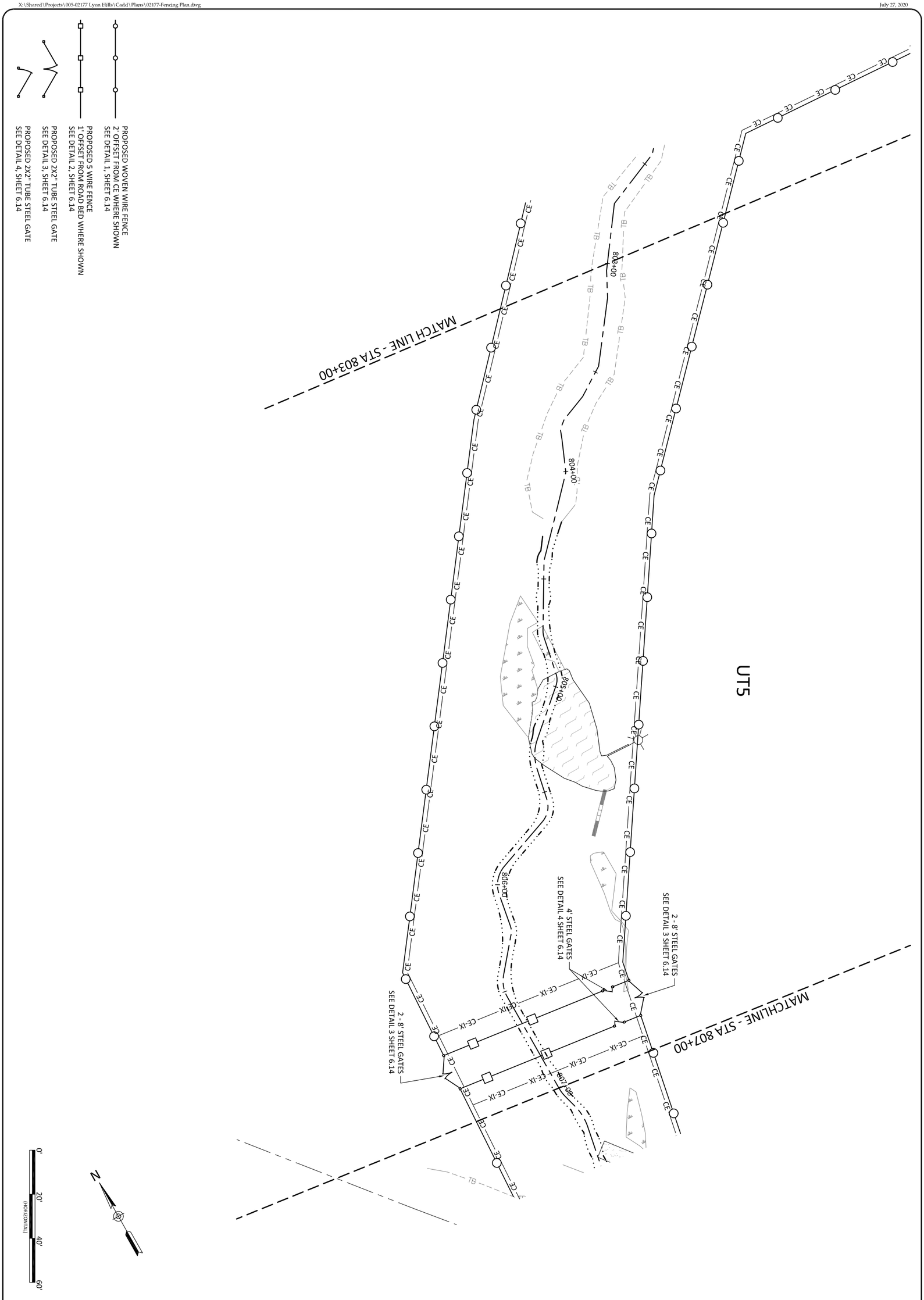

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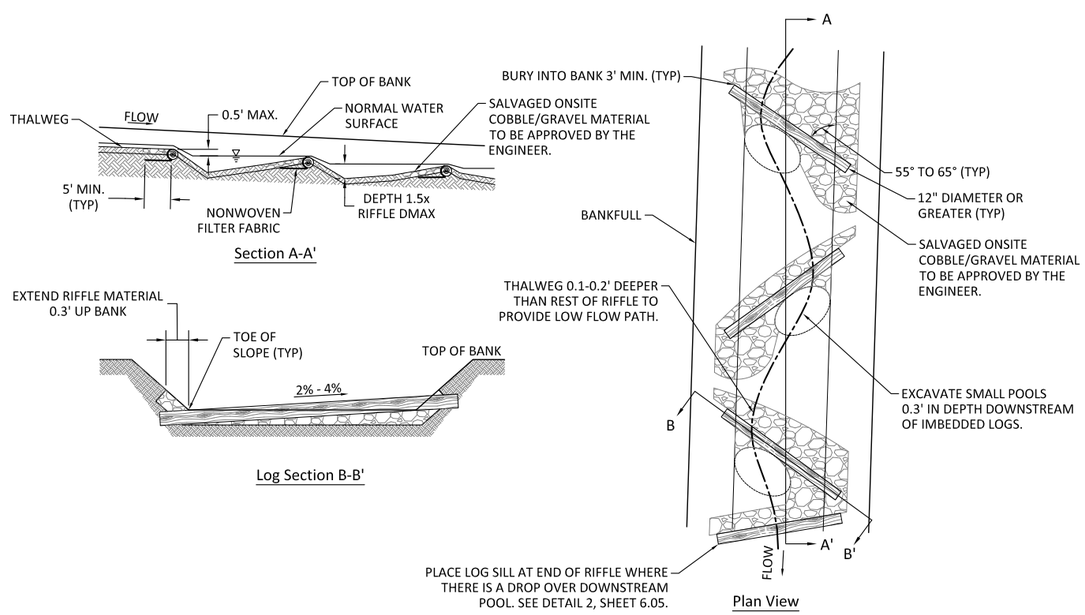
July 27, 2020

RECOMMENDED RIFFLE MATERIAL TABLE - ALL RIFFLE TYPES			
REACH	BOTTOM WIDTH (FT)	RIFFLE THICKNESS (IN)	RIFFLE MATERIAL STONE SIZE EQUIVALENTS (% OF MATRIX)
UT1	2.4	12	CLASS A (45%), CLASS B (45%), ABC STONE (10%)
UT3 - REACH 1	1.7	12	CLASS A (45%), CLASS B (45%), ABC STONE (10%)
UT3 - REACH 3	2.0	12	CLASS A (45%), CLASS B (45%), ABC STONE (10%)
UT4 - REACH 1	1.0	12	CLASS A (45%), CLASS B (45%), ABC STONE (10%)
UT4 - REACH 3	1.3	12	CLASS A (45%), CLASS B (45%), ABC STONE (10%)
UT5	1.4	12	CLASS A (90%), ABC STONE (10%)
NOTES:			
1. ALL RIFFLE MATERIAL SHALL BE COMPACTED IN LIFTS AT A THICKNESS NOT TO EXCEED DMAX.			

1 6.01 Riffle Material Table
Not to Scale



2 6.01 Angled Log Riffle
Not to Scale

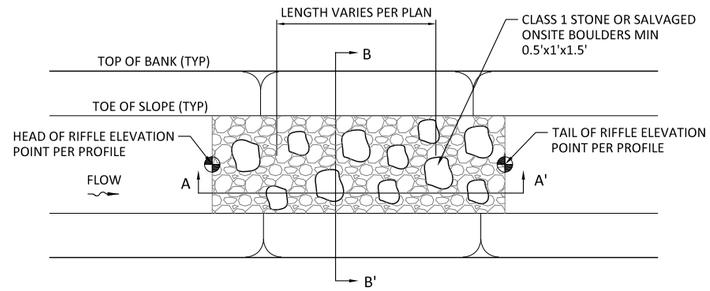
NOTES:

1. RECOMMENDED STONE SIZE AND DISTRIBUTION NOTED BY REACH IN RIFFLE MATERIAL TABLE.
2. MINIMUM LOG DIAMETER 12".
3. MINIMUM THREE LOGS PER STRUCTURE.
4. IF NECESSARY, SALVAGED ONSITE ROCK MAY BE SUBSTITUTED WITH QUARRY ROCK OF SIMILAR SIZE.

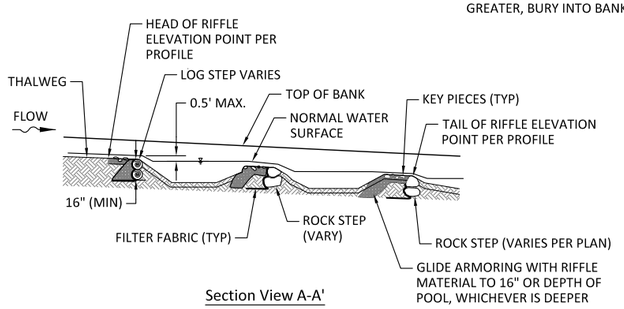
CR-ALR

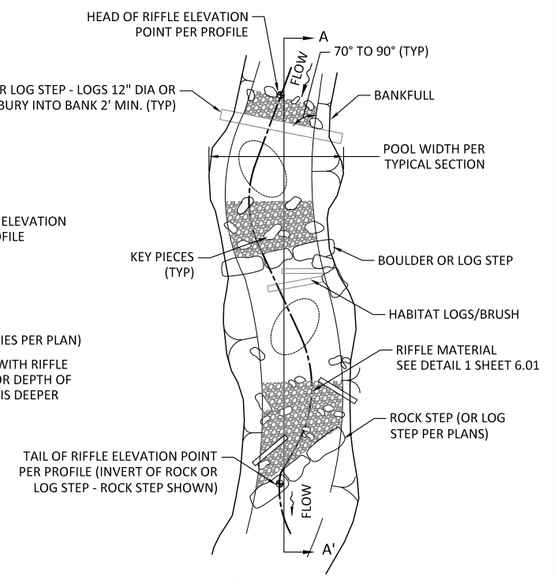
CR-CH

CR-LRC



3 6.01 Chunky Riffle
Not to Scale





NOTES:

1. CONSTRUCT GRADE DROPS IN CASCADE BASED ON ROCK AND LOG STEP DETAIL.
2. VARY THE SEQUENCE, TYPE AND ORIENTATION OF STEPS (DROPS). USE ROCK STEP DETAIL AS A GUIDE FOR VARIATIONS IN ORIENTATION/CONFIGURATION.
3. KEY PIECES ARE LOWER MOBILITY STONE THAT PROVIDE GRADE CONTROL AND TOE PROTECTION. USE CLASS 1 STONE OR SALVAGED ONSITE BOULDERS MIN 0.5'x1'x1.5'. HABITAT LOGS SHOULD BE WORKED IN AS EQUIVALENT OF KEY PIECES.
4. ROCK/LOG STEP BOULDERS AND LOGS TO BE EMBEDDED MINIMUM 3' INTO STREAM BANKS.
5. ROCK STEP OR LOG STEP AT END OF CASCADE RIFFLE PAID SEPARATE. THESE ARE DEPICTED ON PLAN VIEW.
6. NUMBER OF INTERNAL STEPS (INCLUDING STEPS AT THE BEGINNING OF A CASCADE SEQUENCE) VARIES BASED ON LENGTH AND SLOPE. RIFFLES SHALL BE 1.2 - 1.8 TIMES THE AVERAGE CHANNEL SLOPE. STEP DROPS SHALL BE BETWEEN 0.2-0.5' MEASURED AT THE WATER SURFACE.
7. FOOTER ROCK OR LOG SHOWN. FOOTER ONLY REQUIRED WHEN MINIMUM UNFOOTERED DIMENSION OF ROCK OR LOG IS NOT MET. A MINIMUM OF 16" OF RIFFLE MATERIAL SHALL BE PLACED OVER FILTER FABRIC TO PROTECT.
8. REFER TO RIFFLE MATERIAL TABLE ON THIS SHEET FOR RIFFLE MATERIAL SIZING.

4 6.01 Log-Rock Cascade Riffle
Not to Scale

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Wilkes County, North Carolina

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Job Number: 005-02177
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Sheet 6.01

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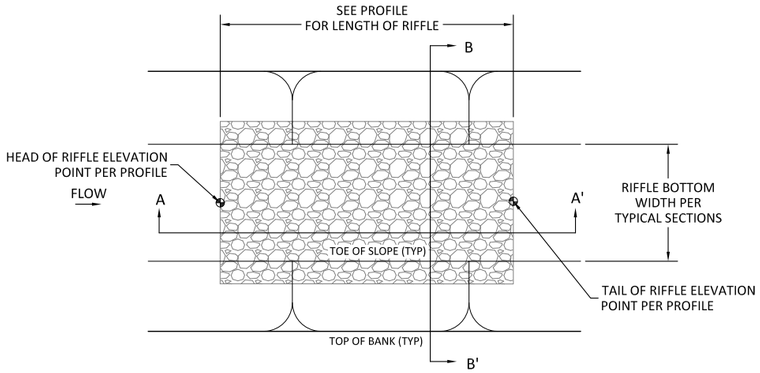
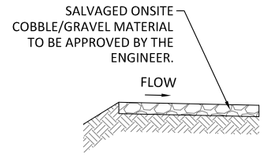
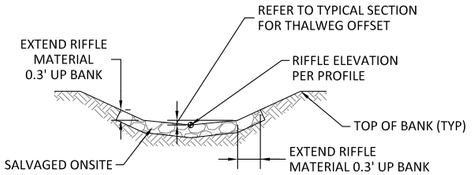


Plan View



Section A-A'



Section B-B'

NOTE:

1. RECOMMENDED STONE SIZE AND DISTRIBUTION NOTED BY REACH IN RIFFLE MATERIAL TABLE.
2. IF NECESSARY, SALVAGED ONSITE ROCK MAY BE SUBSTITUTED WITH QUARRY ROCK OF SIMILAR SIZE.

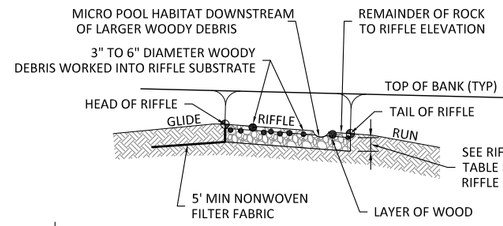
1 6.02 Native Material Riffle
Not to Scale

CR-NM

CR-WD

NOTES:

1. WOOD SHALL COMPRISE 20% TO 50% OF THE RIFFLE SURFACE AREA.
2. BRUSH SHOULD BE PLACED PERPENDICULAR TO CHANNEL UP TO A 15° ANGLE DOWNSTREAM.
3. ANY MATERIAL GREATER THAN 1" DIAMETER THAT IS NOT PERPENDICULAR TO THE CHANNEL SHALL BE INSTALLED SUCH THAT THE EXPOSED END IS POINTING DOWNSTREAM.
4. WOODY MATERIAL SHOULD NOT PROTRUDE GREATER THAN 3" ABOVE RIFFLE BED.
5. BRUSH CUTTERS OR OTHER DEVICE MUST BE USED TO ENSURE PROTRUSION LIMITED TO TOLERANCE IN NOTE 4.
6. IF NECESSARY, QUARRY ROCK OF SIMILAR SIZE MAY BE SUBSTITUTED.



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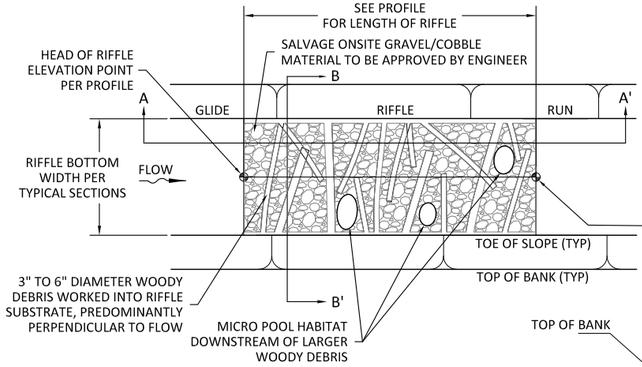
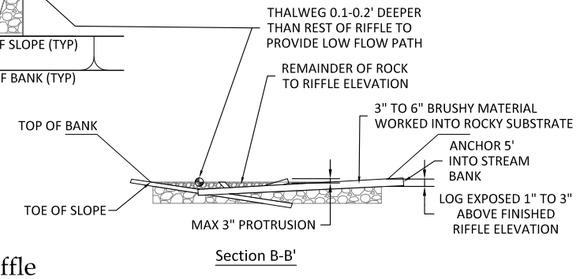


Plan View



Section B-B'

2 6.02 Woody Riffle
Not to Scale

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Drawn By: CAW
Checked By: GAT

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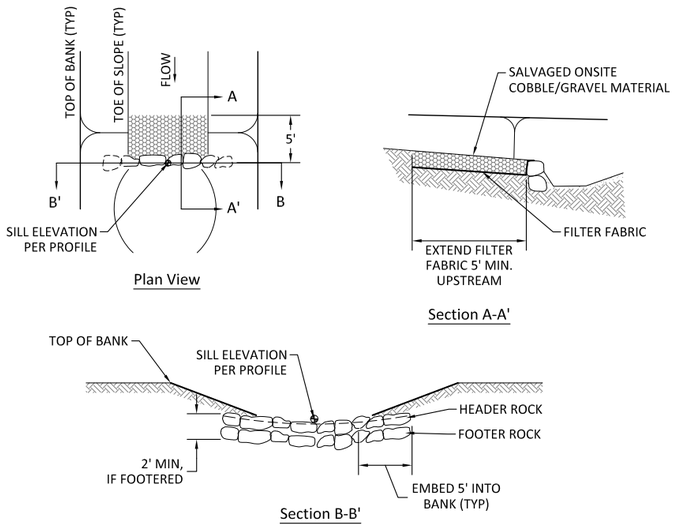
July 27, 2020

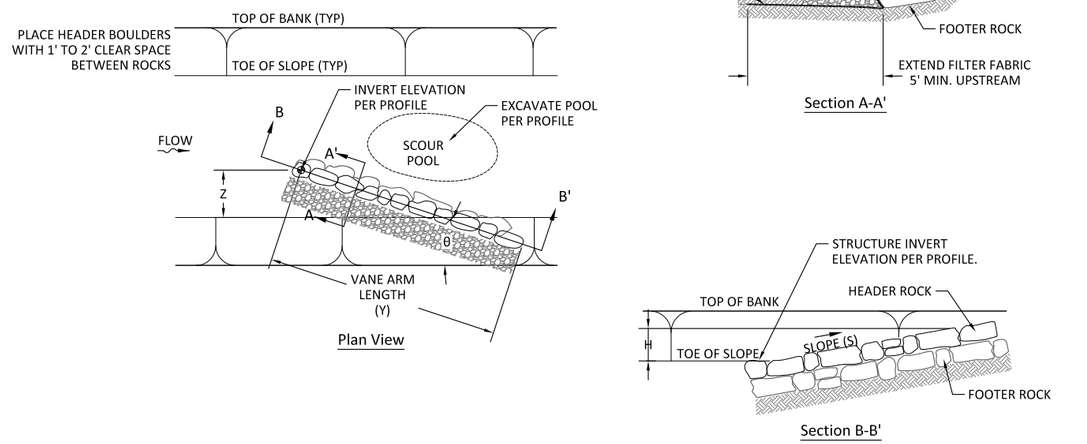
BOULDER SIZE TABLE	
REACH	MIN. BOULDER DIMENSIONS (FT)
HANKS BRANCH	3.0 x 2.0 x 2.0
UT1-UT5	2.0 x 2.0 x 1.0
NOTE: BOULDERS SHALL BE RELATIVELY FLAT ON THE LONG DIMENSION SIDES.	



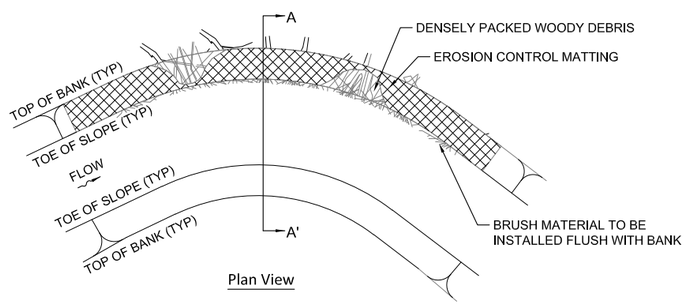
1 6.03 Boulder Sill
Not to Scale

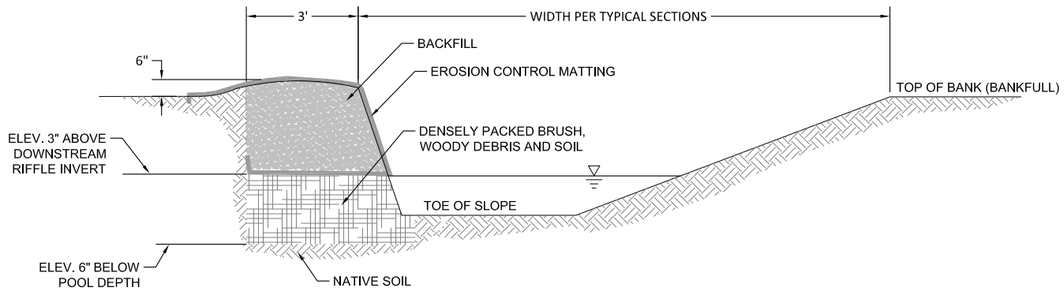
NOTE:

1. REFER TO TABLE FOR SILL MATERIAL SIZING.



2 6.03 Rock Vane
Not to Scale





3 6.03 Brush Toe
Not to Scale

NOTES:

1. OVEREXCAVATE 3' OUTSIDE OF TOP OF BANK (BANKFULL).
2. INSTALL A DENSE LAYER OF BRUSH/WOODY DEBRIS, WHICH SHALL CONSIST OF SMALL BRANCHES AND ROOTS COLLECTED ONSITE AND SOIL TO FILL ANY VOID SPACE. LIGHTLY COMPACT BRUSH/WOODY DEBRIS LAYER.
3. BRUSH SHOULD BE ALIGNED SO STEMS ARE ROUGHLY PARALLEL AND POINTING SLIGHTLY UPSTREAM.
4. INSTALL MATTING OVER BRUSH/WOODY DEBRIS.
5. INSTALL EARTH BACKFILL OVER BRUSH/WOODY LAYER ACCORDING TO TYPICAL SECTION DIMENSIONS.
6. SEED, MULCH AND INSTALL EROSION CONTROL MATTING AND BANK STABILIZATION PER PLANS.

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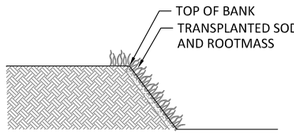
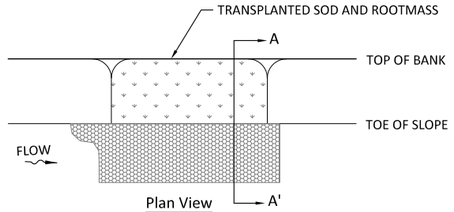


Section A-A'
Riffle Installation

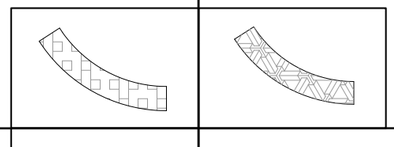


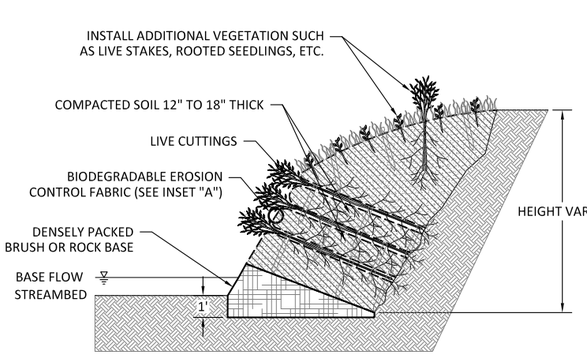
Plan View

NOTES:

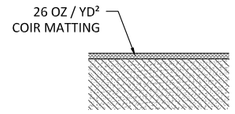
1. PREPARE THE BANK WHERE THE SOD MAT WILL BE TRANSPLANTED BY RAKING.
2. EXCAVATE TRANSPLANT SOD MATS WITH A WIDE BUCKET AND AS MUCH ADDITIONAL SOIL MATERIAL AS POSSIBLE.
3. PLACE TRANSPLANT ON THE BANK TO BE STABILIZED. (SOD MAT ONLY TO BE TOUCHED ONCE.)
4. SECURE WITH SOD STAPLES.
5. FILL IN ANY HOLES AROUND THE TRANSPLANT AND COMPACT.
6. ANY LOOSE SOIL LEFT IN THE STREAM SHOULD BE REMOVED.
7. PLACE MULTIPLE TRANSPLANTS CLOSE TOGETHER SUCH THAT THEY TOUCH.
8. INSTALL EROSION CONTROL MATTING ABOVE TRANSPLANTED SOD MATS.

1 / 6.04 Transplanted Sod Mats
Not to Scale

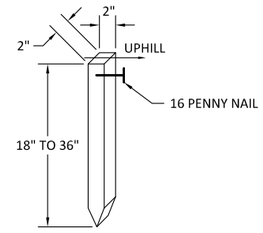




Section View



Inset "A"
Matting and Blanket

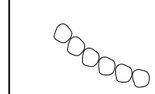


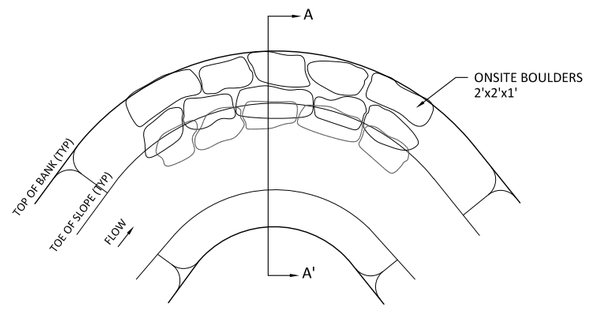
Typical Stakes

NOTES:

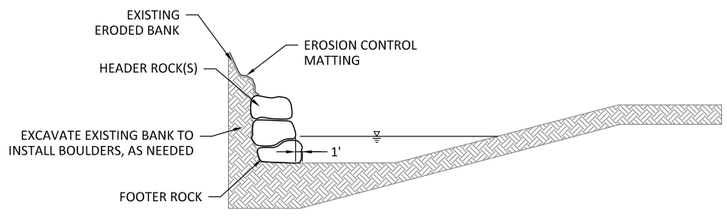
1. ROOTED/LEAFED CONDITION OF THE LIVING PLANT MATERIAL IS NOT REPRESENTATIVE OF THE TIME OF INSTALLATION.
2. BOTTOM OF FIRST COMPACTED EARTH LIFT TO BE PLACED 6" ABOVE NORMAL BASEFLOW.
3. NUMBER OF COMPACTED EARTH LIFTS TO VARY DEPENDING ON DESIGN TOP OF BANK HEIGHT. LIFTS NOT TO EXCEED 18" THICKNESS.

2 / 6.04 Vegetated Soil Lift
Not to Scale





Plan View



Section A-A'

NOTE:

1. FOR STREAMBEDS WITH COARSE SUBSTRATE, PROVIDE FOOTER ROCKS.

3 / 6.04 Boulder Toe
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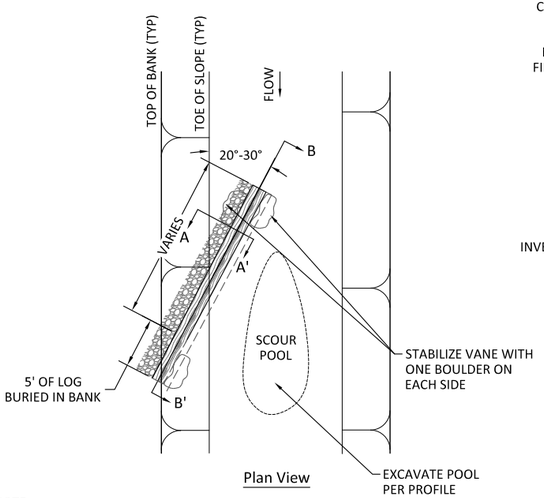
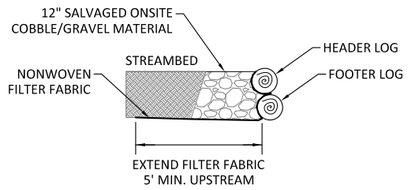
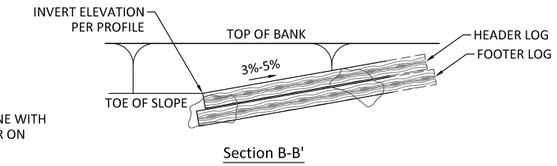


Plan View



Section A-A'

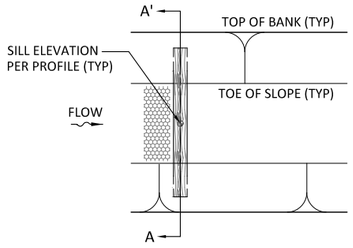


Section B-B'

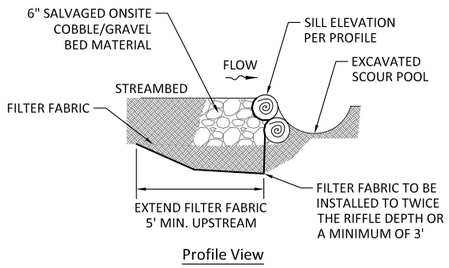
NOTE:

STABILIZATION BOULDER TO BE USED ON HANKS BRANCH ONLY, AND MAY BE REMOVED PER ENGINEER'S DISCRETION.

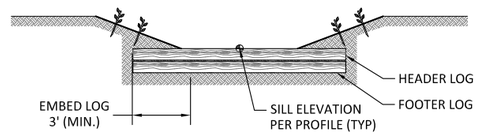
1 6.05 Log Vane
Not to Scale



Plan View

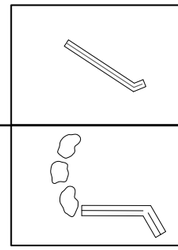


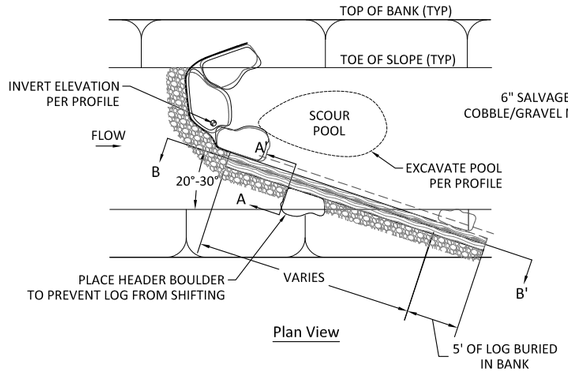
Profile View



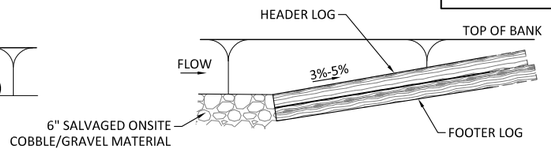
Section A-A'

2 6.05 Log Sill
Not to Scale

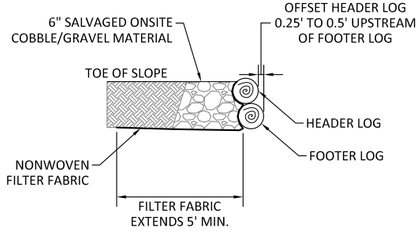




Plan View



Section B-B'



Section A-A'

NOTE:

1. HEADER BOULDER MAY BE ELIMINATED AT DISCRETION OF ENGINEER.

3 6.05 Log J-Hook
Not to Scale

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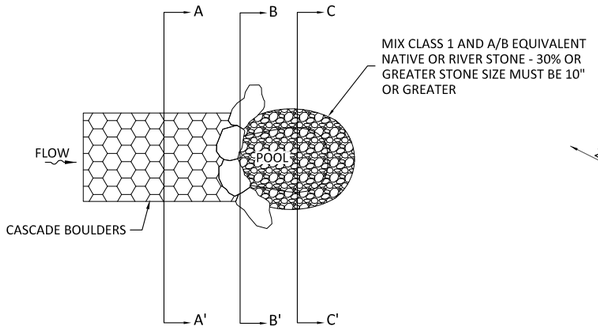
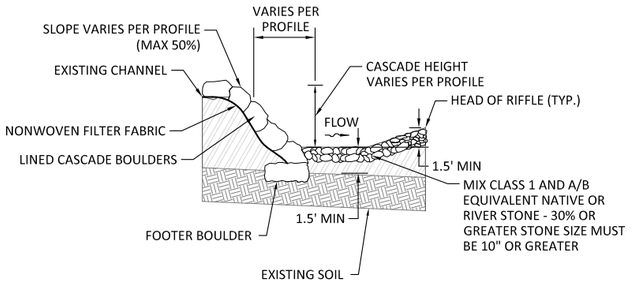


Plan View



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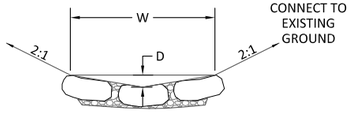
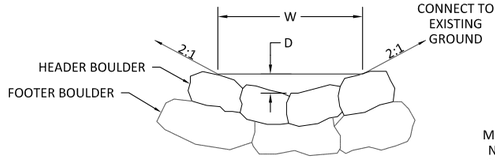
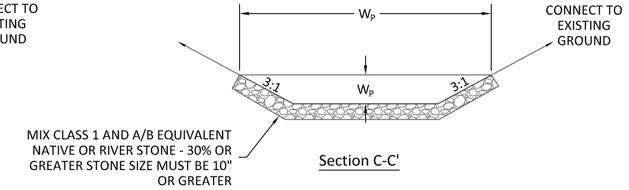


Section A-A'



Section B-B'

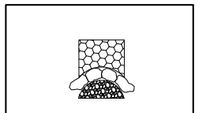


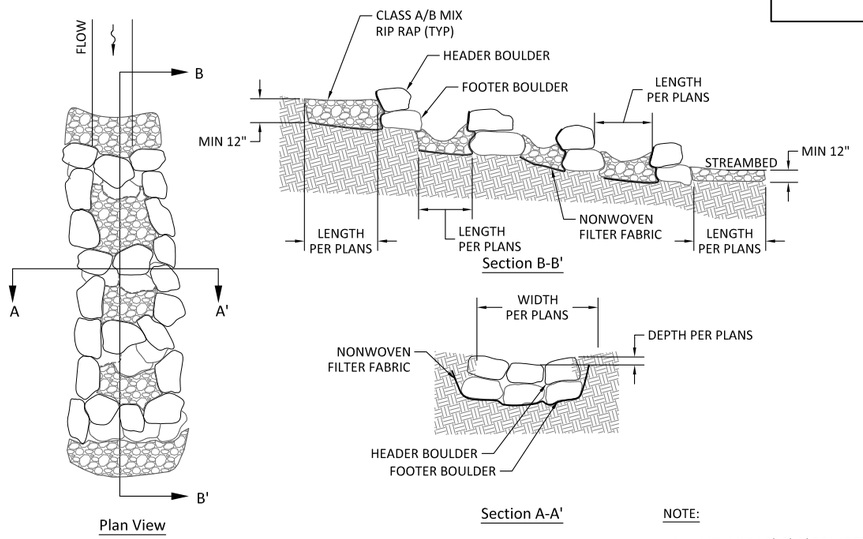
Section C-C'

NOTES:
1. MINIMUM SIZE FOR BOULDERS SHALL BE 2' x 2' x 1'.
2. VOID SPACES BETWEEN BOULDERS ON CASCADE SHALL BE FILLED WITH SMALLER RIVER STONE.
3. ALL SMALLER ROCK SHALL BE HETEROGENEOUS AND WELL MIXED.

TABLE				
	W	D	W_P	D_P
SPSC1	8	0.5	15	2
UT4	4	PER PROFILE	5.2	PER PROFILE

1 / 6.06 Rock Cascade
Not to Scale





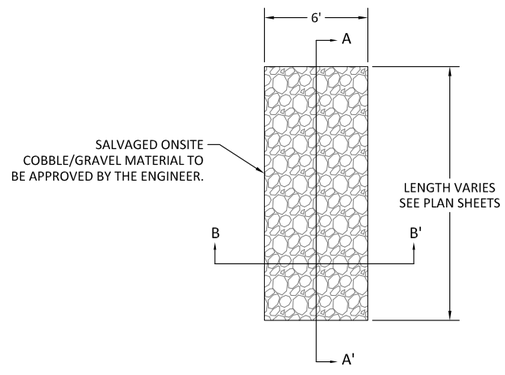
Plan View

Section B-B'

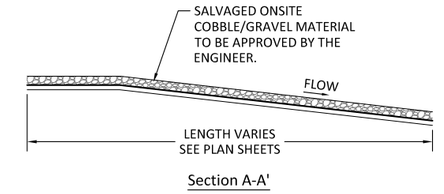
Section A-A'

NOTE:
1. MINIMUM 2'x2'x1' BOULDERS TO BE USED FOR HEADER AND FOOTER ROCKS.
2. BOULDERS MUST BE INSTALLED SUCH THAT THEY EXTEND INTO THE CHANNEL BANK.

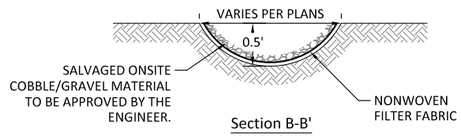
2 / 6.06 Rock Step Pools
Not to Scale



Plan View



Section A-A'



Section B-B'

NOTE:
1. IF NECESSARY, SALVAGED ONSITE ROCK MAY BE SUBSTITUTED WITH QUARRY ROCK OF SIMILAR SIZE.

3 / 6.06 Rock Floodplain Outlet
Not to Scale

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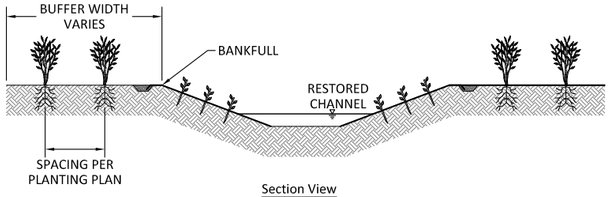


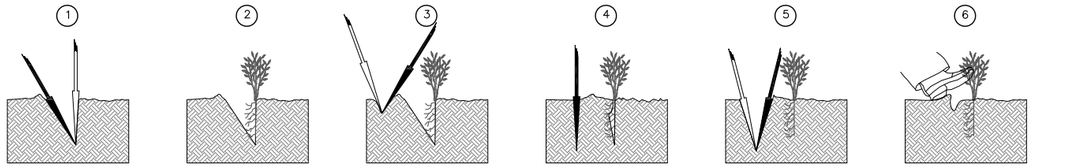
Section View

DIBBLE BAR

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

ROOTING PRUNING

ALL ROOTS SHALL BE PRUNED TO AN APPORIATE LENGTH TO PREVENT J-ROOTING.

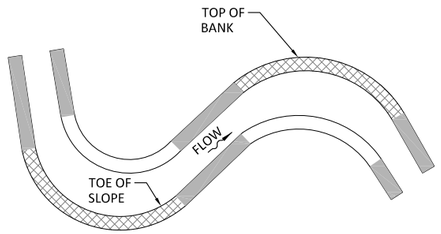


1. INSERT THE DIBBLE, OR SHOVEL, STRAIGHT DOWN INTO THE SOIL TO THE FULL DEPTH OF THE BLADE AND PULL BACK ON THE HANDLE TO OPEN THE PLANTING HOLE. (DO NOT ROCK THE SHOVEL BACK AND FORTH AS THIS CAUSES SOIL IN THE PLANTING HOLE TO BE COMPACTED, INHIBITING ROOT GROWTH.
2. REMOVE THE DIBBLE, OR SHOVEL, AND PUSH THE SEEDLING ROOTS DEEP INTO THE PLANTING HOLE. PULL THE SEEDLING BACK UP TO THE CORRECT PLANTING DEPTH (THE ROOT COLLAR SHOULD BE 1-3" BELOW THE SOIL SURFACE). GENTLY SHAKE THE SEEDLING TO ALLOW THE ROOTS TO STRAIGHTEN OUT. DO NOT TWIST OR SPIN THE SEEDLING OR LEAVE THE ROOTS J-ROOTED.
3. INSERT THE DIBBLE, OR SHOVEL, SEVERAL INCHES IN FRONT OF THE SEEDLING AND PUSH THE BLADE HALFWAY INTO THE SOIL. TWIST AND PUSH THE HANDLE FORWARD TO CLOSE THE TOP OF THE SLIT TO HOLD THE SEEDLING IN PLACE.
4. PUSH THE DIBBLE, OR SHOVEL, DOWN TO THE FULL DEPTH OF THE BLADE.
5. PULL BACK ON THE HANDLE TO CLOSE THE BOTTOM OF THE PLANTING HOLD. THEN PUSH FORWARD TO CLOSE THE TOP, ELIMINATING AIR POCKETS AROUND THE ROOT.
6. REMOVE THE DIBBLE, OR SHOVEL, AND CLOSE AND FIRM UP THE OPENING WITH YOUR HEEL. BE CAREFUL TO AVOID DAMAGING THE SEEDLING.

1 6.07 Bare Root Planting
Not to Scale

NOTES:

1. ALL SOILS WITHIN THE BUFFER PLANTING AREA SHALL BE DISKED, AS REQUIRED, PRIOR TO PLANTING.
2. ALL PLANTS SHALL BE PROPERLY HANDLED PRIOR TO INSTALLATION TO INSURE SURVIVAL.

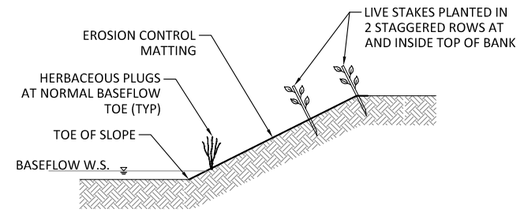


LINEAR SPACING

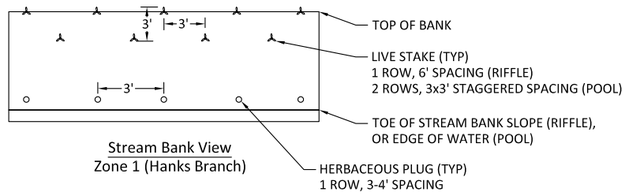
4' SPACING FOR HERBACEOUS PLUGS
6' SPACING FOR LIVE STAKES

3' SPACING FOR HERBACEOUS PLUGS
3' SPACING FOR LIVE STAKES, 2 ROWS

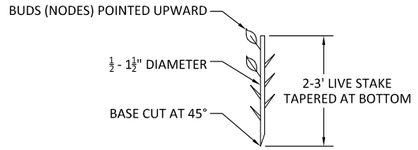
Plan View
Zone 1 (Hanks Branch)



Section View
Zone 1 (Hanks Branch)



Stream Bank View
Zone 1 (Hanks Branch)

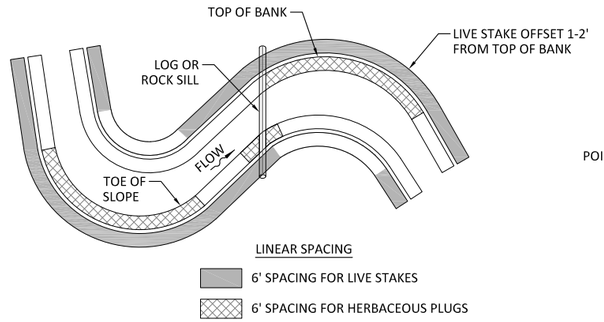


Live Stake Detail

NOTES:

1. CONTRACTOR RESPONSIBLE TO FOLLOW PLAN VIEW DETAILS BY REACH SHOWN ABOVE
2. REFER TO SPECIFICATIONS FOR PROPER STORAGE, HANDLING AND INSTALLATION.
3. FORM PILOT HOLE IN HARD SOIL OR STONY CONDITIONS TO PREVENT DAMAGE TO LIVE STAKES.
4. LIVE STAKES TO BE INSTALLED TO A DEPTH AT LEAST ⅔ THE LENGTH OF THE LIVE STAKE, PLANTED IN AREAS AS SHOWN ON PLANS AND DIRECTED BY THE ENGINEER.
5. INSTALL DORMANT PRIOR TO LEAF OUT. DEPICTED CONDITION WITH LEAVES NOT REPRESENTATIVE OF STAKES AT TIME OF INSTALLATION.

2 6.07 Zone 1 Streambank Planting
Not to Scale

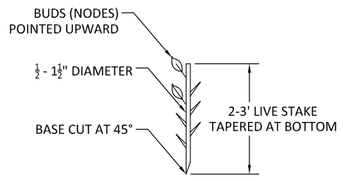


LINEAR SPACING

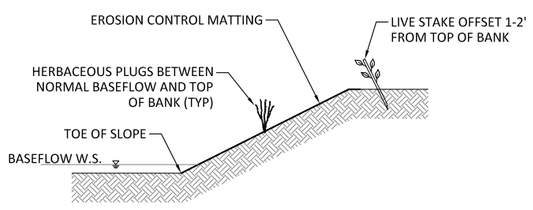
6' SPACING FOR LIVE STAKES

6' SPACING FOR HERBACEOUS PLUGS

Plan View
ZONE 2 (UT1, UT3, UT4 & UT5)



Live Stake Detail

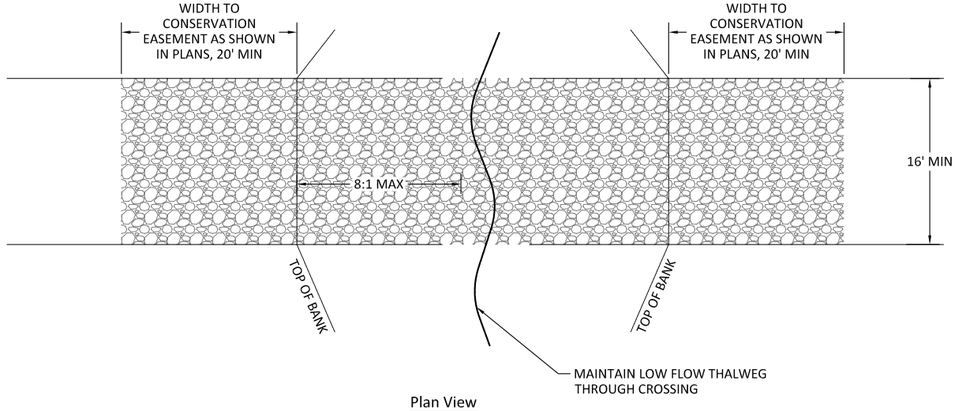


Section View
ZONE 2 (UT1, UT3, UT4 & UT5)

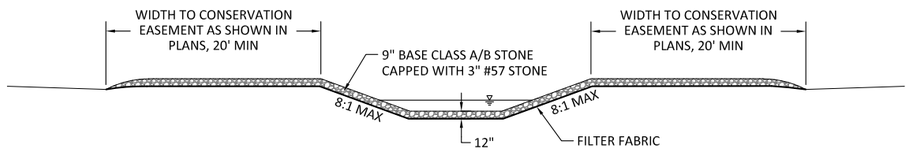
3 6.07 Zone 2 Streambank Planting
Not to Scale

NOTES:

1. CONTRACTOR RESPONSIBLE TO FOLLOW PLAN VIEW DETAILS BY REACH SHOWN ABOVE
2. REFER TO SPECIFICATIONS FOR PROPER STORAGE, HANDLING AND INSTALLATION.
3. FORM PILOT HOLE IN HARD SOIL OR STONY CONDITIONS TO PREVENT DAMAGE TO LIVE STAKES.
4. LIVE STAKES TO BE INSTALLED TO A DEPTH AT LEAST ⅔ THE LENGTH OF THE LIVE STAKE, PLANTED IN AREAS AS SHOWN ON PLANS AND DIRECTED BY THE ENGINEER.
5. INSTALL DORMANT PRIOR TO LEAF OUT. DEPICTED CONDITION WITH LEAVES NOT REPRESENTATIVE OF STAKES AT TIME OF INSTALLATION.
6. ZONE 2 HERBACEOUS PLUGS TO BE PLANTED ALONG OUTSIDE BENDS WHERE BANK REVETMENT STRUCTURES ARE NOT SHOWN AND PLANTED ABOVE AND BELOW LOG AND ROCK SILLS AS SHOWN.



Plan View



4 6.07 Permanent Ford Crossing
Not to Scale

NOTE:

1. FORD CROSSING SHALL BE INSTALLED PERPENDICULAR TO CHANNEL BANKS.

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90% PLANS DO NOT USE FOR CONSTRUCTION

Lyon Hills Mitigation Site
Wilkes County, North Carolina

Details

Revisions:

Date: 06.05.20
Job Number: 005-02177
Project Engineer: NMM
Drawn By: CAW
Checked By: GAT

6.07
Sheet

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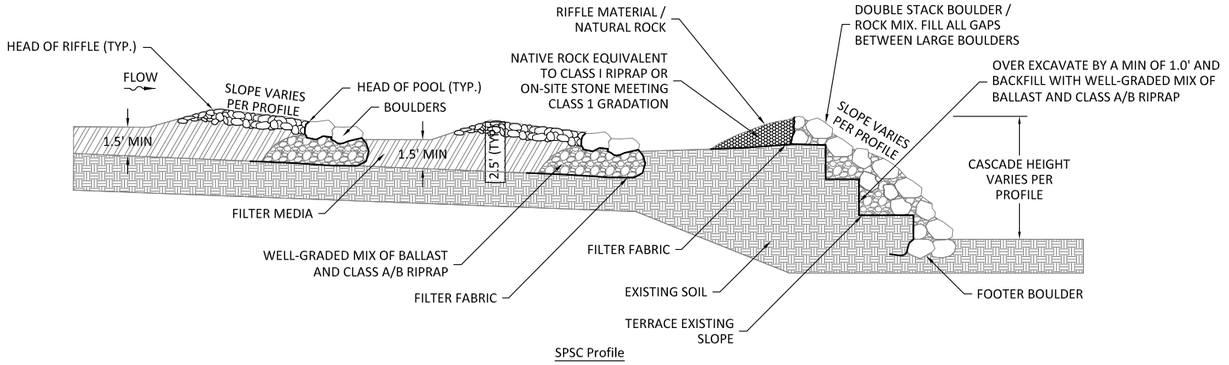
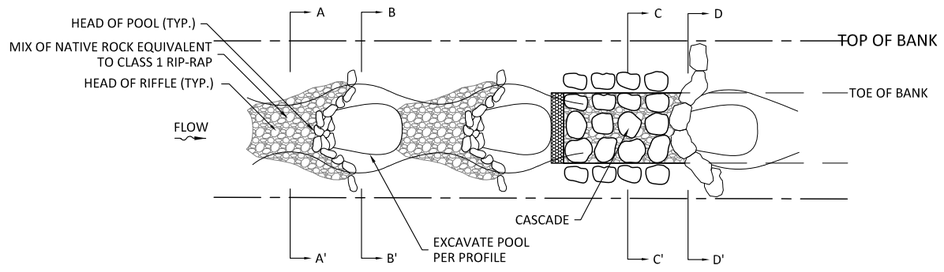
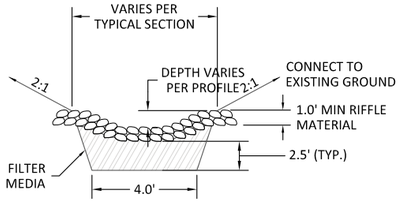


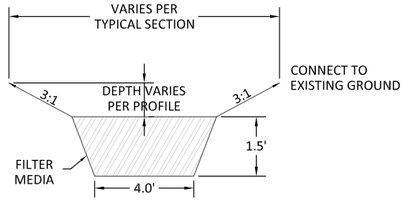
SPSC Profile



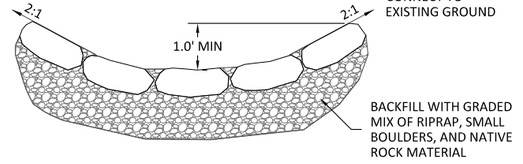
Riffle Sequence Plan View



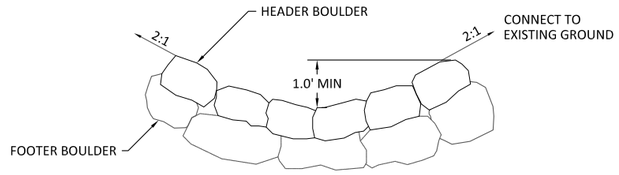
Section A-A'



Section B-B'



Section C-C'



Section D-D'

1 / 6.08 Step Pool Stormwater Conveyance

Not to Scale

NOTES:

1. FILTER MEDIA SHALL BE WELL MIXED AND CONSIST OF 90% SAND AND 10% WOODCHIPS COMPACTED IN 6" LIFTS.
2. MINIMUM SIZE FOR BOULDERS SHALL BE 2' x 2' x 1'.
3. VOID SPACES BETWEEN BOULDERS ON CASCADE SHALL BE FILLED WITH SMALLER NATIVE ROCK.
4. IF NATIVE ROCK IS NOT AVAILABLE, QUARRIED ROCK MAY BE SUBSTITUTED IN THE SAME SIZES.
5. ALL SMALLER ROCK SHALL BE HETEROGENEOUS AND WELL MIXED.
6. WHERE HYDROLOGIC CONDITIONS ARE APPROPRIATE, LIVESTAKES AND/OR JUNCUS PLUGS MAY BE PLANTED ON BANKS AS DETERMINED BY THE ENGINEER.

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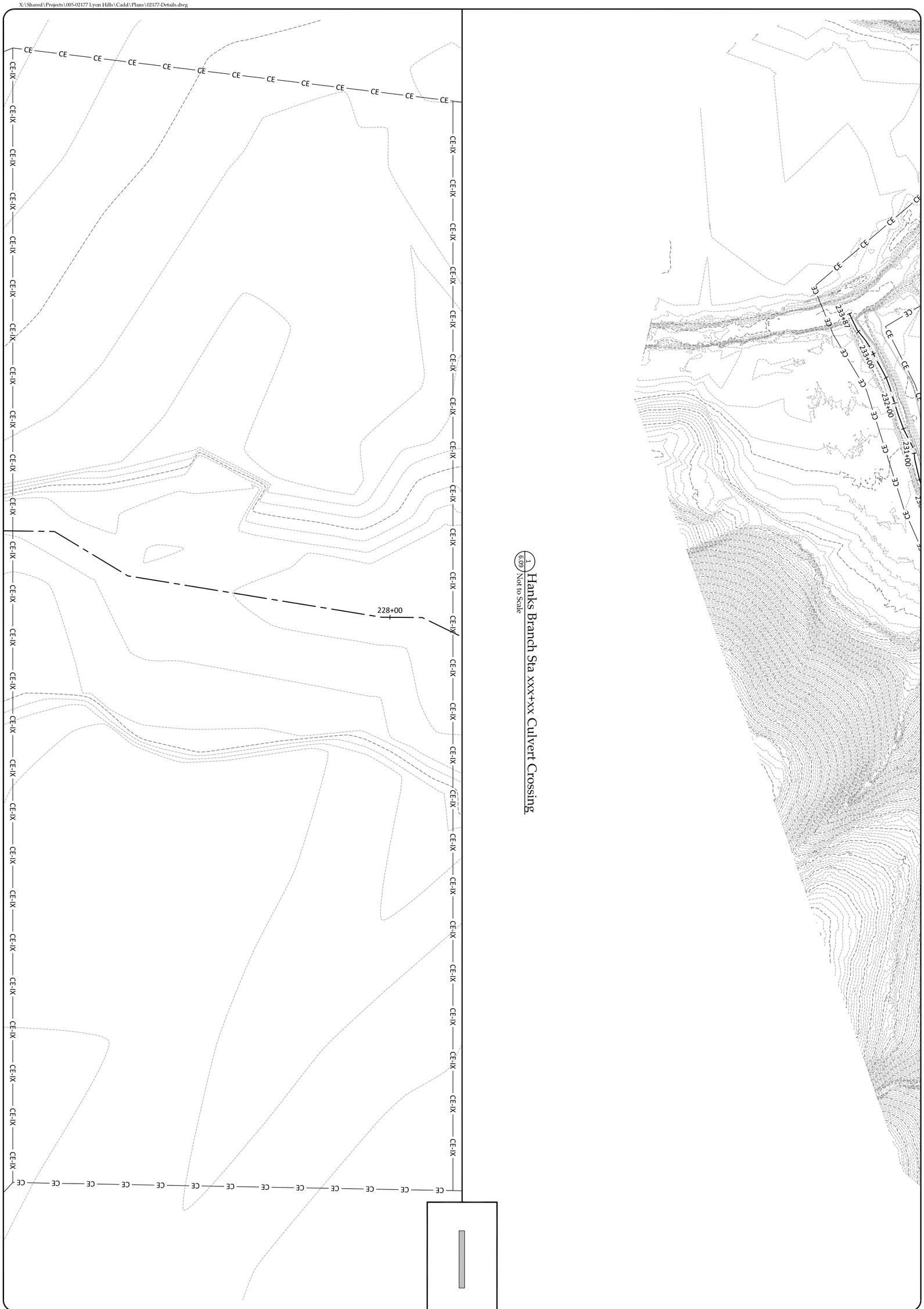

1/6.09 Hanks Branch Sta xxx+xx Culvert Crossing
Not to Scale

Date:	06.05.20
Job Number:	005-02177
Project Engineer:	NMM
Drawn By:	CAW
Checked By:	GAT

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6.09
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Lyon Hills Mitigation Site
Wilkes County, North Carolina

Hanks Branch Crossing Detail

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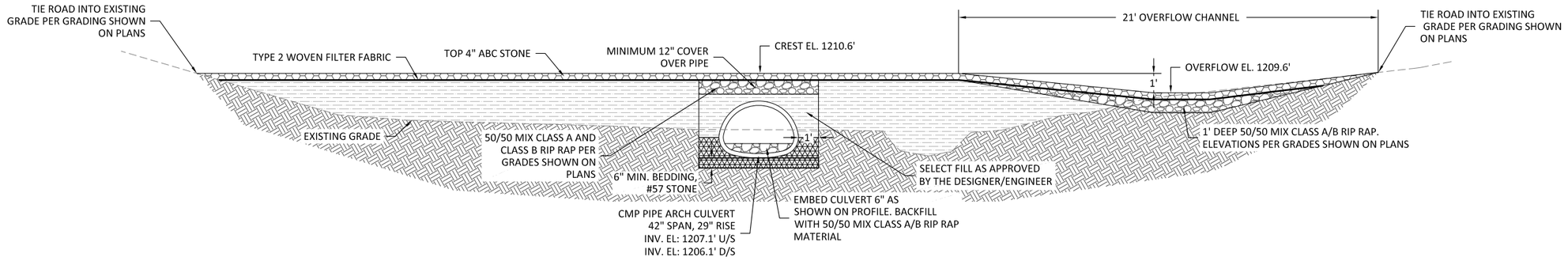
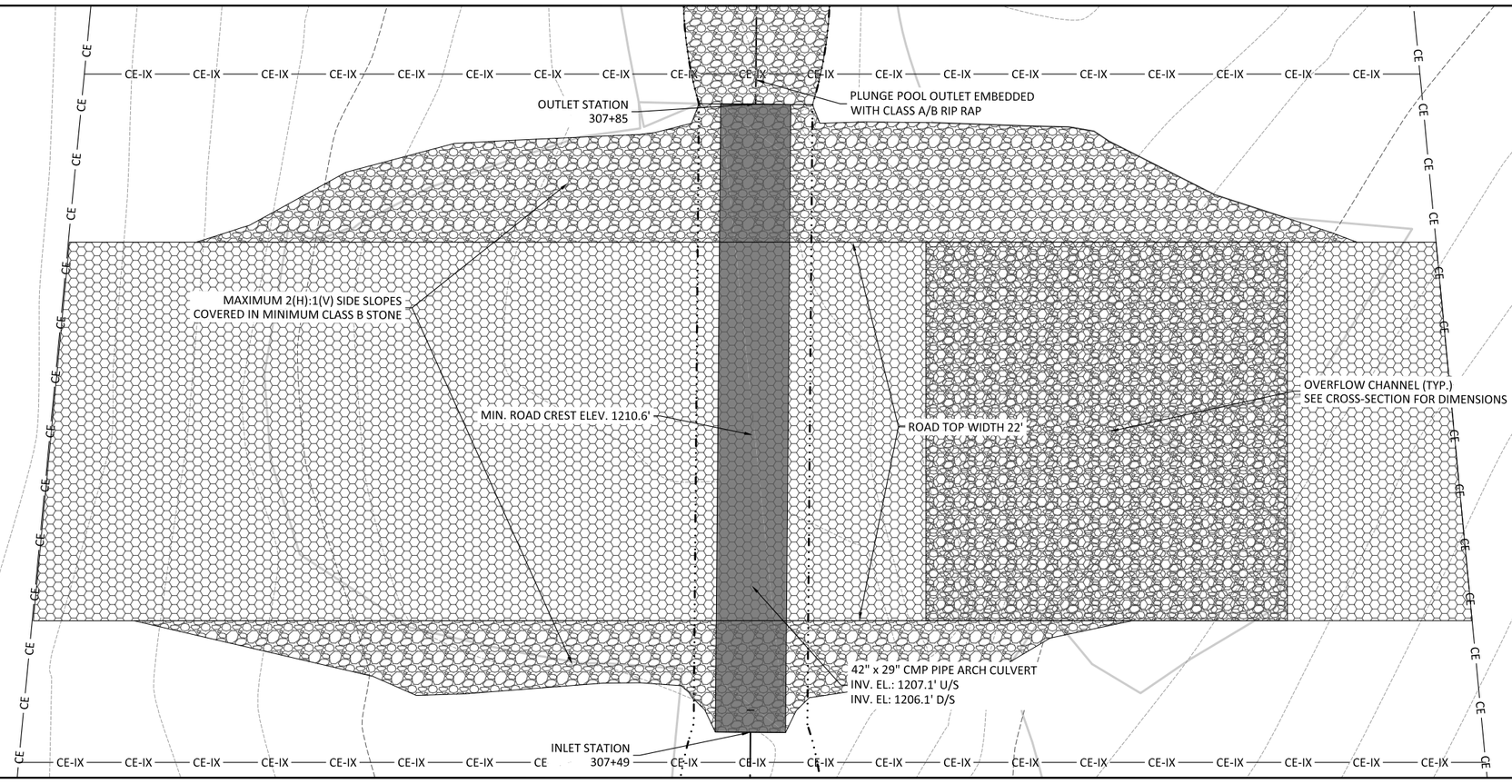


1/6.10 UT1 Sta 307+67 Culvert Crossing
Not to Scale



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Wilkes County, North Carolina

UT1 Crossing Detail

Revisions:

Date: 06.05.20
Job Number: 005-02177
Project Engineer: NMM
Drawn By: CAW
Checked By: GAT

Sheet 6.10

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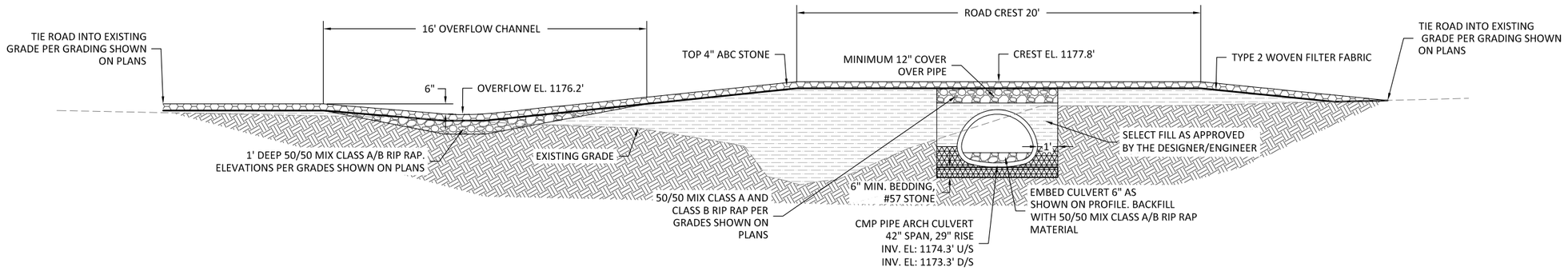
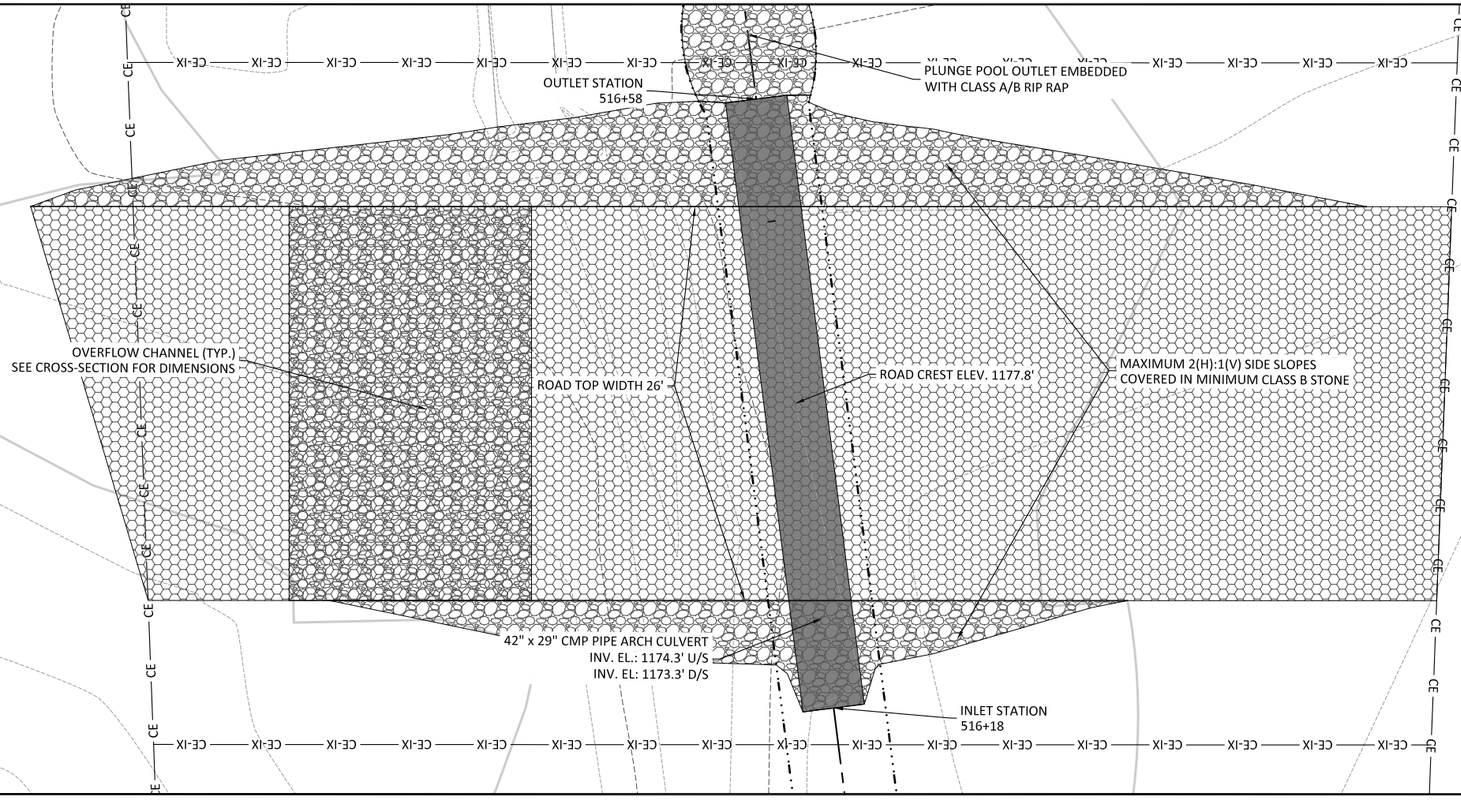


1 / 6.11 UT3 Sta 516+38 Culvert Crossing
Not to Scale



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UT3 Crossing Detail

Revisions:

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Job Number: 005-02177
Project Engineer: NMM
Drawn By: CAW
Checked By: GAT

Sheet 6.11

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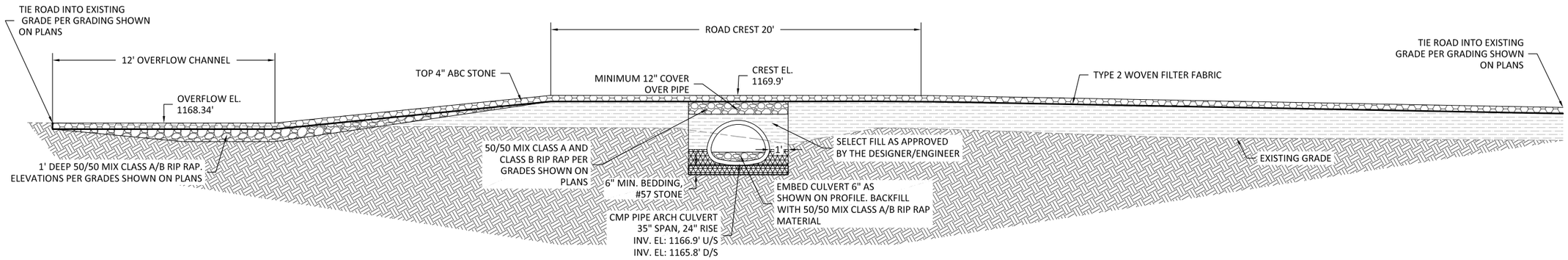
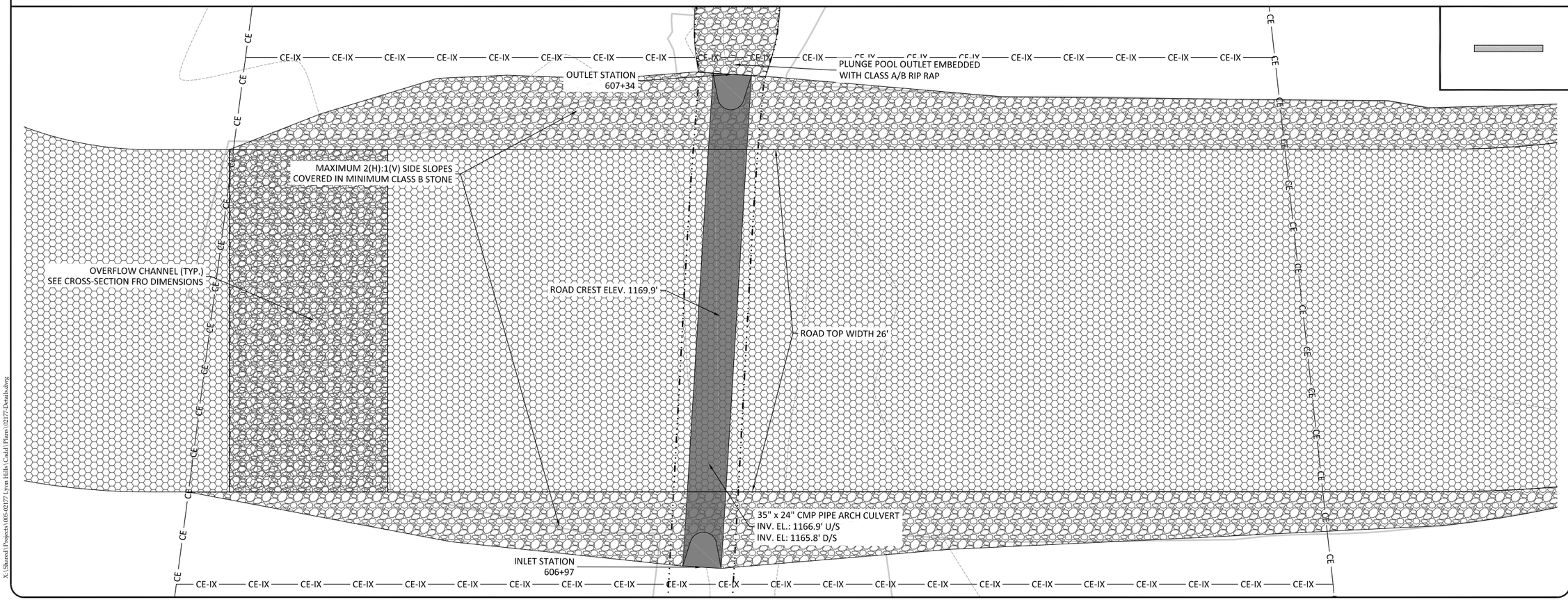


1 / 6.12 UT4 Sta 607+16 Culvert Crossing
Not to Scale



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Lyon Hills Mitigation Site
Wilkes County, North Carolina

UT4 Crossing Detail

Revisions:

Date: 06.05.20
Job Number: 005-02177
Project Engineer: NMM
Drawn By: CAW
Checked By: GAT

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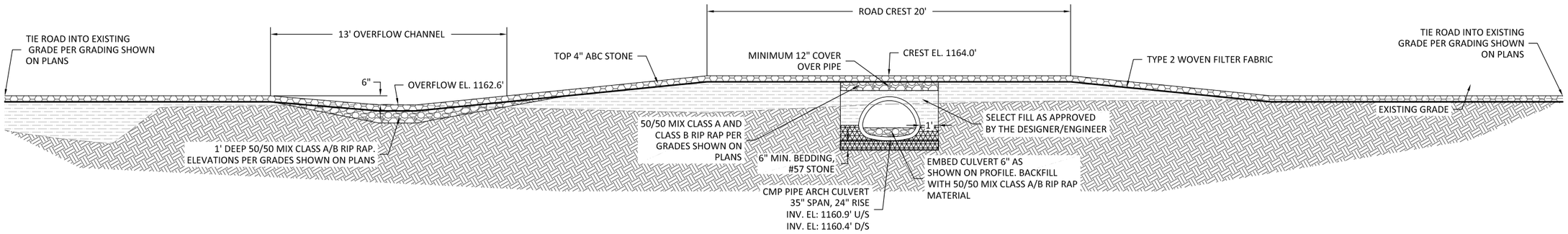
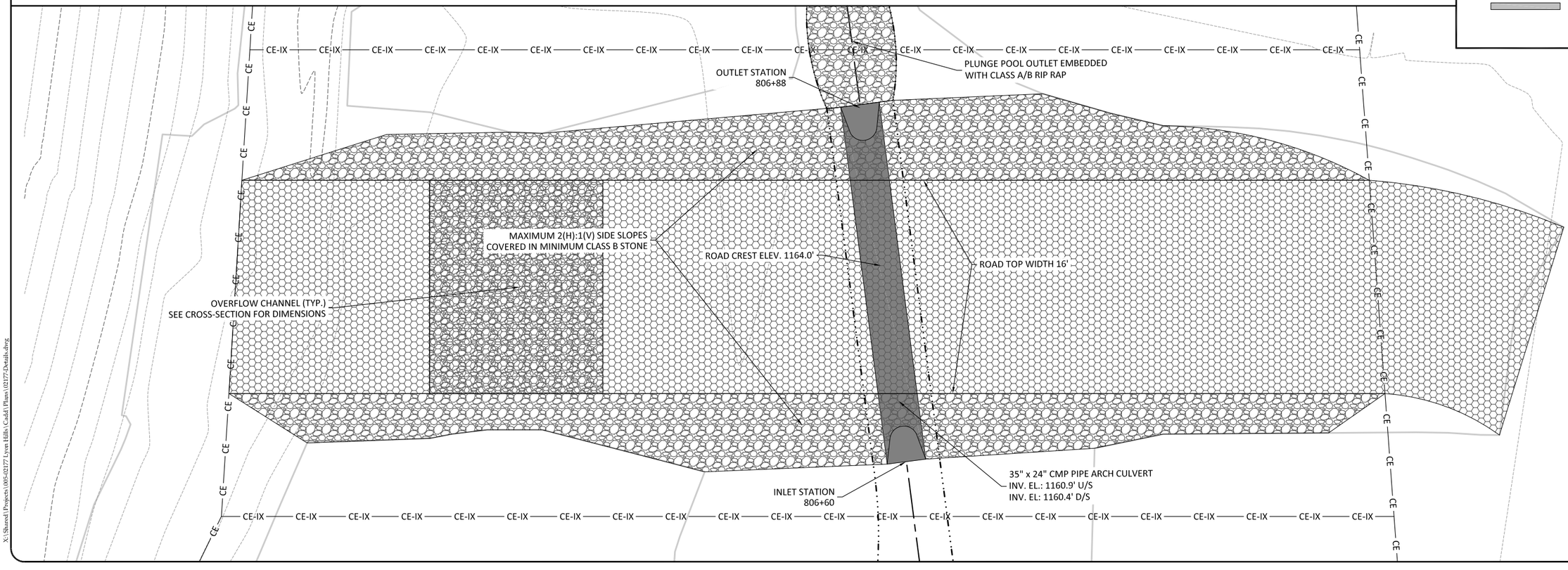


1/6.13 UT5 Sta 806+74 Culvert Crossing
Not to Scale



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Lyon Hills Mitigation Site
Wilkes County, North Carolina

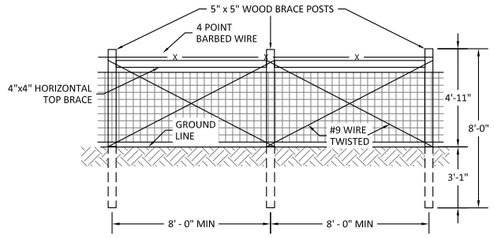
UT5 Crossing Detail

Revisions:

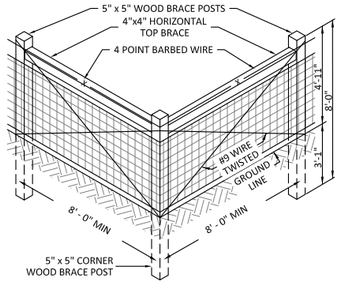
Date: 06.05.20
Job Number: 005-02177
Project Engineer: NMM
Drawn By: CAW
Checked By: GAT

Sheet 6.13

July 27, 2020

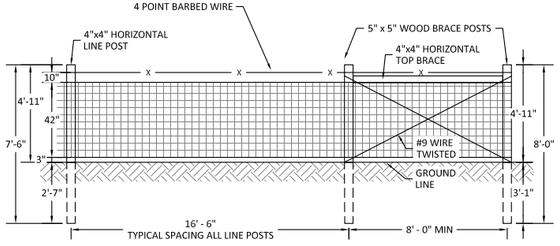


LINE BRACES
(MAXIMUM SPACING 330')



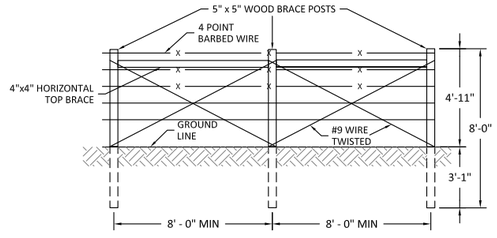
CORNER BRACE
USE WHEN CORNER ANGLE IS 15° OR GREATER

ALTERNATE TYPES OF STAPLES
USE ONE #9 STAPLE OR TWO #16 STAPLES AT EACH POINT OF ATTACHMENT.

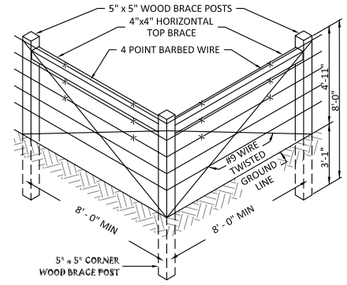


END OR GATE BRACES

1 6.14 Woven Wire Fence - Permanent CE Fencing
Not to Scale

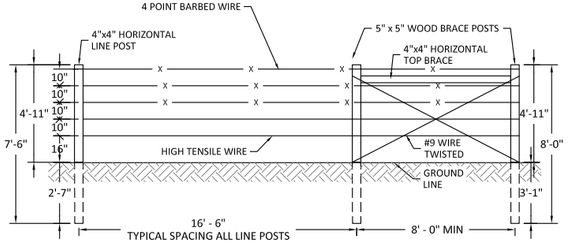


LINE BRACES
(MAXIMUM SPACING 330')



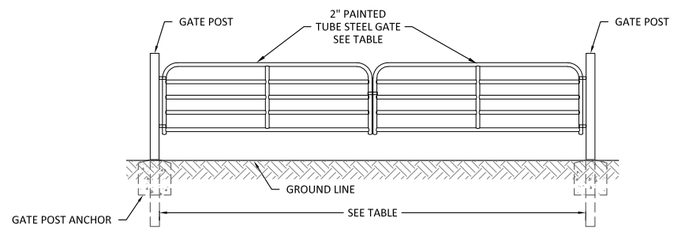
CORNER BRACE
USE WHEN CORNER ANGLE IS 15° OR GREATER

ALTERNATE TYPES OF STAPLES
USE ONE #9 STAPLE OR TWO #16 STAPLES AT EACH POINT OF ATTACHMENT.



END OR GATE BRACES

2 6.14 Five-Strand Wire Fence - CE Crossing
Not to Scale



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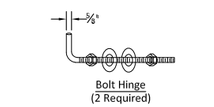
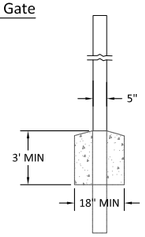


Hinge Assembly



Detail of Gate Post Anchor

GATE POST:

USE CLASS "B" CONCRETE AT GATE POSTS OR WHERE REQUIRED BY SOIL CONDITIONS. CONCRETE MAY ALSO BE USED IN LIEU OF SETTING POSTS TO THEIR MAXIMUM DEPTH.

DOUBLE GATE POST SPACING	
GATES	POST SPACING
2 - 8'	16'
2 - 12'	24'
2 - 14'	28'

3 6.14 Double 2" Tube Steel Gates
Not to Scale

GENERAL NOTES:

ALL POSTS AND BRACES MAY BE EITHER ROUND OR SQUARE AT THE OPTION OF THE CONTRACTOR, PROVIDED THE SAME TYPE IS USED THROUGHOUT THE PROJECT.

DIMENSIONS SHOWN ARE THE DIAMETER OF ROUND OR EDGE DIMENSIONS OF SQUARE POSTS AND BRACES.

ERECT LINE BRACES BETWEEN END, CORNER OR GATE POSTS. PLACE LINE BRACES AT INTERVALS NOT TO EXCEED 300' AND AT THE END OF THE WIRE ROLL.

THE 300' INTERVAL MAY BE REDUCED BY THE ENGINEER ON CURVES WHERE THE DEGREE OF CURVATURE IS GREATER THAN 3 DEGREES.

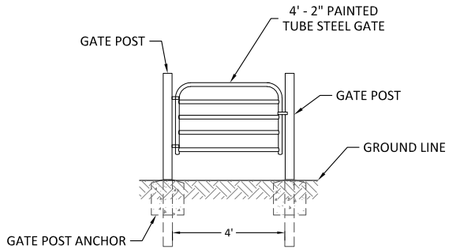
NOTCH BRACE POSTS 1" MINIMUM FOR HORIZONTAL BRACES. PLACE TWO GALVANIZED 12d OR THREE GALVANIZED 10d NAILS AT EACH END OF ALL BRACES.

PLACE THE BRACE WIRE AROUND THE POST. DRAW ALL BRACE WIRE TAUT BY TWISTING BETWEEN EACH POST.

INSTALL THE FENCE FACING THE PROPERTY OWNER EXCEPT THAT ON HORIZONTAL CURVES GREATER THAN THREE DEGREES (3°) INSTALL THE FENCE TO PULL AGAINST ALL POSTS. SEE NCDOT STD. 866.02 FOR FENCING AT DITCH CROSSINGS, BREAKS IN GRADES AND R/W BREAKS.

USE LATCH DEVICE APPROVED BY THE ENGINEER. HINGE ASSEMBLY AS SHOWN IS SUGGESTED. SUBSTITUTION MAY BE SUBJECT TO APPROVAL BY THE ENGINEER. USED 2" PAINTED STEEL PIPE FOR GATE FRAME EXCEPT AS SHOWN HERE.

ANY COMBINATION OF GATE AND FENCE TYPE MEETING THE APPROVAL OF THE ENGINEER IS ACCEPTABLE AND IS NOT LIMITED TO THE EXAMPLES SHOWN HEREON.



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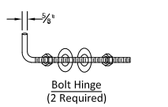
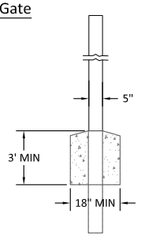


Hinge Assembly



Detail of Gate Post Anchor

GATE POST:

USE CLASS "B" CONCRETE AT GATE POSTS OR WHERE REQUIRED BY SOIL CONDITIONS. CONCRETE MAY ALSO BE USED IN LIEU OF SETTING POSTS TO THEIR MAXIMUM DEPTH.

3 6.14 2" Tube 4' Steel Gate
Not to Scale

GENERAL NOTES:

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ERECT LINE BRACES BETWEEN END, CORNER OR GATE POSTS. PLACE LINE BRACES AT INTERVALS NOT TO EXCEED 300' AND AT THE END OF THE WIRE ROLL.

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PLACE THE BRACE WIRE AROUND THE POST. DRAW ALL BRACE WIRE TAUT BY TWISTING BETWEEN EACH POST.

INSTALL THE FENCE FACING THE PROPERTY OWNER EXCEPT THAT ON HORIZONTAL CURVES GREATER THAN THREE DEGREES (3°) INSTALL THE FENCE TO PULL AGAINST ALL POSTS. SEE NCDOT STD. 866.02 FOR FENCING AT DITCH CROSSINGS, BREAKS IN GRADES AND R/W BREAKS.

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ANY COMBINATION OF GATE AND FENCE TYPE MEETING THE APPROVAL OF THE ENGINEER IS ACCEPTABLE AND IS NOT LIMITED TO THE EXAMPLES SHOWN HEREON.

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90% PLANS DO NOT USE FOR CONSTRUCTION

Lyon Hills Mitigation Site
Wilkes County, North Carolina

Fencing Details
Details

Revisions:

Date: 06.05.20
Job Number: 005-02177
Project Engineer: NMM
Drawn By: CAW
Checked By: GAT

6.14
Sheet

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