MY0 MONITORING REPORT

PHANTOM MILL

Alamance County, North Carolina
Cape Fear River Basin
Cataloging Unit 03030002

DMS Project No. 100057
Full Delivery Contract No. 7526
DMS RFP No. 16-007330
USACE Action ID No. SAW-2018-01166
DWR Project No. 18-0796

Data Collection: June 2021-January 2022
Submission: July 2022

Prepared for:

NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
1652 MAIL SERVICE CENTER
RALEIGH, NORTH CAROLINA 27699-1652

Mitigation Services
ENVIRONMENTAL QUALITY

October 17, 2022

Restoration Systems, LLC
1101 Haynes St. Suite 211
Raleigh, North Carolina
Ph: (919) 755-9490
Fx: (919) 755-9492

Kimberly Isenhour
Mitigation Project Manager, Regulatory Division
U.S. Army Corps of Engineers

Subject: Phantom Mill Mitigation Site - request to count replacement tree species towards site success criteria
DMS Project ID No. 100057
Full Delivery Contract No. 7526
RFP No. 16-007330
USACE Action ID No. SAW-2018-01166
DWR Project No. 18-0796

Mrs. Isenhour,

Restoration Systems, LLC (RS), Sponsor of the Phantom Mill Mitigation Site (Site), is requesting a modification of the Site's Mitigation Plan to include planted tree/shrub species that were not included in the Site's approved Mitigation Plan. A lack of availability from nurseries of approved Mitigation Plan tree/shrub species required RS to adjust the number of stems planted for some approved species and include five additional species not included in the approved Mitigation Plan. Table A below is a list of tree/shrub species detailed in the approved Mitigation Plan that were not planted at the Site.

Table A. Non-planted Species Specified in the Mitigation Plan

Species (Mitigation Plan)	Wetland Indicator Status	Mit. Plan Stems
Tag Alder (*Alnus serrulata*)	OBL	400
Ironwood *(Carpinus caroliniana*)	FAC	300
Sugarberry (*Celtis laevigata*)	FACW	1,000
Sweet Pepperbush (*Clethra alnifolia*)	FAC	25
White Ash (*Fraxinus americana*)	FACU	100
Elderberry (*Sambucus canadensis*)	FACW	25
Possumhaw (*Viburmum nudum*)	OBL	25
	TOTAL	1,875

Species summarized in Table A, as with others in the approved Mitigation Plan, were selected based on Reference Forest Ecosystem (RFE) data, on-site observations, and community descriptions from Classification of the Natural Communities of North Carolina (Schafale and Weakley 1990 and 2012) – Piedmont Alluvial and Dry-Mesic Oak-Hickory Forests.

To replace the 1,875 stems detailed in Table A, 2,300 were supplemented by five species not included in the approved Mitigation Plan: hackberry, red mulberry, overcup oak, Shumard oak, and southern arrowwood. RS selected these species based on their availability and that they were observed in nearby forest communities. The additional 12,000 stems needed to complete the targeted planting density were comprised of Mitigation Plan approved species. Table B summarizes planted species and their individual quantity.

Restoration Systems, LLC
1101 Haynes St. Suite 211
Raleigh, North Carolina
Ph: (919) 755-9490
Fx: (919) 755-9492

Table B. As-Built Planted Species and Stems

Replacement Species & Final Planting Numbers (As-built)	Wetland Indicator Status	Mit. Plan Stems	Planted Stems	Percentage of Total
Hackberry (*Celtis occidentalis*) *	FACU	--	500	3.50%
Red mulberry *(Morus rubra)* *	FACU	--	350	2.45%
Overcup oak *(Quercus lyrata)* *	OBL	--	600	4.20%
Shumard oak *(Quercus shumardii)* *	FAC	--	750	5.24%
Southern arrowwood *(Viburnum dentatum)* *	FAC	--	100	0.70%
River birch (*Betula nigra*)	FACW	1,400	1,000	6.99%
Buttonbush (*Cephalanthus occidentalis*)	OBL	25	300	2.10%
Eastern redbud (*Cercis canadensis*)	FACU	100	750	5.24%
Silky dogwood (*Cornus amomum*)	FACW	2,000	2,000	13.99%
Persimmon (*Diospyros virginiana*)	FAC	200	500	3.50%
Green ash (*Fraxinus pennsylvanica*)	FACW	1,000	700	4.90%
Tulip poplar (*Liriodendron tulipifera*)	FACU	600	1,000	6.99%
Black gum (*Nyssa sylvatica*)	FAC	300	500	3.50%
Sycamore (*Platanus occidentalis*)	FACW	2,600	1,500	10.49%
White oak (*Quercus alba*)	FACU	500	650	4.55%
Water oak (*Quercus nigra*)	FAC	1,500	1,250	8.74%
Willow oak (*Quercus phellos*)	FAC	1,400	1,250	8.74%
Red oak (*Quercus rubra*)	FACU	100	600	4.20%
	TOTALS	11,725	14,300	100%

*Replacement species not included in the approved Mitigation Plan

RS included all planted species in the data collection for the MY0 Monitoring Report. Table 8 within the MY0 Monitoring Report, the DMS vegetation tool, requires providers to select from five options regarding the species status for inclusion in meeting performance standards, "Performance Standard Approval" column:

1. Approved Mit Plan
2. Approved Post Mit Plan
3. Proposed
4. Not Approved – Not Invasive or Exotic
5. Not Approved – Invasive or Exotic

The five additional species detailed in Table B are included in the MY 0 Report as "Proposed" species for inclusion in meeting performance standards – Vegetation Plot Data Table from Vegetation Data Entry Tool, MY 0 Report Table 8, Appendix B. If the IRT concurs that these species may be included to count toward the Site's performance standards, RS will update the four species as "Approved Post Mit Plan" in the MY1 (2022) report.

Please let me know if you have any questions or if I can provide any additional information.

Sincerely,

Raymond Holz
Operations Manager
Restoration Systems, LLC

Restoration Systems, LLC
1101 Haynes St. Suite 211
Raleigh, North Carolina
Ph: (919) 755-9490
Fx: (919) 755-9492

Response to IRT Comments – MY 0, Baseline Report
Phantom Mill Mitigation Site – Alamance County
DMS Project No. 100057
Full Delivery Contract No. 7526
DMS RFP No. 16-007330
USACE Action ID No. SAW-2018-01166
DWR Project No. 18-0796

Comments Received (Black Text) & Responses (Blue Text)

Kim Isenhour, USACE:

1. During monitoring, please make visual observations of the large tree on the bank on Cane Creek STA 0+35. I'd like to know how tree survival is affected after construction.
   Response: The tree will be visually observed throughout the monitoring period.

2. In future monitoring reports, please note any issues that arise on UT-2 and UT-3 where rock riffles and log cross vanes were not installed per Colonial Pipeline regulations.
   Response: Reaches crossing the colonial pipeline easement will be monitored closely during the monitoring period.

3. Please confirm that the shallow wetland marsh treatment area that was constructed in the floodplain was not constructed in a jurisdictional wetland. I'm unclear where it's located. I'd like to see this area during the site visit. The IRT has had concerns with the amount of rip rap armoring of constructed outfalls.
   Response: During construction, it was determined that the marsh treatment areas were not necessary, so no marsh treatment areas were constructed. The UT1 channel was turned and dissipates into a large, restored wetland area. And the swale on the adjacent upstream property was turned into the channel prior to entering the easement. The as-built plan sheets have been updated to show that the marsh treatment areas were not constructed.

4. It would be helpful to show the location of the pipeline, and any other utilities on Figure 1.
   Response: The pipeline easement will be added to Figure 1. No other utilities exist onsite.

5. Table 5: What is the total acreage of invasives on site? Was this not listed on Table 5 because it was below the mapping threshold?
   Response: Invasive species occurrences observed onsite were sporadic and below the mapping threshold; however, spot treatment of privet and multiflora rose has occurred since as-built measurements. Treatment areas will be depicted on Figure 1 in the MY1 report.

6. Concur with DWR's comment #6 and EPA's comment #1.
   Response: See response to DWR comment #6.

7. While I appreciate the diversity in the seed mixes, please note the wetland indicator status for each species. For example, I believe Indiangrass is UPL, but it's listed in the wetland seed mix.
   Response: RS applied several long-term seed mixes to this site. The lower elevation areas including the streamside zones and wetland areas received a wetland specific mix. The entire site (except preservation areas) received a general mix of regionally appropriate native and naturalized species. This mix includes species likely to thrive on the upland margins of the site, some of which have a FACU or UPL indicator status. The mix is intended to provide early soil stabilization, facilitate tree establishment and survival, and support diverse wildlife including pollinators. In our experience it is more effective to broadly apply a diverse seed mix than to restrict species to narrowly delineated zones, and the planting on this site followed that philosophy. Additionally, wetland indicator status will be added to the seed mix table in the MY1 monitoring document.

8. Do you plan to add additional stems to vegetation plot 8, since it's currently not meeting interim success criteria? Is this an old road bed?
   We plan on making a plan to replant plot 8 and other areas of the Site after we review Y1 vegetation data in the fall of 2022.

9. Concur with DWR's comment #5. Please capture the wetland enhancement areas in random veg plots throughout monitoring.
   Response: Vegetation in wetland enhancement areas will be captured with random vegetation plots throughout the monitoring period.

Erin Davis, NCDWR:

1. DWR appreciated and agrees with DMS' site visit comments on invasives treatment and easement boundary markers.
   The marsh treatment area was not constructed. It was deemed unnecessary based on field conditions after rerouting the existing ditch outside of the easement into Cane Creek.

2. Please pay particular attention to stream areas where structures were omitted for any instability or downcutting during monitoring. DWR is concerned with the three structures removed from the meander bend transition point from restoration to preservation on Cane Creek, particularly if any bank grading could've affected the root zone of trees left along the bank. A photo point would be helpful at this location.
   Response: Areas where structures were omitted will be monitored closely for instability and downcutting. A photo point of the omitted log vanes on Cane Creek at the transition from restoration to preservation will be included during monitoring.

3. What was the stream condition along UT1 that initially warranted the proposed structure installation? DWR understands that this is a non-credit reach, but what is the risk of stream instability and/or potential sediment source to the downstream wetland if the current stream condition is not addressed through an alternative treatment or structure?
   Response: UT 1 is not a stream, and there is no risk of stream instability. During design, a structure was proposed based on the slope of the feature; however, during construction it was determined that the slope did not require a structure and there was no risk of incision along UT 1. The feature is a swale that drains into a large swath of reestablished wetland which will naturally treat pollutants and sediment entering the site. This area will be monitored for excessive sediment deposition, but this is not expected to be an issue.

4. DWR appreciated all of the photos, including planting and drone footage. Could a photo of the BMP please be included in the MY1 report?
   Response: The BMPs were not constructed. See response to USACE comment #3.

5. As noted in the report, many of the permanent veg plots have shifted compared to locations in the approved final mitigation plan monitoring plan figure. DWR questions whether the new locations provide representative coverage to demonstrate performance standard success for all proposed credit areas. DWR requires either veg plot 11 or 12 and veg plot 3 or 5 be relocated to at least partially overlap a nearby wetland enhancement credit area. DWR would prefer that veg plots 2 and 4 be located completely within wetland reestablishment areas.
   Response: Vegetation in wetland enhancement/reestablishment areas will be captured with random vegetation plots throughout the monitoring period.

6. DWR is very concerned that six species appear to have been planted that were not on the approved mitigation plan plant list (Viburnum dentatum, Quercus shumardii, Q. rubra, Q. lyrate, Morus rubra, Celtis occidentalis). These changes were not mentioned in the MY0 report. Please provide wetland indicator statuses for all planted species requiring IRT approval and identify which planting zone each species was installed in. DWR would like to review this information before approving species to be able to count toward vegetative performance success.
   The species were included in the planting list based on nursery availability and observation in nearby forest

communities. RS has proposed a modification to the mitigation plan where the additional species are proposed for inclusion to meet performance standards. The additional species counted in MY0 monitoring have been marked as "Proposed" and appear as "Post Mitigation Plan Species" in the vegetation plot data table. See revised MY0 vegetation table and the proposed modification to the mitigation plan.

Todd Bowers, USEPA:

1. Overall, the Site looks good, appears to be performing as intended, and is on track to meet stream, vegetation and wetland hydrology success criteria.
   Response: Noted

2. Table 6a/Page 34 and 97: Recommend adding the wetland indicator status here and updating the table to show deviations from proposed planting plan in final mitigation plan.
   Response: Wetland indicator status will be added to the planting table in the MY1 document. Deviations from the proposed planting plan are described in detail in the proposed modification to the mitigation plan.

3. Modifications made during construction and red line deviations in site plans noted with no issues.
   Response: Noted

4. While overall, vegetation stem counts are performing as expected, several plots have dominant species (>50%) and/or less than 4 species. Recommend keeping a close eye on the areas with these plots (fixed plots 3, 8, 9, 11 and 12).
   Response: Species diversity will be closely monitored throughout the monitoring period.

5. Overall, I am very satisfied with the report and the work that RS has completed at the site. Having not been able to visit this location, I really appreciated the detailed ground-level wetland, vegetation and stream feature photos to illustrate the grading, planting and features implemented.
   Response: Noted, thank you.

Restoration Systems, LLC
1101 Haynes St. Suite 211
Raleigh, North Carolina
Ph: (919) 755-9490
Fx: (919) 755-9492

Response to DMS Comments
DMS Project ID No. 100092
Full Delivery Contract No. 7526
USACE Action ID No. SAW-2018-01166
RFP No. 16-007571

Comments Received (Black Text) & Responses (Blue Text)

Report Document:

1. Cover Page: Please update the cover page to "Phantom Mill" so the project name matches the DMS accounting system (CRM) and the project's Credit Ledger. Please update the project name report wide as necessary.
   The project name was updated to "Phantom Mill" throughout the report.

2. General: Please update the DMS Project No. throughout the report to 100057.
   The DMS project number was updated throughout the document.

3. Table 1 Project Credits: The summation of 3,632.152 should be 3,632.153 when applying the Project Segment Credits listed in Table 1. Please update this to be consistent with the significant figures calculated by CRM.
   The stream credit summation was updated in Table 1 and in the document.

4. Section 2 As-Built Condition: Due to the number of log vanes that were not constructed, please add an interpretative description for the expected channel response following the omission of the structures.
   The list of construction modifications was updated based on a recent field verification, and a description was added in Section 2 explaining that no negative effects are expected from the omission of the structures.

5. Section 2 As-Built Condition: Please note and discuss any monitoring device location changes from the IRT approved mitigation plan.
   A description was added to Section 2 explaining that deviations in monitoring device locations were made based on field conditions and that the locations are representative of site conditions.

6. Section 3 Project Monitoring: The Ordinary High-Water Mark Success Criteria specified in Section 1.2 must be reported in the Project Monitoring and Assessment Sections.
   All streams are maintaining an ordinary high-water mark. This statement was added to Section 4.1.

7. Appendix A Visual Assessment Data: In accordance with agency requests, please add photographs showing the upstream and downstream views of each crossing/utility area in all future monitoring reports (MY1-MY7).
   These photos will be included in future monitoring reports.

8. Appendix F Other Data: Thank you for including the pre-construction benthic sampling and habitat assessment results in the MY0 report.
   You are welcome.

9. Appendix G Plan Sheets: This appendix should be titled "Record Drawing Plan Sheets".
   The title of Appendix G was changed.

DMS conducted a field visit on June 22, 2022. The following comments/observations are a result of that visit:

10. Invasive Treatment: Areas of multiflora rose, privet, tree of heaven and other invasives were noted within the conservation easement in the forested portions of UT2 and Cane Creek. Please treat the existing invasives within the entire conservation easement at first opportunity and notify DMS upon completion. Document successful completion of these efforts in the final MY0 report.
    Invasive treatment at the Site will begin in the fall of 2022. Following conversations with DMS PM Kelly Phillips, RS is providing the following invasive species treatment schedule, including treatments on Site to

date. RS will provide documentation of treatments within the annual monitoring reports.

Monitoring Year / Calendar Year	Spring Treatment Schedule	Fall Treatment Schedule
Pre-Construction		Q3 2020 – fescue treatment, sitewide
Pre-Construction		April 2021 – American thistle treatment, sitewide.
MY 1 (2022)	--	Late Q3/Q4: Species focus - multiflora rose, privet, tree of heaven
MY 2 (2023)	Spring – targeted species TBD	Fall – targeted species TBD
MY 3 (2024)	Spring – targeted species TBD	Fall – targeted species TBD
MY 4 (2025)	Spring – targeted species TBD	Fall – targeted species TBD
MY 5 (2026)	Spring – targeted species TBD	Fall – targeted species TBD
MY 6 (2027)	Spring – targeted species TBD	Fall – targeted species TBD
MY 7 (2028)	Spring – targeted species TBD	Fall – targeted species TBD

11. Conservation Easement Boundary Marking: Conservation easement signs were absent at multiple T-post corner witness markers in the field areas. Please add signs to each witness post at an easement corner. Conservation easement signs were generally placed on trees near corner monuments in forested areas but were frequently located excessively far from the ground monuments. In cases where trees of 3" dbh or greater are not immediately positioned at the ground monuments please add witness posts. In-line marking should be frequent enough to be useful when walking the boundary. In-line markers can deviate from the easement line up to 3' outside the easement. Use DMS standard practices If painting trees along the conservation easement boundary. Please. upgrade the conservation easement boundary marking in accordance with DMS specifications, notify DMS upon completion of the marking upgrades and document in the final MY0 report.
    The boundary has been marked per the RFP protocol with rebar and numbered caps, witness posts, and standard DMS signs at all corners. Additional signs were added at primary entry points and as needed between corners during the week of July 24, 2022. Boundary markers will be maintained throughout monitoring to ensure easement integrity and to allow easy recognition of boundaries at closeout. DMS Project Manager Kelly Phillips visited the Site during the marking, July 28, 2022, and confirmed the completion of the requested work.

Digital Deliverable:

Digital Tables:

12. Please revise the title of the last two cross sections in the morphology table, the titles for these two cross sections appear to be incorrect in the digital submission and the report. The titles for these graphs have been corrected in the geomorphology separate submission.
    The cross-sections are labelled correctly. Cross-sections 1 and 2 are on UT-4 and are listed last in the morphology table.

13. Verify that the Overbank Events Table, Annual Precipitation Table, Wetland Gauge Summary Table, Groundwater and Precipitation Data and Surface water gauge data can be deleted from this submission; they appear to be templates.
    Yes, these are DMS templates that will be used for MY 1-7. They have been deleted from this submittal.

14. The vegetation data submitted is missing data and summary for the 3 random plots.
    The random plot data has been included in this submittal.

Spatial Data:

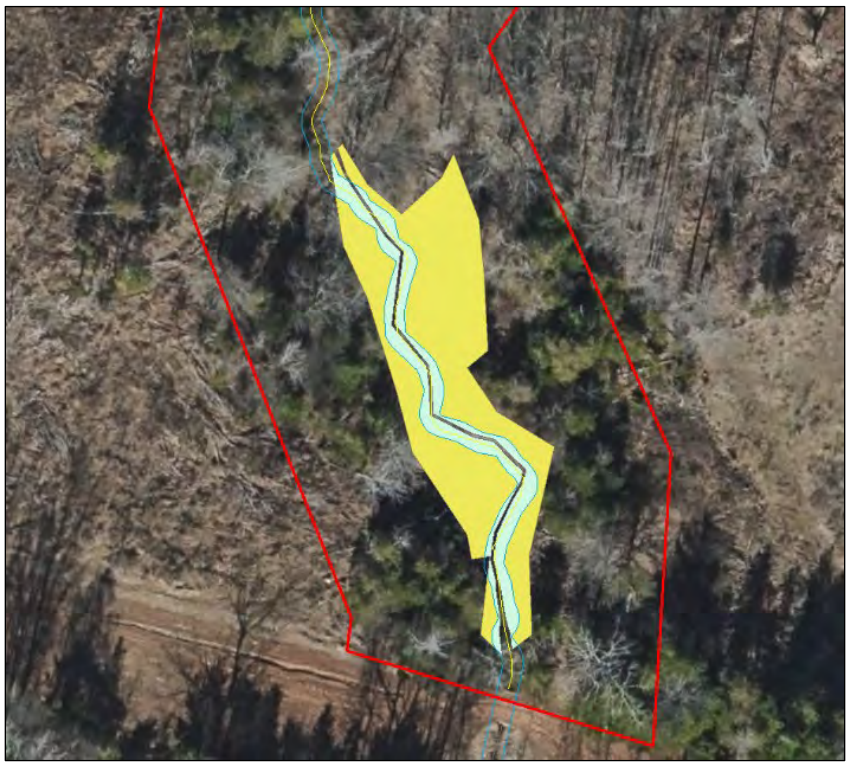
15. Please include trail camera monitoring station and soil temperature probe location file(s).
    The trail cameras are placed at locations along each reach based on field conditions. They are regularly moved during site visits when vegetation, etc. blocks their view. Therefore, there is no shapefile for their location. The soil temperature logger is attached to the rain gauge. That shapefile is included with this submittal.

16. Submit the location file for all required photo points.
    A photo point shapefile was created and included in this submittal.

17. Revise the structure file to include type of structure.
    The structure shapefile has been revised to include structure type.

18. Submit spatial file with mobile vegetation plot locations.
    A shapefile with the random plot locations is included in this submittal.

19. Verify that the wetland enhancement acreage in the file submitted, there is a discrepancy of .035 acres between the acreage reported in the asset table and the spatial data.
    The channel banks on UT-2 were extended into wetland enhancement areas during as-built. These areas total 0.035 acres and were removed from wetland enhancement area calculations during as-built. The as-built wetland enhancement acreage in Table 1 has been updated accordingly. As credit is calculated from the detailed planning phase, wetland credits remain unchanged. See photo below for an explanation of the discrepancy. Blue is the mitigation plan wetland enhancement shapefile (with narrower channel banks), and yellow is the as-built wetlands.



MY0 MONITORING REPORT

PHANTOM MILL

Alamance County, North Carolina
Cape Fear River Basin
Cataloging Unit 03030002

DMS Project No. 100057
Full Delivery Contract No. 7526
DMS RFP No. 16-007330
USACE Action ID No. SAW-2018-01166
DWR Project No. 18-0796

Data Collection: June 2021-January 2022
Submission: July 2022

Prepared for:

NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
1652 MAIL SERVICE CENTER
RALEIGH, NORTH CAROLINA 27699-1652

Prepared by:

Restoration Systems, LLC
1101 Haynes Street, Suite 211
Raleigh, North Carolina 27604
Contact: Worth Creech
919-755-9490 (phone)
919-755-9492 (fax)

And

Axiom Environmental, Inc.
218 Snow Avenue
Raleigh, North Carolina 27603
Contact: Grant Lewis
919-215-1693 (phone)

TABLE OF CONTENTS

APPENDICES

1 PROJECT SUMMARY

Restoration Systems, LLC has established the North Carolina Division of Mitigation Services (NCDMS) Phantom Mill (Site). The Site is on two contiguous parcels along the warm water Cane Creek and unnamed tributaries to Cane Creek in the Carolina Slate Belt Ecoregion of North Carolina. Located in the Cape Fear River Basin, cataloging unit 03030002, the Site is in the Targeted Local Watershed (TLW) 03030002050050 and North Carolina Division of Water Resources (NCDWR) subbasin number 03-06-04. The Site is not located in a Local Watershed Plan (LWP), Regional Watershed Plan (RWP), or Targeted Resource Area (TRA). Site watersheds range from approximately 0.08 of a square mile (50 acres) on UT4 to 4.37 square miles (2,795 acres) at the Site's outfall.

1.1 Project Background, Components, and Structure

Located approximately 1 mile north of Pleasant Hill and 2 miles west of Snow Camp in southwest Alamance County, the Site encompasses 16.1 acres. Mitigation work within the Site included 1) stream restoration, 2) stream enhancement (Level I), 3) stream enhancement (Level II), 4) stream preservation, 5) wetland reestablishment, 6) wetland enhancement, and 7) vegetation planting. The Site is expected to provide 3632.153 warm water stream credits and 4.141 riparian wetland credits by closeout (Table 1, Page 2). A conservation easement was granted to the State of North Carolina and recorded at the Alamance County Register of Deeds on October 18, 2018.

Before construction, land use at the Site was characterized by disturbed forest and livestock pasture. Site design was completed in January 2020. Construction started on March 29, 2021 and ended within a final walkthrough on June 2, 2021. The Site was planted on December 22, 2021. Completed project activities, reporting history, completion dates, and project contacts are summarized in Tables 11-12 (Appendix E).

Additional activities that occurred at the Site included the following.

- Planting 12.5 acres of the Site with 14,300 stems (planted species are included in Table 6A [Appendix B]).
- Installing one shallow wetland marsh treatment area in the floodplain, with an outfall constructed of hydraulically stable rip rap
- Applying an herbaceous seed mix, with upland areas receiving pollinator friendly native and naturalized species including forbs and grasses. Streamside zones and wetlands, including the Marsh Treatment Wetland Areas, received a similarly designed mix with an additional component of FACW species (including *Elymus virginicus, Juncus effusus, and Carex* spp.).
- Fencing the entire conservation easement.

Table 1. Mitigation Site (ID-95017) Project Mitigation Quantities and Credits

Project Segment	Original Mitigation Plan Ft/Ac	As-Built Ft/Ac	Original Mitigation Category	Original Restoration Level	Original Mitigation Ratio (X:1)	Credits	Comments
Stream							
Cane Creek-R	1917	1943	Warm	R	1.00000	1,917.000	70 lf is located outside of the easement and therefore is not generating credit
Cane Creek-P	484	485	Warm	P	10.00000	48.400	
UT 1	198	198	Warm	No Credit	NA	0.000	Feature is non-jurisdictional
UT 2A-P	34	34	Warm	P	10.00000	3.400	
UT 2-EI	214	204	Warm	EI	1.50000	142.667	
UT 2-EII	203	193	Warm	EII	2.00000	101.500	
UT 2-EII	351	341	Warm	EII	2.50000	140.400	
UT 2-P	151	159	Warm	P	10.00000	15.100	
UT 3-EI	121	120	Warm	EI	1.50000	80.667	62 lf is located outside of the easement and therefore is not generating credit
UT 3-R	806	806	Warm	R	1.00000	806.000	
UT 4-EII	112	112	Warm	EII	2.50000	44.800	
UT 4-R	261	263	Warm	R	1.00000	261.000	
					Total:	**3,560.934**	
Wetland							
Wetland Reestablish	3.727	3.727	R	REE	1.00000	3.727	
Wetland Enhancement	0.828	0.794	E	E	2.00000	0.414	
Wetland Preservation							
					Total:	**4.141**	

Project Credits

	Stream			Riparian	Non-Rip	Coastal
Restoration Level	Warm	Cool	Cold	Wetland	Wetland	Marsh
Restoration	2,984.000			0.000	0.000	0.000
Re-establishment	0.000			3.727	0.000	0.000
Rehabilitation	0.000			0.000	0.000	0.000
Enhancement	0.000			0.414	0.000	0.000
Enhancement I	223.334	0.000	0.000			
Enhancement II	286.700	0.000	0.000			
Creation				0.000	0.000	0.000
Preservation	66.900	0.000	0.000	0.000	0.000	
Benthics 2%	71.219	0.000	0.000	0.000	0.000	
Totals	**3,632.153**	**0.000**	**0.000**	**4.141**	**0.000**	**0.000**

Total Stream Credit **3,632.153**
Total Wetland Credit **4.141**

Table 2. Summary: Goals, Performance, and Results

Targeted Functions	Goals	Objectives	Compatibility with Success Criteria
(1) HYDROLOGY			
(2) Flood Flow (4) Wooded Riparian Buffer (4) Microtopography	• Attenuate flood flow across the Site. • Minimize downstream flooding to the maximum extent possible. • Connect streams to functioning wetland systems.	• Construct a new channel at historic floodplain elevation to restore overbank flows and restore jurisdictional wetlands • Plant woody riparian buffer • Remove livestock • Deep rip floodplain soils to reduce compaction and increase soil surface roughness • Protect riparian buffers with a perpetual conservation easement	• BHR not to exceed 1.2 • Document four overbank events in separate monitoring years • Livestock excluded from the easement • Attain Wetland Hydrology Success Criteria • Attain Vegetation Success Criteria • Conservation Easement recorded
(3) Stream Stability (4) Sediment Transport (4) Stream Geomorphology	• Increase stream stability within the Site so that channels are neither aggrading nor degrading.	• Construct channels with the proper pattern, dimension, and longitudinal profile • Remove livestock • Construct stable channels with appropriate substrate • Plant woody riparian buffer • Stabilize stream banks	• Cross-section measurements indicate a stable channel with an appropriate substrate • Visual documentation of stable channels and structures • BHR not to exceed 1.2 • ER of 2.2 or greater • < 10% change in BHR and ER in any given year • Livestock excluded from the easement • Attain Vegetation Success Criteria
(1) WATER QUALITY			
(2) Streamside Area Vegetation (3) Upland Pollutant Filtration (2) Indicators of Stressors (2) Aquatic Life Tolerance Wetland Particulate Change Wetland Physical Change	• Remove direct nutrient and pollutant inputs from the Site and reduce contributions to downstream waters.	• Remove livestock and reduce agricultural land/inputs • Install marsh treatment areas • Plant woody riparian buffer • Restore/enhance jurisdictional wetlands adjacent to Site streams • Provide surface roughness and reduce compaction through deep ripping/plowing. • Restore overbank flooding by constructing channels at historic floodplain elevation.	• Livestock excluded from the easement • Attain Wetland Hydrology Success Criteria • Attain Vegetation Success Criteria
(1) HABITAT			
(2) In-stream Habitat (3) Substrate (3) In-Stream Habitat (2) Stream-side Habitat (3) Stream-side Habitat (3) Thermoregulation Wetland Physical Structure Wetland Landscape Patch Structure	• Improve instream and streamside habitat.	• Construct stable channels with appropriate substrate • Plant woody riparian buffer to provide organic matter and shade • Construct a new channel at historic floodplain elevation to restore overbank flows • Plant woody riparian buffer • Protect riparian buffers with a perpetual conservation easement • Restore/enhance jurisdictional wetlands adjacent to Site streams • Stabilize stream banks • Install in-stream structures	• Cross-section measurement indicate a stable channel with appropriate substrate • Visual documentation of stable channels and in-stream structures. • Attain Wetland Hydrology Success Criteria • Attain Vegetation Success Criteria • Conservation Easement recorded

Table 3. Project Attribute Table

Project Information				
Project Name	Phantom Mill			
Project County	Alamance County, North Carolina			
Project Area (acres)	16.1			
Project Coordinates (latitude & latitude)	35.8924ºN, 79.4754ºW			
Planted Area (acres)	12.5			
Project Watershed Summary Information				
Physiographic Province	Piedmont			
Project River Basin	Cape Fear			
USGS HUC for Project (14-digit)	03030002050050			
NCDWR Sub-basin for Project	03-06-04			
Project Drainage Area (acres)	2795			
Percentage of Project Drainage Area that is Impervious	<5%			
CGIA Land Use Classification	Managed Herbaceous Cover & Hardwood Swamps			
Reach Summary Information				
Parameters	**Cane Creek**	**UT2**	**UT 3**	**UT4**
Pre-Project Length (linear feet)	2333	967	1037	225
Post-Project Length (linear feet)	2499	955	969	374
Valley Classification & Confinement	Alluvial, confined – moderately confined			
Drainage Area (acres)	2795	67	83	50
NCDWR Stream ID Score	--	34.5	32	34.5
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial/ Intermittent	Perennial
NCDWR Water Quality Classification	WS-V, NSW			
Existing Morphological Description (Rosgen 1996)	Eg5	Cg 3/4	F4	Eg4
Proposed Stream Classification (Rosgen 1996)	C/E 3/4	C/E 3/4	Cb 3/4	C/E 3/4
Existing Evolutionary Stage (Simon and Hupp 1986)	II/III	II/III	III/IV	II/III
Underlying Mapped Soils	Chewacla loam, Cullen clay loam, Riverview loam			
Drainage Class	Somewhat poorly drained, well-drained, well-drained, respectively			
Hydric Soil Status	Nonhydric (may contain hydric inclusions), nonhydric, nonhydric, respectively			
Valley Slope	0.0035	0.0225	0.0320	0.0237
FEMA Classification	Lower reaches AE floodway	NA	NA	NA
Native Vegetation Community	Piedmont Alluvial Forest/Dry-Mesic Oak-Hickory Forest			
Watershed Land Use/Land Cover (Site)	43% forest,55% agricultural land, <2% low density residential/impervious surface			
Watershed Land Use/Land Cover (Cedarock Reference Channel)	65% forest, 30% agricultural land, <5% low density residential/impervious surface			
Percent Composition of Exotic Invasive Vegetation	<5%			

Table 3. Project Attribute Table (Continued)

Wetland Summary Information			
Parameters	**Wetlands**		
Wetland acreage	4.377 acre drained & 0.923 acre degraded		
Wetland Type	Riparian riverine		
Mapped Soil Series	Worsham and Wehadkee		
Drainage Class	Poorly drained		
Hydric Soil Status	Hydric		
Source of Hydrology	Groundwater, stream overbank		
Hydrologic Impairment	Incised streams, compacted soils, livestock, ditches		
Native Vegetation Community	Piedmont/Low Mountain Alluvial Forest		
% Composition of Exotic Invasive Vegetation	<5%		
Restoration Method	Hydrologic, vegetative, livestock		
Enhancement Method	Vegetative, livestock		
Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States-Section 401	Yes	Yes	JD Package (App D)
Waters of the United States-Section 404	Yes	Yes	JD Package (App D)
Endangered Species Act	Yes	Yes	CE Document (App E)
Historic Preservation Act	Yes	Yes	CE Document (App E)
Coastal Zone Management Act	No	--	NA
FEMA Floodplain Compliance	Yes	No	In Process (App F)
Essential Fisheries Habitat	No	--	NA

1.2 Success Criteria

Monitoring and success criteria for stream restoration should relate to project goals and objectives identified from on-site NC SAM data collection. From a mitigation perspective, several goals and objectives are assumed to be functionally elevated by restoration activities without direct measurement. Other goals and objectives will be considered successful upon achieving success criteria. The following summarizes Site success criteria.

Success Criteria

Streams
• All streams must maintain an Ordinary High-Water Mark (OHWM), per RGL 05-05. • A continuous surface flow must be documented each year for at least 30 consecutive days on the intermittent reach of UT3. • Bank height ratio (BHR) cannot exceed 1.2 at any measured cross-section during the monitoring period. • The entrenchment ratio (ER) must be no less than 2.2 at any measured riffle cross-section during the monitoring period. • BHR and ER at any measure riffle cross-section should not change by more than 10% from baseline condition during the monitoring period. • The stream project shall remain stable, and all other performance standards shall be met through four separate bankfull events, occurring in separate years, during the monitoring years 1-7.

Success Criteria (Continued)

Wetland Hydrology
• Saturation or inundation within the upper 12 inches of the soil surface for, at a minimum, 12 percent of the growing season during average climatic conditions
Vegetation
• Within planted portions of the site, a minimum of 320 stems per acre must be present at year 3; a minimum of 260 stems per acre must be present at year 4; and a minimum of 210 stems per acre must be present at year 7. • Trees must average 7 feet in height at year 5, and 10 feet in height at year 7 in each plot. • Planted and volunteer stems are counted, provided they are included in the approved planting list for the site; natural recruits not on the planting list may be considered by the IRT on a case-by-case basis.

2 AS-BUILT CONDITION (BASELINE)

Site construction started on March 29, 2021 and ended within a final walkthrough on June 2, 2021. The Site was planted on December 22, 2021. As-built and MY0 data collection occurred between December 2021 and January 2022.

In general, no significant issues arose during the construction of the Site. A sealed half-size set of record drawings are provided in Appendix G, which includes the post-construction survey, alignments, structures, and monitoring features. These include redlines for any significant field adjustments made during construction that differ from the design plans. Where needed, adjustments were made during construction based on field evaluations and are listed below.

Modifications Made During Construction

Location	Deviation	Explanation
Cane Creek sta. 0+35	Log vane added	Extra protection required for large tree on bank
Cane Creek sta. 16+45	Log cross vane not constructed	Slope in field conditions did not require structure
Cane Creek sta. 16+95	Log cross vane not constructed	Slope in field conditions did not require structure
Cane Creek sta. 21+30	Log vane not constructed	Existing tree roots provide sufficient bank protection
Cane Creek sta. 21+40	Log vane not constructed	Existing tree roots provide sufficient bank protection
Cane Creek sta. 21+50	Log vane not constructed	Existing tree roots provide sufficient bank protection
UT-1 sta. 1+15	Log cross vane not constructed	UT-1 is not a stream, and grade control is not required
UT-2 sta. 4+05	Rock riffle not constructed	This activity was not allowed by Colonial Pipeline
UT-3 sta. 0+70	Log cross vane not constructed	This activity was not allowed by Colonial Pipeline
UT-3 sta. 1+50	Log cross vane not constructed	This activity was not allowed by Colonial Pipeline
UT-3 sta. 7+10	Log cross vane not constructed	Slope in field conditions did not require structure
UT-3 sta. 9+45	Log vane not constructed	Slope in field conditions did not require structure

Several grade control structures were omitted on a case-by-case basis based on field conditions or due to their proximity with the Colonial Pipeline easement. The field analyses that led to the decisions to omit each structure determined that no negative effects on the stream channel are expected from their omission.

Additionally, several monitoring devices (vegetation plots, cross-sections, and groundwater gauges) were relocated slightly from the locations depicted in the monitoring plan in the approved mitigation plan. The deviations were made based on field conditions and by using the best professional judgement of the monitoring contractor. The as-built locations of all monitoring devices are representative of current Site conditions.

Additional activities that occurred at the Site included the following.

- Planting 12.5 acres of the Site with 14,300 stems (planted species are included in Table 6A [Appendix B]).
- Installing one shallow wetland marsh treatment area in the floodplain, with an outfall constructed of hydraulically stable rip rap.
- Applying an herbaceous seed mix, with upland areas receiving pollinator-friendly native and naturalized species, including forbs and grasses. Streamside zones and wetlands, including the Marsh Treatment Wetland Areas, received a similarly designed mix with an additional component of FACW species (Table 6B, Appendix B).
- Fencing the entire conservation easement.

3 PROJECT MONITORING – METHODS

Monitoring will be conducted by Axiom Environmental, Inc. Annual monitoring reports of the data collected will be submitted to the NCDMS by Restoration Systems no later than December 1 of each monitoring year data is collected. The monitoring schedule is summarized in the following table.

Monitoring Schedule

Resource	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Streams							
Wetlands							
Vegetation							
Macroinvertebrates							
Visual Assessment							
Report Submittal							

3.1 Monitoring

The monitoring parameters are summarized in the following table.

Monitoring Summary

Stream Parameters				
Parameter	**Method**	**Schedule/Frequency**	**Number/Extent**	**Data Collected/Reported**
Stream Profile	Full longitudinal survey	As-built (unless otherwise required)	All restored stream channels	Graphic and tabular data.
Stream Dimension	Cross-sections	Years 1, 2, 3, 5, and 7	Total of 16 cross-sections on restored channels	Graphic and tabular data.
Channel Stability	Visual Assessments	Yearly	All restored stream channels	Areas of concern will be depicted on a plan view figure with a written assessment and photograph of the area included in the report.
	Additional Cross-sections	Yearly	Only if instability is documented during monitoring	Graphic and tabular data.
Stream Hydrology	Continuous monitoring of surface water gauges and/or trail camera	Continuous recording through the monitoring period	3 surface water gauges on UT 2, 3, and 4	Surface water data for each monitoring period
Bankfull Events	Continuous monitoring of surface water gauges and/or trail camera	Continuous recording through the monitoring period	3 surface water gauges on UT 2, 3, and 4	Surface water data for each monitoring period
	Visual/Physical Evidence	Continuous through the monitoring period	1 trail camera on Cane Creek	Visual evidence, photo documentation, and/or rain data.
Benthic Macroinvertebrates	"Qual 4" method described in *Standard Operating Procedures for Collection and Analysis of Benthic Macroinvertebrates, Version 5.0* (NCDWR 2016)	Pre-construction, Years 3, 5, and 7 during the "index period" referenced in *Small Streams Biocriteria Development* (NCDWQ 2009)	2 stations (on Cane Creek upstream and Cane Creek downstream); however, the exact locations will be determined at the time pre-construction benthics are collected	Results* will be presented on a site-by-site basis and will include a list of taxa collected, an enumeration of *Ephemeroptera, Plecoptera,* and *Tricopetera* taxa as well as Biotic Index values.
Wetland Parameters				
Parameter	**Method**	**Schedule/Frequency**	**Number/Extent**	**Data Collected/Reported**
Wetland Restoration	Groundwater gauges	Years 1, 2, 3, 4, 5, 6, and 7 throughout the year, with the growing season defined as March 1-October 22	7 gauges spread throughout restored wetlands	Soil temperature at the beginning of each monitoring period to verify the start of the growing season, groundwater and rain data for each monitoring period
Vegetation Parameters				
Parameter	**Method**	**Schedule/Frequency**	**Number/Extent**	**Data Collected/Reported**
Vegetation establishment and vigor	Permanent vegetation plots 0.0247 acre (100 square meters) in size; *CVS-EEP Protocol for Recording Vegetation, Version 4.2* (Lee et al. 2008)	As-built, Years 1, 2, 3, 5, and 7	12 plots spread across the Site	Species, height, planted vs. volunteer, stems/acre
	Annual random vegetation plots, 0.0247 acre (100 square meters) in size	As-built, Years 1, 2, 3, 5, and 7	3 plots; randomly selected each year	Species and height

*Benthic Macroinvertebrate sampling data will not be tied to success criteria; however, the data may be used as a tool to observe positive gains to in-stream habitat

4 MONITORING YEAR 0 – DATA ASSESSMENT

Annual monitoring and site visits were conducted between December 2021 and January 2022 to assess the condition of the project. Stream, wetland, and vegetation criteria for the Site follow the approved success criteria presented in the Mitigation Plan and summarized in Section 1.3; monitoring methods are detailed in Section 3.0.

4.1 Stream Assessment

Morphological surveys for MY0 were conducted on December 9-10, 2021. All streams within the Site are stable, functioning as designed, and are maintaining an ordinary high-water mark. Refer to Appendix A for the Visual Stream Morphology Stability Assessment Table and Stream Photographs. Refer to Appendix C for Stream Geomorphology Data. No stream areas of concern were identified during MY0.

4.2 Hydrology Assessment

7 groundwater monitoring gauges were installed throughout the Site's wetlands. Hydrologic data will be collected and reported during MY1 (2022).

4.3 Vegetative Assessment

The MY0 vegetative survey was completed on January 5, 2022. Vegetation monitoring resulted in a sitewide stem density average of 478 planted stems per acre, above the interim requirement of 320 stems per acre required at MY3. Eleven of the twelve fixed vegetation plots and all three of the random temporary plots met the interim success criteria. Please refer to Appendix A for Vegetation Plot Photographs, the Vegetation Condition Assessment Table, and Appendix B for Vegetation Plot Data. No vegetation areas of concern were identified during MY0.

4.4 Monitoring Year 0 Summary

Overall, the Site looks good, is performing as intended, and is on track to meet success criteria. All vegetation plots are on track to exceed the MY3 interim requirement of 320 planted stems per acre, and all streams within the Site are stable and are meeting project goals.

5 REFERENCES

Lee, M.T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation. Version 4.2. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, North Carolina.

North Carolina Division of Water Resources (NCDWR). 2016. Standard Operating Procedures for Collection and Analysis of Benthic Macroinvertebrates (Version 5.0). (online). Available: https://files.nc.gov/ncdeq/Water%20Quality/Environmental%20Sciences/BAU/NCDWRMacroinvertebrate-SOP-February%202016_final.pdf

North Carolina Division of Water Quality (NCDWQ). 2009. Small Streams Biocriteria Development. Available: http://portal.ncdenr.org/c/document_library/get_file?uuid=2d54ad23-0345-4d6e-82fd-04005f48eaa7&groupId=38364

North Carolina Ecosystem Enhancement Program (NCEEP). 2009. Cape Fear River Basin Restoration Priorities 2009 (online). Available : http://portal.ncdenr.org/c/document_library/get_file?uuid=864e82e8-725c-415e-8ed9-c72dfcb55012&groupId=60329

North Carolina Stream Functional Assessment Team. (NC SFAT 2015). N.C. Stream Assessment Method (NC SAM) User Manual. Version 2.1.

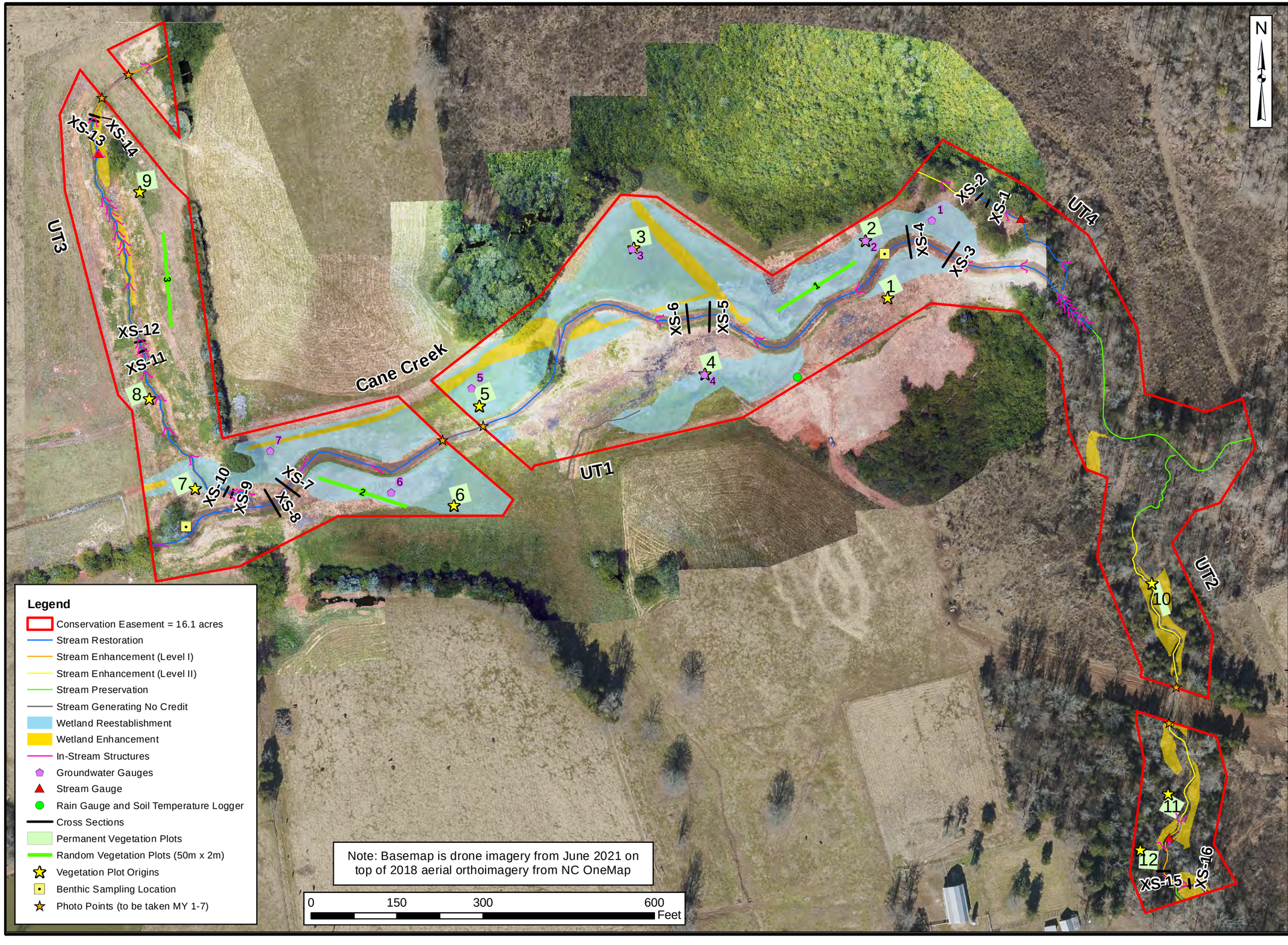
North Carolina Wetland Functional Assessment Team. (NC WFAT 2010). N.C. Wetland Assessment Method (NC WAM) User Manual. Version 4.1.

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology (Publisher). Pagosa Springs, Colorado

Simon A, Hupp CR. 1986. Geomorphic and Vegetative Recovery Processes Along Modified Tennessee Streams: An Interdisciplinary Approach to Disturbed Fluvial Systems. Forest Hydrology and Watershed Management. IAHS-AISH Publ.167.

Appendix A: Visual Assessment Data

Figure 1. Current Conditions Plan View
Tables 4A-D. Stream Visual Stability Assessment
Table 5. Visual Vegetation Assessment
Vegetation Plot Photographs
Site Photo Log



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

PHANTOM MILL MITIGATION SITE

Alamance County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by: KRJ

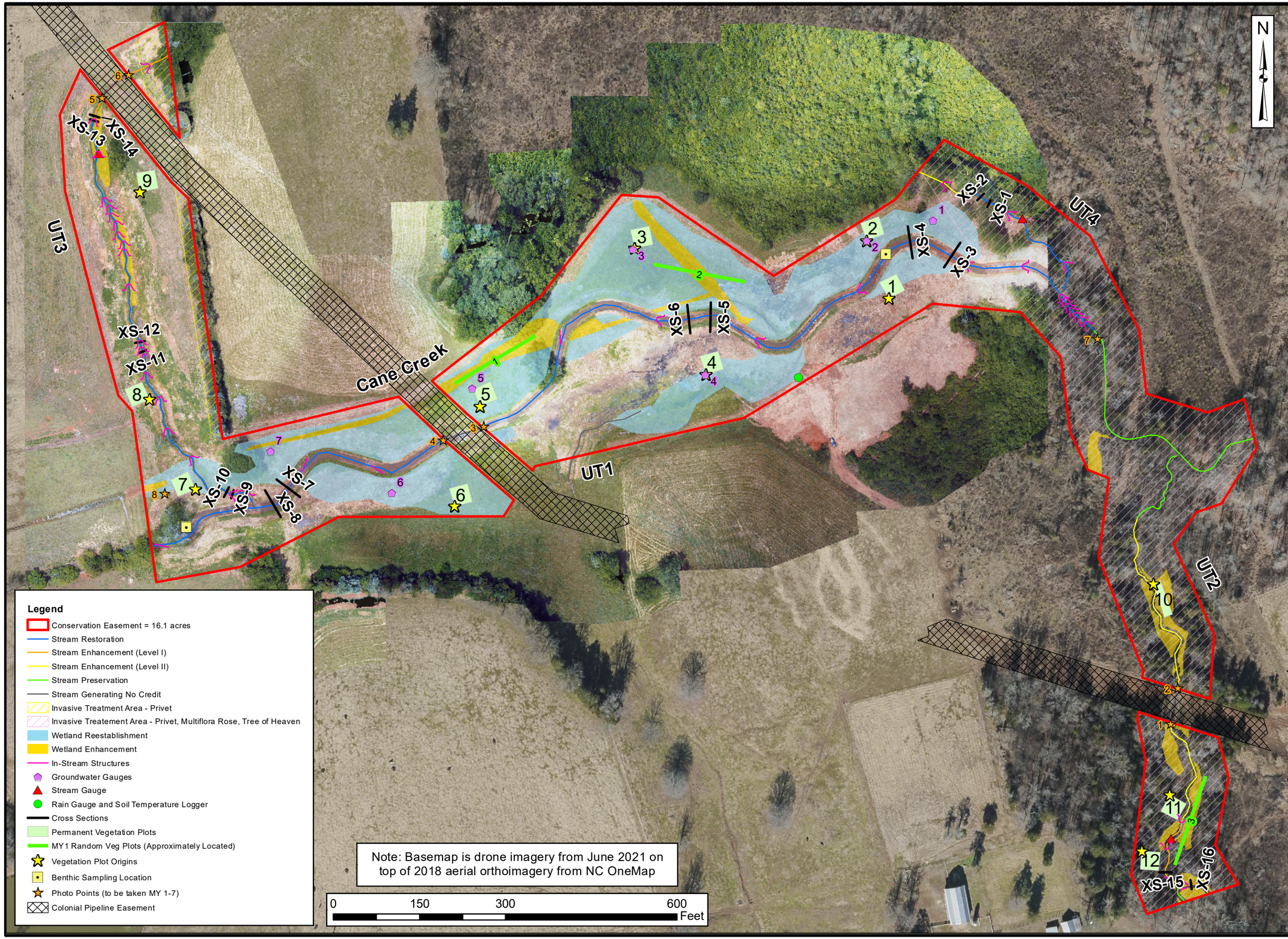
Date: JUL 2022

Scale: 1:1900

Project No.: 18-012

FIGURE

1



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

PHANTOM MILL MITIGATION SITE

Alamance County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by: KRJ

Date: JUL 2022

Scale: 1:1900

Project No.: 18-012

FIGURE

1

Table 4A. Visual Stream Stability Assessment

Reach Cane Creek

Assessed Stream Length 1943

Assessed Bank Length 3886

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	10	10		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	10	10		100%

Table 4B. Visual Stream Stability Assessment

Reach UT 2

Assessed Stream Length 738

Assessed Bank Length 1476

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	4	4		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	4	4		100%

Table 4C. Visual Stream Stability Assessment

Reach UT 3

Assessed Stream Length 926

Assessed Bank Length 1852

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	16	16		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	16	16		100%

Table 4D. Visual Stream Stability Assessment

Reach UT 4

Assessed Stream Length 374

Assessed Bank Length 748

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	4	4		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	4	4		100%

Table 5. Visual Vegetation Assessment

Planted acreage **12.5**

Vegetation Category	Definitions	Mapping Threshold	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.10 acres	0.00	0.0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.10acres	0.00	0.0%
		Total	0.00	0.0%
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.10 acres	0.00	0.0%
		Cumulative Total	0.00	0.0%

Easement Acreage **16.1**

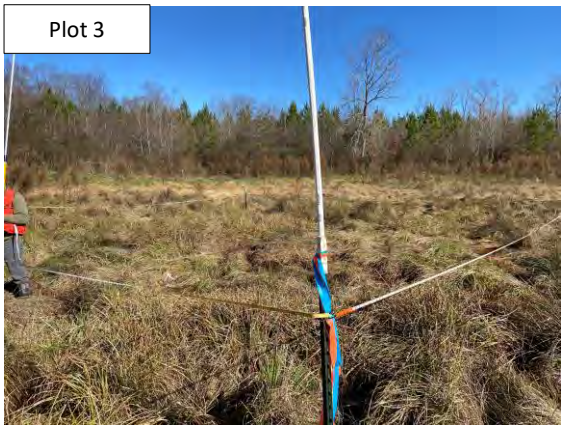
Vegetation Category	Definitions	Mapping Threshold	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Invasives may occur outside of planted areas and within the easement and will therefore be calculated against the total easement acreage. Include species with the potential to directly outcompete native, young, woody stems in the short-term or community structure for existing communities. Species included in summation above should be identified in report summary.	0.10 acres	0.00	0.0%
Easement Encroachment Areas	Encroachment may be point, line, or polygon. Encroachment to be mapped consists of any violation of restrictions specified in the conservation easement. Common encroachments are mowing, cattle access, vehicular access. Encroachment has no threshold value as will need to be addressed regardless of impact area.	none	0 Encroachments noted	

Phantom Mill Site
MY0 (2022) Vegetation Monitoring Photographs (taken January 4-5, 2022)

Plot 1

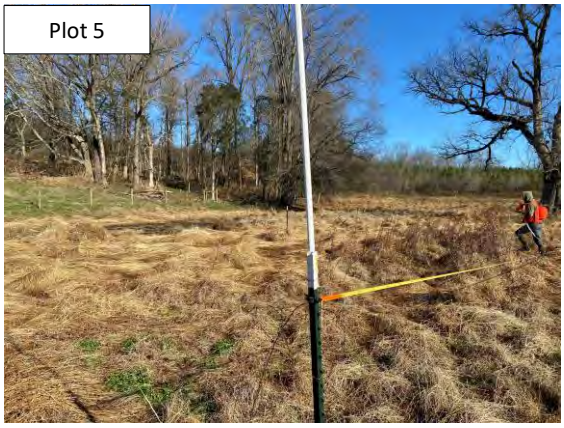
Plot 2

Plot 3

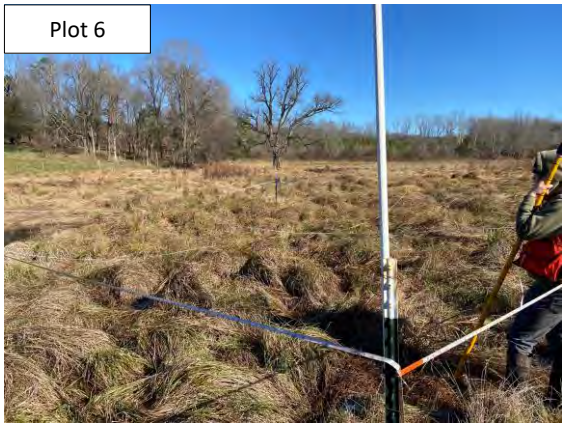


Plot 4

Plot 5

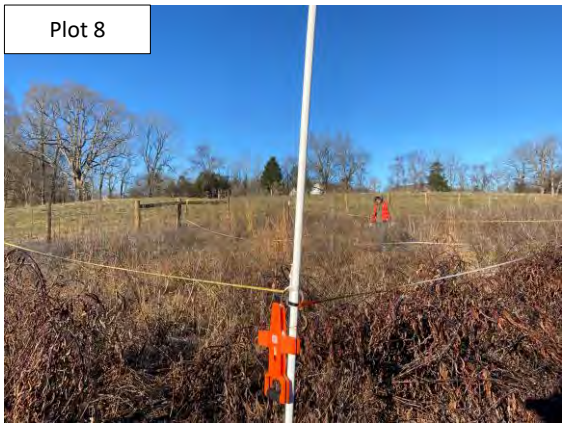


Plot 6



Plot 7

Plot 8



Phantom Mill Site
MY0 (2022) Vegetation Monitoring Photographs (taken January 4-5, 2022)

Plot 9

Plot 10

Plot 11

Plot 12

Phantom Mill Mitigation Site: Task 5 – Planting & Monitoring Devices
DMS Contract #: 7743; DMS Project ID: 100092; RFP # 16-007571

Bare-root planting - 12/22/2022

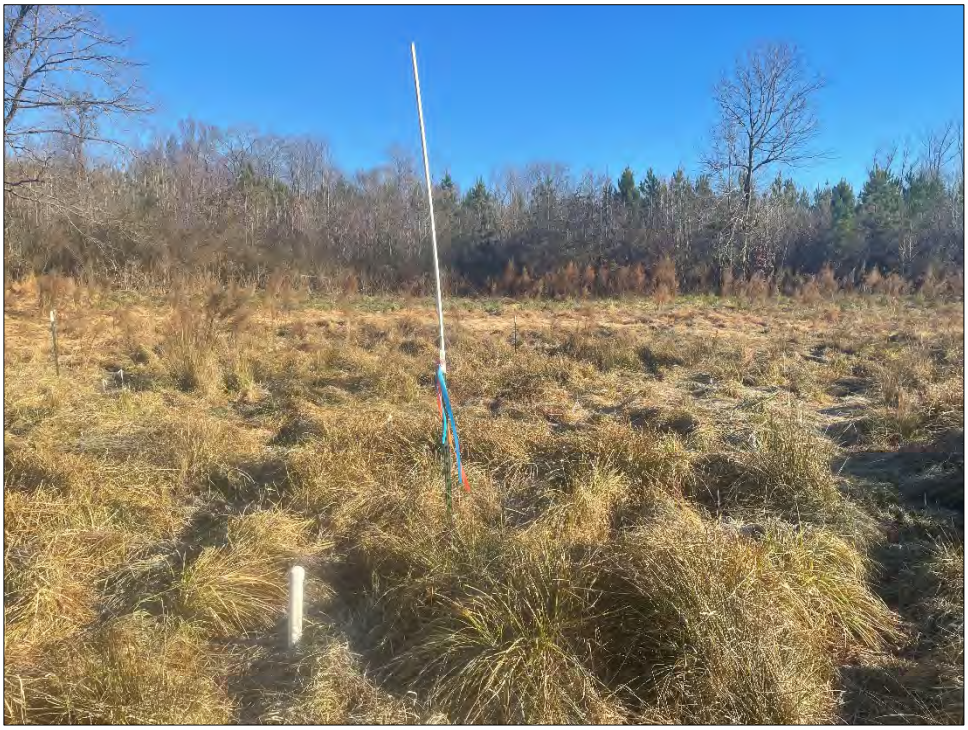
Bare-root planting - 12/22/2022

Bare-root planting - 12/22/2022

Bare-root planting - 12/22/2022

Veg Plot with bare-root saplings planted and flagged - 01/11/2022

Veg Plot with bare-root saplings planted and flagged - 01/11/2022



Veg Plot with bare-root saplings planted and flagged & groundwater gauge installed - 01/11/2022

Veg Plot with bare-root saplings planted and flagged - 01/11/2022

Veg Plot with bare-root saplings planted - 01/11/2022

Groundwater gauge installed - 01/11/2022

XS1 - 12/09/2021

XS2 - 12/09/2021

XS9 - 12/09/2021

XS16 - 12/09/2021

Appendix B: Vegetation Data

Table 6A. Planted Bare-Root Woody Vegetation
Table 6B. Permanent Seed Mix
Table 7. Vegetation Plot Counts and Densities
Table 8. Vegetation Plot Data Table from Vegetation Data Entry Tool

Table 6A. Planted Bare Root Woody Vegetation
Phantom Mill

Species	Total
Acres	**12.5**
Betula nigra	1,000
Celtis occidentalis	500
Cephalanthus occidentalis	300
Cercis canadensis	750
Cornus ammomum	2,000
Diospyros virginiana	500
Fraxinus pennsylvanica	700
Liriodendron tulipifera	1,000
Morus rubra	350
Nyssa sylvatica	500
Platanus occidentalis	1,500
Quercus alba	650
Quercus lyrata	600
Quercus nigra	1,250
Quercus phellos	1,250
Quercus rubra	600
Quercus shumardii	750
Viburnum dentatum	100
TOTALS	14,300
Average Stems/Acre	**1,144**

Table 6B. Permanent Seed Mix
Phantom Mill

Meadow Mix (50 lbs)			
Species*	**%**	**Species***	**%**
Common Yarrow (*Achillea millefolium*)	1	Boneset (*Eupatorium perfoliatum*)	0.5
Redtop (*Agrostis gigantea*)	15	Perennial Gaillardia (Blanketflower) (*Gaillardia perennial*)	2
Winter Bentgrass (*Agrostis hyemalis*)	5	Narrowleaf Sunflower (*Helianthus angustifolius*)	1
Creeping Bentgrass (*Agrostis stolonifera*)	2	Oxeye Sunflower (*Heliopsis helianthoides*)	1
Blue False Indigo (*Baptisia australis*)	2	Crimsoneyed Rosemallow (*Delmarva Peninsula*)	0.5
Fox Sedge (*Carex vulpinoidea*)	1	Path Rush (*Juncus tenuis*)	0.5
Partridge Pea (*Chamaecrista fasciculata*)	1	Roundhead Lespedeza (*Lespedeza capitata*)	0.5
Sensitive Pea (*Chamaecrista nictitans*)	1	Marsh Blazing Star (*Liatris spicata*)	0.5
Oxeye Daisy (*Leucanthemum vulgare*)	4.5	Wild Bergamot (*Monarda fistulosa*)	0.5
Shasta Daisy (*Leucanthemum superbum*)	3	Deertongue (*Dichanthelium clandestinum*)	5
Lanceleaf Coreopsis (*Coreopsis lanceolata*)	4	Redtop Panicgrass	0.5
Plains Coreopsis (*Coreopsis tinctoria*)	4	Tall White Beardtongue (*Penstemon digitalis*)	1
Cosmos (*Cosmos bipinnatus*)	1	Clasping Coneflower (*Dracopis amplexicaulis*)	1
Rocket Larkspur (*Consolida ajacis*)	2	Blackeyed Susan (*Rudbeckia hirta*)	3
Showy Ticktrefoil (*Desmodium canadense*)	1	Little Bluestem (*Schizachyrium scoparium*)	5
Purple Coneflower (*Echinacea purpurea*)	5	Wild Senna (*Senna hebecarpa*)	0.5
Virginia Wildrye (*Elymus virginicus*)	5	Purpletop (*Tridens flavus*)	18
Mistflower (*Conoclinium coelestinum*)	0.5	Blue Vervain (*Verbena hastata*)	1
		Total	**100%**
Wetland Mix (30 lbs)			
Bur-marigold (*Bidens aristosa*)	13.33	Leathery Rush (*Juncus coriaceus*)	1.67
Greenwhite Sedge (*Carex albolutescens*)	4.67	Soft Rush (*Juncus effusus*)	1.67
Hop Sedge (*Carex lupulina*)	1.67	Path Rush (*Juncus tenuis*)	1.67
Fox Sedge (*Carex vulpinoidea*)	0.67	Redtop Panicgrass (*Panicum rigidulum*)	22
Partridge Pea (*Chamaecrista fasciculata*)	1.67	Switchgrass (*Panicum virgatum*)	3.33
Large-flowered Tickseed (*Coreopsis grandiflora*)	1.67	Black eyed Susan (*Rudbeckia hirta*)	3
Lance-leaved Coreopsis (*Coreopsis lanceolata*)	3.33	Little Bluestem (*Schizachyrium scoparium*)	5
Plains Coreopsis (*Coreopsis tinctoria*)	1.67	Indiangrass (*Sorghastrum nutans*)	10
Virginia Wildrye (*Elymus virginicus*)	10.33	Purpletop (*Tridens flavus*)	1.67
Narrowleaf Sunflower (*Helianthus angustifolius*)	11	**Total**	**100%**

Table 7. Planted Vegetation Totals
Phantom Mill

Plot #	Planted Stems/Acre	Success Criteria Met?
1	364	Yes
2	405	Yes
3	364	Yes
4	364	Yes
5	364	Yes
6	648	Yes
7	324	Yes
8	283	No
9	324	Yes
10	1093	Yes
11	850	Yes
12	526	Yes
T-1	486	Yes
T-2	405	Yes
T-3	364	Yes
Average Planted Stems/Acre	**478**	**Yes**

Table 8. Vegetation Plot Data Table from Vegetation Data Entry Tool

Planted Acreage	12.5
Date of Initial Plant	12/22/2021
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	1/5/2022
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 1 F		Veg Plot 2 F		Veg Plot 3 F		Veg Plot 4 F		Veg Plot 5 F		Veg Plot 6 F		Veg Plot 7 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Betula nigra	river birch	Tree	FACW	1	1	2	2							2	2	1	1
	Betula Nigra																	
	Cercis canadensis	eastern redbud	Tree	FACU					1	1	1	1						
	Cornus amomum	silky dogwood	Shrub	FACW									3	3				
	Diospyros virginiana	common persimmon	Tree	FAC							1	1						
	Fraxinus pennsylvanica	green ash	Tree	FACW	1	1												
	Liriodendron tulipifera	tuliptree	Tree	FACU									1	1	2	2		
	Nyssa sylvatica	blackgum	Tree	FAC	1	1					4	4					5	5
	Other				2	2	1	1					3	3			1	1
	Platanus occidentalis	American sycamore	Tree	FACW					1	1								
	Quercus alba	white oak	Tree	FACU														
	Quercus nigra	water oak	Tree	FAC			1	1							4	4		
	Quercus pagoda	cherrybark oak	Tree	FACW														
	Quercus phellos	willow oak	Tree	FAC											8	8		
	Quercus sp.				4	4	5	5	7	7	3	3	1	1			1	1
	Viburnum dentatum	southern arrowwood	Tree	FAC			1	1					1	1				
Sum	Performance Standard				9	9	10	10	9	9	9	9	9	9	16	16	8	8
Mitigation Plan Performance Standard	Current Year Stem Count					9		10		9		9		9		16		8
	Stems/Acre					364		405		364		364		364		648		324
	Species Count					5		5		3		4		5		4		4
	Dominant Species Composition (%)					44		50		78		44		33		50		62
	Average Plot Height (ft.)					2		2		2		2		2		2		1
	% Invasives					0		0		0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					9		10		9		9		9		16		8
	Stems/Acre					364		405		364		364		364		648		324
	Species Count					5		5		3		4		5		4		4
	Dominant Species Composition (%)					44		50		78		44		33		50		62
	Average Plot Height (ft.)					2		2		2		2		2		2		1
	% Invasives					0		0		0		0		0		0		0

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Table 8. Vegetation Plot Data Table from Vegetation Data Entry Tool (continued)

Planted Acreage	12.5
Date of Initial Plant	12/22/2021
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	1/5/2022
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/S hrub	Indicator Status	Veg Plot 8 F		Veg Plot 9 F		Veg Plot 10 F		Veg Plot 11 F		Veg Plot 12 F		Veg Plot 1 R	Veg Plot 2 R	Veg Plot 3 R
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Total	Total	Total
Species Included in Approved Mitigation Plan	Betula nigra	river birch	Tree	FACW					5	5	2	2	2	2		2	1
	Betula Nigra						1	1									
	Cercis canadensis	eastern redbud	Tree	FACU													1
	Cornus amomum	silky dogwood	Shrub	FACW					5	5	3	3	1	1	2	3	2
	Diospyros virginiana	common persimmon	Tree	FAC													
	Fraxinus pennsylvanica	green ash	Tree	FACW											3		
	Liriodendron tulipifera	tuliptree	Tree	FACU	1	1											
	Nyssa sylvatica	blackgum	Tree	FAC	4	4	5	5			1	1					
	Other						2	2	3	3	1	1					
	Platanus occidentalis	American sycamore	Tree	FACW	1	1			1	1	1	1	1	1		3	2
	Quercus alba	white oak	Tree	FACU					1	1							
	Quercus nigra	water oak	Tree	FAC					1	1							1
	Quercus pagoda	cherrybark oak	Tree	FACW									1	1			
	Quercus phellos	willow oak	Tree	FAC	1	1									3		
	Quercus sp.								10	10	13	13	8	8	4	2	2
	Viburnum dentatum	southern arrowwood	Tree	FAC					1	1							
Sum	Performance Standard				7	7	8	8	27	27	21	21	13	13	12	10	9
Mitigation Plan Performance Standard	Current Year Stem Count					7		8		27		21		13	12	10	9
	Stems/Acre					283		324		1093		850		526	486	405	364
	Species Count					4		3		8		6		5	4	4	6
	Dominant Species Composition (%)					57		62		37		62		62	33	30	22
	Average Plot Height (ft.)					2		2		2		2		2	1	1	1
	% Invasives					0		0		0		0		0	0	0	0
Post Mitigation Plan Performance Standard	Current Year Stem Count					7		8		27		21		13	12	10	9
	Stems/Acre					283		324		1093		850		526	486	405	364
	Species Count					4		3		8		6		5	4	4	6
	Dominant Species Composition (%)					57		62		37		62		62	33	30	22
	Average Plot Height (ft.)					2		2		2		2		2	1	1	1
	% Invasives					0		0		0		0		0	0	0	0

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Appendix C: Stream Geomorphology Data

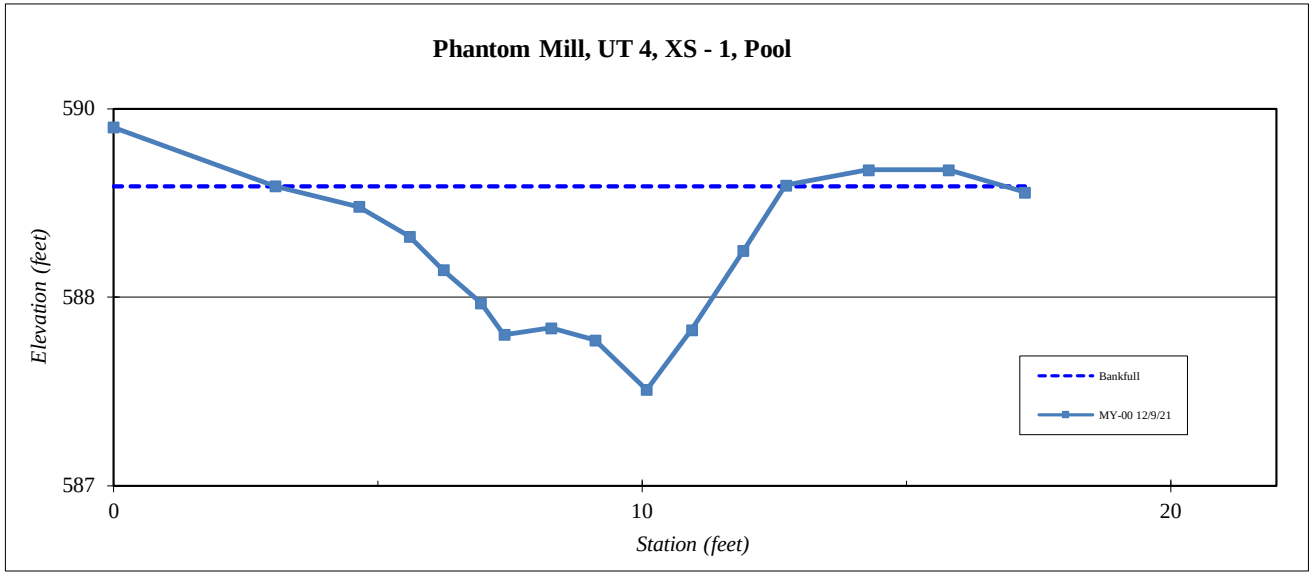
Cross-Sections with Annual Overlays
Longitudinal Profile
Table 9A-D. Baseline Stream Data Summary Tables
Table 10A-B. Cross-Section Morphology Monitoring Summary

Site	Phantom Mill
Watershed:	Cape Fear River Basin, 03030002
XS ID	UT 4, XS -1, Pool
Feature	Pool
Date:	12/9/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	589.5
3.1	589.1
4.6	589.0
5.6	588.8
6.2	588.6
7.0	588.4
7.4	588.2
8.3	588.2
9.1	588.1
10.1	587.8
10.9	588.2
11.9	588.7
12.7	589.2
14.3	589.3
15.8	589.3
17.2	589.1

SUMMARY DATA	
Bankfull Elevation:	589.1
Bank Hieght Ratio:	1.0
Thalweg Elevation:	587.8
LTOB Elevation:	589.1
LTOB Max Depth:	1.4
LTOB Cross Sectional Area:	6.2

Stream Type	E/C 5

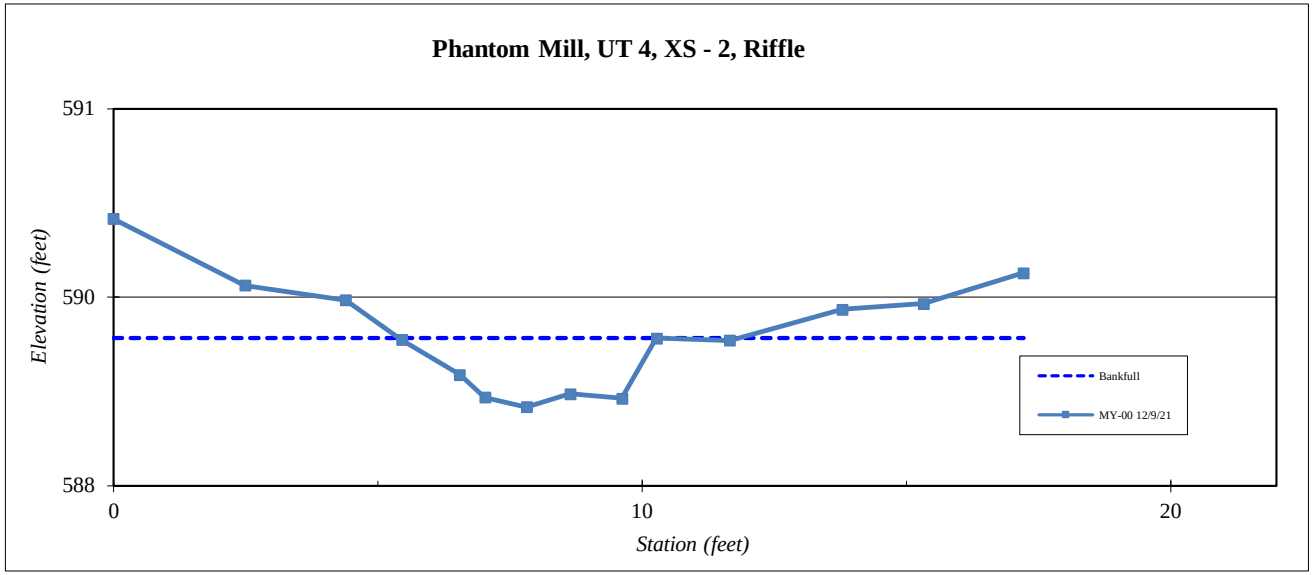


Site	Phantom Mill
Watershed:	Cape Fear River Basin, 03030002
XS ID	UT 4, XS -2, Riffle
Feature	Riffle
Date:	12/9/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	590.2
2.5	589.7
4.4	589.6
5.5	589.4
6.5	589.1
7.0	589.0
7.8	588.9
8.6	589.0
9.6	589.0
10.3	589.4
11.7	589.4
13.8	589.6
15.3	589.6
17.2	589.8

SUMMARY DATA	
Bankfull Elevation:	589.4
Bank Hieght Ratio:	1.0
Thalweg Elevation:	588.9
LTOB Elevation:	589.4
LTOB Max Depth:	0.5
LTOB Cross Sectional Area:	1.5

Stream Type	E/C 5

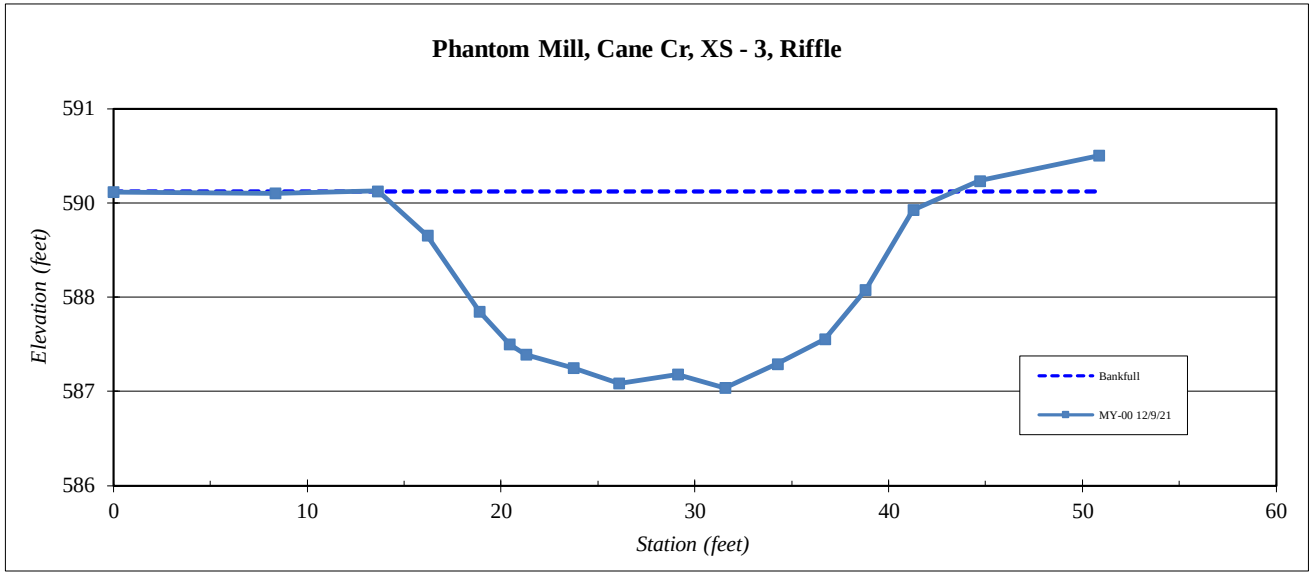


Site	Phantom Mill
Watershed:	Cape Fear River Basin, 03030002
XS ID	Cane Cr, XS -3, Riffle
Feature	Riffle
Date:	12/9/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	589.8
8.4	589.8
13.6	589.8
16.2	589.2
18.9	588.2
20.4	587.8
21.3	587.6
23.7	587.5
26.1	587.3
29.1	587.4
31.6	587.2
34.3	587.5
36.7	587.8
38.8	588.5
41.3	589.6
44.7	590.0
50.9	590.3

SUMMARY DATA	
Bankfull Elevation:	589.8
Bank Hieght Ratio:	1.0
Thalweg Elevation:	587.2
LTOB Elevation:	589.8
LTOB Max Depth:	2.6
LTOB Cross Sectional Area:	50.9

Stream Type	E/C 5

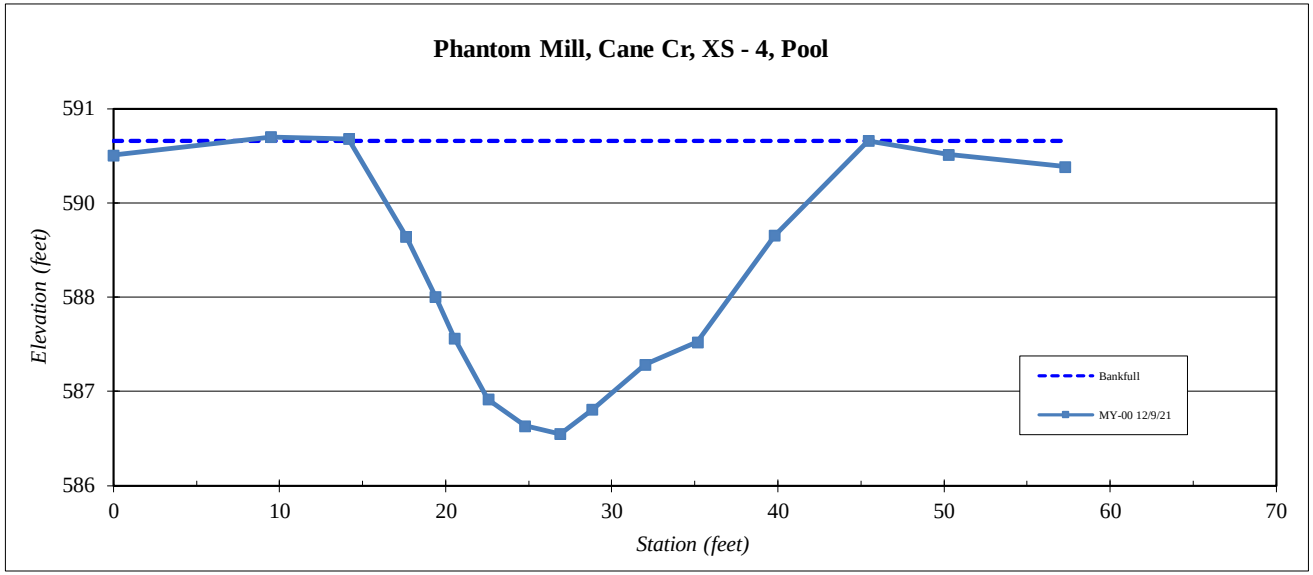


Site	Phantom Mill
Watershed:	Cape Fear River Basin, 03030002
XS ID	Cane Cr, XS -4, Pool
Feature	Pool
Date:	12/9/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	590.3
9.5	590.5
14.2	590.5
17.6	589.2
19.4	588.4
20.5	587.9
22.6	587.0
24.8	586.7
26.9	586.6
28.8	586.9
32.0	587.5
35.2	587.8
39.8	589.2
45.5	590.5
50.3	590.3
57.3	590.1

SUMMARY DATA	
Bankfull Elevation:	590.5
Bank Hieght Ratio:	1.0
Thalweg Elevation:	586.6
LTOB Elevation:	590.5
LTOB Max Depth:	3.9
LTOB Cross Sectional Area:	69.4

Stream Type	E/C 5

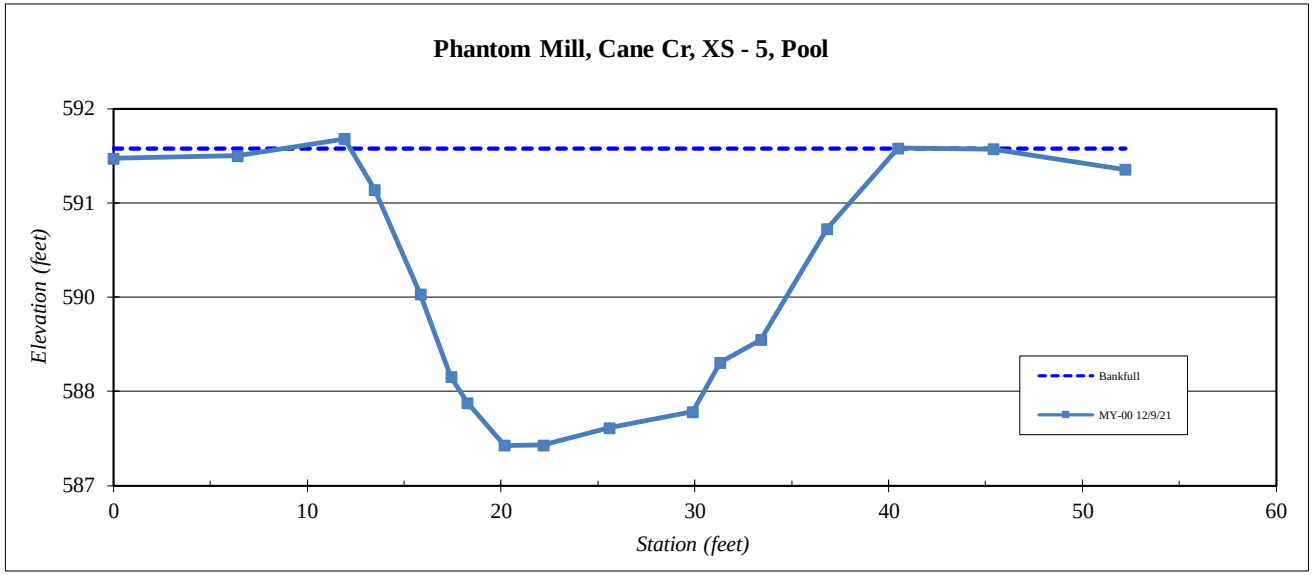


Site	Phantom Mill
Watershed:	Cape Fear River Basin, 03030002
XS ID	Cane Cr, XS -5, Pool
Feature	Pool
Date:	12/9/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	591.5
6.4	591.5
11.9	591.8
13.5	591.1
15.8	589.7
17.4	588.6
18.3	588.3
20.2	587.7
22.2	587.7
25.6	587.9
29.9	588.1
31.3	588.8
33.4	589.1
36.8	590.6
40.5	591.6
45.4	591.6
52.2	591.4

SUMMARY DATA	
Bankfull Elevation:	591.6
Bank Hieght Ratio:	1.0
Thalweg Elevation:	587.7
LTOB Elevation:	591.6
LTOB Max Depth:	4.0
LTOB Cross Sectional Area:	71.9

Stream Type	E/C 5

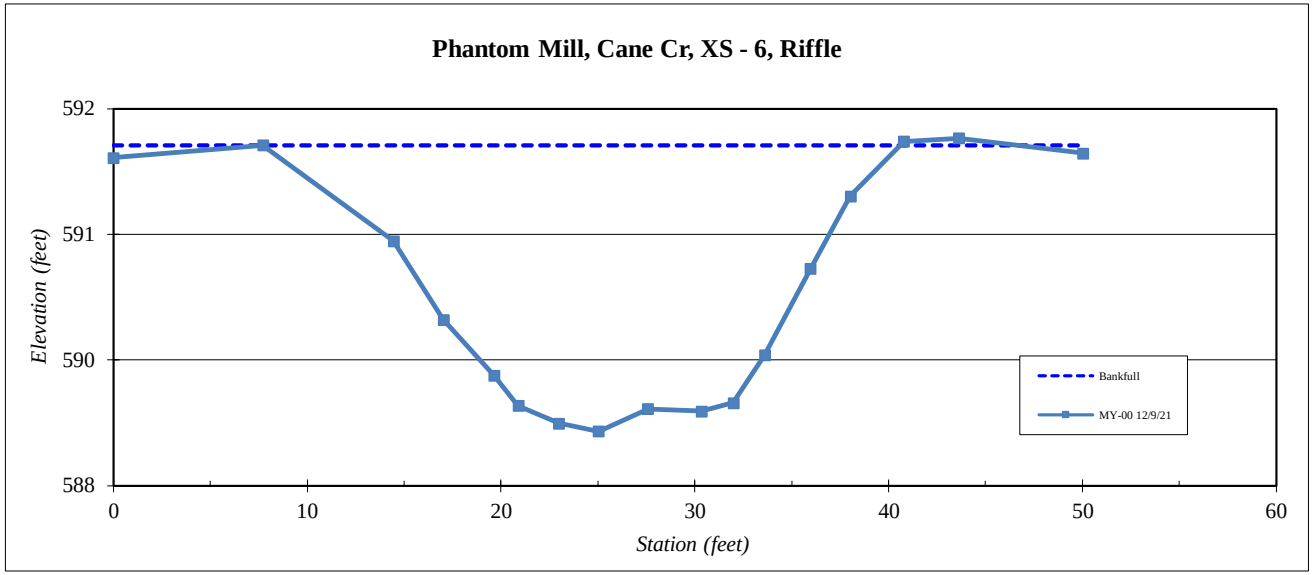


Site	Phantom Mill
Watershed:	Cape Fear River Basin, 03030002
XS ID	Cane Cr, XS - 6, Riffle
Feature	Riffle
Date:	12/9/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	591.7
7.7	591.8
14.4	590.9
17.0	590.1
19.6	589.5
20.9	589.2
23.0	589.0
25.0	589.0
27.6	589.2
30.3	589.2
32.0	589.2
33.6	589.7
36.0	590.6
38.0	591.3
40.8	591.8
43.6	591.9
50.0	591.7

SUMMARY DATA	
Bankfull Elevation:	591.8
Bank Hieght Ratio:	1.0
Thalweg Elevation:	589.0
LTOB Elevation:	591.8
LTOB Max Depth:	2.9
LTOB Cross Sectional Area:	55.2

Stream Type	E/C 5

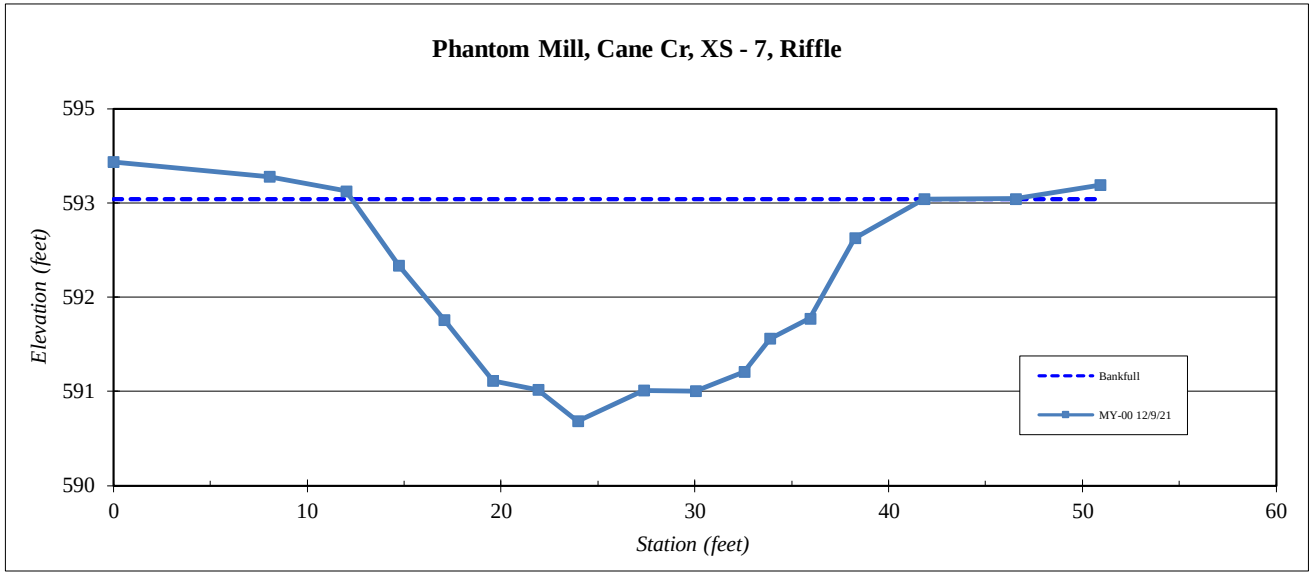


Site	Phantom Mill
Watershed:	Cape Fear River Basin, 03030002
XS ID	Cane Cr, XS - 7, Riffle
Feature	Riffle
Date:	12/9/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	594.0
8.0	593.8
12.0	593.6
14.7	592.6
17.1	591.9
19.6	591.1
21.9	590.9
24.0	590.5
27.4	590.9
30.0	590.9
32.5	591.2
33.9	591.6
35.9	591.9
38.3	593.0
41.8	593.5
46.6	593.5
50.9	593.7

SUMMARY DATA	
Bankfull Elevation:	593.5
Bank Hieght Ratio:	1.0
Thalweg Elevation:	590.5
LTOB Elevation:	593.5
LTOB Max Depth:	3.0
LTOB Cross Sectional Area:	52.4

Stream Type	E/C 5

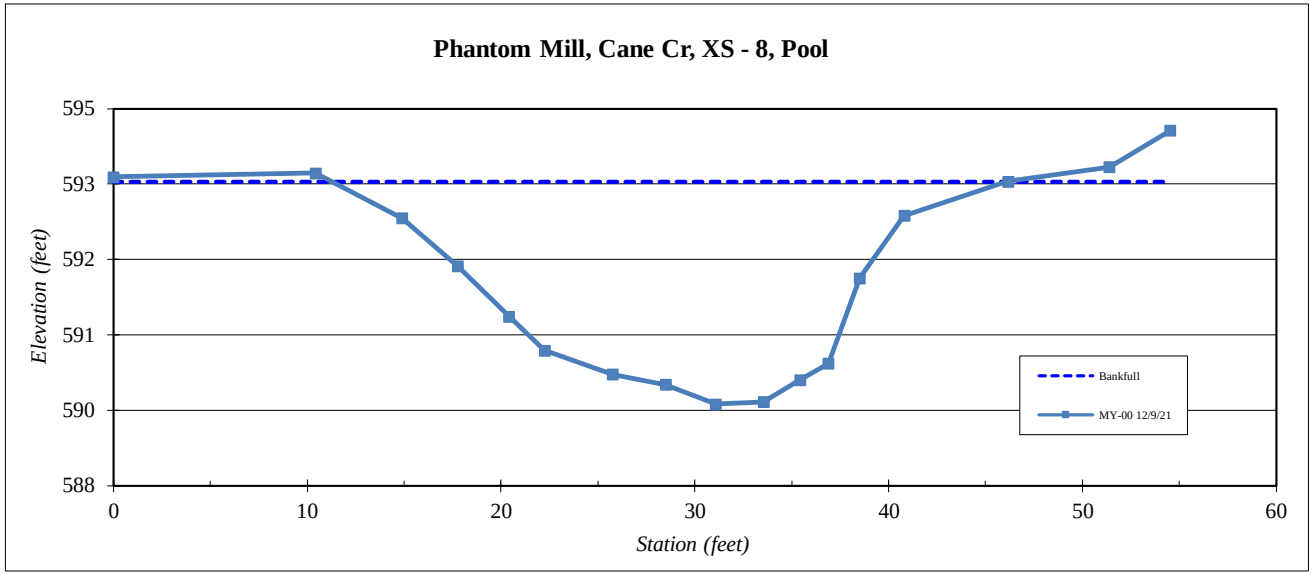


Site	Phantom Mill
Watershed:	Cape Fear River Basin, 03030002
XS ID	Cane Cr, XS - 8, Pool
Feature	Pool
Date:	12/9/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	593.5
10.4	593.6
14.9	592.9
17.8	592.1
20.4	591.2
22.2	590.7
25.8	590.3
28.5	590.1
31.1	589.8
33.5	589.8
35.4	590.2
36.9	590.4
38.5	591.9
40.8	592.9
46.2	593.5
51.4	593.7
54.5	594.3

SUMMARY DATA	
Bankfull Elevation:	593.5
Bank Hieght Ratio:	1.0
Thalweg Elevation:	589.8
LTOB Elevation:	593.5
LTOB Max Depth:	3.7
LTOB Cross Sectional Area:	70.4

Stream Type	E/C 5

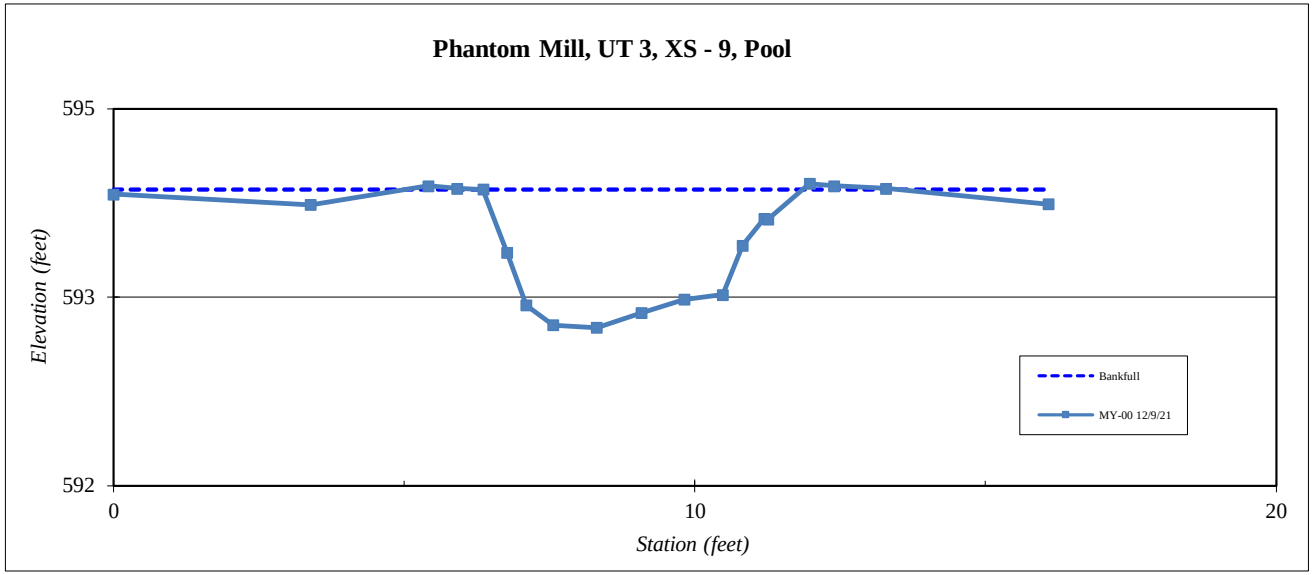


Site	Phantom Mill
Watershed:	Cape Fear River Basin, 03030002
XS ID	UT 3, XS - 9, Pool
Feature	Pool
Date:	12/9/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	594.1
3.4	594.0
5.4	594.2
5.9	594.2
6.4	594.1
6.8	593.7
7.1	593.4
7.6	593.2
8.3	593.2
9.1	593.3
9.8	593.4
10.5	593.4
10.8	593.8
11.2	593.9
11.3	593.9
12.0	594.2
12.4	594.2
13.3	594.2
16.1	594.0

SUMMARY DATA	
Bankfull Elevation:	594.1
Bank Hieght Ratio:	1.0
Thalweg Elevation:	593.2
LTOB Elevation:	594.1
LTOB Max Depth:	0.9
LTOB Cross Sectional Area:	3.4

Stream Type	E/C 5

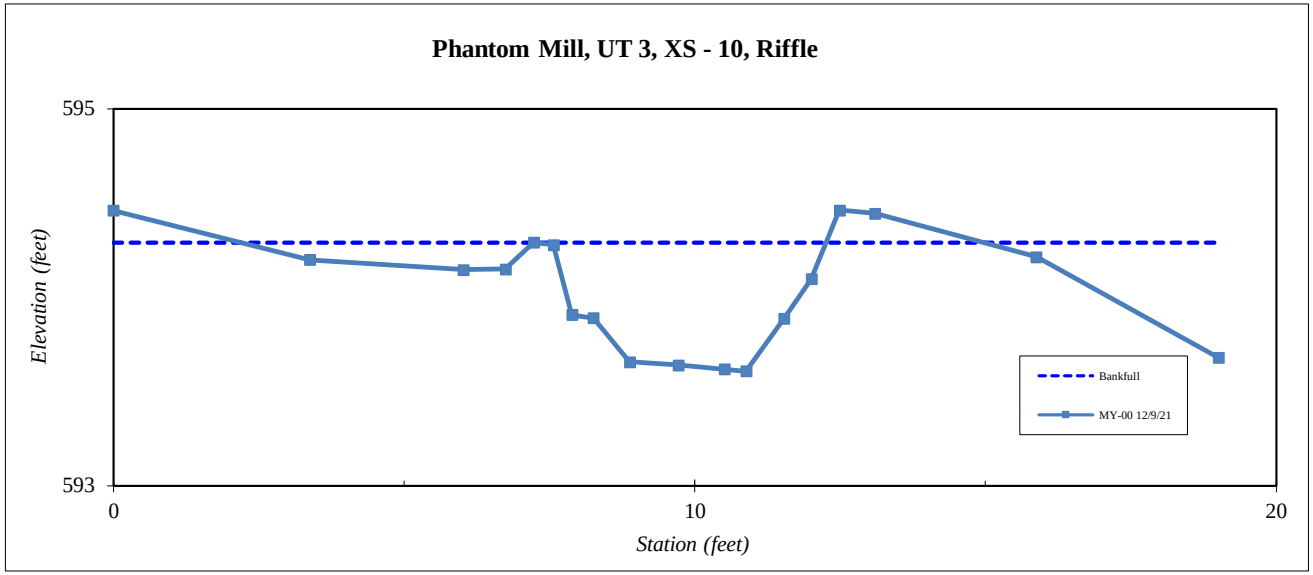


Site	Phantom Mill
Watershed:	Cape Fear River Basin, 03030002
XS ID	UT 3, XS - 10, Riffle
Feature	Riffle
Date:	12/9/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	594.3
3.4	594.2
6.0	594.1
6.7	594.1
7.2	594.2
7.6	594.2
7.9	594.0
8.3	594.0
8.9	593.8
9.7	593.8
10.5	593.8
10.9	593.8
11.5	594.0
12.0	594.1
12.5	594.3
13.1	594.3
15.9	594.2
19.0	593.9

SUMMARY DATA	
Bankfull Elevation:	594.2
Bank Hieght Ratio:	1.0
Thalweg Elevation:	593.8
LTOB Elevation:	594.2
LTOB Max Depth:	0.4
LTOB Cross Sectional Area:	1.5

Stream Type	E/C 5

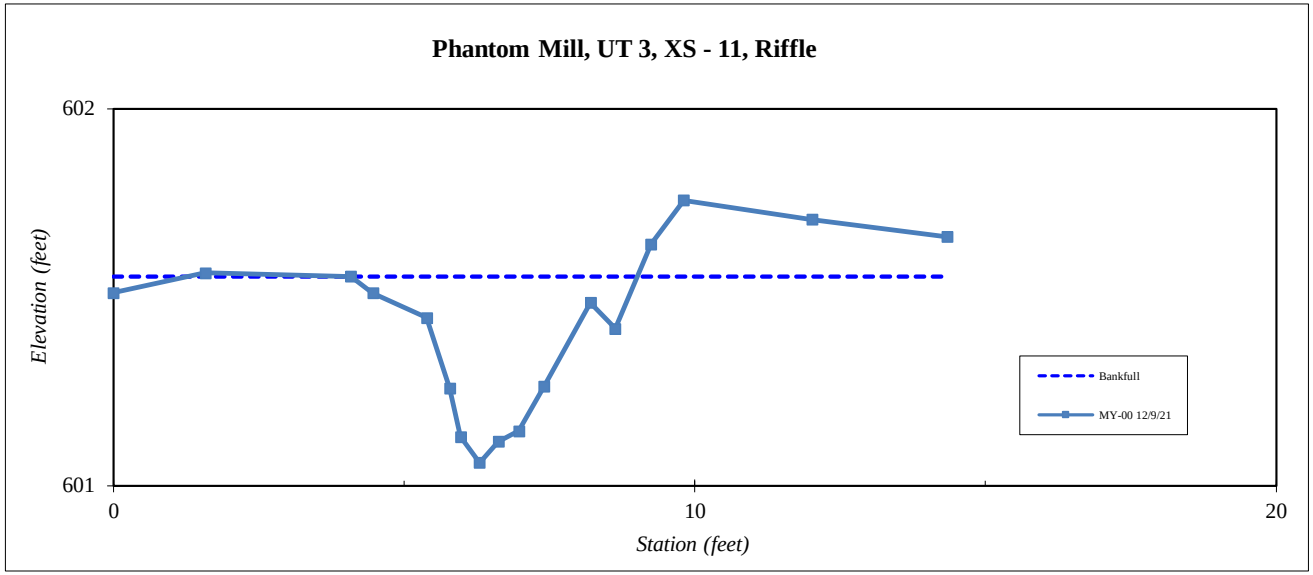


Site	Phantom Mill
Watershed:	Cape Fear River Basin, 03030002
XS ID	UT 3, XS - 11, Riffle
Feature	Riffle
Date:	12/9/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	601.6
1.6	601.7
4.1	601.7
4.5	601.6
5.4	601.5
5.8	601.3
6.0	601.1
6.3	601.0
6.6	601.1
7.0	601.1
7.4	601.3
8.2	601.6
8.6	601.5
9.2	601.8
9.8	601.9
12.0	601.8
14.3	601.8

SUMMARY DATA	
Bankfull Elevation:	601.7
Bank Hieght Ratio:	1.0
Thalweg Elevation:	601.0
LTOB Elevation:	601.7
LTOB Max Depth:	0.6
LTOB Cross Sectional Area:	1.3

Stream Type	E/C 5

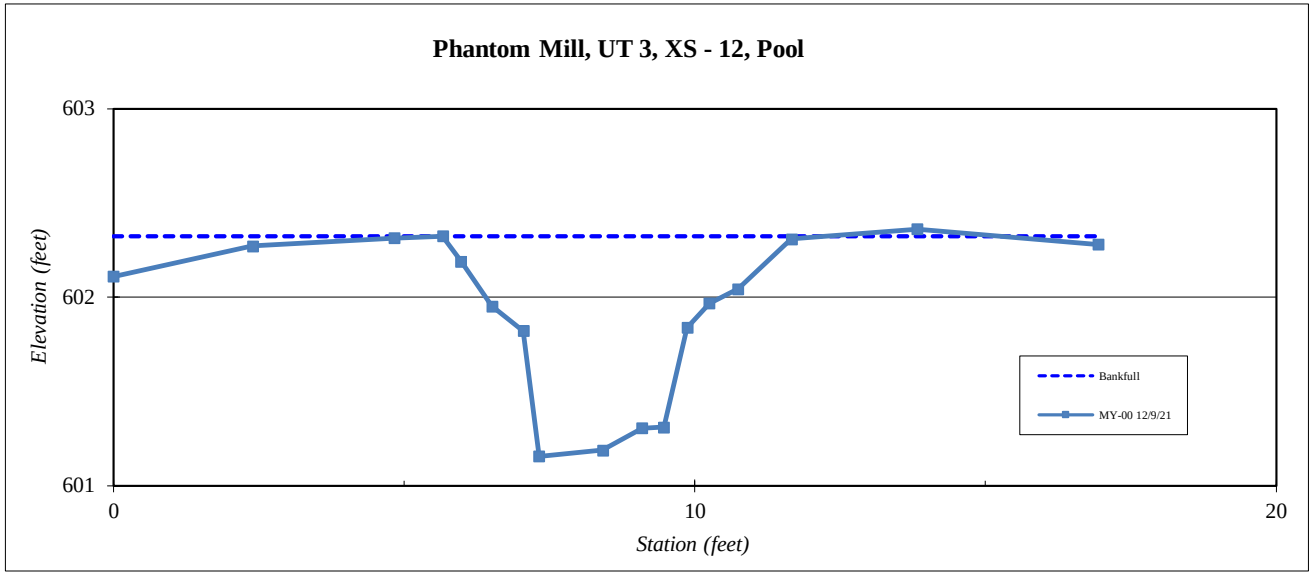


Site	Phantom Mill
Watershed:	Cape Fear River Basin, 03030002
XS ID	UT 3, XS - 12, Pool
Feature	Pool
Date:	12/9/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	602.3
2.4	602.5
4.8	602.6
5.7	602.6
6.0	602.4
6.5	602.1
7.0	602.0
7.3	601.2
8.4	601.2
9.1	601.3
9.5	601.3
9.9	602.0
10.2	602.2
10.7	602.3
11.7	602.6
13.8	602.7
16.9	602.6

SUMMARY DATA	
Bankfull Elevation:	602.6
Bank Hieght Ratio:	1.0
Thalweg Elevation:	601.2
LTOB Elevation:	602.6
LTOB Max Depth:	1.5
LTOB Cross Sectional Area:	4.7

Stream Type	E/C 5

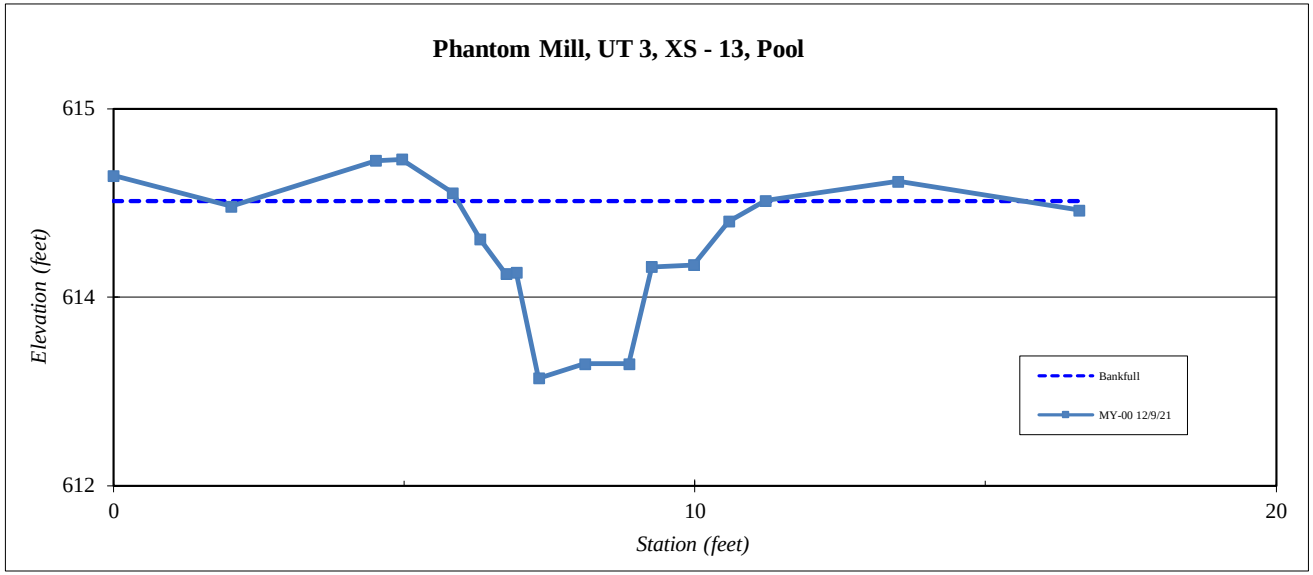


Site	Phantom Mill
Watershed:	Cape Fear River Basin, 03030002
XS ID	UT 3, XS - 13, Pool
Feature	Pool
Date:	12/9/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	614.3
2.0	614.1
4.5	614.4
5.0	614.4
5.8	614.2
6.3	613.9
6.8	613.7
6.9	613.7
7.3	613.0
8.1	613.1
8.9	613.1
9.3	613.7
10.0	613.7
10.6	614.0
11.2	614.1
13.5	614.3
16.6	614.1

SUMMARY DATA	
Bankfull Elevation:	614.1
Bank Hieght Ratio:	1.0
Thalweg Elevation:	613.0
LTOB Elevation:	614.1
LTOB Max Depth:	1.2
LTOB Cross Sectional Area:	3.2

Stream Type	E/C 5

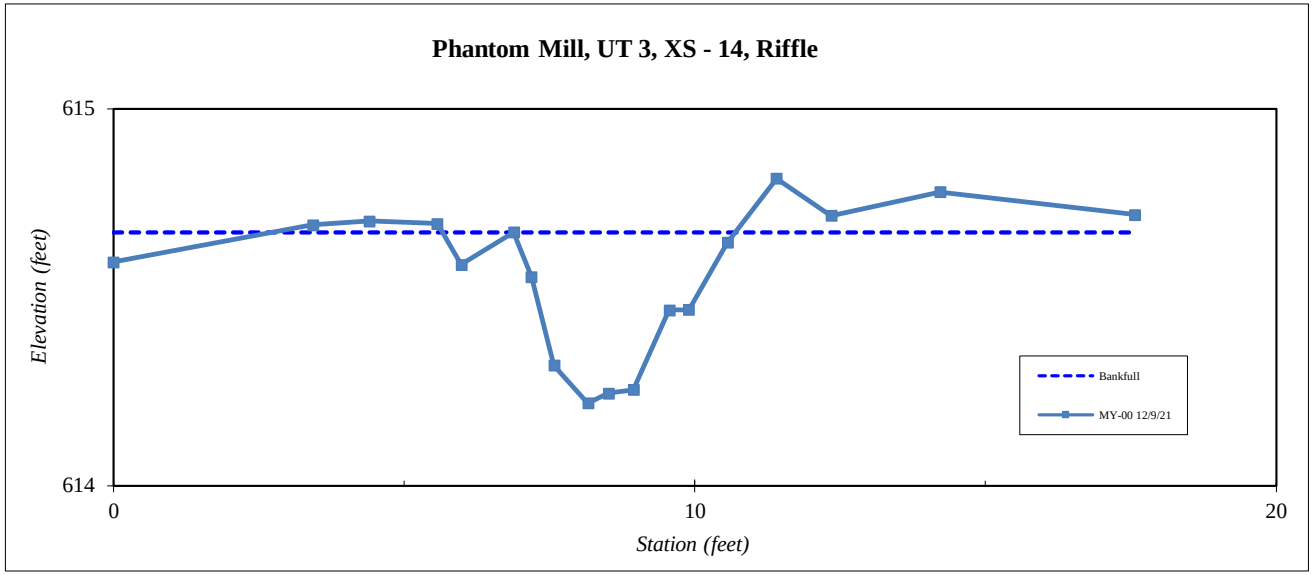


Site	Phantom Mill
Watershed:	Cape Fear River Basin, 03030002
XS ID	UT 3, XS - 14, Riffle
Feature	Riffle
Date:	12/9/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	614.2
3.4	614.4
4.4	614.4
5.6	614.4
6.0	614.2
6.9	614.3
7.2	614.2
7.6	613.9
8.2	613.8
8.5	613.8
8.9	613.8
9.6	614.1
9.9	614.1
10.6	614.3
11.4	614.5
12.3	614.4
14.2	614.5
17.6	614.4

SUMMARY DATA	
Bankfull Elevation:	614.3
Bank Hieght Ratio:	1.0
Thalweg Elevation:	613.8
LTOB Elevation:	614.3
LTOB Max Depth:	0.6
LTOB Cross Sectional Area:	1.3

Stream Type	E/C 5

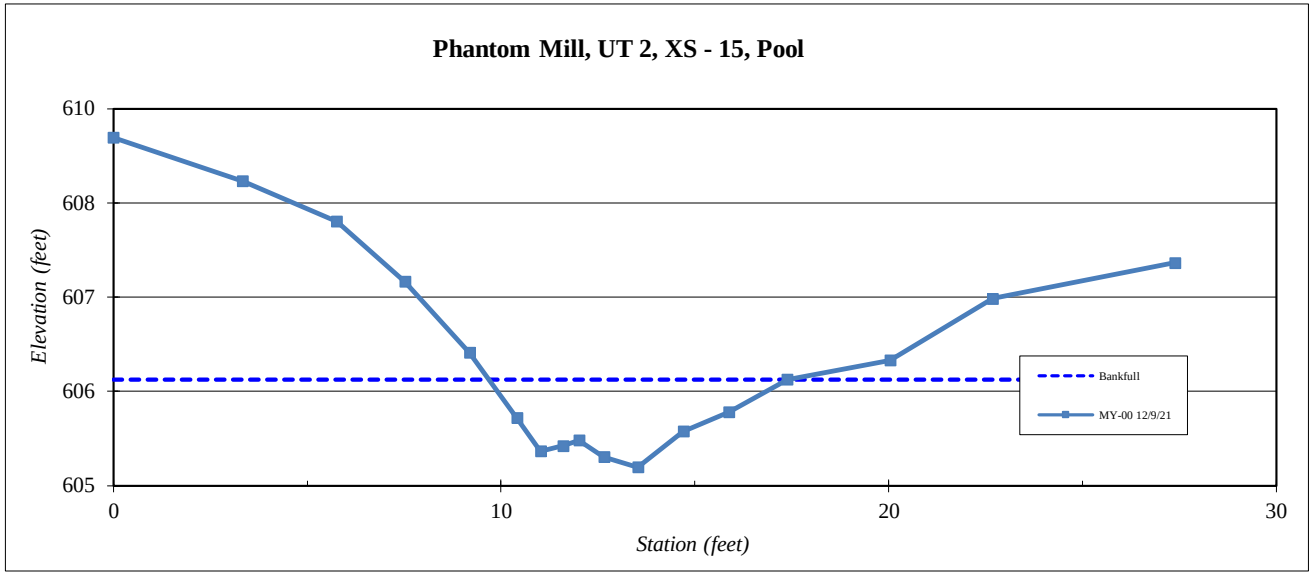


Site	Phantom Mill
Watershed:	Cape Fear River Basin, 03030002
XS ID	UT 2, XS - 15, Pool
Feature	Pool
Date:	12/9/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	609.3
3.3	608.8
5.8	608.2
7.5	607.4
9.2	606.5
10.4	605.6
11.0	605.2
11.6	605.2
12.0	605.3
12.7	605.1
13.5	605.0
14.7	605.4
15.9	605.7
17.4	606.1
20.0	606.4
22.7	607.2
27.4	607.7

SUMMARY DATA	
Bankfull Elevation:	606.1
Bank Hieght Ratio:	1.0
Thalweg Elevation:	605.0
LTOB Elevation:	606.1
LTOB Max Depth:	1.2
LTOB Cross Sectional Area:	5.1

Stream Type	E/C 5

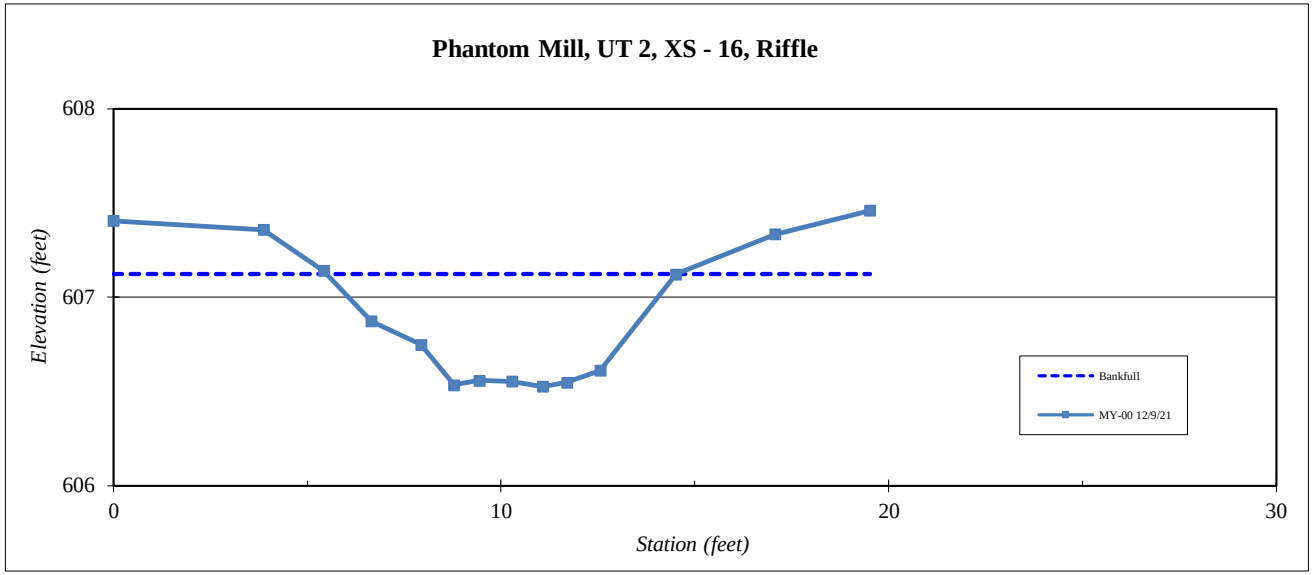


Site	Phantom Mill
Watershed:	Cape Fear River Basin, 03030002
XS ID	UT 2, XS - 16, Riffle
Feature	Riffle
Date:	12/9/2021
Field Crew:	Perkinson, D. Lewis

Station	Elevation
0.0	607.7
3.9	607.7
5.4	607.4
6.7	607.1
7.9	606.9
8.8	606.6
9.4	606.7
10.3	606.7
11.1	606.6
11.7	606.7
12.6	606.7
14.5	607.4
17.1	607.6
19.5	607.8

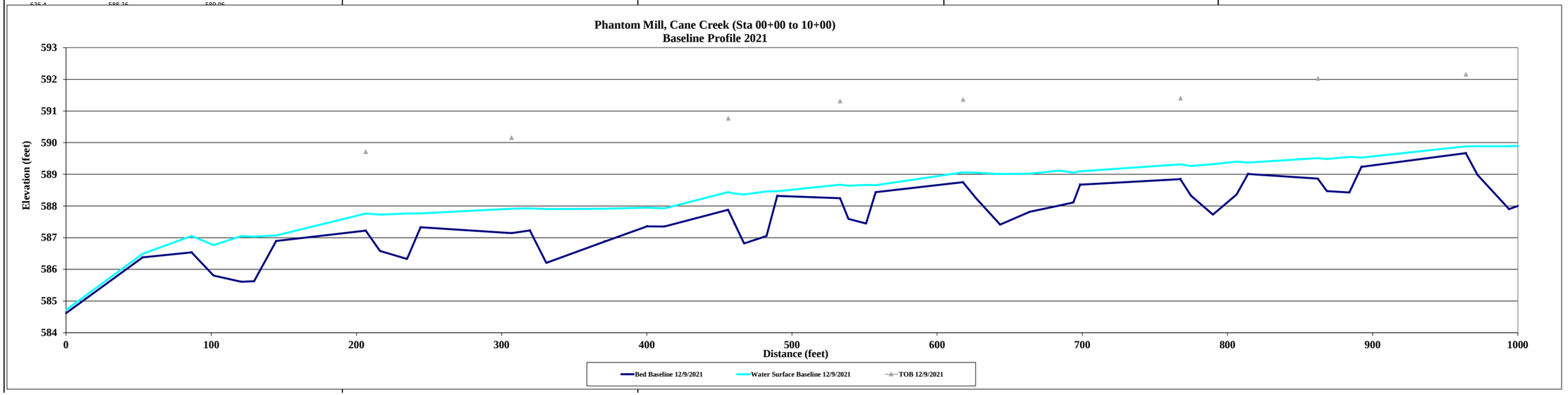
SUMMARY DATA	
Bankfull Elevation:	607.4
Bank Hieght Ratio:	1.0
Thalweg Elevation:	606.6
LTOB Elevation:	607.4
LTOB Max Depth:	0.7
LTOB Cross Sectional Area:	4.5

Stream Type	E/C 5



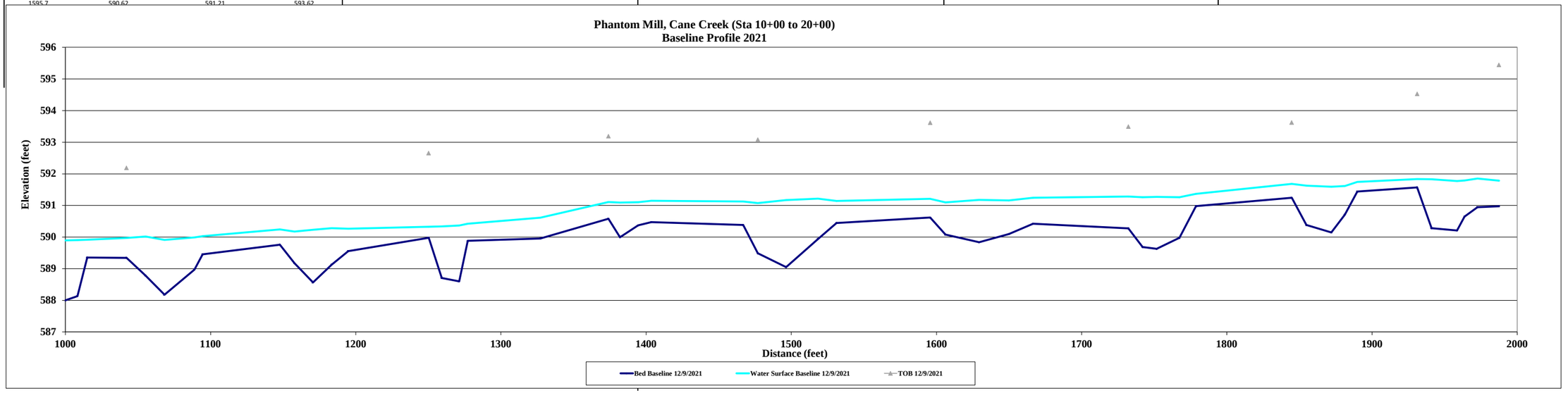
Project Name	Phantom Mill - Baseline (2021) Profile
Reach	Cane Creek (Sta 00+00 to 10+00)
Feature	Profile
Date	12/9/21
Crew	Perkinson

2021 Baseline Survey				As needed				As needed				As needed			
Station	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**
0.0	584.62	584.72													
52.7	586.38	586.49													
86.4	586.54	587.05													
101.5	585.81	586.77													
120.6	585.61	587.05													
129.5	585.62	587.03													
144.6	586.89	587.07													
206.3	587.22	587.77	589.71												
216.1	586.58	587.73													
234.8	586.33	587.76													
244.1	587.33	587.77													
306.8	587.14	587.92	590.15												
319.5	587.23	587.93													
330.8	586.21	587.90													
371.0	586.88	587.91													
400.1	587.36	587.95													
412.0	587.35	587.92													
456.0	587.88	588.44	590.76												
460.5	587.44	588.39													
467.0	586.82	588.37													
482.5	587.05	588.46													
489.8	588.32	588.47													
533.1	588.25	588.68	591.31												
538.9	587.59	588.64													
551.0	587.45	588.67													
557.7	588.44	588.66													
617.8	588.75	589.06	591.36												
636.4	588.26	589.05													



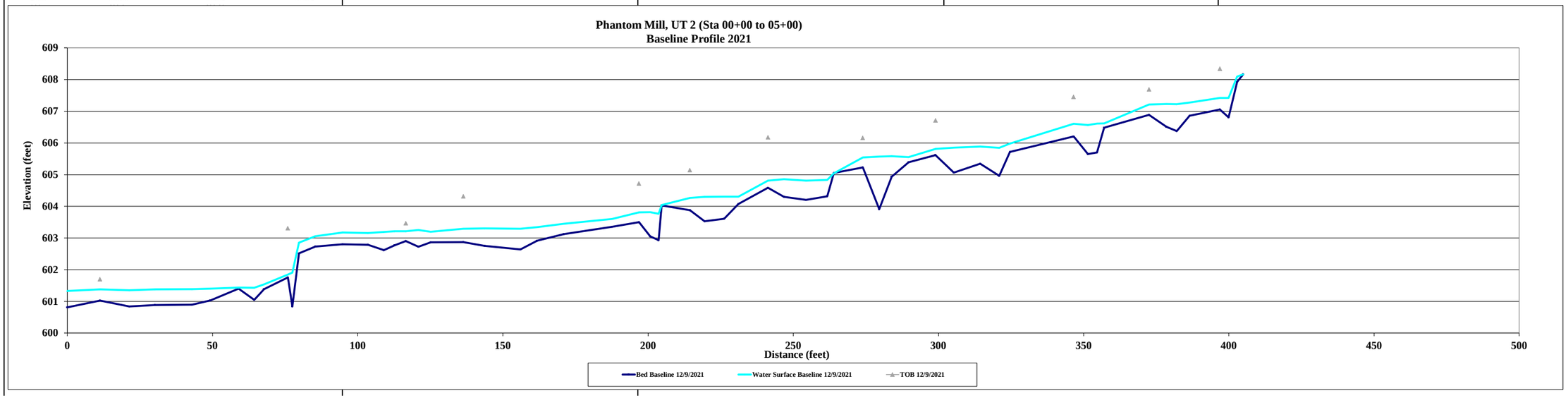
Project Name	Phantom Mill - Baseline (2021) Profile
Reach	Cane Creek (Sta 10+00 to 20+00)
Feature	Profile
Date	12/9/21
Crew	Perkinson

2021 Baseline Survey				As needed				As needed				As needed			
Station	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**
993.9	587.90	589.89													
1008.3	588.13	589.91													
1015.0	589.36	589.92													
1042.1	589.35	589.98	592.19												
1055.2	588.78	590.02													
1068.3	588.18	589.91													
1088.8	588.97	589.99													
1094.6	589.46	590.03													
1147.7	589.76	590.24													
1157.8	589.18	590.18													
1170.6	588.57	590.23													
1183.4	589.13	590.28													
1194.8	589.56	590.27													
1250.3	589.98	590.33	592.66												
1259.2	588.71	590.34													
1271.2	588.60	590.37													
1277.2	589.88	590.43													
1327.2	589.96	590.62													
1374.1	590.58	591.11	593.19												
1382.0	590.00	591.10													
1394.5	590.37	591.11													
1403.6	590.47	591.15													
1466.9	590.39	591.13													
1477.0	589.49	591.08	593.08												
1496.4	589.05	591.17													
1518.3	589.94	591.22													
1531.1	590.45	591.14													
1595.7	590.62	591.21	593.62												



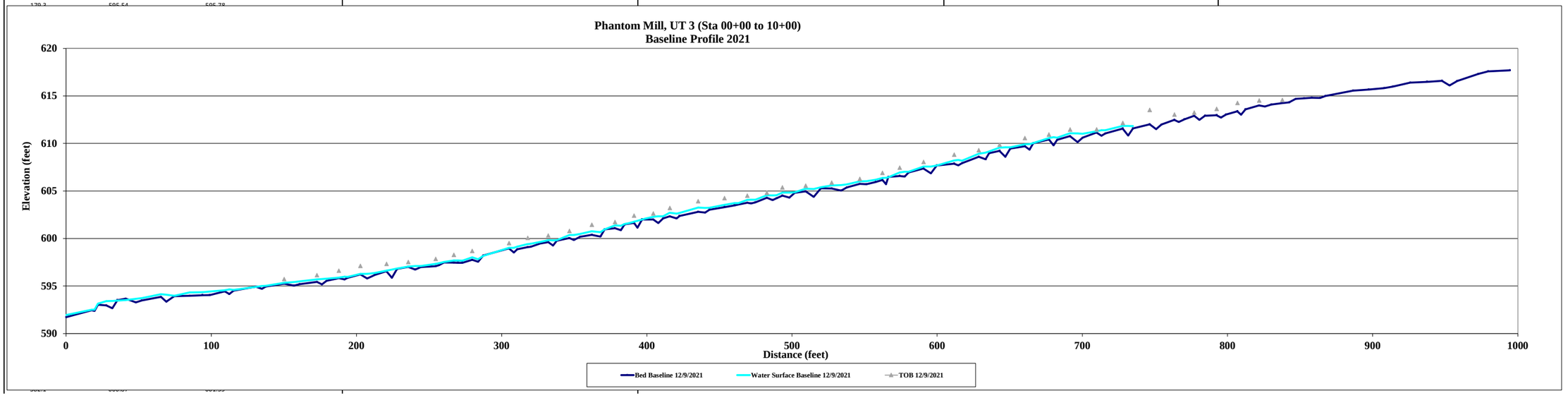
Project Name	Phantom Mill - Baseline (2021) Profile
Reach	UT 2 (Sta 00+00 to 05+00)
Feature	Profile
Date	12/9/21
Crew	Perkinson

2021 Baseline Survey				As needed				As needed				As needed			
Station	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**
0.0	600.81	601.33													
11.3	601.03	601.38	601.70												
21.3	600.84	601.35													
30.2	600.89	601.38													
43.0	600.90	601.39													
49.3	601.03	601.40													
59.0	601.40	601.44													
64.3	601.05	601.43													
67.7	601.39	601.54													
75.9	601.76	601.85	603.31												
77.5	600.84	601.91													
79.8	602.52	602.85													
85.4	602.73	603.06													
94.8	602.80	603.18													
103.5	602.79	603.16													
109.0	602.62	603.19													
112.7	602.77	603.21													
116.6	602.90	603.21	603.47												
120.9	602.73	603.25													
125.2	602.87	603.20													
136.4	602.87	603.29	604.32												
143.7	602.76	603.30													
156.0	602.64	603.29													
161.8	602.92	603.35													
171.0	603.13	603.45													
187.6	603.36	603.60													
196.9	603.50	603.81	604.72												



Project Name	Phantom Mill - Baseline (2021) Profile
Reach	UT 3 (Sta 00+00 to 10+00)
Feature	Profile
Date	12/9/21
Crew	Perkinson

2021 Baseline Survey				As needed				As needed				As needed			
Station	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**
0.0	591.72	591.94													
17.6	592.46	592.51													
19.5	592.38	592.51													
21.9	593.04	593.15													
27.6	592.97	593.41													
31.8	592.66	593.43													
35.2	593.51	593.47													
41.0	593.66	593.52													
48.0	593.28	593.65													
52.1	593.48	593.74													
65.2	593.86	594.14													
69.0	593.35	594.09													
74.5	593.94	593.98													
85.1	593.97	594.33													
93.7	594.03	594.35													
99.0	594.05	594.43													
109.2	594.44	594.55													
112.4	594.16	594.64													
115.4	594.52	594.60													
130.7	594.92	594.91													
134.9	594.71	595.00													
137.5	594.94	595.03													
150.2	595.24	595.34	595.73												
156.9	595.04	595.42													
160.8	595.19	595.50													
172.7	595.43	595.69	596.14												
176.2	595.17	595.73													
179.3	595.54	595.78													



Project Name	Phantom Mill - Baseline (2021) Profile
Reach	UT 4 (Sta 00+00 to 04+00)
Feature	Profile
Date	12/9/21
Crew	Perkinson

2021 Baseline Survey				As needed				As needed				As needed			
Station	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**	**Station**	**Bed Elevation**	**Water Elevation**	**TOB**
0.0	586.35	586.57	587.90												
19.9	586.32	586.74													
28.5	586.41	586.90	587.40												
31.8	586.33	586.87													
38.1	586.19	586.90													
43.4	585.87	586.91													
45.1	585.96	586.89													
48.9	586.58	586.90													
61.7	586.45	586.89	587.29												
63.2	586.24	586.90													
70.1	586.33	586.87													
73.0	586.43	586.90													
84.8	586.58	586.99													
86.8	586.44	586.97													
94.7	586.14	586.97													
100.6	586.40	586.99													
102.9	586.67	586.99													
116.2	586.91	587.31	587.79												
119.9	587.00	587.35													
124.7	586.74	587.16													
131.0	586.86	587.33													
135.2	587.03	587.32													
154.1	587.55	587.81	587.93												
157.8	586.90	587.78													
163.1	586.86	587.78													
167.8	587.07	587.78													
170.0	587.49	587.79													
358.0	590.92	591.25													

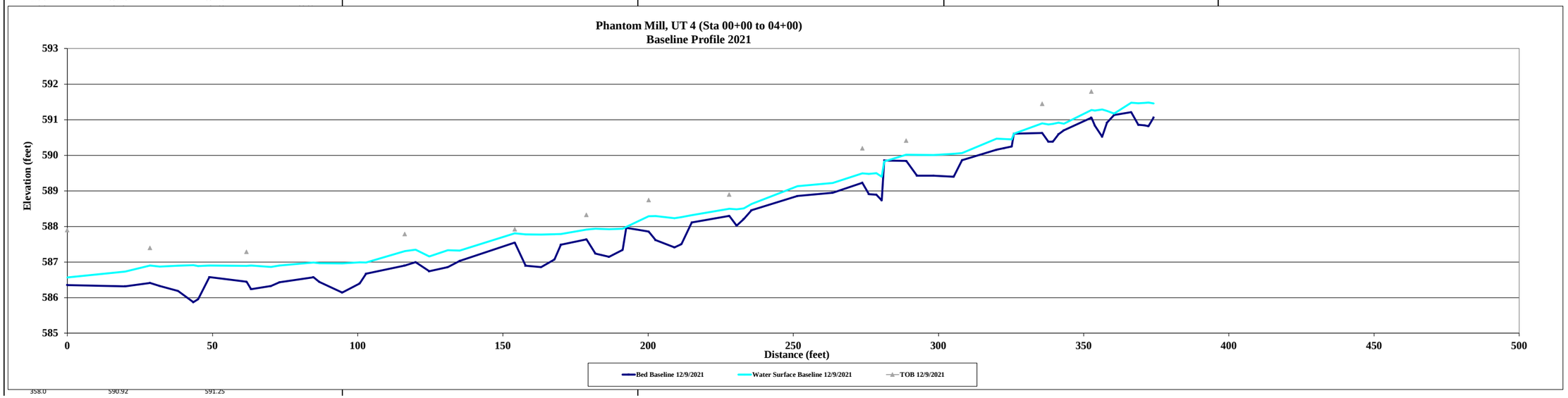


Table 9A. Baseline Stream Data Summary Phantom Mill - Cane Creek										
Parameter	**Pre-Existing Condition (applicaple)**					**Design**		**Monitoring Baseline (MY0)**		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	18.6	23		43.5		25.1	28.9	29.5	32.9	3
Floodprone Width (ft)	50	100		100		100	150	100	100	3
Bankfull Mean Depth (ft)	1.2	2.3		2.8		1.8	2.1	1.7	1.8	3
Bankfull Max Depth (ft)	2	3.3		4.4		2.3	2.9	2.6	3.0	3
Bankfull Cross Sectional Area (ft^2)	52.3	52.3		52.3		52.3	52.3	50.9	55.3	3
Width/Depth Ratio	6.6	10		36.3		12	16	16.6	19.6	3
Entrenchment Ratio	1.6	4.3		5.4		3.7	5.5	3.0	3.4	3
Bank Height Ratio	**1.1**	**1.4**		**2**		**1**	**1.2**	**1.0**	**1.0**	3
Max part size (mm) mobilized at bankfull										
Rosgen Classification	Eg 5					E/C 3/4		E/C 4		
Bankfull Discharge (cfs)	232.1					232.1		232.1		
Sinuosity (ft)	1.06					1.15		1.15		
Water Surface Slope (Channel) (ft/ft)	0.0033					0.003		0.0026		
Other										

Table 9B. Baseline Stream Data Summary Phantom Mill - UT 2										
Parameter	**Pre-Existing Condition (applicaple)**					**Design**		**Monitoring Baseline (MY0)**		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	7.8	11		17.2		7.2	8.3	9.0	9.0	1
Floodprone Width (ft)	20	50		100		30	90	50.0	50.0	1
Bankfull Mean Depth (ft)	0.2	0.4		0.6		0.5	0.6	0.5	0.5	1
Bankfull Max Depth (ft)	0.4	0.8		1.2		0.7	0.8	0.7	0.7	1
Bankfull Cross Sectional Area (ft^2)	4.3	4.3		4.3		4.3	4.3	4.5	4.5	1
Width/Depth Ratio	13	27.5		86		12	16	18.0	18.0	1
Entrenchment Ratio	1.2	3.6		12.8		3.9	11.6	5.6	5.6	1
Bank Height Ratio	**0.9**	**1.5**		**3.1**		**1**	**1.2**	**1.0**	**1.0**	1
Max part size (mm) mobilized at bankfull										
Rosgen Classification	Cg 3/4					E/C 3/4		C 4		
Bankfull Discharge (cfs)	16.2					16.2		16.2		
Sinuosity (ft)	1.2					1.2		1.2		
Water Surface Slope (Channel) (ft/ft)	0.0188					0.0188		0.0169		
Other										

Table 9C. Baseline Stream Data Summary
Phantom Mill - UT 3

Parameter	Pre-Existing Condition (applicaple)					Design		Monitoring Baseline		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	4.1	7.9		11.7		4.4	5.1	3.8	4.8	3
Floodprone Width (ft)	8	12		25		30	90	50.0	50.0	3
Bankfull Mean Depth (ft)	0.1	0.2		0.3		0.3	0.4	0.3	0.3	3
Bankfull Max Depth (ft)	0.2	0.4		0.7		0.4	0.5	0.4	0.6	3
Bankfull Cross Sectional Area (ft^2)	1.6	1.6		1.6		1.6	1.6	1.2	1.5	3
Width/Depth Ratio	10.3	39.5		117		12	16	11.2	15.6	3
Entrenchment Ratio	1.1	1.4		4.8		6.3	19	10.5	13.0	3
Bank Height Ratio	**1.3**	**5**		**10**		**1**	**1.2**	**1.0**	**1.0**	3
Max part size (mm) mobilized at bankfull										
Rosgen Classification	F4					Cb 3/4		E/C 4		
Bankfull Discharge (cfs)	18.9					18.9		18.9		
Sinuosity (ft)	1.01					1.05		1.05		
Water Surface Slope (Channel) (ft/ft)	0.0317					0.0305		0.0263		
Other										

Table 9D. Baseline Stream Data Summary
Phantom Mill - UT 4

Parameter	Pre-Existing Condition (applicaple)					Design		Monitoring Baseline		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	5	6.4		7.4		6.5	7.5	4.9	4.9	1
Floodprone Width (ft)	8	10		100		30	90	15.0	15.0	1
Bankfull Mean Depth (ft)	0.5	0.6		0.7		0.5	0.5	0.3	0.3	1
Bankfull Max Depth (ft)	0.6	0.9		1		0.6	0.8	0.5	0.5	1
Bankfull Cross Sectional Area (ft^2)	3.5	3.5		3.5		3.5	3.5	1.5	1.5	1
Width/Depth Ratio	7.1	10.7		14.8		12	16	16.0	16.0	1
Entrenchment Ratio	1.1	1.8		20		4.3	12.9	3.1	3.1	1
Bank Height Ratio	**1.1**	**1.8**		**3.2**		**1**	**1.2**	**1.0**	**1.0**	1
Max part size (mm) mobilized at bankfull										
Rosgen Classification	Eg 4					E/C 3/4		C 4		
Bankfull Discharge (cfs)	13.1					13.1		13.1		
Sinuosity (ft)	1.04					1.15		1.15		
Water Surface Slope (Channel) (ft/ft)	0.0228					0.0206		0.0135		
Other										

Table 10A. Monitoring Data - Cross Section Morphology Monitoring Summary
(Phantom Mill / DMS:95017) Cane Creek

	Cane Creek - Cross Section 3 (Riffle)							Cane Creek - Cross Section 4 (Pool)							Cane Creek - Cross Section 5 (Pool)							Cane Creek - Cross Section 6 (Riffle)							Cane Cr - Cross Section 7 (Riffle)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	589.82							590.49							591.65							591.81							593.48						
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00							1.00							1.00							1.00							1.00						
Thalweg Elevation	587.20							586.59							587.69							588.95							590.53						
LTOB[2] Elevation	589.82							590.49							591.65							591.81							593.48						
LTOB[2] Max Depth (ft)	2.62							3.90							3.96							2.85							2.95						
LTOB[2] Cross Sectional Area (ft[2])	50.9							69.4							71.9							55.2							52.4						
	Cane Creek - Cross Section 8 (Pool)																																			
	MY0	MY1	MY2	MY3	MY5	MY7	MY+																													
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	593.47																																			
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00																																			
Thalweg Elevation	589.77																																			
LTOB[2] Elevation	593.47																																			
LTOB[2] Max Depth (ft)	3.71																																			
LTOB[2] Cross Sectional Area (ft[2])	70.4																																			

The above morphology parameters reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT and industry mitigation providers/practitioners. The outcome resulted in the focus on three primary morphological parameters of interest for the purposes of tracking channel change moving forward. They are the bank height ratio using a constant As-built bankfull area and the cross sectional area and max depth based on each years low top of bank. These are calculated as follows:

1 - **Bank Height Ratio (BHR)** takes the As-built bankfull area as the basis for adjusting each subsequent years bankfull elevation. For example if the As-built bankfull area was 10 ft2, then the MY1 bankfull elevation would be adjusted until the calculated bankfull area within the MY1 cross section survey = 10 ft2. The BHR would then be calculated with the difference between the low top of bank (LTOB) elevation for MY1 and the thalweg elevation for MY1 in the numerator with the difference between the MY1 bankfull elevation and the MY1 thalweg elevation in the denominator. This same process is then carried out in each successive year.

2 - **LTOB Area and Max depth** - These are based on the LTOB elevation for each years survey (The same elevation used for the LTOB in the BHR calculation). Area below the LTOB elevation will be used and tracked for each year as above. The difference between the LTOB elevation and the thalweg elevation (same as in the BHR calculation) will be recroded and tracked above as LTOB max depth.

Note: The smaller the channel the closer the survey measurements are to their limit of reliable detection, therefore inter-annual variation in morphological measurement (as a percentage) is by default magnified as channel size decereases. Some of the variability above is the result of this factor and some is due to the large amount of depositional sediments observed.

Table 10B. Monitoring Data - Cross Section Morphology Monitoring Summary
(Phantom Mill / DMS:95017) UT 2, 3, and 4

	UT 2 - Cross Section 15 (Pool)							UT 2 - Cross Section 16 (Riffle)							UT 3 - Cross Section 9 (Pool)							UT 3 - Cross Section 10 (Riffle)							UT 3 - Cross Section 11 (Riffle)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	606.13							607.38							594.14							594.24							601.65						
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00							1.00							1.00							1.00							1.00						
Thalweg Elevation	604.963							606.63							593.22							593.81							601.03						
LTOB[2] Elevation	606.13							607.38							594.14							594.24							601.65						
LTOB[2] Max Depth (ft)	1.17							0.75							0.92							0.43							0.62						
LTOB[2] Cross Sectional Area (ft[2])	5.1							4.5							3.4							1.5							1.3						
	UT 3 - Cross Section 12 (Pool)							UT 3 - Cross Section 13 (Pool)							UT 3 - Cross Section 14 (Riffle)							UT 4 - Cross Section 1 (Pool)							UT 4 - Cross Section 2 (Riffle)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	602.61							614.14							614.34							589.15							589.39						
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00							1.00							1.00							1.00							1.00						
Thalweg Elevation	601.15							612.96							613.78							587.79							588.93						
LTOB[2] Elevation	602.61							614.14							614.34							589.15							589.39						
LTOB[2] Max Depth (ft)	1.46							1.18							0.57							1.36							0.46						
LTOB[2] Cross Sectional Area (ft[2])	4.7							3.2							1.3							6.2							1.5						

The above morphology parameters reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT and industry mitigation providers/practitioners. The outcome resulted in the focus on three primary morphological parameters of interest for the purposes of tracking channel change moving forward. They are the bank height ratio using a constant As-built bankfull area and the cross sectional area and max depth based on each years low top of bank. These are calculated as follows:

1 - **Bank Height Ratio (BHR)** takes the As-built bankfull area as the basis for adjusting each subsequent years bankfull elevation. For example if the As-built bankfull area was 10 ft2, then the MY1 bankfull elevation would be adjusted until the calculated bankfull area within the MY1 cross section survey = 10 ft2. The BHR would then be calculated with the difference between the low top of bank (LTOB) elevation for MY1 and the thalweg elevation for MY1 in the numerator with the difference between the MY1 bankfull elevation and the MY1 thalweg elevation in the denominator. This same process is then carried out in each successive year.

2 - **LTOB Area and Max depth** - These are based on the LTOB elevation for each years survey (The same elevation used for the LTOB in the BHR calculation). Area below the LTOB elevation will be used and tracked for each year as above. The difference between the LTOB elevation and the thalweg elevation (same as in the BHR calculation) will be recroded and tracked above as LTOB max depth.

Note: The smaller the channel the closer the survey measurements are to their limit of reliable detection, therefore inter-annual variation in morphological measurement (as a percentage) is by default magnified as channel size decereases. Some of the variability above is the result of this factor and some is due to the large amount of depositional sediments observed.

Appendix D: Hydrologic Data

Groundwater Gauge Soil Profiles

AXIOM ENVIRONMENTAL, INC
218 Snow Avenue
Raleigh, North Carolina 27603
919-215-1693

SOIL BORING LOG

Project/Site: Phantom Mill

County, State: Alamance, North Carolina

Sampling Point/ Coordinates: GW-01 (35.89823, -79.47427)

Investigator: DL/PP

Notes: Wetland Restoration

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-8	10yr 5/2	70	10yr 5/6	30	SiCL
8-14	2.5y 5/1	80	10yr 5/6	20	SiCL
14-25	10yr 5/2	85	10yr 5/6	15	SiCL
25+	10yr 5/2	90	10yr 5/6	20	CL

North Carolina Licensed Soil Scientist

Number: 1233

Signature: W Grant Lewis

Name/Print: W. Grant Lewis

AXIOM ENVIRONMENTAL, INC
218 Snow Avenue
Raleigh, North Carolina 27603
919-215-1693

SOIL BORING LOG

Project/Site: Phantom Mill

County, State: Alamance, North Carolina

Sampling Point/ Coordinates: GW-2 (35.89313, -79.474466)

Investigator: DL/PP

Notes: Wetland Restoration

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-8	10yr 5/2	75	10yr 5/6	25	CL
8-12	10yr 6/2	85	10yr 5/6	15	CL
12-25	10yr 6/2	70	10yr 5/6	20	-
-	-	-	3-5 BG	10	CL
25-33+	2.5y 6-2	90	10yr 5/6	10	SiCL

North Carolina Licensed Soil Scientist

Number: 1233

Signature: W Grant Lewis

Name/Print: W. Grant Lewis

AXIOM ENVIRONMENTAL, INC
218 Snow Avenue
Raleigh, North Carolina 27603
919-215-1693

SOIL BORING LOG

Project/Site: Phantom Mill

County, State: Alamance, North Carolina

Sampling Point/ Coordinates: GW-3 (35.893083, -79.476039)

Investigator: DL/PP

Notes: Wetland Restoration Water table @6" some surface water in vicinity.

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-3	10yr 5/3	100	-	-	SiCL
5-8	10yr 5/2	95	10yr 4/6	5	SiCL
8-20+	10yr 5/2	60	10yr 4/6	10	CL

North Carolina Licensed Soil Scientist

Number: 1233

Signature: W Grant Lewis

Name/Print: W. Grant Lewis

AXIOM ENVIRONMENTAL, INC
218 Snow Avenue
Raleigh, North Carolina 27603
919-215-1693

SOIL BORING LOG

Project/Site: Phantom Mill

County, State: Alamance, North Carolina

Sampling Point/ Coordinates: GW-4 (35.892481, -79.475608

Investigator: PP/DL

Notes: some disturbance from site construction to upper soil profile

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-30	10yr 5/3	85	10yr4/6	15	SiCL

North Carolina Licensed Soil Scientist

Number: 1233

Signature: W Grant Lewis

Name/Print: W. Grant Lewis

AXIOM ENVIRONMENTAL, INC
218 Snow Avenue
Raleigh, North Carolina 27603
919-215-1693

SOIL BORING LOG

Project/Site: Phantom Mill

County, State: Alamance, North Carolina

Sampling Point/ Coordinates: GW-5 (35.892412, -79.477453)

Investigator: PP/DL

Notes: wetland restoration, surface water, water table at 5"

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-3	10yr 5/3	100	-	-	SiCL
3-10	10yr 5/3	95	10yr 5/6	5	SiC
10-24	10yr 5/2	90	10yr 5/6	10	SiC
24+	10yr 6/2	85	10yr 5/6	15	SiC

North Carolina Licensed Soil Scientist

Number: 1233

Signature: W Grant Lewis

Name/Print: W. Grant Lewis

AXIOM ENVIRONMENTAL, INC
218 Snow Avenue
Raleigh, North Carolina 27603
919-215-1693

SOIL BORING LOG

Project/Site: Phantom Mill

County, State: Alamance, North Carolina

Sampling Point/ Coordinates: GW-6 (35.891909, -79.477453)

Investigator: PP/DL

Notes:

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-24	10yr 5/2	90	10yr 5/1	10	SiC
24+	10yr 5/2	50	10yr 5/6	40	SiC
-	-	-	10yr 6/1	10	

North Carolina Licensed Soil Scientist

Number: 1233

Signature: W Grant Lewis

Name/Print: W. Grant Lewis

AXIOM ENVIRONMENTAL, INC
218 Snow Avenue
Raleigh, North Carolina 27603
919-215-1693

SOIL BORING LOG

Project/Site: Phantom Mill

County, State: Alamance, North Carolina

Sampling Point/ Coordinates: GW-7 (35.892106, -79.478171)

Investigator: DL/PP

Notes: Wetland restoration water table 6"

Depth (inches)	Matrix		Mottling		Texture
	Color	%	Color	%	
0-8	10yr 5/4	85	10yr 5/1	15	SiC
8-20	10yr 5/2	90	10yr 4/6	10	SiC
20-30+	10yr 4/2	90	10yr 4/6	10	SiC

North Carolina Licensed Soil Scientist

Number: 1233

Signature: W Grant Lewis

Name/Print: W. Grant Lewis

Appendix E: Project Timeline and Contact Info

Table 11. Project Timeline
Table 12. Project Contacts

Table 11. Project Timeline

Activity or Deliverable	Data Collection Complete	Task Completion or Deliverable Submission
Project Instituted	--	19-Apr-18
Mitigation Plan Approved	7-Aug-19	Jan-20
Construction (Grading) Completed	NA	2-Jun-21
Planting Completed	NA	22-Dec-21
As-built Survey Completed	9-Dec-21	May-22
MY-0 Baseline Report	Dec-21	May-22
MY1+ Monitoring Reports		
Remediation Items (e.g. beaver removal, supplements, repairs etc.)		
Encroachment		

Table 12. Project Contacts

Phantom Mill Site/95017	
Provider	Restoration Systems, LLC 1101 Haynes Street, Suite 211 Raleigh, NC 27604
Mitigation Provider POC	Worth Creech 919-755-9490
Designer	Axiom Environmental, Inc. 218 Snow Ave Raleigh, NC 27603
Primary project design POC	Grant Lewis 919-215-1693
Construction Contractor	Land Mechanics Designs, Inc. 126 Circle G Lane Willow Spring, NC 27592
	Charles Hill 919-639-6132

Appendix F: Other Data

Preconstruction Benthic Results
Preconstruction Benthic Habitat Assessment Data Forms

PAI ID NO			**52706**	**52707**
STATION			**Phantom**	**Phantom**
			US	**DS**
DATE			**7/1/2019**	**7/1/2019**
SPECIES	**T.V.**	**F.F.G.**		
MOLLUSCA				
Bivalvia				
Veneroida				
Sphaeriidae		**FC**		
Sphaerium simile	7.2	**FC**		8
ARTHROPODA				
Arachnoidea				
Acariformes				
Hygrobatidae				
Atractides sp.			2	
Insecta				
Ephemeroptera				
Caenidae		**CG**		
Caenis latipennie	6.8	**CG**	14	
Heptageniidae		**SC**		
Maccaffertium sp.		**SC**		1
Odonata				
Coenagrionidae		**P**		
Enallagma sp.	8.5	**P**	1	
Gomphidae		**P**		1
Agrigomphus sp.	**5,9**	**P**	3	1
Hemiptera				
Corixidae		**PI**	2	
Megaloptera				
Corydalidae		**P**		
Corydalus cornutus	5.2	**P**		1
Sialidae		**P**		
Sialis sp.	7	**P**		1
Trichoptera				
Hydropsychidae		**FC**		
Cheumatopsyche sp.	6.6	**FC**		3
Hydropsyche sp.		**FC**		3
Coleoptera				
Gyrinidae		**P**		
Dineutus sp.	*5*	**P**	1	
Gyrinus sp.	*5.8*	**P**	1	
Hydrophilidae		**P**		
Tropisternus sp.	*9.3*	**P**	1	
Diptera				
Ceratopogonidae		**P**		1

PAI ID NO			**52706**	**52707**
STATION			**Phantom**	**Phantom**
			US	**DS**
DATE			**7/1/2019**	**7/1/2019**
SPECIES	**T.V.**	**F.F.G.**		
Chironomidae				
Cryptochironomus sp.	*6.4*	**P**		6
Glyptotendipes sp.	*8.6*	**FC**	1	
Paracladopelma undine	*4.5*		1	1
Tanytarsus sp.	*6.6*	**FC**	2	
Tribelos jucundum	*5.7*	**CG**	6	4
Tvetenia sp.		**CG**		1
TOTAL NO. OF ORGANISMS			**35**	**32**
TOTAL NO. OF TAXA			**12**	**13**
EPT TAXA			**1**	**3**
NC BIOTIC INDEX Assigned Values			**6.57**	**6.27**

Phantom_US

3/06 Revision 6

Habitat Assessment Field Data Sheet
Mountain/ Piedmont Streams

53

Biological Assessment Unit, DWQ **TOTAL SCORE** 53

Directions for use: The observer is to survey a **minimum of 100 meters with 200 meters preferred** of stream, preferably in an **upstream** direction starting above the bridge pool and the road right-of-way. The segment which is assessed should represent average stream conditions. To perform a proper habitat evaluation the observer needs to get into the stream. To complete the form, select the description which best fits the observed habitats and then circle the score. If the observed habitat falls in between two descriptions, select an intermediate score. A final habitat score is determined by adding the results from the different metrics.

Stream Cane Creek - DS Location/road: Charlie Gulley (Road Name " ") County Alamance

Date 19070 **CC#** 03030002 **Basin** Cape Fear **Subbasin** 03-06-04

Observer(s) A.S, P.P Type of Study: ☐ Fish ☒ Benthos ☐ Basinwide ☐ Special Study (Describe) _____

Latitude 35.891927 Longitude 79.478232 Ecoregion: ☐ MT ☒ P ☐ Slate Belt ☐ Triassic Basin

Water Quality: Temperature _____ °C DO _____ mg/l Conductivity (corr.) _____ µS/cm pH _____

Physical Characterization: Visible land use refers to immediate area that you can see from sampling location - include what you estimate driving thru the watershed in watershed land use.

Visible Land Use: _____%Forest _____%Residential 100 %Active Pasture _____% Active Crops
_____%Fallow Fields _____% Commercial _____%Industrial _____%Other - Describe: _____

Watershed land use : ☒ Forest ☒ Agriculture ☐ Urban ☒ Animal operations upstream

Width: (meters) Stream _____ Channel (at top of bank) _____ **Stream Depth:** (m) Avg .5 Max 1
☐ Width variable ☐ Large river >25m wide

Bank Height (from deepest part of riffle to top of bank-first flat surface you stand on): (m) 2

Bank Angle: 90 ° or ☐ NA (Vertical is 90°, horizontal is 0°. Angles > 90° indicate slope is towards mid-channel, < 90° indicate slope is away from channel. NA if bank is too low for bank angle to matter.)

☐ Channelized Ditch
☒ Deeply incised-steep, straight banks ☐ Both banks undercut at bend ☒ Channel filled in with sediment
☐ Recent overbank deposits ☒ Bar development ☐ Buried structures ☐ Exposed bedrock
☐ Excessive periphyton growth ☐ Heavy filamentous algae growth ☐ Green tinge ☐ Sewage smell
Manmade Stabilization: ☒ N ☐ Y: ☐ Rip-rap, cement, gabions ☐ Sediment/grade-control structure ☐ Berm/levee
Flow conditions : ☐ High ☒ Normal ☐ Low
Turbidity: ☐ Clear ☐ Slightly Turbid ☒ Turbid ☐ Tannic ☐ Milky ☐ Colored (from dyes)
Good potential for Wetlands Restoration Project?? ☒ **YES** ☐ **NO Details** Stream/wetland restoration site

Channel Flow Status

Useful especially under abnormal or low flow conditions.

A. Water reaches base of both lower banks, minimal channel substrate exposed	☐
B. Water fills >75% of available channel, or <25% of channel substrate is exposed	☒
C. Water fills 25-75% of available channel, many logs/snags exposed	☐
D. Root mats out of water	☐
E. Very little water in channel, mostly present as standing pools	☐

Weather Conditions: Cloudy, 60's **Photos:** ☐ N ☒ Y ☐ Digital ☐ 35mm

Remarks: livestock in stream

I. Channel Modification

	Score
A. channel natural, frequent bends	5
B. channel natural, infrequent bends (channelization could be old)	4
C. some channelization present	3
D. more extensive channelization, >40% of stream disrupted	2
E. no bends, completely channelized or rip rapped or gabioned, etc	(0)

☐ Evidence of dredging ☐Evidence of desnagging=no large woody debris in stream ☒Banks of uniform shape/height

Remarks Stream has been channelized Subtotal 0

II. Instream Habitat: Consider the percentage of the reach that is favorable for benthos colonization or fish cover. If >70% of the reach is rocks, 1 type is present, circle the score of 17. Definition: leafpacks consist of older leaves that are packed together and have begun to decay (not piles of leaves in pool areas). Mark as Rare, Common, or Abundant.

___Rocks _X_ Macrophytes _X_ Sticks and leafpacks ___Snags and logs ___Undercut banks or root mats

AMOUNT OF REACH FAVORABLE FOR COLONIZATION OR COVER

	>70% Score	40-70% Score	20-40% Score	<20% Score
4 or 5 types present	20	16	12	8
3 types present	19	15	11	7
2 types present	18	(14)	10	6
1 type present	17	13	9	5
No types present	0			

☐ No woody vegetation in riparian zone Remarks _____ Subtotal 14

III. Bottom Substrate (silt, sand, detritus, gravel, cobble, boulder) Look at entire reach for substrate scoring, but only look at riffle for embeddedness, and use rocks from all parts of riffle-look for "mud line" or difficulty extracting rocks.

	Score
A. substrate with good mix of gravel, cobble and boulders	
1. embeddedness <20% (very little sand, usually only behind large boulders)	15
2. embeddedness 20-40%	12
3. embeddedness 40-80%	8
4. embeddedness >80%	3
B. substrate gravel and cobble	
1. embeddedness <20%	14
2. embeddedness 20-40%	11
3. embeddedness 40-80%	6
4. embeddedness >80%	2
C. substrate mostly gravel	
1. embeddedness <50%	8
2. embeddedness >50%	4
D. substrate homogeneous	
1. substrate nearly all bedrock	3
2. substrate nearly all sand	(3)
3. substrate nearly all detritus	2
4. substrate nearly all silt/ clay	1

Remarks _____ Subtotal 3

IV. Pool Variety Pools are areas of deeper than average maximum depths with little or no surface turbulence. Water velocities associated with pools are always slow. Pools may take the form of "pocket water", small pools behind boulders or obstructions, in large high gradient streams, or side eddies.

A. Pools present	Score
1. Pools Frequent (>30% of 200m area surveyed)	
a. variety of pool sizes	10
b. pools about the same size (indicates pools filling in)	(8)
2. Pools Infrequent (<30% of the 200m area surveyed)	
a. variety of pool sizes	6
b. pools about the same size	4
B. Pools absent	0

Subtotal 8

☐ Pool bottom boulder-cobble=hard ☒ Bottom sandy-sink as you walk ☐ Silt bottom ☐ Some pools over wader depth

Remarks minimal cover

Page Total 25

2

V. Riffle Habitats

Definition: Riffle is area of reaeration-can be debris dam, or narrow channel area.

	Riffles **Frequent** Score	Riffles **Infrequent** Score
A. well defined riffle and run, riffle as wide as stream and extends 2X width of stream....	16	12
B. riffle as wide as stream but riffle length is not 2X stream width	(14)	7
C. riffle not as wide as stream and riffle length is not 2X stream width	10	3
D. riffles absent.....	0	

Channel Slope: ☒Typical for area ☐Steep=fast flow ☐Low=like a coastal stream Subtotal 14

VI. Bank Stability and Vegetation

FACE UPSTREAM	Left Bank Score	Rt. Bank Score
A. Banks stable		
1. little evidence of erosion or bank failure(except outside of bends), little potential for erosion..	7	7
B. Erosion areas present		
1. diverse **trees**, shrubs, grass; plants healthy with good root systems.....	6	6
2. few trees or small trees and **shrubs**; vegetation appears generally healthy.....	5	5
3. sparse **mixed** vegetation; plant types and conditions suggest poorer soil binding.....	3	3
4. mostly **grasses**, few if any trees and shrubs, high erosion and failure potential at high flow..	(2)	(3)
5. little or no bank vegetation, mass erosion and bank failure evident.....	0	0
		Total 4

Remarks _____

VII. Light Penetration Canopy is defined as tree or vegetative cover directly above the stream's surface. Canopy would block out sunlight when the sun is directly overhead. Note shading from mountains, but not use to score this metric.

	Score
A. Stream with **good** canopy with some breaks for light penetration	10
B. Stream with **full canopy** - breaks for light penetration absent.....	8
C. Stream with **partial** canopy - sunlight and shading are essentially equal.....	7
D. Stream with **minimal** canopy - full sun in all but a few areas.....	2
E. **No canopy** and no shading.....	(0)

Remarks _____ Subtotal 0

VIII. Riparian Vegetative Zone Width

Definition: Riparian zone for this form is area of natural vegetation adjacent to stream (can go beyond floodplain). Definition: A break in the riparian zone is any place on the stream banks which allows sediment or pollutants to directly enter the stream, such as paths down to stream, storm drains, uprooted trees, otter slides, etc.

FACE UPSTREAM	Lft. Bank Score	Rt. Bank Score
Dominant vegetation: ☐ Trees ☐ Shrubs ☐ Grasses ☒ Weeds/old field ☐Exotics (kudzu, etc)		
A. Riparian zone **intact** (no breaks)		
1. width > 18 meters.....	(5)	(5)
2. width 12-18 meters.....	4	4
3. width 6-12 meters.....	3	3
4. width < 6 meters.....	2	2
B. Riparian zone **not intact** (breaks)		
1. breaks rare		
a. width > 18 meters.....	4	4
b. width 12-18 meters.....	3	3
c. width 6-12 meters.....	2	2
d. width < 6 meters.....	1	1
2. breaks common		
a. width > 18 meters.....	3	3
b. width 12-18 meters.....	2	2
c. width 6-12 meters.....	1	1
d. width < 6 meters.....	0	0
		Total 10

Remarks _____

Page Total 28

☐ Disclaimer-form filled out, but score doesn't match subjective opinion-atypical stream. **TOTAL SCORE** 53

3

Phantom – DS

3/06 Revision 6

Habitat Assessment Field Data Sheet
Mountain/ Piedmont Streams

Biological Assessment Unit, DWQ **TOTAL SCORE** 81

Directions for use: The observer is to survey a **minimum of 100 meters with 200 meters preferred** of stream, preferably in an **upstream** direction starting above the bridge pool and the road right-of-way. The segment which is assessed should represent average stream conditions. To perform a proper habitat evaluation the observer needs to get into the stream. To complete the form, select the description which best fits the observed habitats and then circle the score. If the observed habitat falls in between two descriptions, select an intermediate score. A final habitat score is determined by adding the results from the different metrics.

Stream Cane Creek Location/road: Charleston (Road Name " ") County Alamance

Date _____ **CC#** 03030002 Basin Cape Fear Subbasin 03-06-04

Observer(s)_____ Type of Study: ☐ Fish ☒ Benthos ☐ Basinwide ☐Special Study (Describe) _____

Latitude 35.893186 Longitude -79.473736 Ecoregion: ☐ MT ☒ P ☐ Slate Belt ☐ Triassic Basin

Water Quality: Temperature_____°C DO _____mg/l Conductivity (corr.) _____µS/cm pH _____

Physical Characterization: Visible land use refers to immediate area that you can see from sampling location - include what you estimate driving thru the watershed in watershed land use.

Visible Land Use: 100 %Forest _____%Residential _____%Active Pasture _____% Active Crops
_____%Fallow Fields _____% Commercial _____%Industrial _____%Other - Describe:_____

Watershed land use : ☒Forest ☒Agriculture ☐Urban ☒ Animal operations upstream

Width: (meters) Stream 8 Channel (at top of bank) 7 **Stream Depth:** (m) Avg .5 Max 1.5
☐ Width variable ☐ Large river >25m wide

Bank Height (from deepest part of riffle to top of bank-first flat surface you stand on): (m) 1.5

Bank Angle: 100 ° or ☐ NA (Vertical is 90°, horizontal is 0°. Angles > 90° indicate slope is towards mid-channel, < 90° indicate slope is away from channel. NA if bank is too low for bank angle to matter.)

☐ Channelized Ditch
☐Deeply incised-steep, straight banks ☐Both banks undercut at bend ☐Channel filled in with sediment
☒ Recent overbank deposits ☒Bar development ☐Buried structures ☐Exposed bedrock
☐ Excessive periphyton growth ☐ Heavy filamentous algae growth ☐Green tinge ☐ Sewage smell
Manmade Stabilization: ☒N ☐Y: ☐Rip-rap, cement, gabions ☐ Sediment/grade-control structure ☐Berm/levee
Flow conditions : ☐High ☒Normal ☐Low
Turbidity: ☐Clear ☐ Slightly Turbid ☒Turbid ☐Tannic ☐Milky ☐Colored (from dyes)
Good potential for Wetlands Restoration Project?? ☒ **YES** ☐**NO Details**_____
Channel Flow Status

Useful especially under abnormal or low flow conditions.

A. Water reaches base of both lower banks, minimal channel substrate exposed	☐
B. Water fills >75% of available channel, or <25% of channel substrate is exposed	☒
C. Water fills 25-75% of available channel, many logs/snags exposed	☐
D. Root mats out of water	☐
E. Very little water in channel, mostly present as standing pools	☐

Weather Conditions: Cloudy cool **Photos:** ☐N ☐Y ☒ Digital ☐35mm

Remarks: Just down stream of pasture

4

I. Channel Modification

	Score
A. channel natural, frequent bends	5
B. channel natural, infrequent bends (channelization could be old)	(4)
C. some channelization present	3
D. more extensive channelization, >40% of stream disrupted	2
E. no bends, completely channelized or rip rapped or gabioned, etc	0

☐ Evidence of dredging ☐Evidence of desnagging=no large woody debris in stream ☐Banks of uniform shape/height

Remarks _____ Subtotal 4

II. Instream Habitat: Consider the percentage of the reach that is favorable for benthos colonization or fish cover. If >70% of the reach is rocks, 1 type is present, circle the score of 17. Definition: leafpacks consist of older leaves that are packed together and have begun to decay (not piles of leaves in pool areas). Mark as Rare, Common, or Abundant.

X **Rocks** ____**Macrophytes** X **Sticks and leafpacks** ____**Snags and logs** ____**Undercut banks or root mats**

AMOUNT OF REACH FAVORABLE FOR COLONIZATION OR COVER

	>70% Score	40-70% Score	20-40% Score	<20% Score
4 or 5 types present	20	(16)	12	8
3 types present	19	15	11	7
2 types present	18	14	10	6
1 type present	17	13	9	5
No types present	0			

☐ No woody vegetation in riparian zone Remarks _____ Subtotal 16

III. Bottom Substrate (silt, sand, detritus, gravel, cobble, boulder) Look at entire reach for substrate scoring, but only look at riffle for embeddedness, and use rocks from all parts of riffle-look for "mud line" or difficulty extracting rocks.

A. substrate with good mix of gravel, cobble and boulders	Score
1. embeddedness <20% (very little sand, usually only behind large boulders)	15
2. embeddedness 20-40%	12
3. embeddedness 40-80%	8
4. embeddedness >80%	3
B. substrate gravel and cobble	
1. embeddedness <20%	(14)
2. embeddedness 20-40%	11
3. embeddedness 40-80%	6
4. embeddedness >80%	2
C. substrate mostly gravel	
1. embeddedness <50%	8
2. embeddedness >50%	4
D. substrate homogeneous	
1. substrate nearly all bedrock	3
2. substrate nearly all sand	3
3. substrate nearly all detritus	2
4. substrate nearly all silt/ clay	1

Remarks _____ Subtotal 14

IV. Pool Variety Pools are areas of deeper than average maximum depths with little or no surface turbulence. Water velocities associated with pools are always slow. Pools may take the form of "pocket water", small pools behind boulders or obstructions, in large high gradient streams, or side eddies.

A. Pools present	Score
1. Pools Frequent (>30% of 200m area surveyed)	
a. variety of pool sizes	10
b. pools about the same size (indicates pools filling in)	(8)
2. Pools Infrequent (<30% of the 200m area surveyed)	
a. variety of pool sizes	6
b. pools about the same size	4
B. Pools absent	0

Subtotal 8

☒ Pool bottom boulder-cobble=hard ☐ Bottom sandy-sink as you walk ☐ Silt bottom ☐ Some pools over wader depth

Remarks Pools a-o Sediment/Silt Silty over rocks

Page Total 42

5

V. Riffle Habitats

Definition: Riffle is area of reaeration-can be debris dam, or narrow channel area.

	Riffles **Frequent** Score	Riffles **Infrequent** Score
A. well defined riffle and run, riffle as wide as stream and extends 2X width of stream....	16	12
B. riffle as wide as stream but riffle length is not 2X stream width	14	(7)
C. riffle not as wide as stream and riffle length is not 2X stream width	10	3
D. riffles absent.....	0	

Channel Slope: ☐Typical for area ☐Steep=fast flow ☐Low=like a coastal stream

Subtotal 7

VI. Bank Stability and Vegetation

FACE UPSTREAM	Left Bank Score	Rt. Bank Score
A. Banks stable		
1. little evidence of erosion or bank failure(except outside of bends), little potential for erosion.	(7)	(7)
B. Erosion areas present		
1. diverse **trees**, shrubs, grass; plants healthy with good root systems.....	6	6
2. few trees or small trees and **shrubs**; vegetation appears generally healthy.....	5	5
3. sparse **mixed** vegetation; plant types and conditions suggest poorer soil binding.....	3	3
4. mostly **grasses**, few if any trees and shrubs, high erosion and failure potential at high flow..	2	2
5. little or no bank vegetation, mass erosion and bank failure evident.....	0	0

Total 14

Remarks _____

VII. Light Penetration Canopy is defined as tree or vegetative cover directly above the stream's surface. Canopy would block out sunlight when the sun is directly overhead. Note shading from mountains, but not use to score this metric.

	Score
A. Stream with **good** canopy with some breaks for light penetration	10
B. Stream with **full canopy** - breaks for light penetration absent.....	(8)
C. Stream with **partial** canopy - sunlight and shading are essentially equal.....	7
D. Stream with **minimal** canopy - full sun in all but a few areas.....	2
E. **No canopy** and no shading.....	0

Remarks _____ Subtotal 8

VIII. Riparian Vegetative Zone Width

Definition: Riparian zone for this form is area of natural vegetation adjacent to stream (can go beyond floodplain). Definition: A break in the riparian zone is any place on the stream banks which allows sediment or pollutants to directly enter the stream, such as paths down to stream, storm drains, uprooted trees, otter slides, etc.

FACE UPSTREAM	Lft. Bank Score	Rt. Bank Score
Dominant vegetation: ☒ Trees ☒ Shrubs ☐ Grasses ☐ Weeds/old field ☐Exotics (kudzu, etc)		
A. Riparian zone **intact** (no breaks)		
1. width > 18 meters.....	(5)	(5)
2. width 12-18 meters.....	4	4
3. width 6-12 meters.....	3	3
4. width < 6 meters.....	2	2
B. Riparian zone **not intact** (breaks)		
1. breaks rare		
a. width > 18 meters.....	4	4
b. width 12-18 meters.....	3	3
c. width 6-12 meters.....	2	2
d. width < 6 meters.....	1	1
2. breaks common		
a. width > 18 meters.....	3	3
b. width 12-18 meters.....	2	2
c. width 6-12 meters.....	1	1
d. width < 6 meters.....	0	0

Total 10

Remarks _____

Page Total 39

☐ Disclaimer-form filled out, but score doesn't match subjective opinion-atypical stream.

TOTAL SCORE 96

6

Appendix G: Record Drawing Plan Sheets

DocuSign Envelope ID: EBA9C22B-A15E-4BD9-AA8A-3CB6144C0E8D

09/08/59

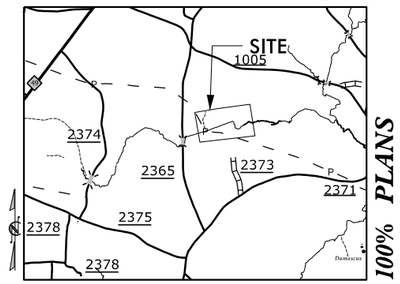
NC DEPARTMENT OF ENVIRONMENTAL QUALITY,
DIVISION OF MITIGATION SERVICES

AS–BUILT PLANS
PHANTOM MILL SITE

LOCATION: ALAMANCE COUNTY, NORTH CAROLINA

TYPE OF WORK: STREAM RESTORATION AND ENHANCEMENT (CLEARING, GRUBBING, GRADING, EROSION CONTROL AND PLANTING)

100% PLANS

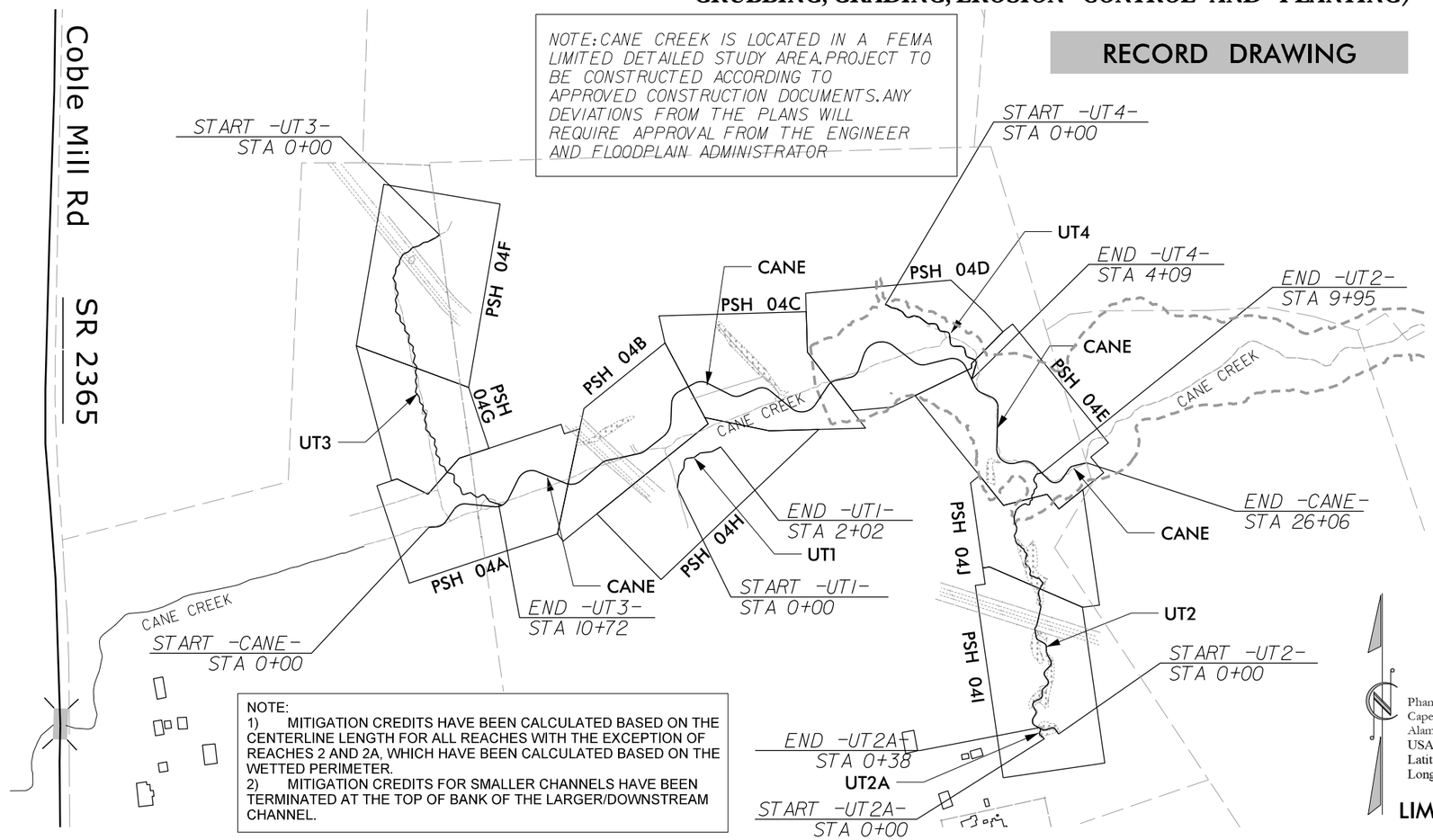


VICINITY MAP
Not to Scale

INDEX OF SHEETS

NOTE: CANE CREEK IS LOCATED IN A FEMA LIMITED DETAILED STUDY AREA. PROJECT TO BE CONSTRUCTED ACCORDING TO APPROVED CONSTRUCTION DOCUMENTS. ANY DEVIATIONS FROM THE PLANS WILL REQUIRE APPROVAL FROM THE ENGINEER AND FLOODPLAIN ADMINISTRATOR

RECORD DRAWING



NOTE:
1) MITIGATION CREDITS HAVE BEEN CALCULATED BASED ON THE CENTERLINE LENGTH FOR ALL REACHES WITH THE EXCEPTION OF REACHES 2 AND 2A, WHICH HAVE BEEN CALCULATED BASED ON THE WETTED PERIMETER.
2) MITIGATION CREDITS FOR SMALLER CHANNELS HAVE BEEN TERMINATED AT THE TOP OF BANK OF THE LARGER/DOWNSTREAM CHANNEL.

SURVEYORS CERTIFICATION(S)

Surveyor's disclaimer: No attempt was made to locate any cemeteries, wetlands, hazardous material sites, underground utilities or any other features above, or below ground other than those shown. However, no visible evidence of cemeteries or utilities, aboveground or otherwise, was observed by the undersigned (other than those shown).

I certify that the survey is of an existing parcel or parcels of land or one or more existing easements and does not create a new street or change an existing street.

I JOHN A. RUDOLPH , certify that this plat was prepared under my supervision from an actual field survey made under my supervision, of as-built conditions.

That the boundaries not surveyed are clearly indicated as such and were plotted from information as referenced hereon; That the ratio of precision as calculated was 1:7,500+ and that the global navigational satellite system (GNSS) was used to perform this survey and the following information was used:
Class of Survey: CLASS B (HORIZONTAL) CLASS B (VERTICAL)
Positional Accuracy: 0.12 feet (HORIZONTAL)
Type of GPS field procedure: RTK
Dates of survey: February and March 2021
Datum/Epoch: NAD 1983(2011)
Published/Fixed Control Use: OPUS
Geoid Model: 2012B CONUS
Combined Grid Factor: 0.99995565 GROUND TO GRID
Units: US SURVEY FEET

That this plat meets the requirements of the standards of practice for land surveying in North Carolina. Witness my hand and seal this 3rd day of March , 2021.

DocuSigned by:
A71EB50246D54EC...
NORTH CAROLINA PROFESSIONAL SEAL L-4194 LAND SURVEYOR JOHN ASHLEY RUDOLPH

10/14/2022

L-4194
Professional Land Surveyor — License Number

Phantom Mill Stream and Wetland Mitigation Site #100057
Cape Fear 03030002
Alamance County
USACE AID#: SAW-2018-01166
Latitude: 35.8924
Longitude: -79.4754 (WGS84)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

LIMITS OF CONSTRUCTION: 11.1 ACRES

CONTRACT: PHANTOM MILL SITE

GRAPHIC SCALES

50 25 0 50 100
PLANS

50 25 0 50 100
PROFILE (HORIZONTAL)

10 5 0 10 5
PROFILE (VERTICAL)

PROPOSED LENGTH OF CAIN = 2609 LF	PROPOSED LENGTH OF UT2A = 38 LF
PROPOSED LENGTH OF UT1 = 202 LF	PROPOSED LENGTH OF UT3 = 1072 LF
PROPOSED LENGTH OF UT2 = 995 LF	PROPOSED LENGTH OF UT4 = 409 LF
TOTAL STREAM LENGTH = 5325 LF	

RESTORATION LEVEL	STREAM (linear footage)	RIPARIAN WETLAND (acreage)	NONRIPARIAN WETLAND (acreage)
RESTORATION	2984	3.727	0.000
ENHANCEMENT I	335	0.828	0.000
ENHANCEMENT II	666	0.000	0.000
PRESERVATION	669	0.000	0.000
TOTALS	4654	4.555	0.000
MITIGATION UNITS	3632 SMUs	4.141 RIPARIAN WMUs	NONRIPARIAN WMUs

Axiom Environmental
218 Snow Ave
Raleigh, NC 27603
GRANT LEWIS
PROJECT DESIGNER

Restoration Systems
1101 Haynes St.
Suite 211
Raleigh, NC 27604
WORTH CREECH
SITE CONSTRUCTION MANAGER

Prepared in the Office of:
SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890
JOSHUA G. DALTON, P.E.
PROJECT ENGINEER

DocuSigned by:
Josh Dalton
1089AD8C14994C3...
NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

10/14/2022
DATE:

10/14/2022
Phantom_Hyd_psh_AB_01.dgn
jharvey

DocuSign Envelope ID: EBA9C22B-A15E-4BD9-AA8A-3CB6144C0E8D

RECORD DRAWING

CONVENTIONAL PLAN SHEET SYMBOLS

Note: Not to Scale **S.U.E. = Subsurface Utility Engineering*

SHEET NAME	SHEET NUMBER
SYMBOLOGY	02
PROJECT NAME: PHANTOM STREAM AND WETLAND RESTORATION SITE	
COUNTY: ALAMANCE	DATE: 2022

Axiom Environmental, Inc.
SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890

BOUNDARIES AND PROPERTY:

- State Line
- County Line
- Township Line
- City Line
- Reservation Line
- Property Line
- Existing Iron Pin (EIP)
- Computed Property Corner
- Property Monument (ECM)
- Parcel/Sequence Number (123)
- Existing Fence Line
- Proposed Fence Gate
- Proposed Barbed Wire Fence
- Existing Wetland Boundary (WLB)
- Proposed Wetland Boundary (WLB)
- Existing Endangered Animal Boundary (EAB)
- Existing Endangered Plant Boundary (EPB)
- Existing Historic Property Boundary (HPB)

BUILDINGS AND OTHER CULTURE:

- Gas Pump Vent or U/G Tank Cap
- Sign (S)
- Well (W)
- Small Mine
- Foundation
- Area Outline
- Cemetery
- Building
- School
- Church
- Dam

HYDROLOGY:

- Stream or Body of Water
- Hydro, Pool or Reservoir
- Jurisdictional Stream (JS)
- Buffer Zone 1 (BZ 1)
- Buffer Zone 2 (BZ 2)
- Flow Arrow
- Disappearing Stream
- Spring
- Wetland
- Proposed Lateral, Tail, Head Ditch (FLOW)

RIGHT OF WAY & PROJECT CONTROL:

- Secondary Horiz and Vert Control Point
- Primary Horiz Control Point
- Primary Horiz and Vert Control Point

- Exist Permanent Easment Pin and Cap
- New Permanent Easement Pin and Cap
- Vertical Benchmark
- Existing Right of Way Marker
- Existing Right of Way Line
- New Right of Way Line (RW)
- New Right of Way Line with Pin and Cap (RW)
- New Right of Way Line with Concrete or Granite R/W Marker (RW)
- New Control of Access Line with Concrete C/A Marker (CA)
- Existing Control of Access (CA)
- New Control of Access (CA)
- Existing Easement Line (E)
- New Conservation Easement (E)
- New Temporary Drainage Easement (TDE)
- New Permanent Drainage Easement (PDE)
- New Permanent Drainage / Utility Easement (DUE)
- New Permanent Utility Easement (PUE)
- New Temporary Utility Easement (TUE)
- New Aerial Utility Easement (AUE)

ROADS AND RELATED FEATURES:

- Existing Edge of Pavement
- Existing Curb
- Proposed Slope Stakes Cut (C)
- Proposed Slope Stakes Fill (F)
- Proposed Curb Ramp (CR)
- Existing Metal Guardrail
- Proposed Guardrail
- Existing Cable Guiderail
- Proposed Cable Guiderail
- Equality Symbol
- Pavement Removal

VEGETATION:

- Single Tree
- Single Shrub
- Hedge
- Woods Line
- Orchard
- Vineyard

EXISTING STRUCTURES:

MAJOR:
- Bridge, Tunnel or Box Culvert (CONC)
- Bridge Wing Wall, Head Wall and End Wall (CONC WW)

MINOR:
- Head and End Wall (CONC HW)
- Pipe Culvert
- Footbridge
- Drainage Box: Catch Basin, DI or JB (CB)
- Paved Ditch Gutter
- Storm Sewer Manhole (S)
- Storm Sewer (S)

UTILITIES:

POWER:
- Existing Power Pole
- Proposed Power Pole
- Existing Joint Use Pole
- Proposed Joint Use Pole
- Power Manhole (P)
- Power Line Tower
- Power Transformer
- U/G Power Cable Hand Hole
- H-Frame Pole
- U/G Power Line LOS B (S.U.E.*) (P)
- U/G Power Line LOS C (S.U.E.*) (P)
- U/G Power Line LOS D (S.U.E.*) (P)

TELEPHONE:
- Existing Telephone Pole

WATER:
- Water Manhole (W)
- Water Meter
- Water Valve
- Water Hydrant
- U/G Water Line LOS B (S.U.E*) (W)
- U/G Water Line LOS C (S.U.E*) (W)
- U/G Water Line LOS D (S.U.E*) (W)
- Above Ground Water Line (A/G Water)

GAS:
- Gas Valve
- Gas Meter
- U/G Gas Line LOS B (S.U.E.*) (G)
- U/G Gas Line LOS C (S.U.E.*) (G)
- U/G Gas Line LOS D (S.U.E.*) (G)
- Above Ground Gas Line (A/G Gas)

SANITARY SEWER:
- Sanitary Sewer Manhole
- Sanitary Sewer Cleanout
- U/G Sanitary Sewer Line (SS)
- Above Ground Sanitary Sewer (A/G Sanitary Sewer)
- SS Forced Main Line LOS B (S.U.E.*) (FSS)
- SS Forced Main Line LOS C (S.U.E.*) (FSS)
- SS Forced Main Line LOS D (S.U.E.*) (FSS)

MISCELLANEOUS:
- Utility Pole
- Utility Pole with Base
- Utility Located Object
- Utility Traffic Signal Box (S)
- Utility Unknown U/G Line LOS B (S.U.E.*) (?UTL)
- U/G Tank; Water, Gas, Oil
- Underground Storage Tank, Approx. Loc. (UST)
- A/G Tank; Water, Gas, Oil
- Geoenvironmental Boring
- U/G Test Hole LOS A (S.U.E.*)
- Abandoned According to Utility Records (AATUR)
- End of Information (E.O.I.)
- Riffle Rip Rap
- Log Vane
- Log Cross Vane
- Step Pool Structure (Begin / End)
- Stream Plug
- Floodplain Interceptor
- Proposed Fence
- Limits of Disturbance (LOD)

AS-BUILT:

- Stream Centerline
- Stream Top of Bank
- Stream Gauge
- Groundwater Gauge (#)
- Benthic & Water Quality Station (1)
- Origin Point on CVS Plots
- CVS Plots (#)
- Cross Section (XS-10R)
- Adjusted Stream Structure
- Not Constructed

DocuSign Envelope ID: EBA9C22B-A15E-4BD9-AA8A-3CB6144C0E8D

SURVEY INFORMATION PROPERTY/ EASEMENT PROVIDED BY:
K2 DESIGN GROUP, P.A.
5688 U.S. HIGHWAY 70 EAST
GOLDSBORO, NC 27534

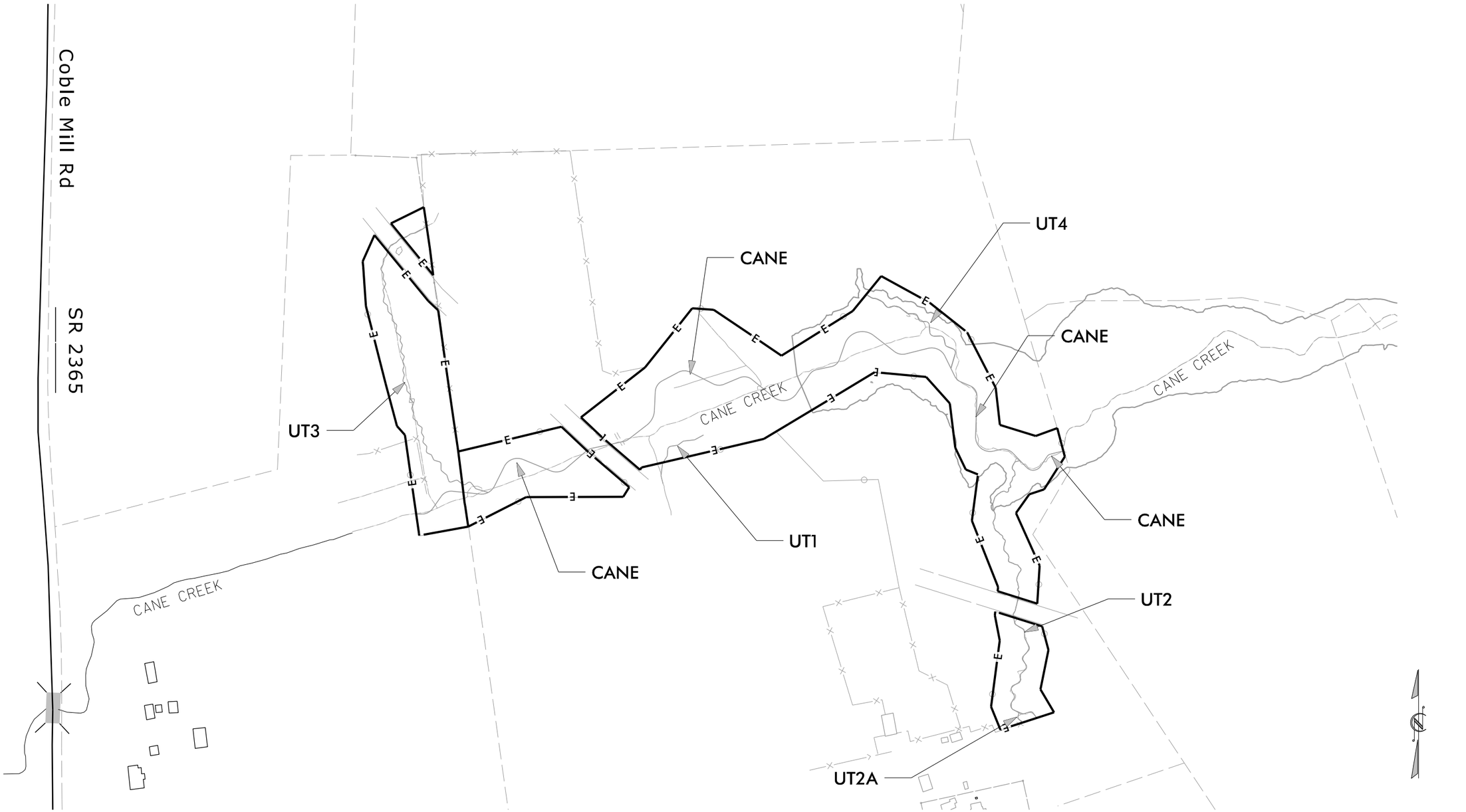
RECORD DRAWING

EXISTING FENCING
PROPOSED FENCING
PROPOSED EASEMENT

SHEET NAME		SHEET NUMBER
EASEMENT		03
PROJECT NAME: PHANTOM STREAM AND WETLAND RESTORATION SITE		
	COUNTY: ALAMANCE	DATE: 2022

Axiom Environmental, Inc.

SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890



10/4/2022
Phantom_hyd_psh_AB_03.dgn
jharvey

DocuSign Envelope ID: EBA9C22B-A15E-4BD9-AA8A-3CB6144C0E8D

-CANE- AS-BUILT STRUCTURE LOCATIONS

STR. TYPE	OFFSET	NORTHING	EASTING	ELEVATION	AB Survey Elevation
LOG STRUCTURE	0	779,799.16	1,858,178.07		591.62
LOG VANE	0	779,935.44	1,858,426.06	591.12	591.26
LOG VANE	0	779,933.46	1,858,560.29	590.92	590.54

SHEET NAME: AS-BUILT STRUCTURES

SHEET NUMBER: 4A

PROJECT NAME: PHANTOM STREAM AND WETLAND RESTORATION SITE

COUNTY: ALAMANCE

DATE: 2022

Axiom Environmental, Inc.

SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890

DocuSigned by: Josh Dalton
1089AD8C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

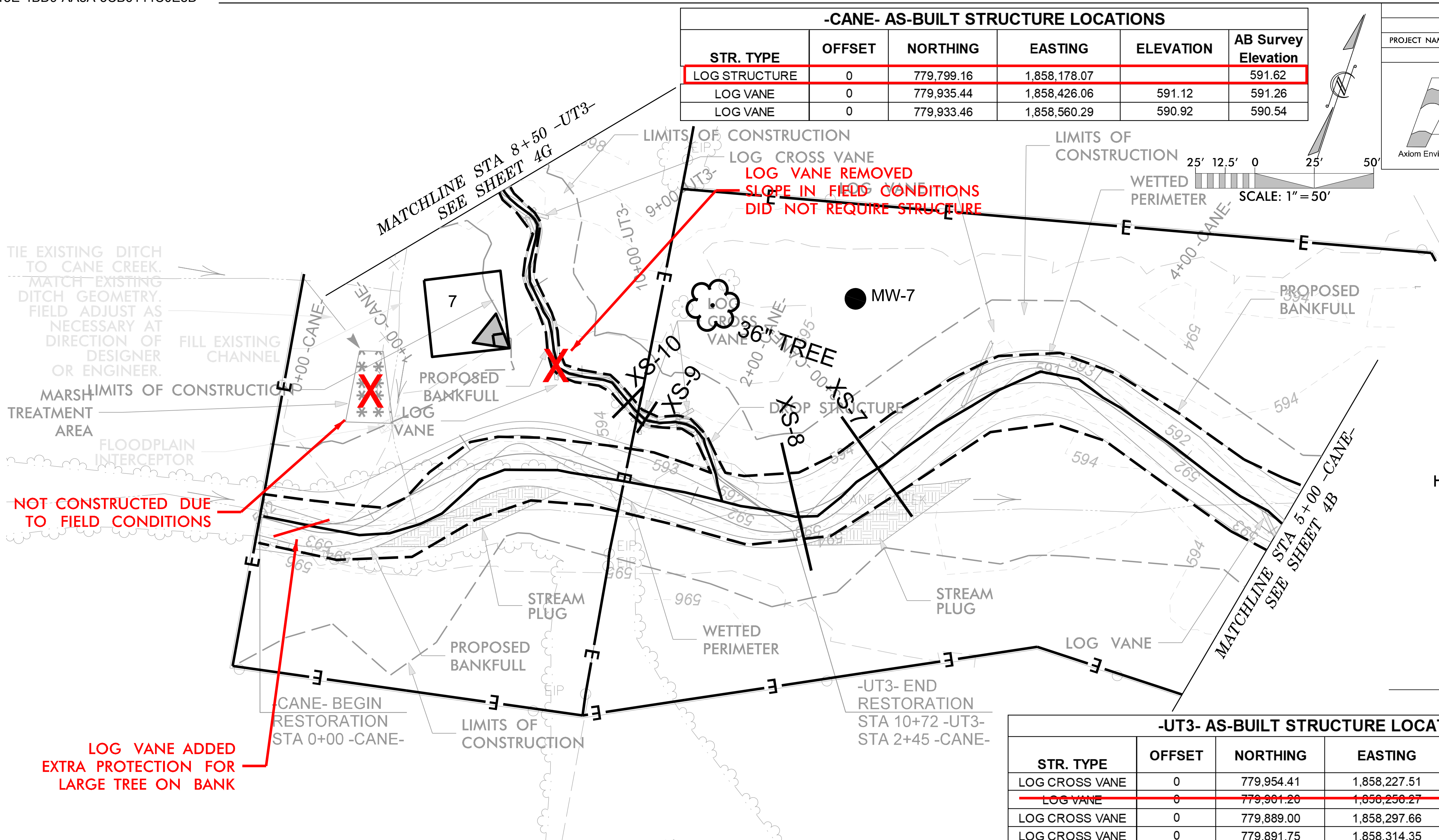
10/14/2022

DATE:

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

HORIZONTAL DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 88

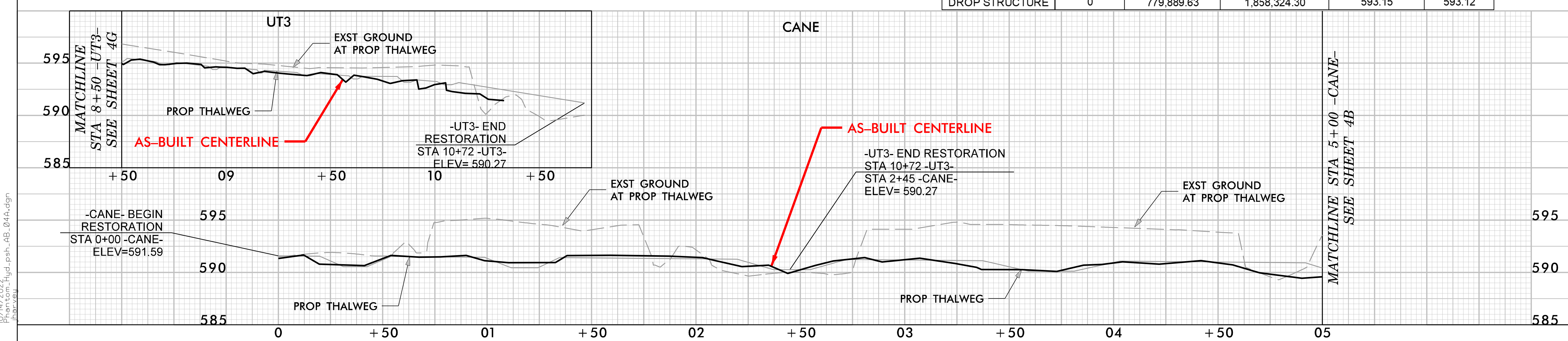
RECORD DRAWING



25' 12.5' 0 25' 50'
SCALE: 1" = 50'
MATCHLINE STA 8+50 -UT3- SEE SHEET 4G
MATCHLINE STA 5+00 -CANE- SEE SHEET 4B
LIMITS OF CONSTRUCTION
LOG CROSS VANE
LOG VANE REMOVED
SLOPE IN FIELD CONDITIONS
DID NOT REQUIRE STRUCTURE
LIMITS OF CONSTRUCTION
WETTED PERIMETER
TIE EXISTING DITCH TO CANE CREEK. MATCH EXISTING DITCH GEOMETRY. FIELD ADJUST AS NECESSARY AT DIRECTION OF DESIGNER OR ENGINEER.
FILL EXISTING CHANNEL
MARSH TREATMENT AREA
LIMITS OF CONSTRUCTION
FLOODPLAIN INTERCEPTOR
PROPOSED BANKFULL
LOG VANE
MW-7
36" TREE
XS-10
XS-9
XS-8
XS-7
DROP STRUCTURE
PROPOSED BANKFULL
NOT CONSTRUCTED DUE TO FIELD CONDITIONS
STREAM PLUG
WETTED PERIMETER
STREAM PLUG
LOG VANE
PROPOSED BANKFULL
-CANE- BEGIN RESTORATION STA 0+00 -CANE-
LIMITS OF CONSTRUCTION
-UT3- END RESTORATION STA 10+72 -UT3- STA 2+45 -CANE-
LOG VANE ADDED EXTRA PROTECTION FOR LARGE TREE ON BANK
DENOTES WETTED PERIMETER

-UT3- AS-BUILT STRUCTURE LOCATIONS

STR. TYPE	OFFSET	NORTHING	EASTING	ELEVATION	AB Survey Elevation
LOG CROSS VANE	0	779,954.41	1,858,227.51	595.14	
~~LOG VANE~~	~~0~~	~~779,901.20~~	~~1,858,250.27~~	~~594.10~~	
LOG CROSS VANE	0	779,889.00	1,858,297.66	593.47	
LOG CROSS VANE	0	779,891.75	1,858,314.35	593.24	593.40
DROP STRUCTURE	0	779,889.63	1,858,324.30	593.15	593.12



UT3
CANE
MATCHLINE STA 8+50 -UT3- SEE SHEET 4G
EXST GROUND AT PROP THALWEG
PROP THALWEG
AS-BUILT CENTERLINE
-UT3- END RESTORATION STA 10+72 -UT3- ELEV= 590.27
595
590
585
+50 09 +50 10 +50
-CANE- BEGIN RESTORATION STA 0+00 -CANE- ELEV=591.59
EXST GROUND AT PROP THALWEG
AS-BUILT CENTERLINE
-UT3- END RESTORATION STA 10+72 -UT3- STA 2+45 -CANE- ELEV= 590.27
EXST GROUND AT PROP THALWEG
PROP THALWEG
PROP THALWEG
MATCHLINE STA 5+00 -CANE- SEE SHEET 4B
0 +50 01 +50 02 +50 03 +50 04 +50 05

10/14/2022 Phantom_Hyd_psh_AB_04A.dgn

DocuSign Envelope ID: EBA9C22B-A15E-4BD9-AA8A-3CB6144C0E8D

-CANE- AS-BUILT STRUCTURE LOCATIONS

STR. TYPE	OFFSET	NORTHING	EASTING	ELEVATION	AB Survey Elevation
LOG VANE	0	780,159.46	1,858,876.99	590.03	590.13

25' 12.5' 0 25' 50'
SCALE: 1" = 50'

SHEET NAME: AS-BUILT STRUCTURES
SHEET NUMBER: 4C
PROJECT NAME: PHANTOM STREAM AND WETLAND RESTORATION SITE
COUNTY: ALAMANCE
DATE: 2022

Axiom Environmental, Inc.

SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890

RECORD DRAWING

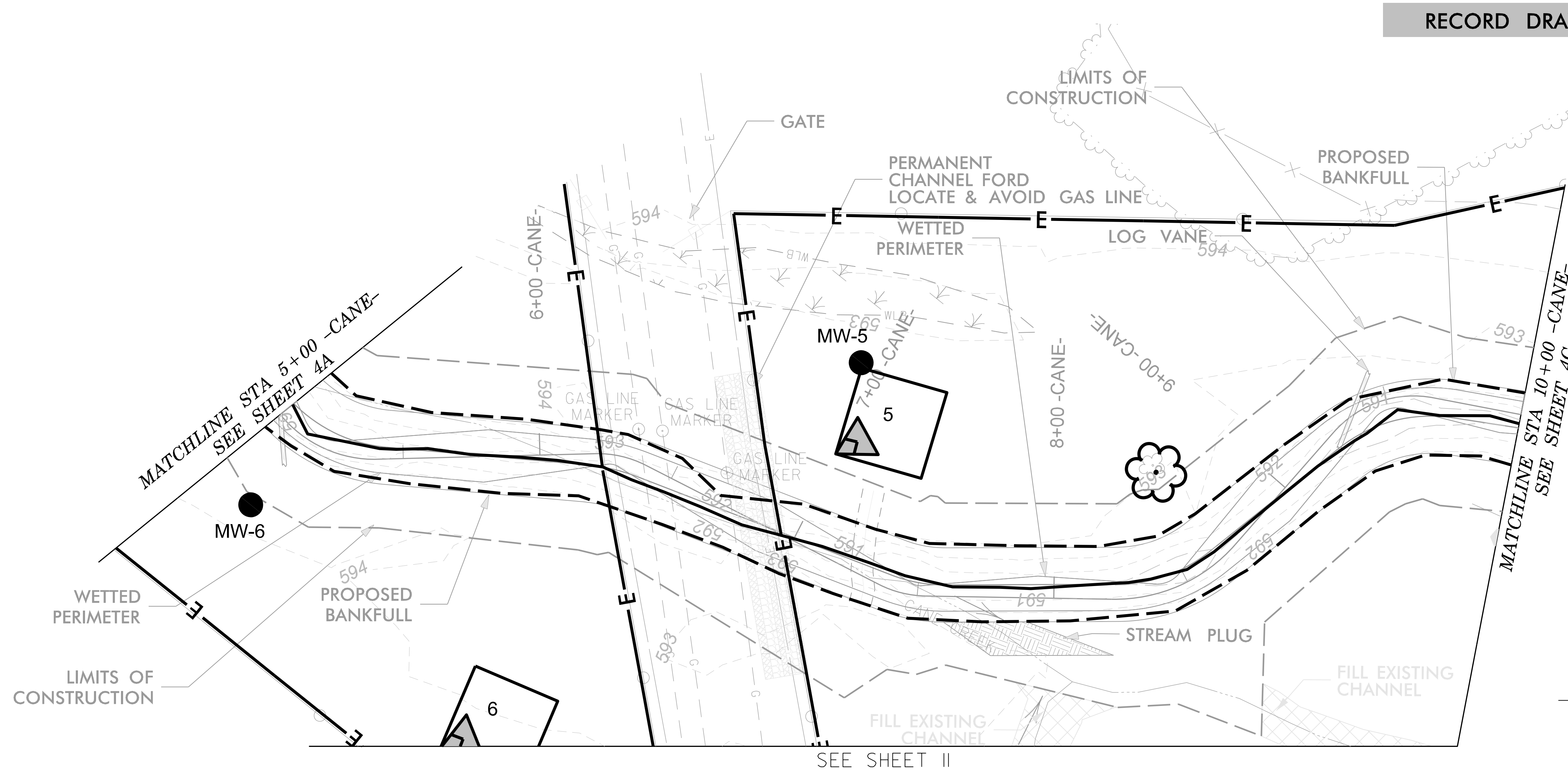
DocuSigned by:
Josh Dalton
1089AD8C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

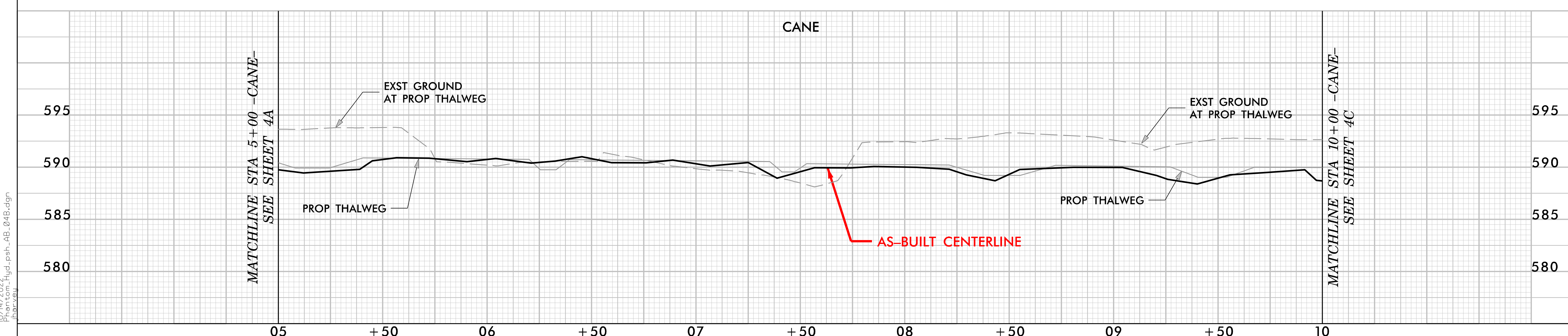
10/14/2022
DATE:

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

HORIZONTAL DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 88



DENOTES WETTED PERIMETER



10/14/2022
Phantom_Hyd_psh_AB_04B.dgn
jharvey

DocuSign Envelope ID: EBA9C22B-A15E-4BD9-AA8A-3CB6144C0E8D

SHEET NAME	SHEET NUMBER
AS-BUILT STRUCTURES	4C

PROJECT NAME: PHANTOM STREAM AND WETLAND RESTORATION SITE

COUNTY: ALAMANCE DATE: 2022

Axiom Environmental, Inc.

SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890

DocuSigned by:
Josh Dalton
1089AD8C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

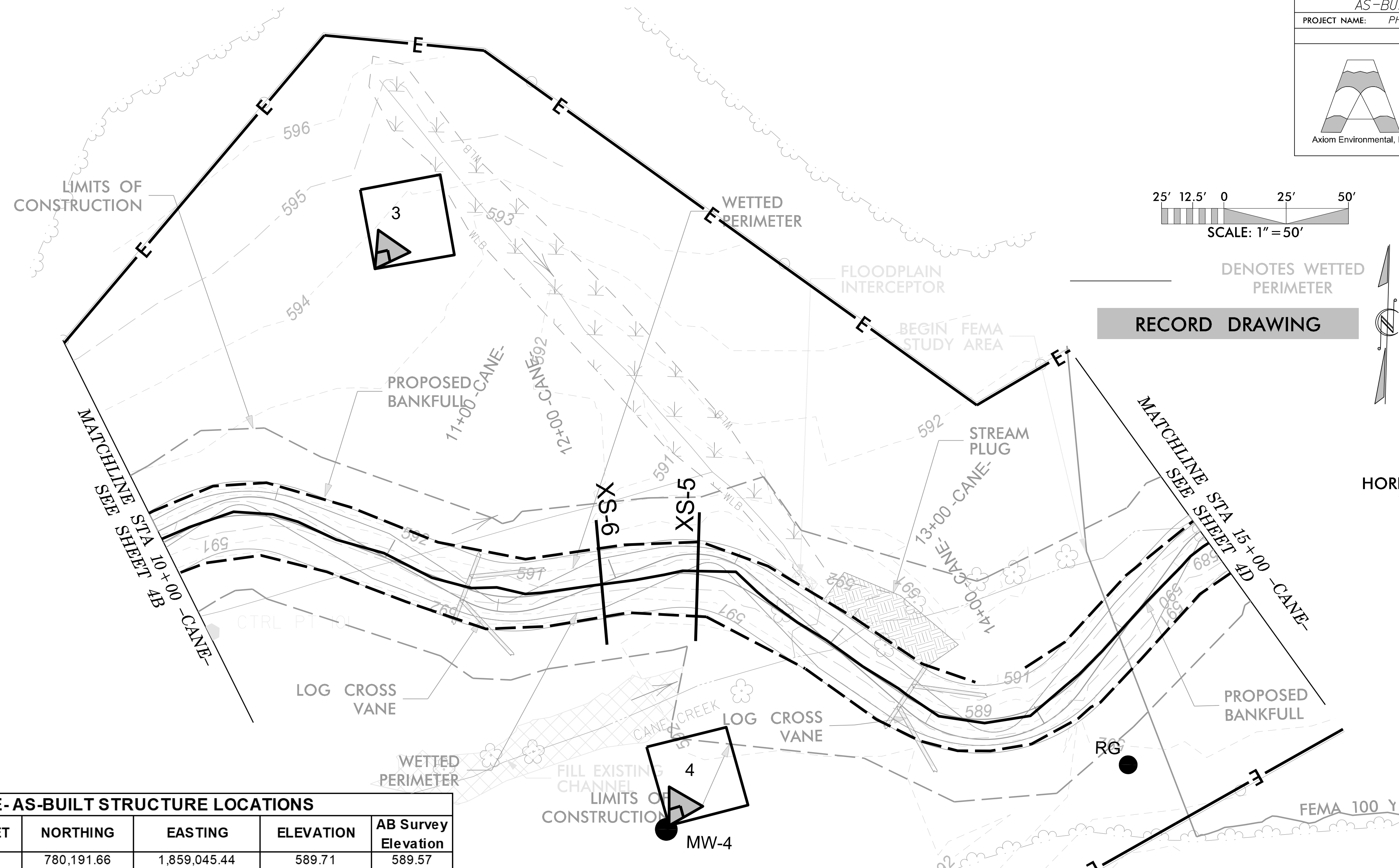
10/14/2022

DATE:

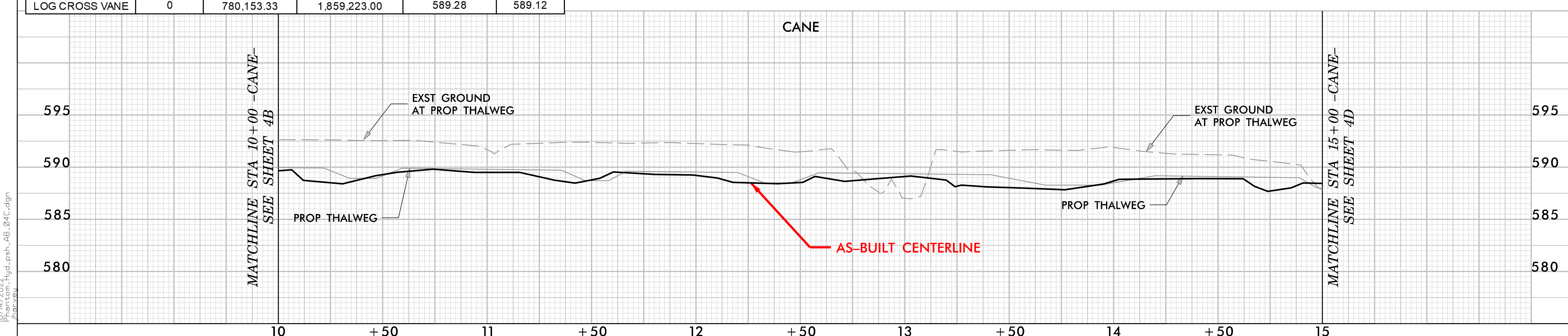
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

HORIZONTAL DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 88

RECORD DRAWING



-CANE- AS-BUILT STRUCTURE LOCATIONS					
STR. TYPE	OFFSET	NORTHING	EASTING	ELEVATION	AB Survey Elevation
LOG CROSS VANE	0	780,191.66	1,859,045.44	589.71	589.57
LOG CROSS VANE	0	780,153.33	1,859,223.00	589.28	589.12



10/14/2022 Phantom_Hyd_psh_AB_04C.dgn jharvey

DocuSign Envelope ID: EBA9C22B-A15E-4BD9-AA8A-3CB6144C0E8D

-UT4- AS-BUILT STRUCTURE LOCATIONS

STR. TYPE	OFFSET	NORTHING	EASTING	ELEVATION	AB Survey Elevation
LOG CROSS VANE	0	780,432.82	1,859,545.50	591.16	591.01
LOG CROSS VANE	0	780,417.86	1,859,581.38	590.39	590.23
LOG CROSS VANE	0	780,380.69	1,859,657.18	588.61	588.37
LOG VANE	0	780,291.04	1,859,756.66	587.17	586.81

HORIZONTAL DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 88

25' 12.5' 0 25' 50'
SCALE: 1" = 50'

SHEET NAME	SHEET NUMBER
AS-BUILT STRUCTURES	4D

PROJECT NAME: PHANTOM STREAM AND WETLAND RESTORATION SITE
COUNTY: ALAMANCE DATE: 2022

Axiom Environmental, Inc.

SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890

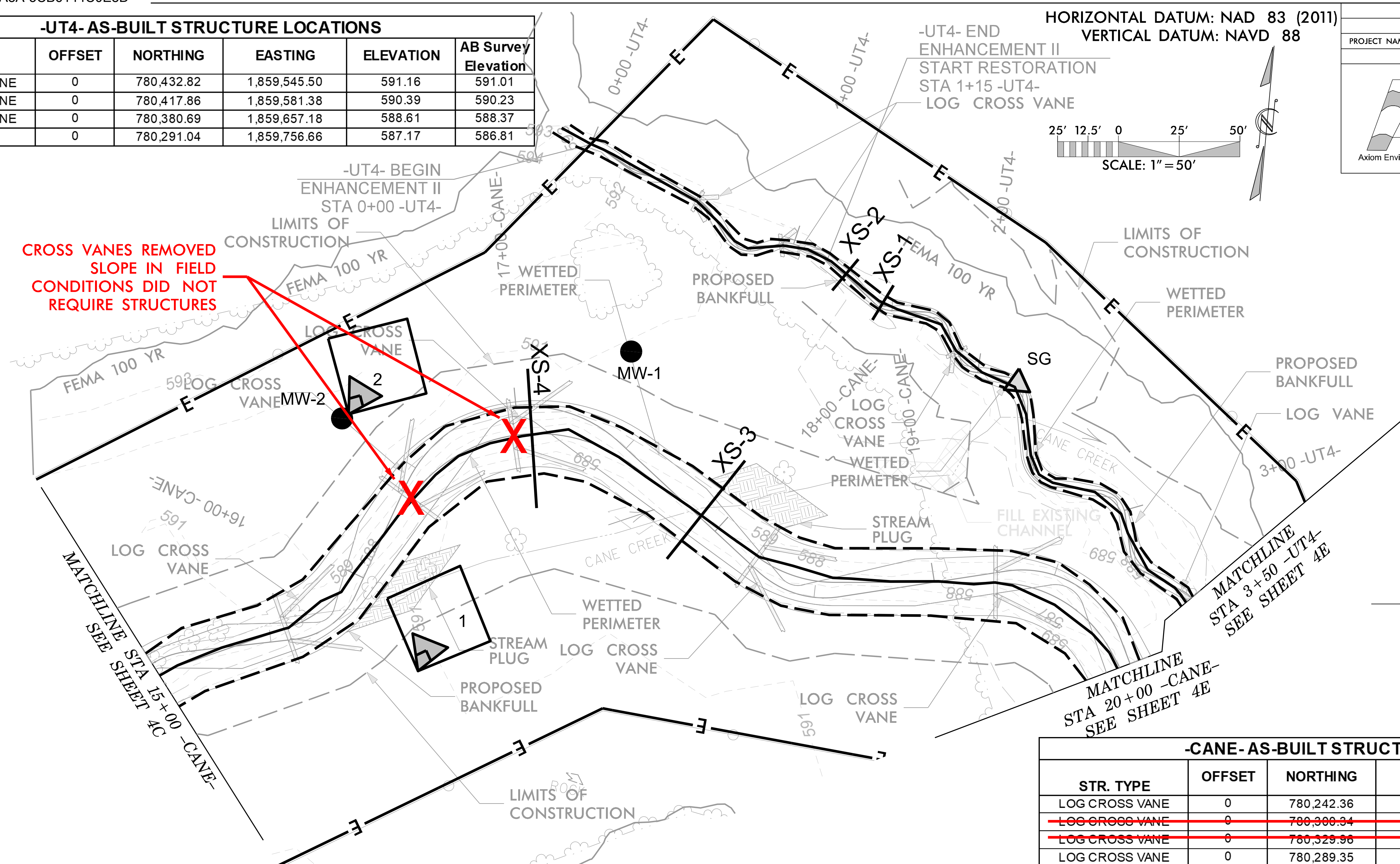
DocuSigned by:
Josh Dalton
1089AD8C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

10/14/2022
DATE:

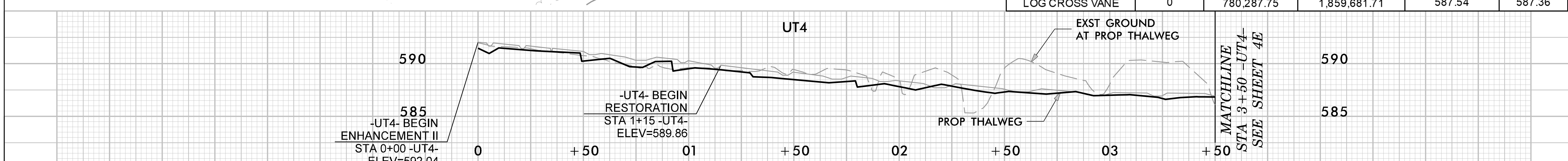
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

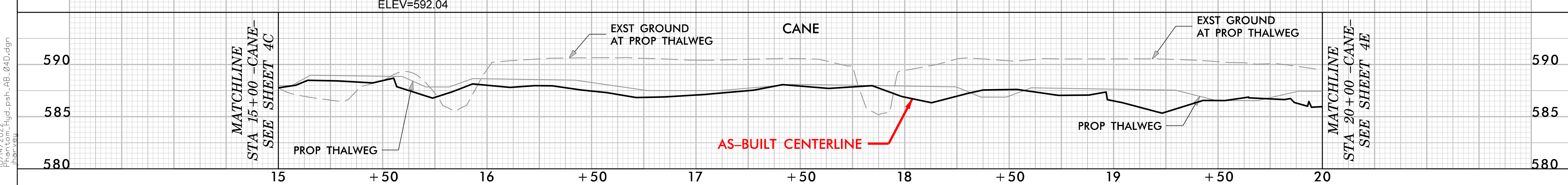
RECORD DRAWING



-CANE- AS-BUILT STRUCTURE LOCATIONS

STR. TYPE	OFFSET	NORTHING	EASTING	ELEVATION	AB Survey Elevation
LOG CROSS VANE	0	780,242.36	1,859,392.81	588.85	588.69
~~LOG CROSS VANE~~	~~0~~	~~780,300.34~~	~~1,859,430.78~~	~~588.50~~	
~~LOG CROSS VANE~~	~~0~~	~~780,329.96~~	~~1,859,476.80~~	~~587.50~~	
LOG CROSS VANE	0	780,289.35	1,859,583.20	587.87	587.67
LOG CROSS VANE	0	780,287.75	1,859,681.71	587.54	587.36





10/14/2022
Phantom_Hyd_psh_AB_04D.dgn

DocuSign Envelope ID: EBA9C22B-A15E-4BD9-AA8A-3CB6144C0E8D

SHEET NAME: AS-BUILT STRUCTURES | SHEET NUMBER: 4E

PROJECT NAME: PHANTOM STREAM AND WETLAND RESTORATION SITE

COUNTY: ALAMANCE | DATE: 2022

Axiom Environmental, Inc.

SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890

DocuSigned by: Josh Dalton
1089AD8C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

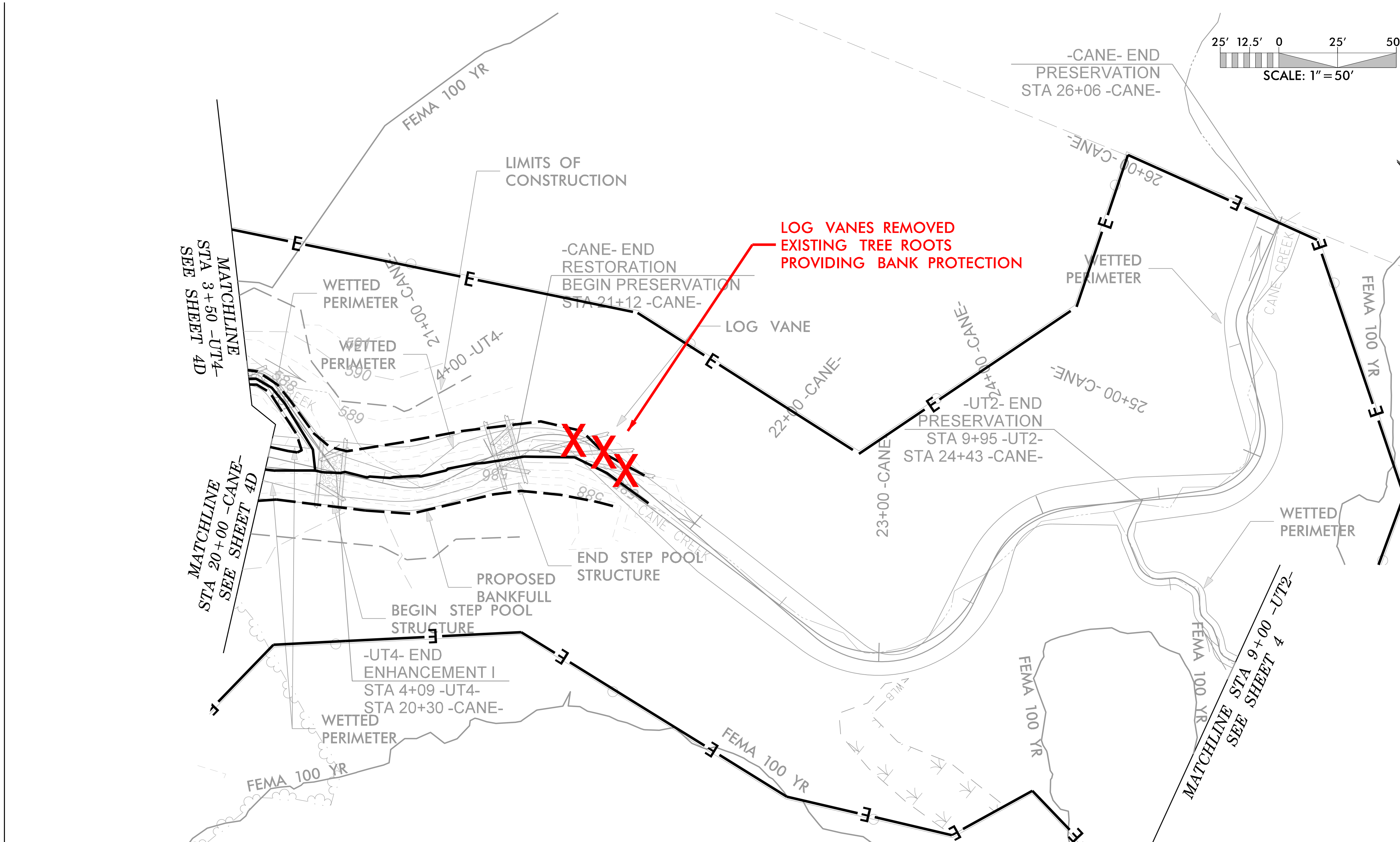
10/14/2022

DATE:

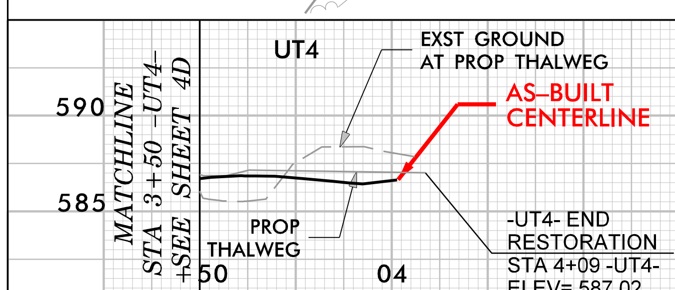
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

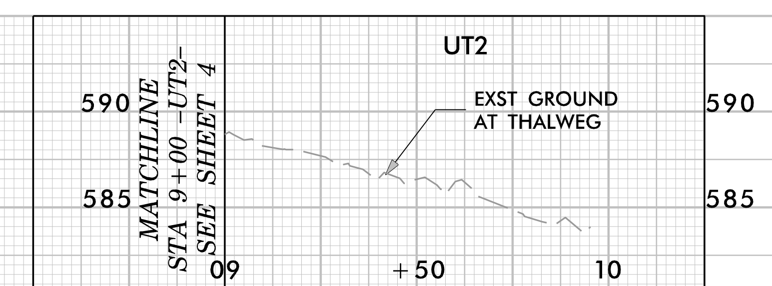
HORIZONTAL DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 88

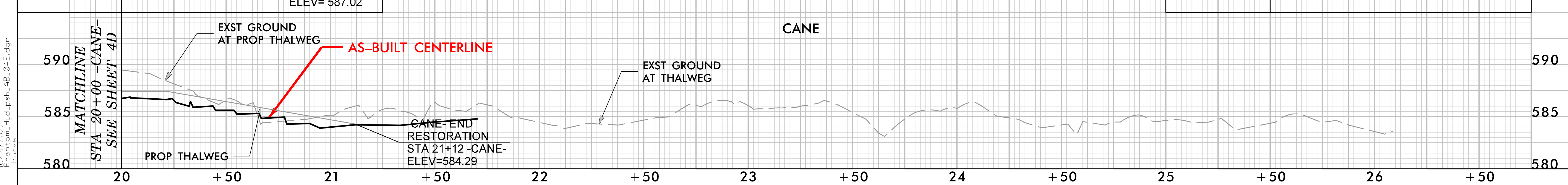
RECORD DRAWING



-CANE- AS-BUILT STRUCTURE LOCATIONS					
STR. TYPE	OFFSET	NORTHING	EASTING	ELEVATION	AB Survey Elevation
STEP POOL STRUCTURE	0	780,238.51	1,859,748.34	584.29	586.74
~~LOG VANE~~	~~0~~	~~780,170.96~~	~~1,859,814.50~~		
~~LOG VANE~~	~~0~~	~~780,162.29~~	~~1,859,818.46~~		
~~LOG VANE~~	~~0~~	~~780,152.86~~	~~1,859,822.75~~		







10/14/2022
Phantom_Hyd_psh_AB_04E.dgn
jharvey

DocuSign Envelope ID: EBA9C22B-A15E-4BD9-AA8A-3CB6144C0E8D

SHEET NAME	SHEET NUMBER
AS–BUILT STRUCTURES	4F

PROJECT NAME: PHANTOM STREAM AND WETLAND RESTORATION SITE

COUNTY: ALAMANCE DATE: 2022

Axiom Environmental, Inc.

SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890

RECORD DRAWING

DocuSigned by: Josh Dalton
1089AD8C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

10/14/2022

DATE:

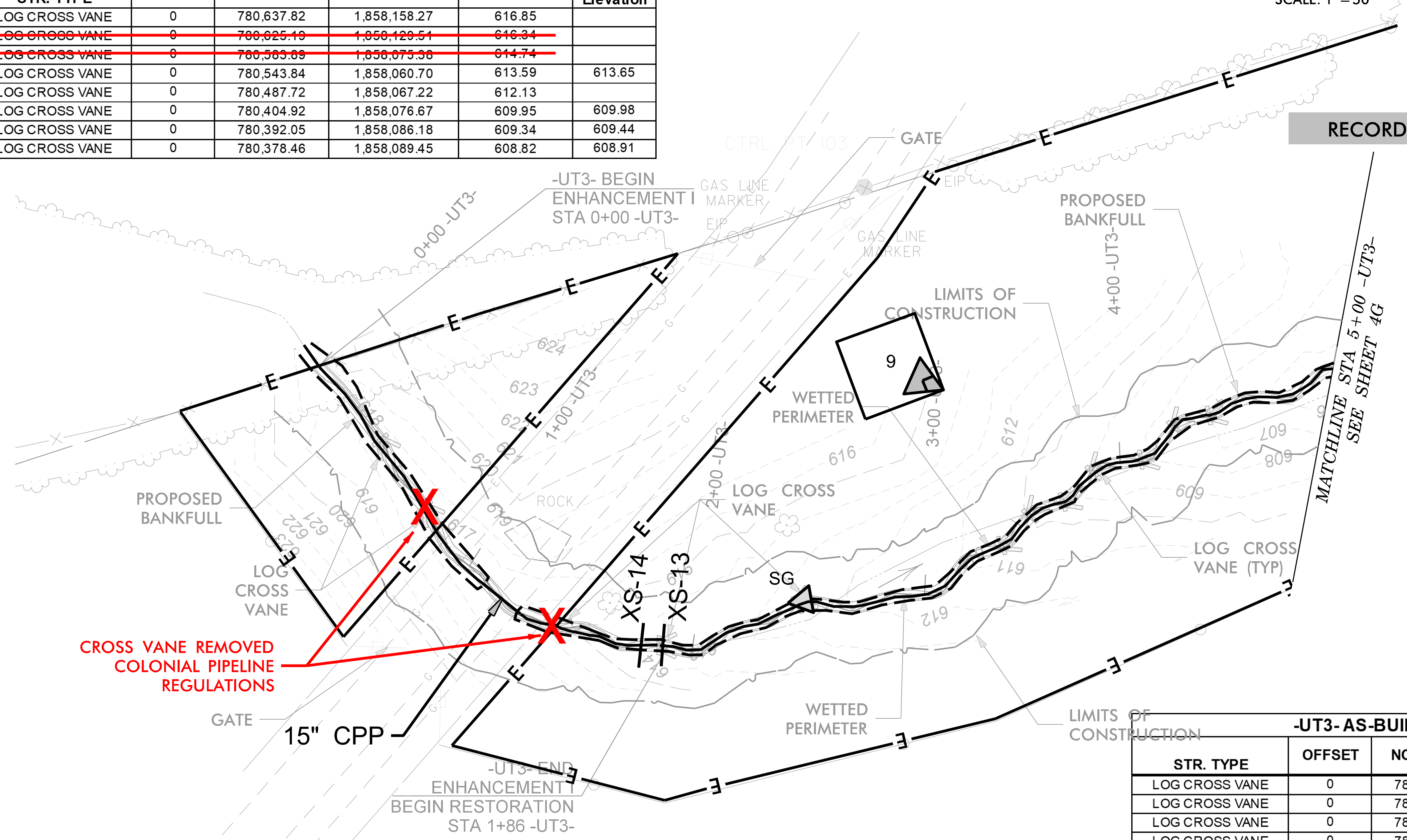
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

HORIZONTAL DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 88

SCALE: 1" = 50'

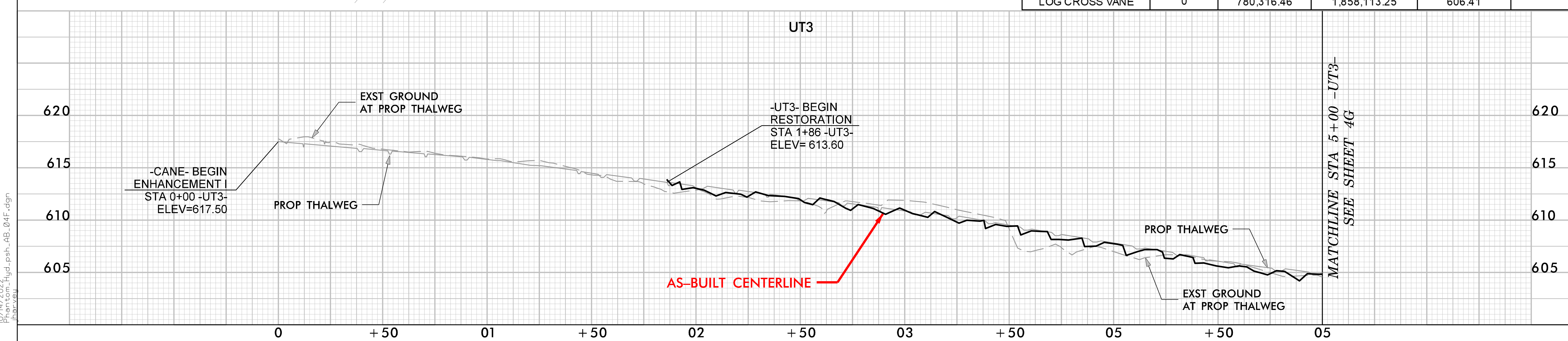
-UT3- AS-BUILT STRUCTURE LOCATIONS

STR. TYPE	OFFSET	NORTHING	EASTING	ELEVATION	AB Survey Elevation
LOG CROSS VANE	0	780,637.82	1,858,158.27	616.85	
~~LOG CROSS VANE~~	~~0~~	~~780,625.19~~	~~1,858,129.51~~	~~616.34~~	
~~LOG CROSS VANE~~	~~0~~	~~780,583.89~~	~~1,858,075.38~~	~~614.74~~	
LOG CROSS VANE	0	780,543.84	1,858,060.70	613.59	613.65
LOG CROSS VANE	0	780,487.72	1,858,067.22	612.13	
LOG CROSS VANE	0	780,404.92	1,858,076.67	609.95	609.98
LOG CROSS VANE	0	780,392.05	1,858,086.18	609.34	609.44
LOG CROSS VANE	0	780,378.46	1,858,089.45	608.82	608.91



-UT3- AS-BUILT STRUCTURE LOCATIONS

STR. TYPE	OFFSET	NORTHING	EASTING	ELEVATION	AB Survey Elevation
LOG CROSS VANE	0	780,364.76	1,858,098.76	608.21	608.28
LOG CROSS VANE	0	780,345.56	1,858,100.66	607.53	607.59
LOG CROSS VANE	0	780,330.28	1,858,110.71	606.91	606.95
LOG CROSS VANE	0	780,316.46	1,858,113.25	606.41	



10/14/2022
Phantom_Hyd_psh_AB_04F.dgn

DocuSign Envelope ID: EBA9C22B-A15E-4BD9-AA8A-3CB6144C0E8D

-UT3- AS-BUILT STRUCTURE LOCATIONS

STR. TYPE	OFFSET	NORTHING	EASTING	ELEVATION	AB Survey Elevation
LOG CROSS VANE	0	780,255.03	1,858,120.93	604.68	604.80
LOG CROSS VANE	0	780,156.97	1,858,140.11	601.88	601.96
LOG CROSS VANE	0	780,144.98	1,858,142.38	601.42	601.44
LOG CROSS VANE	0	780,132.66	1,858,149.03	600.88	600.86
LOG CROSS VANE	0	780,100.82	1,858,150.79	599.89	599.87
~~LOG CROSS VANE~~	~~0~~	~~780,075.82~~	~~1,858,160.13~~	~~598.90~~	
LOG CROSS VANE	0	780,058.19	1,858,173.84	598.12	598.12
LOG CROSS VANE	0	780,002.52	1,858,188.67	596.59	596.76

25' 12.5' 0 25' 50'
SCALE: 1" = 50'

SHEET NAME: AS-BUILT STRUCTURES
SHEET NUMBER: 4G
PROJECT NAME: PHANTOM STREAM AND WETLAND RESTORATION SITE
COUNTY: ALAMANCE
DATE: 2022

Axiom Environmental, Inc.

SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890

RECORD DRAWING

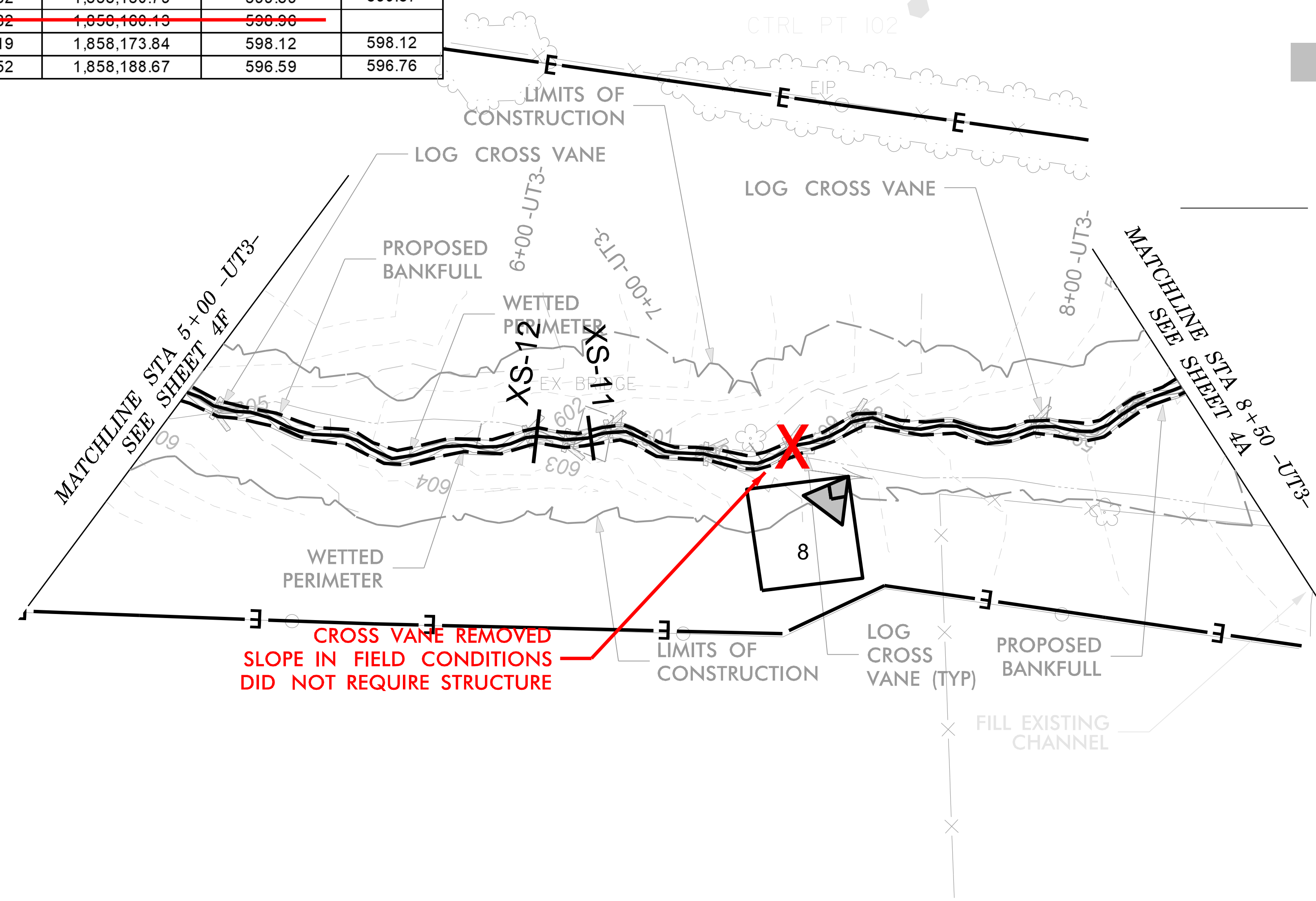
DocuSigned by: Josh Dalton
1089AD8C14994C3...
NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

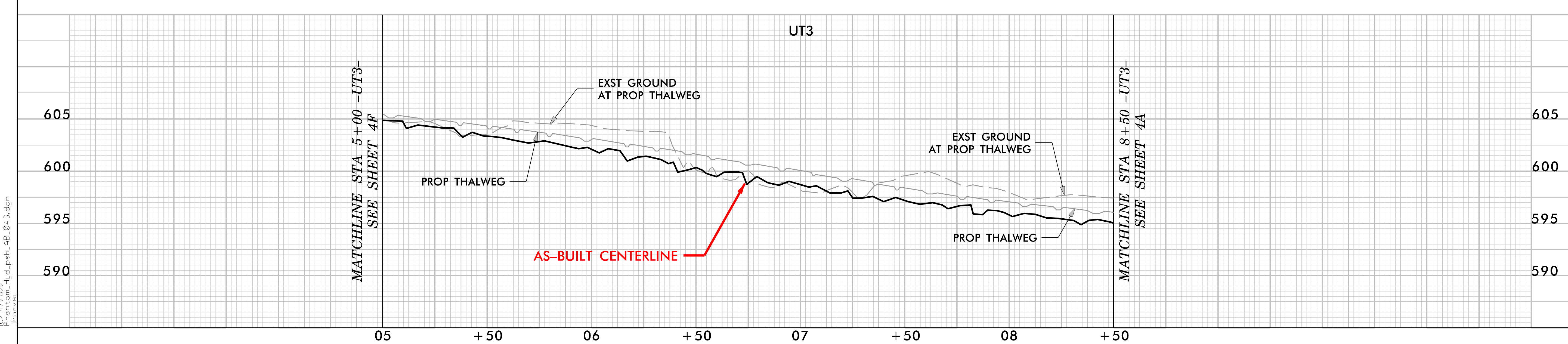
10/14/2022
DATE:

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

DENOTES WETTED PERIMETER

HORIZONTAL DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 88





10/14/2022 Phantom_Hyd_psh_AB_04G.dgn jharvey

DocuSign Envelope ID: EBA9C22B-A15E-4BD9-AA8A-3CB6144C0E8D

SHEET NAME	SHEET NUMBER
AS-BUILT STRUCTURES	4H

PROJECT NAME: PHANTOM STREAM AND WETLAND RESTORATION SITE
COUNTY: ALAMANCE DATE: 2022

Axiom Environmental, Inc.

SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890

25' 12.5' 0 25' 50'
SCALE: 1" = 50'

RECORD DRAWING

DocuSigned by: Josh Dalton
1089AD8C14994C3...
NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

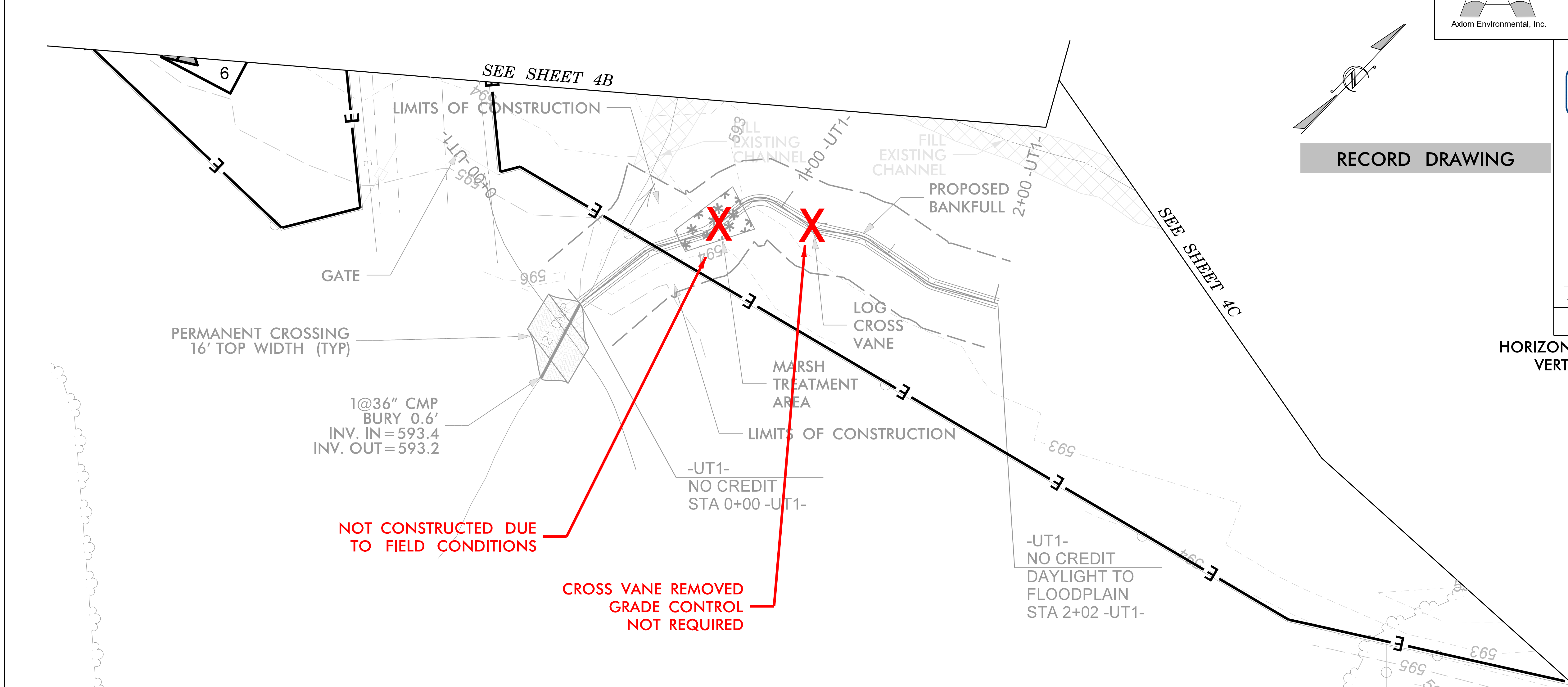
DATE: 10/14/2022

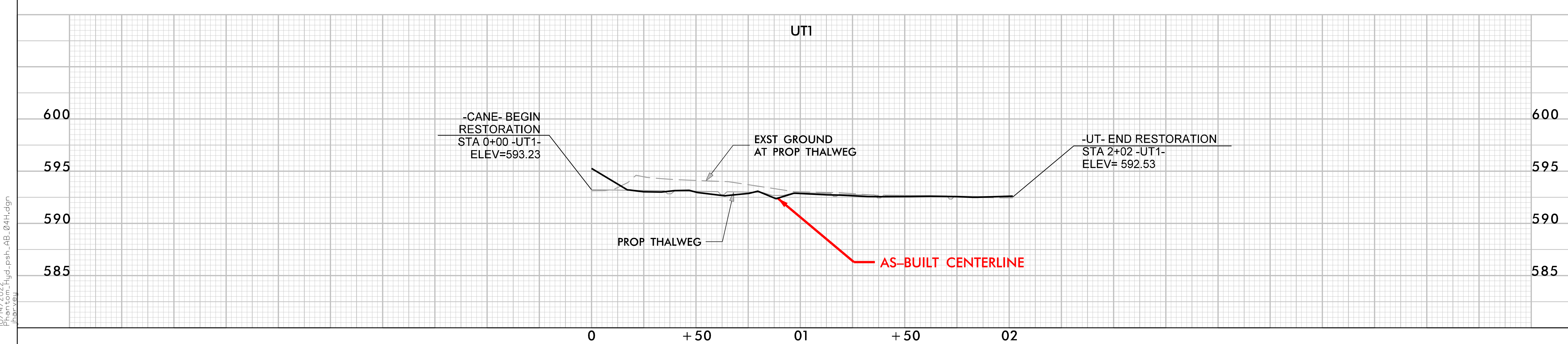
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

HORIZONTAL DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 88

-UT1- AS-BUILT STRUCTURE LOCATIONS

STR. TYPE	OFFSET	NORTHING	EASTING	ELEVATION	AB Survey Elevation
~~LOG CROSS VANE~~	~~0~~	~~780,004.28~~	~~1,858,036.30~~	~~592.88~~	





10/14/2022
Phantom_Hyd_psh_AB_04H.dgn
jharvey

DocuSign Envelope ID: EBA9C22B-A15E-4BD9-AA8A-3CB6144C0E8D

SHEET NAME	SHEET NUMBER
AS-BUILT STRUCTURES	4I
PROJECT NAME: PHANTOM STREAM AND WETLAND RESTORATION SITE	
COUNTY: ALAMANCE	DATE: 2022

Axiom Environmental, Inc.

SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890

DocuSigned by:
Josh Dalton
1089AD8C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

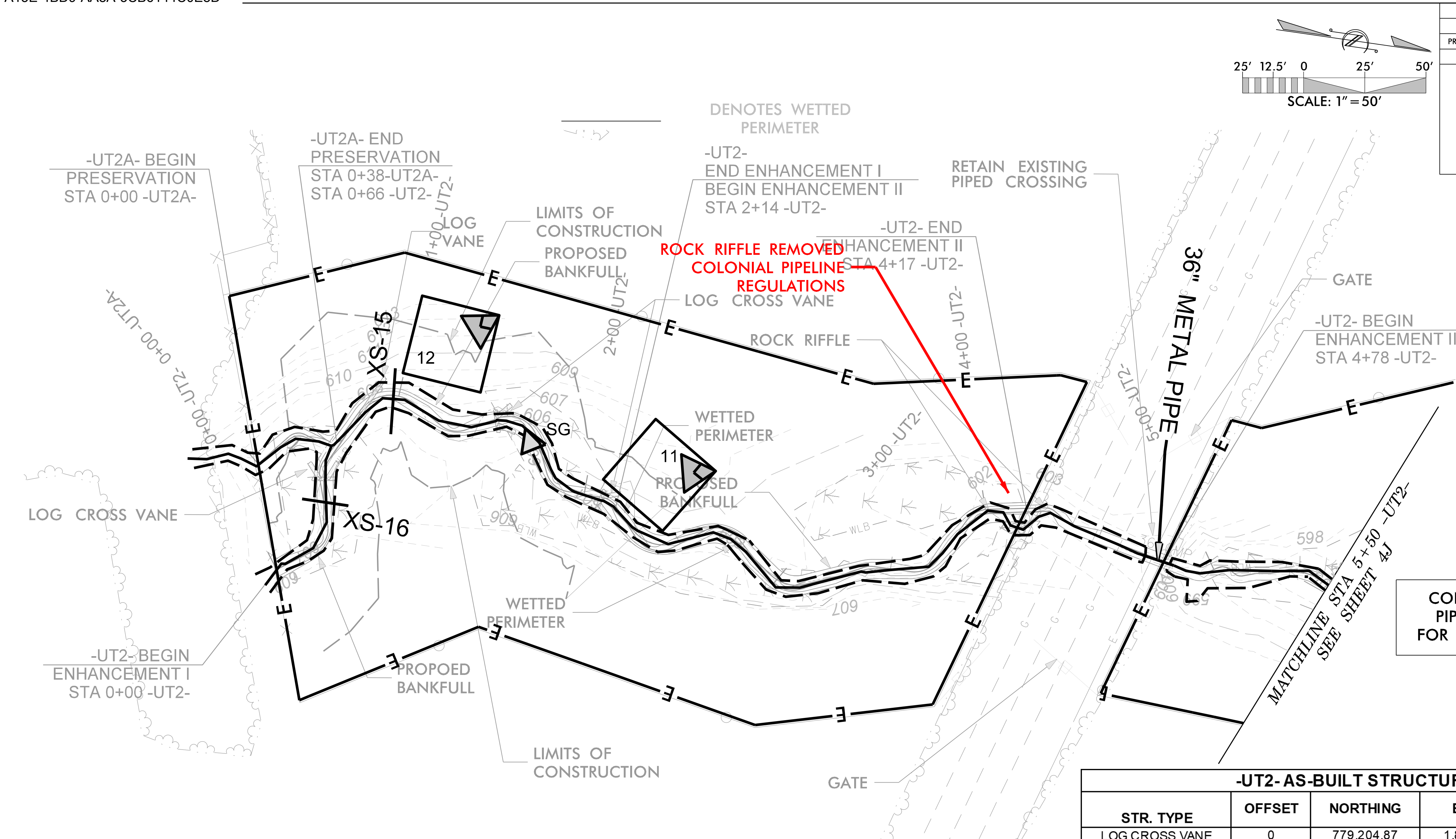
10/14/2022
DATE:

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

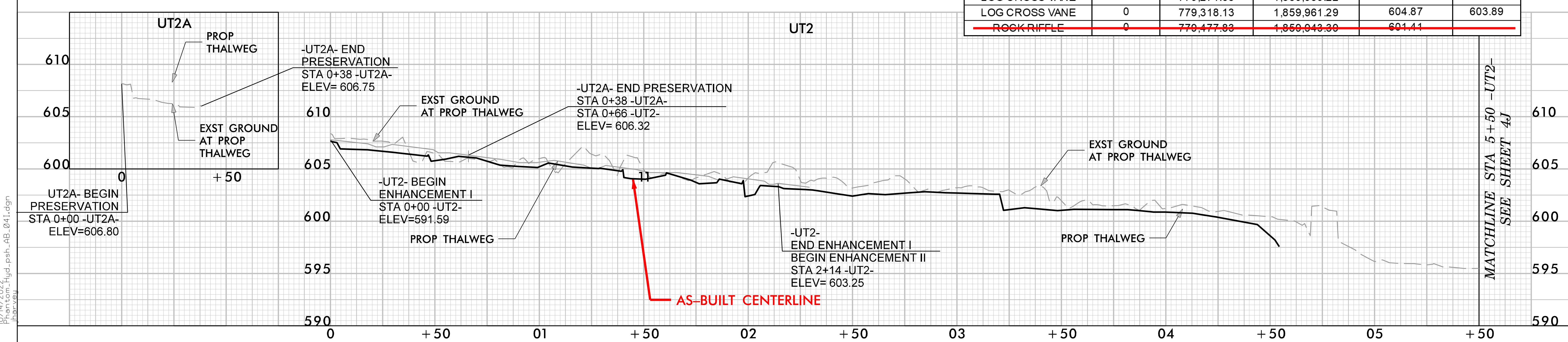
HORIZONTAL DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 88

RECORD DRAWING

CONTRACTOR MUST CONTACT COLONIAL PIPELINE TO GET THEIR SPECIFICATIONS FOR CONSTRUCTING A PIPELINE CROSSING.



-UT2- AS-BUILT STRUCTURE LOCATIONS					
STR. TYPE	OFFSET	NORTHING	EASTING	ELEVATION	AB Survey Elevation
LOG CROSS VANE	0	779,204.87	1,859,968.73	607.05	606.33
LOG VANE	0	779,215.97	1,859,940.21	606.45	605.82
LOG CROSS VANE	0	779,271.65	1,859,935.22	605.68	604.92
LOG CROSS VANE	0	779,318.13	1,859,961.29	604.87	603.89
~~ROCK RIFFLE~~	~~0~~	~~779,477.83~~	~~1,859,943.30~~	~~601.41~~	



10/14/2022
Phantom_Hyd_psh_AB_041.dgn
jharvey

DocuSign Envelope ID: EBA9C22B-A15E-4BD9-AA8A-3CB6144C0E8D

SHEET NAME	SHEET NUMBER
AS-BUILT STRUCTURES	4J
PROJECT NAME: PHANTOM STREAM AND WETLAND RESTORATION SITE	
COUNTY: ALAMANCE	DATE: 2022

Axiom Environmental, Inc.

SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890

RECORD DRAWING

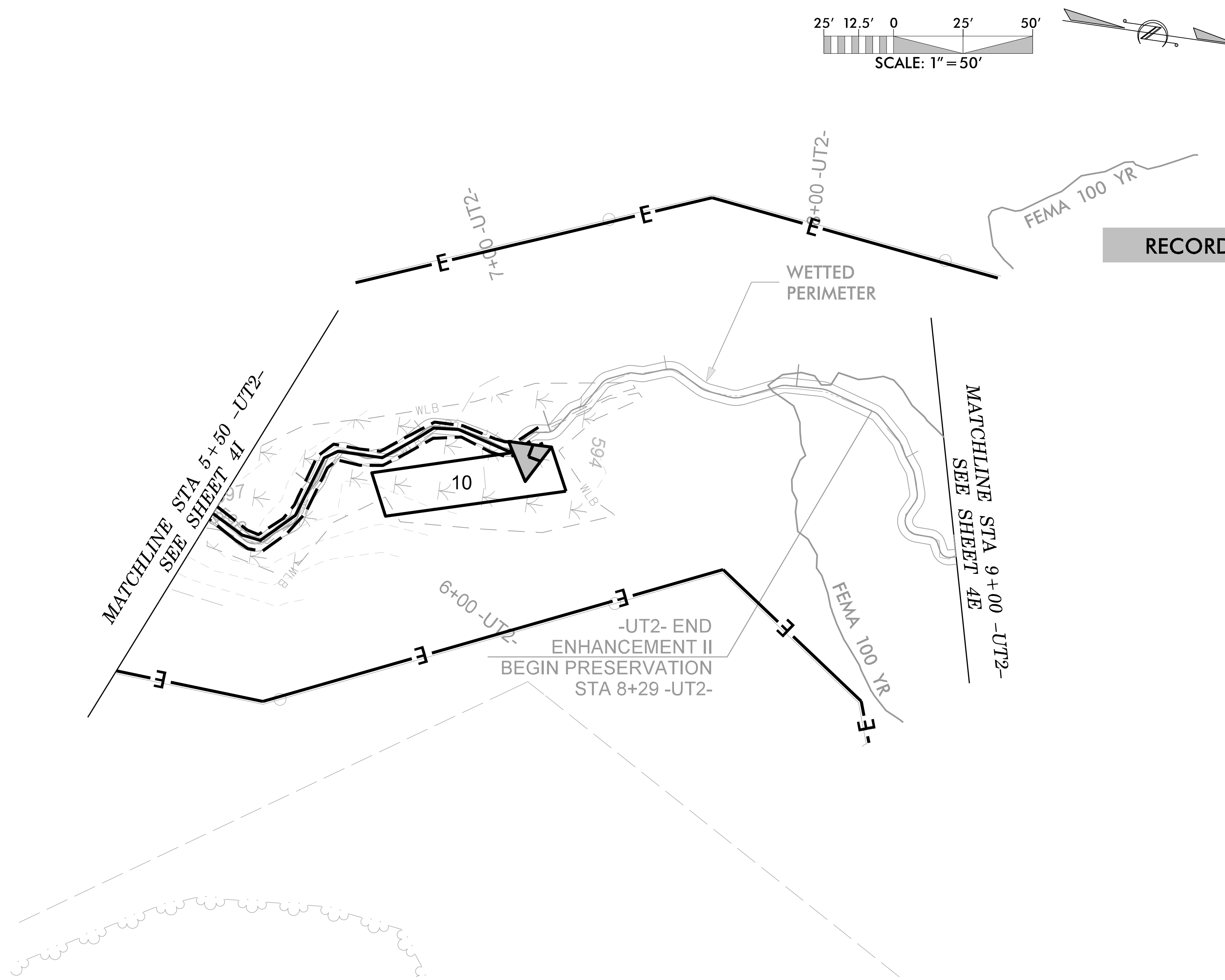
DocuSigned by:
Josh Dalton
1089AD8C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

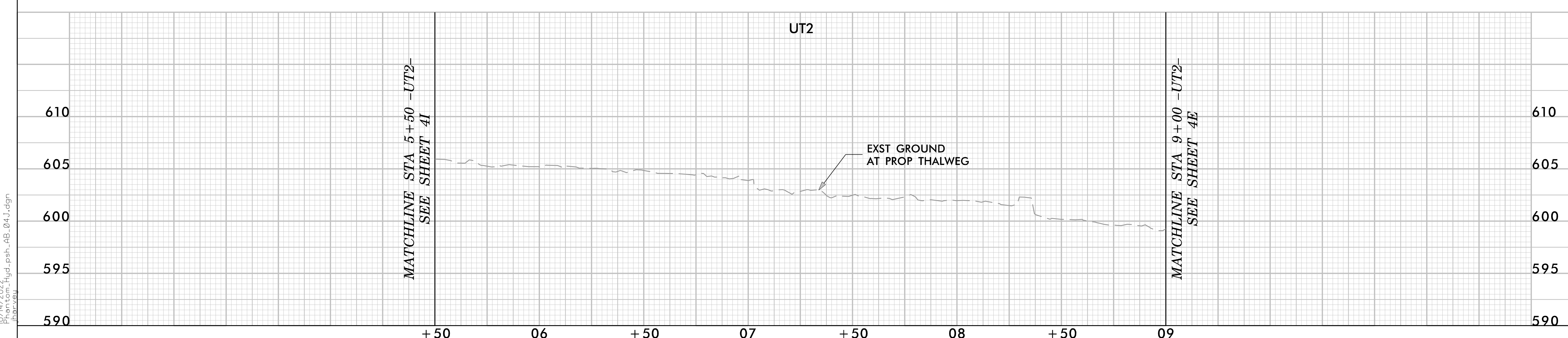
DATE: 10/14/2022

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

HORIZONTAL DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 88



DENOTES WETTED PERIMETER



10/14/2022
Phantom_Hyd_psh_AB_04J.dgn
jharvey

DocuSign Envelope ID: EBA9C22B-A15E-4BD9-AA8A-3CB6144C0E8D

SHEET NAME	SHEET NUMBER
AS-BUILT PLANTING	4K
PROJECT NAME: PHANTOM STREAM AND WETLAND RESTORATION SITE	
COUNTY: ALAMANCE	DATE: 2022

Axiom Environmental, Inc.

SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL (919) 859-2243
ENG FIRM LICENSE NO. C-890

RECORD DRAWING

DESIGN TABLE

Table 14. Planting Plan

Vegetation Association	Piedmont/Low Mountain Alluvial Forest*		Dry-Mesic Oak-Hickory Forest*		Marsh Treatment Wetland**		Stream-side Assemblage**		TOTAL
Area (acres)	7.7		2.0		0.01		2.8		12.5
Species	# planted*	% of total	# planted*	% of total	# planted**	% of total	# planted**	% of total	# planted
Tag alder (*Alnus serrulata*)	--	--	--	--	25	17	375	5	400
River birch (*Betula nigra*)	600	11	--	--	--	--	800	11	1400
Ironwood (*Carpinus caroliniana*)	--	--	300	21	--	--	--	--	300
Sugarberry (*Celtis laevigata*)	500	10	--	--	--	--	500	7	1000
Buttonbush (*Cephalanthus occidentalis*)	--	--	--	--	25	17	--	--	25
Red bud (*Cercis canadensis*)	--	--	100	7	--	--	--	--	100
Sweet pepperbush (*Clethra alnifolia*)	--	--	--	--	25	17	--	--	25
Silky dogwood (*Cornus amomum*)	500	10	--	--	25	17	1475	20	2000
Persimmon (*Diospyros virginiana*)	--	--	200	14	--	--	--	--	200
White ash (*Fraxinus americana*)	--	--	100	7	--	--	--	--	100
Green ash (*Fraxinus pennsylvanica*)	300	6	--	--	--	--	700	9	1000
Tulip poplar (*Liriodendron tulipifera*)	500	10	100	7	--	--	--	--	600
Sycamore (*Platanus occidentalis*)	1100	21	--	--	--	--	1500	20	2600
Black gum (*Nyssa sylvatica*)	100	2	200	14	--	--	--	--	300
White oak (*Quercus alba*)	250	5	250	17	--	--	--	--	500
Water oak (*Quercus nigra*)	700	13	100	7	--	--	700	9	1500
Red oak (*Quercus rubra*)	--	--	100	7	--	--	--	--	100
Willow oak (*Quercus phellos*)	700	13	--	--	--	--	700	9	1400
Black willow (*Salix nigra*)	--	--	--	--	--	--	750	10	750
Elderberry (*Sambucus canadensis*)	--	--	--	--	25	17	--	--	25
Possumhaw (*Viburnum nudum*)	--	--	--	--	25	17	--	--	25
TOTAL	**5250**	**100**	**1450**	**100**	**150**	**100**	**7500**	**100**	**14,350**

* Planted at a density of 680 stems/acre.
** Planted at a density of 2720 stems/acre.

AS–BUILT TABLE

Table 6A. Planted Bare Root Woody Vegetation
Phantom Mill Site

Species	Total
Acres	**12.5**
Betula nigra	1,000
Celtis occidentalis	500
Cephalanthus occidentalis	300
Cercis canadensis	750
Cornus ammomum	2,000
Diospyros virginiana	500
Fraxinus pennsylvanica	700
Liriodendron tulipifera	1,000
Morus rubra	350
Nyssa sylvatica	500
Platanus occidentalis	1,500
Quercus alba	650
Quercus lyrata	600
Quercus nigra	1,250
Quercus phellos	1,250
Quercus rubra	600
Quercus shumardii	750
Viburnum dentatum	100
TOTALS	14,300
Average Stems/Acre	**1,144**