MY0 FINAL MONITORING REPORT

NESBIT SITE

Union County, North Carolina
Catawba River Basin
Cataloging Unit 03050103

DMS Project No. 100121
Full Delivery Contract No. 7868
DMS RFP No. 16-007704 (issued 9/6/2018)
USACE Action ID No. SAW-2019-00832
DWR Project No. 2019-0862

Data Collection: January 2022-February 2022
Submission: September 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

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Response to DMS Comments
DMS Project ID No. 100121
Full Delivery Contract No. 7868
RFP No. 16-007704
USACE Action ID No. SAW-2019-00832
DWR Project No. 2019-0862

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

1. Thank you for including the RFP number on the report title and the data collection dates.
   Response: You're welcome.

2. Table of Contents: Include each of the tables presented in the report. Lumping Table 4A-C is fine but other tables presented in the report are absent from the TOC. Include the table number on each table and add to the TOC.
   Response: Each table was added to the table of contents. Unnumbered tables in the report narrative were labeled with letters (A, B, C, D) and were included in the TOC.

3. Table 2, Summary: Goals, Performance, and Results: OHWM is a specified success criteria and must be added to Table 2 and in Section 3 and associated tables.
   Response: Observation/documentation of all streams maintaining an OHWM was added to Table 2 and Table D (Section 3).

4. Section 2 As-Built Condition: Please note and discuss any monitoring device location changes from the IRT approved mitigation plan.
   Response: 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.

5. 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.
   Response: These photos will be included in future monitoring reports.

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

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

8. Sheet AB-03: Add callout for crossing.
   Response: UT1 crossing, and 60' access easement notes added

9. Sheet AB-04I and AB-041H: Add 60' Easement for Ingress/Egress/Regress.
   Response: 60' access easement added with note

DMS conducted a field visit on August 18, 2022. The following comments/observations are a result of that visit:

10. Invasive Treatment: Areas of invasive species were noted within the conservation easement as indicated in the report. Please treat the existing invasives within the entire conservation easement. Document successful completion of these efforts in the MY1 report.
    Response: Invasive treatments started at construction and will continue as needed. The latest round of herbicide application will be completed in mid-September 2022.

11. Conservation Easement Boundary Integrity: The conservation easement was very well marked with signs and posts at close intervals. Multiple areas of row crop scalloping were observed between the corner posts and markers and was a common occurrence. The intrusions included areas where soybeans were planted several feet within the easement and areas where herbicide application had extended several feet into the easement. The integrity of the easement boundary must be secured. Upon completion of the measures necessary to secure the boundary please document and include in the MY1 report.
    Response: Additional posts will be added as needed to address scalloping and documented as requested in MY1 report.

12. Multiple areas of exposed soil with low herbaceous and stem growth were observed along the sideslopes and outer floodplain. Please address these areas as necessary to promote vegetation growth and reduce the enlargement of erosive rills.
    Response: These areas will be addressed with soil amendment and replanting as needed beginning this fall.

13. Large areas of tall grass were seen onsite as was in-stream vegetation. Please evaluate the successional processes expected in these area to insure tree survival and vigor is acceptable.
    Response: Herbaceous vegetation will be monitored and addressed if tree survival/vigor requires it.

14. Please review live stake performance to insure streambank objectives will be met as the project moves forward.
    Response: Streambank objectives will be monitored as required and additional live staking may be used to help meet the success criteria.

Spatial Data Submission:

15. Please review the groundwater gauge labels, the labels on the CCPV included in the report differ from the labels in the digital submission (ex. Gauges 7, 8, 11, and 12).
    Response: There are only 9 groundwater gauges at this site labeled 1-9. The labels in the digital submittal match the labels on the CCPV and soil boring logs. However, based on this comment, all shapefile labels were checked, and it was discovered that the cross-section labels do not match the CCPV. This has been corrected.

16. Please verify that the vegetation plot origins are the photo station locations for required vegetation visual monitoring station locations. Please note that in the future, DMS will require a point file for all visual inspection stations including veg plot and cross section locations.
    Response: All vegetation plot photos were taken at plot origins. We are happy to comply with all future DMS monitoring requirements as they are issued.

Tables:

17. Tables submitted have minor deviation from the templates. Please note that DMS is in the process of developing a Digital Monitoring Application which will require submission of standard data tables in the future.
    Response: Noted. If DMS would like table formats changed, please advise. As far as we are aware, this is the latest template.

18. The Goals Table is missing from this submission.
    Response: Table 2. Summary: Goals, Performance, and Results was added to the Tables excel file.

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And

Axiom Environmental, Inc.
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APPENDICES

1 PROJECT SUMMARY

Restoration Systems, LLC has established the North Carolina Division of Mitigation Services (NCDMS) Nesbit Site (Site). The Site is on one parcel along the warm water Glen Branch and unnamed tributaries to Glen Branch in the Carolina Slate Belt portion of the Piedmont ecoregion of North Carolina. Located in the Catawba River Basin, cataloguing unit 03050103, the Site is in Targeted Local Watershed 030501003030030 and North Carolina Division of Water Resources (NCDWR) subbasin number 03-08-38. 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 0.07 of a square mile (46 acres) on UT2 to 1.25 square miles (799 acres) at the Site's outfall.

1.1 Project Background, Components, and Structure

Located seven miles southwest of Monroe and five miles southeast of Waxhaw in the southwest corner of Union County near the North Carolina and South Carolina border, the Site encompasses 18.0 acres. Mitigation work within the Site included 1) stream restoration, 2) stream enhancement (Level I), 3) stream enhancement (Level II), 4) wetland reestablishment, 5) wetland rehabilitation, 6) wetland enhancement, and 7) vegetation planting. The Site is expected to provide 5198.736 warm water stream credits and 6.477 riparian wetland credits by closeout (Table 1, Page 2). A conservation easement was granted to the State of North Carolina and recorded at the Union County Register of Deeds on August 28, 2020.

Before construction, the Site was characterized by agricultural row crops. Site design was completed in June 2021. Construction started on October 7, 2021 and ended within a final walkthrough on December 20, 2021. The Site was planted on February 3, 2022. Completed project activities, reporting history, completion dates, and project contacts are summarized in Tables 11-12 (Appendix E).

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Table 1. Nesbit Mitigation Site (ID-100121) 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								
Glen Br Reach 1	1275	1260	Warm	R	1.00000	1,275.000		
Glen Br Reach 2	63	62	Warm	EI	1.50000	42.000		
Glen Br Reach 3	2776	2763	Warm	R	1.00000	2,776.000		
UT 1A	314	314	Warm	EII	5.00000	62.800		
UT 1 Reach 1	253	253	Warm	EI	2.50000	101.200		
UT 1 Reach 2	381	373	Warm	R	1.00000	381.000		
UT 1 Reach 3	115	116	Warm	EII	2.50000	46.000		
UT 1 Reach 4	171	169	Warm	R	1.00000	171.000		
UT 2 Reach 1	112	112	Warm	EII	2.50000	44.800		
UT 2 Reach 2	197	197	Warm	R	1.00000	197.000		
					Total:	**5,096.800**		
Wetland								
Wetland Reestablishment	5.338	5.338	R	REE	1.00000	5.338		
Wetland Rehabilitation	0.902	0.902	R	RH	1.50000	0.601		
Wetland Enhancement	1.075	1.075	R	E	2.00000	0.538		
					Total:	**6.477**		

Project Credits

	Stream			Riparian	Non-Rip	Coastal
Restoration Level	Warm	Cool	Cold	Wetland	Wetland	Marsh
Restoration	4,800.000	0.000	0.000	0.000	0.000	0.000
Re-establishment				5.338	0.000	0.000
Rehabilitation				0.601	0.000	0.000
Enhancement				0.538	0.000	0.000
Enhancement I	143.200	0.000	0.000			
Enhancement II	153.600	0.000	0.000			
Preservation				0.000	0.000	0.000
Benthics	101.936	0.000	0.000	0.000	0.000	
Totals	**5,198.736**	**0.000**	**0.000**	**6.477**	**0.000**	**0.000**

Total Stream Credit **5,198.736**
Total Wetland Credit **6.477**

Wetland Mitigation Category

CM	Coastal Marsh
R	Riparian
NR	Non-Riparian

Restoration Level

HQP	High Quality Preservation
P	Preservation
E	Wetland Enhancement - Veg and Hydro
EII	Stream Enhancement II
EI	Stream Enhancement I
C	Wetland Creation
RH	Wetland Rehabilitation - Veg and Hydro
REE	Wetland Re-establishment Veg and Hydro
R	Restoration

Table 2. Summary: Goals, Performance, and Results

Goals	Objectives	Success Criteria
(1) HYDROLOGY		
- 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/enhance jurisdictional wetlands - Plant woody riparian buffer - Install marsh treatment areas - Remove agricultural row crops - 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 - All streams must maintain an Ordinary High-Water Mark - Attain Wetland Hydrology Success Criteria - Attain Vegetation Success Criteria - Conservation Easement recorded
- Increase stream stability within the Site so that channels are neither aggrading nor degrading.	- Construct channels with a proper pattern, dimension, and longitudinal profile - Remove agricultural row crops - Construct stable channels with the appropriate substrate - Upgrade forded crossings - Plant woody riparian buffer - Stabilize stream banks	- Cross-section measurements indicate a stable channel with the appropriate substrate - Visual documentation of stable channels and structures - BHR not to exceed 1.2 - < 10% change in BHR in any given year - Attain Vegetation Success Criteria
(1) WATER QUALITY		
- Remove direct nutrient and pollutant inputs from the Site and reduce contributions to downstream waters.	- Remove agricultural row crops 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	- Attain Wetland Hydrology Success Criteria - Attain Vegetation Success Criteria
(1) HABITAT		
- Improve instream and streamside habitat.	- Construct stable channels with the 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 indicates a stable channel with the appropriate substrate - Visual documentation of stable channels and in-stream structures - All streams must maintain an Ordinary High-Water Mark - Attain Wetland Hydrology Success Criteria - Attain Vegetation Success Criteria - Conservation Easement recorded

Table 3. Project Attribute Table					
Project Information					
Project Name	Nesbit Site				
Project County	Union County, North Carolina				
Project Area (acres)	18				
Project Coordinates (latitude & latitude)	34.8936, -80.6544				
Planted Area (acres)	16				
Project Watershed Summary Information					
Physiographic Province	Piedmont				
Project River Basin	Catawba				
USGS HUC for Project (14-digit)	03050103030030				
NCDWR Sub-basin for Project	03-08-38				
Project Drainage Area (acres)	798.8				
Percentage of Project Drainage Area that is Impervious	<5%				
CGIA Land Use Classification	Managed Herbaceous Cover				
Reach Summary Information					
Parameters	**Glen Br Upstream**	**Glen Br Downstream**	**UT 1A**	**UT1**	**UT 2**
Length of reach (linear feet)	1586	2499	314	971	309
Valley Classification & Confinement	Alluvial, confined				
Drainage Area (acres)	494.6	798.8	152.6	176.7	45.6
NCDWR Stream ID Score	--	--	28	33	30
Stream Thermal Regime	Warm				
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial/ Intermittent	Perennial	Perennial/ Intermittent
NCDWR Water Quality Classification	C				
Existing Morphological Description (Rosgen 1996)	Cg4	Eg 4	-----	Eg 4	Eg 6
Proposed Stream Classification (Rosgen 1996)	Ce 3/4	Ce 3/4	-----	Ce 3/4	Ce 3/4
Existing Evolutionary Stage (Simon and Hupp 1986)	III/IV	III/IV	III	II/III	II/III
Underlying Mapped Soils	Secrest Cid complex				
Drainage Class	Somewhat poorly drained				
Hydric Soil Status	Nonhydric (may contain hydric inclusions)				
Valley Slope	0.0077	0.0048	0.0204	0.0086	0.0147
FEMA Classification	AE floodway	AE floodway	NA	NA	AE floodway
Native Vegetation Community	Piedmont Alluvial Forest/Dry-Mesic Oak-Hickory Forest				
Watershed Land Use/Land Cover (Site)	30% forest, 65% ag. land, 5% low density residential/impervious surface				
Watershed Land Use/Land Cover (Uwharrie Reference Channel)	100% forest				
Percent Composition of Exotic Invasive Vegetation	15%				

Wetland Summary Information	
Parameters	**Wetlands**
Wetland acreage	5.338 acres reestablished & 1.977 acres enhanced/rehabilitated
Wetland Type	Riparian riverine
Mapped Soil Series	Secrest Cid Complex
Drainage Class	Somewhat Poorly drained
Hydric Soil Status	Nonhydric (may contain hydric inclusions)
Source of Hydrology	Groundwater, stream overbank
Hydrologic Impairment	Incised streams, compacted soils, agriculture
Native Vegetation Community	Piedmont/Low Mountain Alluvial Forest
% Composition of Exotic Invasive Vegetation	<5%
Restoration Method	Hydrologic and vegetative
Enhancement Method	---

Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States-Section 401	Yes	Yes	Section 401 Certification
Waters of the United States-Section 404	Yes	Yes	Section 404 Permit
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	Yes	DMS FEMA Checklist (App E)
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 of the 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.

Table A. 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. • Bank height ratio (BHR) cannot exceed 1.2 at any measured cross-section. • BHR at any measure riffle cross-section should not change by more than 10% from baseline condition during any given monitoring period. • The stream project shall remain stable, and all other performance standards shall be met through four separate bankfull events, occurring in individual years, during the monitoring years 1-7. • Intermittent streams will demonstrate at least 30-days consecutive flow.
Wetland Hydrology
• Annual 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 5; 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)

Construction started on October 7, 2021 and ended within a final walkthrough on December 20, 2021. The Site was planted on February 3, 2022. As-built and MY0 data collection occurred in February 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.

Table B. Deviations from Construction Plans

Location	Deviation	Explanation
UT-1 sta. 1+07	Log cross vane not constructed	Slope in field conditions did not require structure

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 16.0 acres of the Site with 18,600 stems (planted species are included in Table 6 [Appendix B]).
- Treating Chinese privet (*Ligustrum sinense*) mechanically prior to planting.
- Applying 160 lbs of temporary soil health seed mix consisting of white clover (*Trifolium repens*), red clover (*Trifolium pratense*), crimson clover (*Trifolium incarnatum*), berseem clover (*Trifolium alexandrinum*), chicory (*Cichorium intybus*), and purple top turnips (*Brassica rapa*) along the easement boundary and in upland areas.
- Applying sitewide and streamside/wetland permanent seed mixes at 2 lbs per acre across the Site. Species lists are included in Table 6B-C (Appendix B).

3 PROJECT MONITORING – METHODS

Monitoring will be conducted in accordance with 2016 NCIRT Guidelines. Monitoring will be conducted by Axiom Environmental, Inc based on the schedule in the following table. A summary of monitoring is outlined in the table on page 7. Annual monitoring reports will be submitted to the NCDMS by Restoration Systems no later than December 1 of each monitoring year data is collected.

Table C. Monitoring Schedule

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

3.1 Monitoring

The monitoring parameters are summarized in the following table.

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Table D. 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 12 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 photographs
	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	1 surface water gauge on UT1 and 1 surface water gauge on UT2	Surface water data for each monitoring period
	Visual Evidence	Continuous through the monitoring period	All restored stream channels	Observation/documentation that all streams maintain Ordinary High-Water Mark (OHWM)
Bankfull Events	Continuous monitoring of surface water gauges and/or trail camera	Continuous recording through the monitoring period	1 surface water gauges on Glen Branch	Surface water data for each monitoring period
	Visual/Physical Evidence	Continuous through the monitoring period	All restored stream channels	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)	Preconstruction, Years 3, 5, and 7 during the "index period" referenced in *Small Streams Biocriteria Development* (NCDWQ 2009)	3 stations (Glen Br upper and lower reaches, and the lower reach of UT 1)	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	9 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	16 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	Only if poor vegetation grow is documented during monitoring	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.

**The growing season will not be initiated prior to March 1 based on confirmed soil temperature unless evidence of vegetative indicators such as bud burst is present and documented by more than two species (excluding red maple and sambucus)

4 MONITORING YEAR 0 – DATA ASSESSMENT

Annual monitoring and site visits were conducted in February 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 February 8-9, 2022. All streams within the Site are stable and functioning as designed. 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

9 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 February 8, 2022. Vegetation monitoring resulted in a sitewide stem density average of 658 planted stems per acre, above the interim requirement of 320 stems per acre required at MY3. All 16 fixed vegetation plots met the interim success criteria. Please refer to Appendix A for Vegetation Plot Photographs and 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.

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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 Mitigation Services (NCDMS). 2014. Stream and Wetland Mitigation Monitoring Guidelines. North Carolina Department of Environmental Quality, Raleigh, North Carolina.

North Carolina Ecosystem Enhancement Program (NCEEP 2007). Lower Catawba River Basin Restoration Priorities 2007 (online). Available: https://files.nc.gov/ncdeq/Mitigation%20Services/Watershed_Planning/Catawba_River_Basin/RBRP_2007%20Lower%20CAT_032013%20Final.pdf. North Carolina Department of Environment and Natural Resources, Raleigh (December 18, 2018).

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.

Appendix A: Visual Assessment Data

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

Note: Basemap is drone imagery from February 2022 overlaid on 2019 orthoimagery from NC OneMap.

N

Glen Branch

UT-1

UT-1A

UT-2

Rain Gauge

Nesbit Road

XS 1
XS 2
XS 3
XS 4
XS 5
XS 6
XS 7
XS 8
XS 9
XS 10
XS 11
XS 12

0 300 600 1,200 Feet

Legend

- Nesbit Easement = 18.0 ac
- Stream Restoration
- Stream Enhancement (Level I)
- Stream Enhancement (Level II)
- Stream Generating No Credit
- Instream Structures
- Wetland Reestablishment
- Wetland Rehabilitation
- Wetland Enhancement
- Permanent Vegetation Plots
- Vegetation Plot Origins
- Cross Sections
- Groundwater Gauge
- Rain Gauge/Soil Probe
- Stream Crest Gauge
- Stream Flow Gauge
- Benthic Sampling Locations

Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

NESBIT SITE

Union County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by: KRJ

Date: JUN 2022

Scale: 1:3000

Project No.: 20-007

FIGURE

1

Table 4A. Visual Stream Stability Assessment

Reach	Glen Branch
Assessed Stream Length	4085
Assessed Bank Length	8170

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.	32	32		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)	32	32		100%

Table 4B. Visual Stream Stability Assessment

Reach	UT 1
Assessed Stream Length	971
Assessed Bank Length	1942

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.	15	15		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)	15	15		100%

Table 4C. Visual Stream Stability Assessment

Reach	UT 2
Assessed Stream Length	309
Assessed Bank Length	618

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 **16.0**

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%

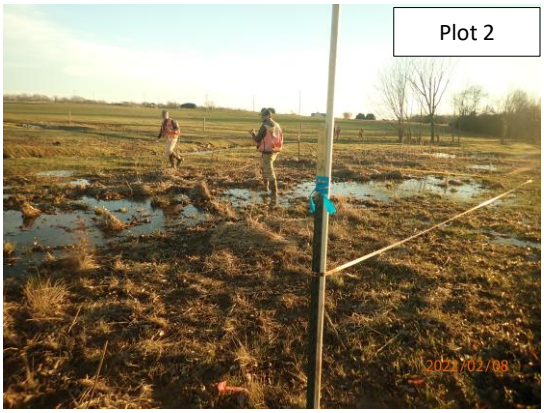
Easement Acreage **18.0**

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	

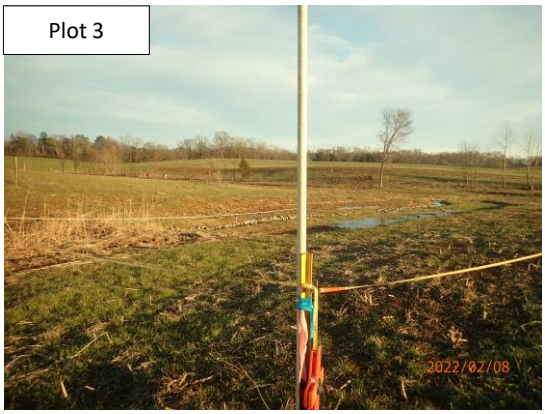
Nesbit Site
MY0 (2022) Vegetation Monitoring Photographs (taken February 8, 2022)

Plot 1

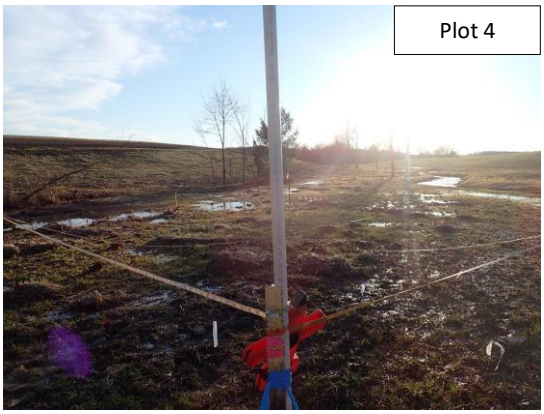
Plot 2



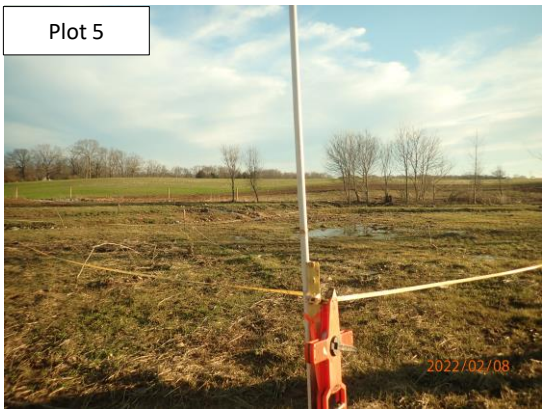
Plot 3



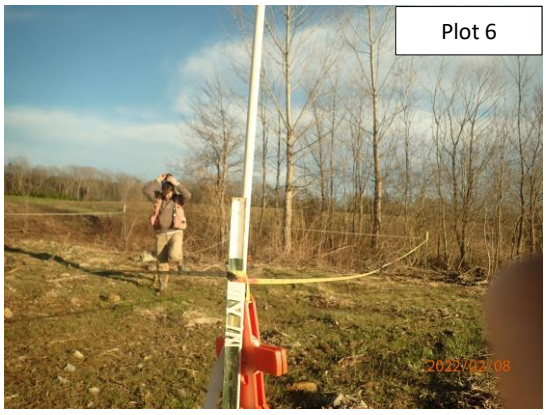
Plot 4



Plot 5

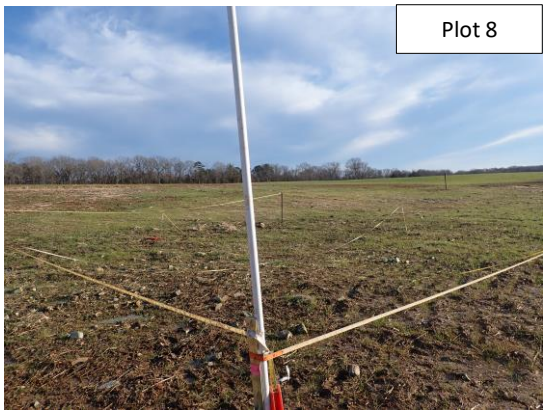


Plot 6



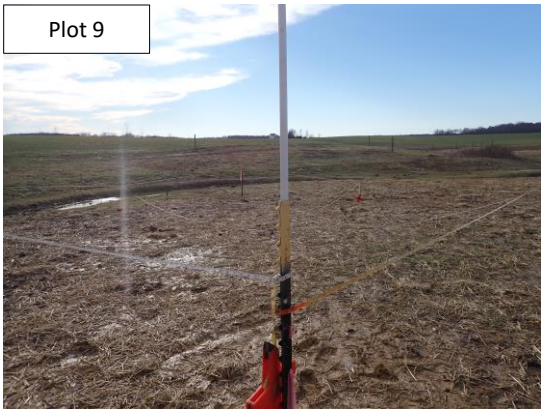
Plot 7

Plot 8



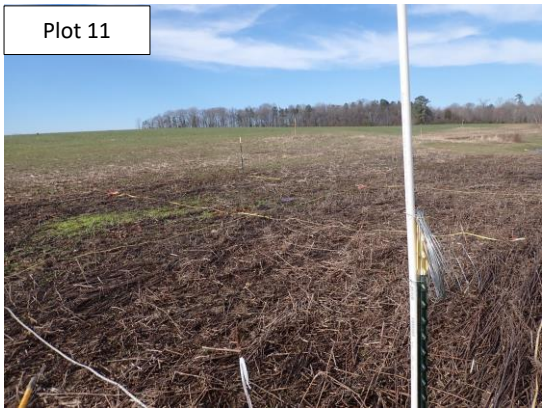
Nesbit Site
MY0 (2022) Vegetation Monitoring Photographs (taken February 8, 2022)

Plot 9



Plot 10

Plot 11



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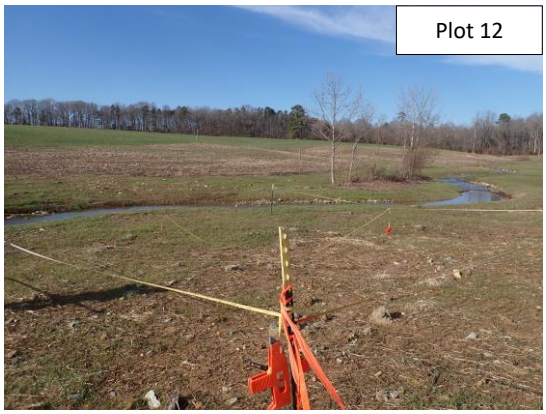
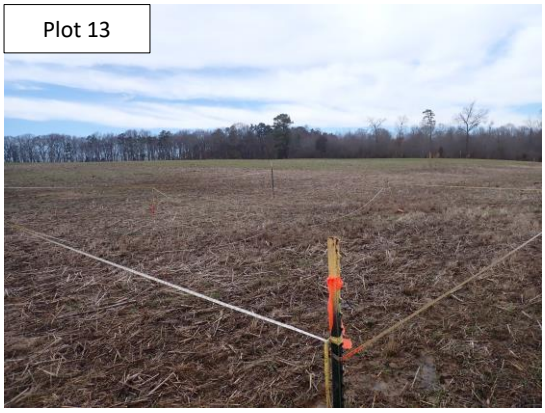
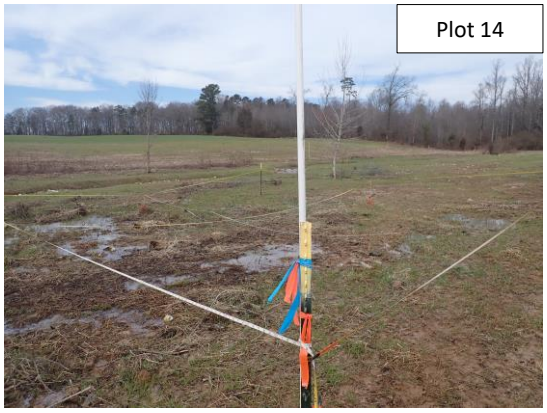


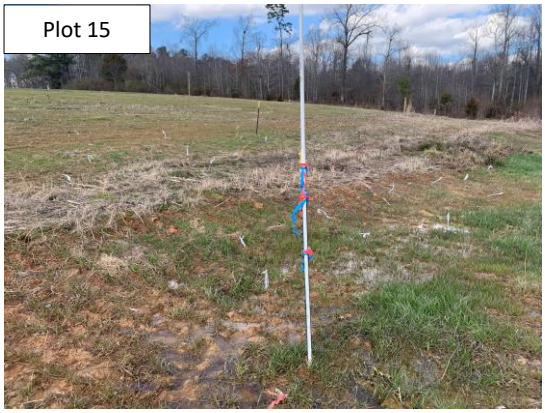
Plot 13



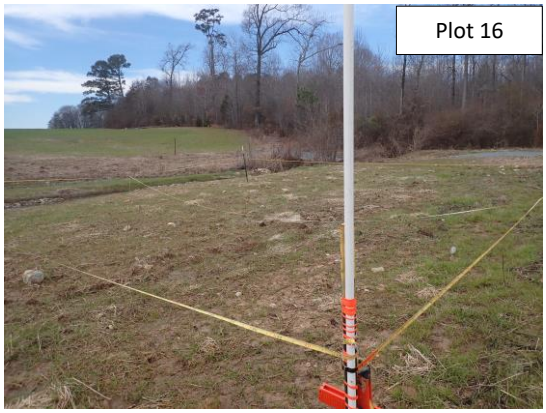
Plot 14



Plot 15



Plot 16



Appendix B: Vegetation Data

Table 6A. Planted Bare-Root Woody Vegetation
Table 6B. Permanent Seed Mix – Sitewide Mix
Table 6C. Permanent Seed Mix – Streamside and Wetland 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
Nesbit Site

Vegetation Association	Piedmont/Mountain Bottomland Forest*		Dry-Mesic Oak-Hickory Forest*		Stream-side Assemblage**		TOTAL
Area (acres)	**7.2**		**5.0**		**3.8**		**16.0**
Species	**# planted***	**% of total**	**# planted***	**% of total**	**# planted****	**% of total**	**# planted**
River birch (*Betula nigra*)	250	5	--	--	1750	17	2000
Shagbark hickory (*Carya cordiformis*)	500	10	--	--	--	--	500
Hackberry (*Celtis occidentalis*)	400	8	--	--	600	6	1000
Red bud (*Cercis canadensis*)	--	--	600	18	--	--	600
Silky dogwood (*Cornus amomum*)	350	7	--	--	2150	21	2500
Persimmon (*Diospyros virginiana*)	--	--	500	15	--	--	500
Green ash (*Fraxinus pennsylvanica*)	200	4.5	--	--	700	7	900
Tulip poplar (*Liriodendron tulipifera*)	200	4.5	150	4	650	6.5	1000
Red mulberry (*Morus rubra*)	--	--	150	4	350	3	500
Black gum (*Nyssa sylvatica*)	300	6	--	--	950	9	1250
Sycamore (*Platanus occidentalis*)	400	8	150	4	1700	16.5	2250
White oak (*Quercus alba*)	200	4.5	150	4	650	6	1000
Water oak (*Quercus nigra*)	1000	20	1000	30	--	--	2000
Willow oak (*Quercus phellos*)	200	4.5	--	--	800	8	1000
Red oak (*Quercus rubra*)	--	--	500	15	--	--	500
Shumard oak (*Quercus shumardii*)	600	12	--	--	--	--	600
American elm (*Ulmus americana*)	300	6	200	6	--	--	500
TOTAL	**4900**	**100**	**3400**	**100**	**10300**	**100**	**18600**

Table 6B. Permanent Seed Mix
Nesbit Site – Sitewide Mix

Species*	Percentage	Species*	Percentage
Achillea millefolium	0.4	*Gaillardia perennial*	2
Agrostis gigantea	15	*Helianthus angustifolius*	1
Agrostis hyemalis	5	*Heliopsis helianthoides*	1
Agrostis stolonifera	2	*Hibiscus moscheutos*	0.5
Baptisia australis	2	*Juncus tenuis*	0.5
Carex vulpinoidea	1	*Lespedeza capitata*	0.5
Chamaecrista fasciculata	1	*Liatris spicata*	1
Chamaecrista nictitans	1	*Monarda fistulosa*	0.5
Chrysanthemum leucanthemum	4.5	*Panicum clandestinum*	5
Chrysanthemum x superbum	3	*Panicum rigidulum*	0.5
Coreopsis lanceolata	4	*Penstemon digitalis*	1
Coreopsis tinctoria	4	*Rudbeckia amplexicaulis*	1
Cosmos bipinnatus	1	*Rudbeckia hirta*	3
Delphinium ajacis	2	*Schizachyrium scoparium*	5
Desmodium canadense	1	*Senna hebecarpa*	0.5
Echinacea purpurea	5	*Tridens flavus*	18
Elymus virginicus	5	*Verbena hastata*	1
Eupatorium perfoliatum	0.5		
		Total	**100**

Table 6C. Permanent Seed Mix
Nesbit Site – Streamside & Wetland Mix

Species*	Percentage	Species*	Percentage
Bidens aristosa	10	*Panicum rigidulum*	30
Carex albolutescens	6	*Panicum virgatum*	5
Elymus virginicus	15	*Rudbeckia hirta*	4
Helianthus angustifolius	10	*Sorghastrum nutans*	15
Juncus coriaceus	5		
		Total	**100**

* Both seed mixes were applied at 2 lbs per acre; however, in streamside areas, an additional 160 lbs of temporary soil health mix (turnip, clover, chicory) were applied along the easement boundary and in the upland areas.

Table 7. Planted Vegetation Totals
Nesbit Site

Plot #	Planted Stems/Acre	Success Criteria Met?
1	810	Yes
2	688	Yes
3	688	Yes
4	891	Yes
5	445	Yes
6	972	Yes
7	607	Yes
8	891	Yes
9	526	Yes
10	567	Yes
11	567	Yes
12	688	Yes
13	445	Yes
14	364	Yes
15	850	Yes
16	526	Yes
Average Planted Stems/Acre	658	**Yes**

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

Planted Acreage	16
Date of Initial Plant	2022-02-03
Date(s) of Supplemental Plant(s)	
Date(s) Mowing	
Date of Current Survey	2022-02-08
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		Veg Plot 8 F	
					Planted	Total	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									4	4						
	Carya cordiformis	bitternut hickory	Tree	FAC	3	3									1	1				
	Celtis occidentalis	common hackberry	Tree	FACU									3	3						
	Cornus amomum	silky dogwood	Shrub	FACW	2	2	3	3	3	3	11	11			7	7			5	5
	Diospyros virginiana	common persimmon	Tree	FAC	3	3													5	5
	Fraxinus pennsylvanica	green ash	Tree	FACW			2	2			2	2	1	1	1	1	2	2		
	Liriodendron tulipifera	tuliptree	Tree	FACU			2	2	5	5	1	1								
	Morus alba	white mulberry	Tree	FACU																
	Morus rubra	red mulberry	Tree	FACU	3	3	3	3												
	Nyssa sylvatica	blackgum	Tree	FAC											4	4	7	7		
	other																			
	Platanus occidentalis	American sycamore	Tree	FACW	4	4	2	2							1	1	2	2		
	Quercus alba	white oak	Tree	FACU															1	1
	Quercus nigra	water oak	Tree	FAC			3	3	3	3			1	1			1	1		
	Quercus phellos	willow oak	Tree	FACW	2	2					1	1	1	1	7	7			7	7
	Quercus rubra	northern red oak	Tree	FACU											2	2	1	1		
	Quercus shumardii	Shumard's oak	Tree	FAC													1	1		
	Quercus sp.				3	3	2	2	6	6	6	6	1	1			1	1	3	3
	Ulmus americana	American elm	Tree	FAC							1	1			1	1			1	1
Sum	Performance Standard				20	20	17	17	17	17	22	22	11	11	24	24	15	15	22	22
Mitigation Plan Performance Standard	Current Year Stem Count					20		17		17		22		11		24		15		22
	Stems/Acre					810		688		688		891		445		972		607		891
	Species Count					7		7		4		6		6		8		7		6
	Dominant Species Composition (%)					20		18		35		50		36		29		47		32
	Average Plot Height (ft.)					123		138		185		169		131		169		121		174
	% Invasives					0		0		0		0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					20		17		17		22		11		24		15		22
	Stems/Acre					810		688		688		891		445		972		607		891
	Species Count					7		7		4		6		6		8		7		6
	Dominant Species Composition (%)					20		18		35		50		36		29		47		32
	Average Plot Height (ft.)					123		138		185		169		131		169		121		174
	% 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.

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

Planted Acreage	16
Date of Initial Plant	2022-02-03
Date(s) of Supplemental Plant(s)	
Date(s) Mowing	
Date of Current Survey	2022-02-08
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 9 F		Veg Plot 10 F		Veg Plot 11 F		Veg Plot 12 F		Veg Plot 13 F		Veg Plot 14 F		Veg Plot 15 F		Veg Plot 16 F	
					Planted	Total	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	5	5	4	4						
	Carya cordiformis	bitternut hickory	Tree	FAC			2	2			2	2	1	1						
	Celtis occidentalis	common hackberry	Tree	FACU	2	2							1	1					1	1
	Cornus amomum	silky dogwood	Shrub	FACW					5	5							4	4		
	Diospyros virginiana	common persimmon	Tree	FAC	4	4	1	1	1	1			1	1	1	1			3	3
	Fraxinus pennsylvanica	green ash	Tree	FACW																
	Liriodendron tulipifera	tuliptree	Tree	FACU	4	4			1	1					1	1				
	Morus alba	white mulberry	Tree	FACU											1	1				
	Morus rubra	red mulberry	Tree	FACU									1	1						
	Nyssa sylvatica	blackgum	Tree	FAC																
	other																		1	1
	Platanus occidentalis	American sycamore	Tree	FACW							1	1					6	6	2	2
	Quercus alba	white oak	Tree	FACU	1	1	3	3	1	1	1	1			2	2	2	2		
	Quercus nigra	water oak	Tree	FAC			2	2	1	1	4	4			1	1	2	2	1	1
	Quercus phellos	willow oak	Tree	FACW			4	4			2	2					1	1	2	2
	Quercus rubra	northern red oak	Tree	FACU					1	1									3	3
	Quercus shumardii	Shumard's oak	Tree	FAC											1	1				
	Quercus sp.				2	2	1	1	3	3	2	2	3	3	2	2	6	6		
	Ulmus americana	American elm	Tree	FAC			1	1												
Sum	Performance Standard				13	13	14	14	14	14	17	17	11	11	9	9	21	21	13	13
Mitigation Plan Performance Standard	Current Year Stem Count					13		14		14		17		11		9		21		13
	Stems/Acre					526		567		567		688		445		364		850		526
	Species Count					5		7		8		7		6		7		6		7
	Dominant Species Composition (%)					31		29		36		29		36		22		29		23
	Average Plot Height (ft.)					153		167		164		173		172		188		185		181
	% Invasives					0		0		0		0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					13		14		14		17		11		9		21		13
	Stems/Acre					526		567		567		688		445		364		850		526
	Species Count					5		7		8		7		6		7		6		7
	Dominant Species Composition (%)					31		29		36		29		36		22		29		23
	Average Plot Height (ft.)					153		167		164		173		172		188		185		181
	% 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

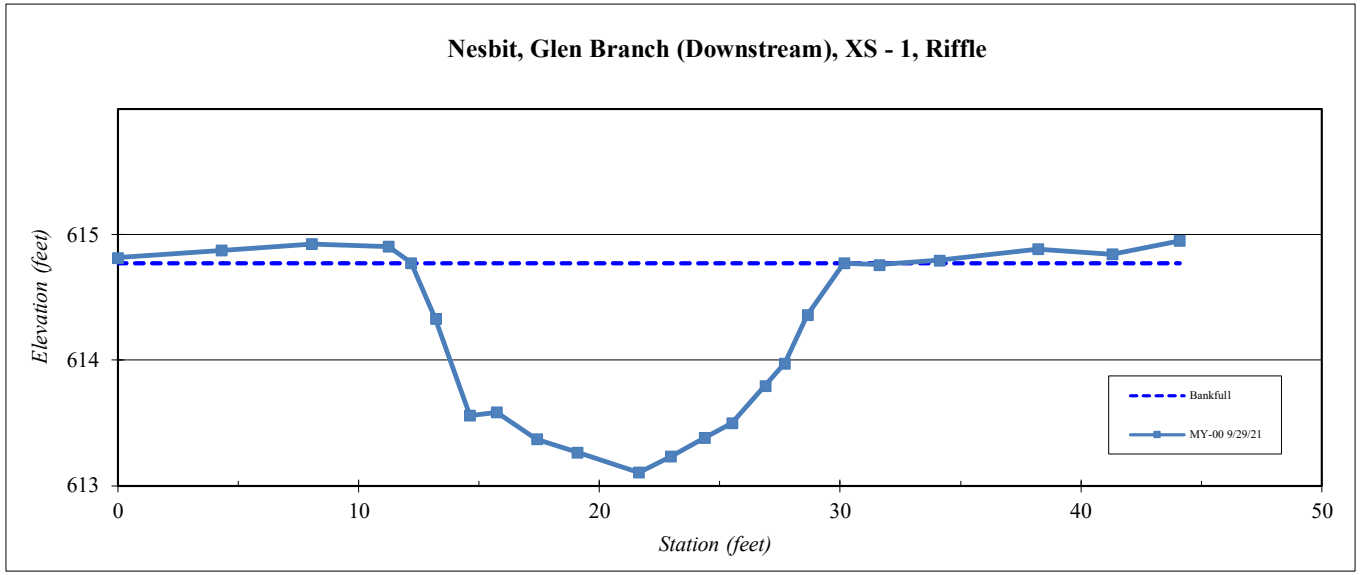
Cross-Sections with Annual Overlays
Longitudinal Profile
Table 9A-D. Baseline Stream Data Summary Tables
Table 10A-B. Cross-Section Morphology Monitoring Summary

Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	Glen Br (Downstream), XS - 1, Riffle
Feature	Riffle
Date:	2/8/2022
Field Crew:	Perkinson

Station	Elevation
0.0	614.8
4.3	614.9
8.1	615.0
11.2	614.9
12.2	614.8
13.2	614.3
14.6	613.4
15.7	613.4
17.4	613.2
19.1	613.1
21.6	612.9
23.0	613.0
24.4	613.2
25.5	613.3
26.9	613.7
27.7	613.9
28.6	614.3
30.2	614.8
31.6	614.8
34.1	614.8
38.2	614.91
41.3	614.9
44.1	615.0

SUMMARY DATA	
Bankfull Elevation:	614.79
Bank Hieght Ratio:	1.00
Thalweg Elevation:	612.90
LTOB Elevation:	614.79
LTOB Max Depth:	1.88
LTOB Cross Sectional Area:	22.9

Stream Type	E/C 5

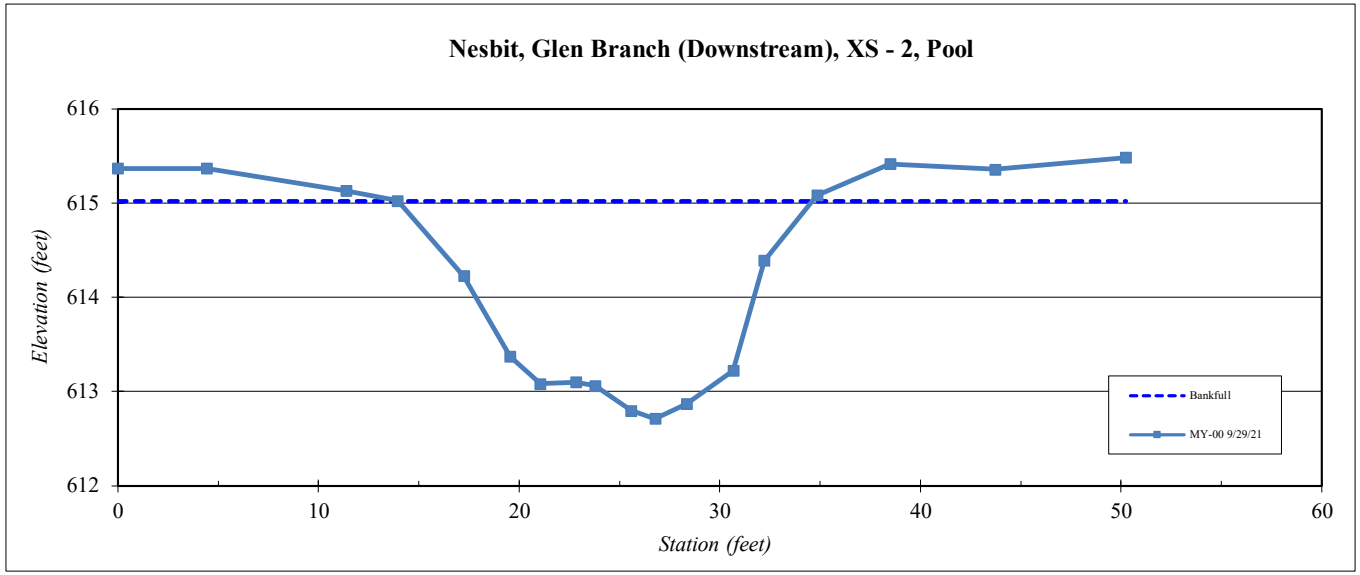


Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	Glen Br (Downstream), XS - 2, Pool
Feature	Pool
Date:	2/8/2022
Field Crew:	Perkinson

Station	Elevation
0.0	615.5
4.4	615.5
11.4	615.2
13.9	615.1
17.2	614.2
19.6	613.2
21.1	612.9
22.8	612.9
23.8	612.9
25.6	612.6
26.8	612.5
28.3	612.6
30.7	613.0
32.2	614.4
34.8	615.1
38.5	615.5
43.7	615.4
50.2	615.6

SUMMARY DATA	
Bankfull Elevation:	615.07
Bank Hieght Ratio:	1.00
Thalweg Elevation:	612.46
LTOB Elevation:	615.07
LTOB Max Depth:	2.61
LTOB Cross Sectional Area:	33.2

Stream Type	E/C 5

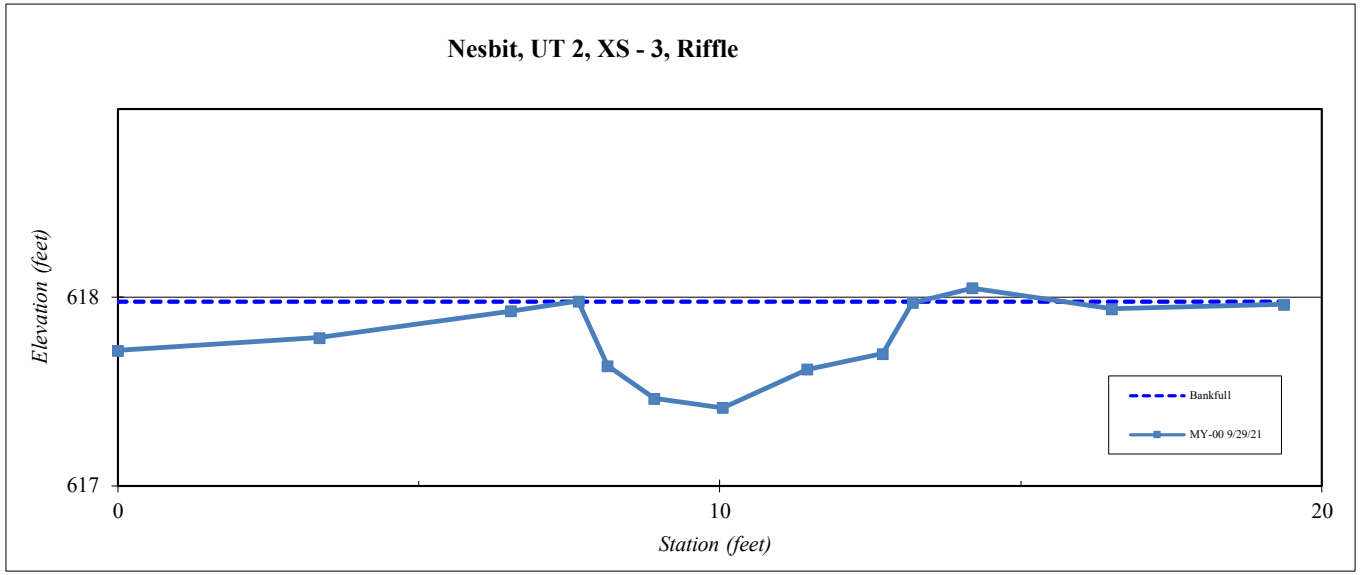


Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	UT 2, XS - 3, Riffle
Feature	Riffle
Date:	2/8/2022
Field Crew:	Perkinson

Station	Elevation
0.0	618.1
3.3	618.2
6.5	618.4
7.6	618.4
8.1	618.0
8.9	617.8
10.0	617.8
11.5	618.0
12.7	618.1
13.2	618.4
14.2	618.5
16.5	618.4
19.4	618.4

SUMMARY DATA	
Bankfull Elevation:	618.41
Bank Hieght Ratio:	1.00
Thalweg Elevation:	617.78
LTOB Elevation:	618.41
LTOB Max Depth:	0.64
LTOB Cross Sectional Area:	2.4

Stream Type	E/C 5

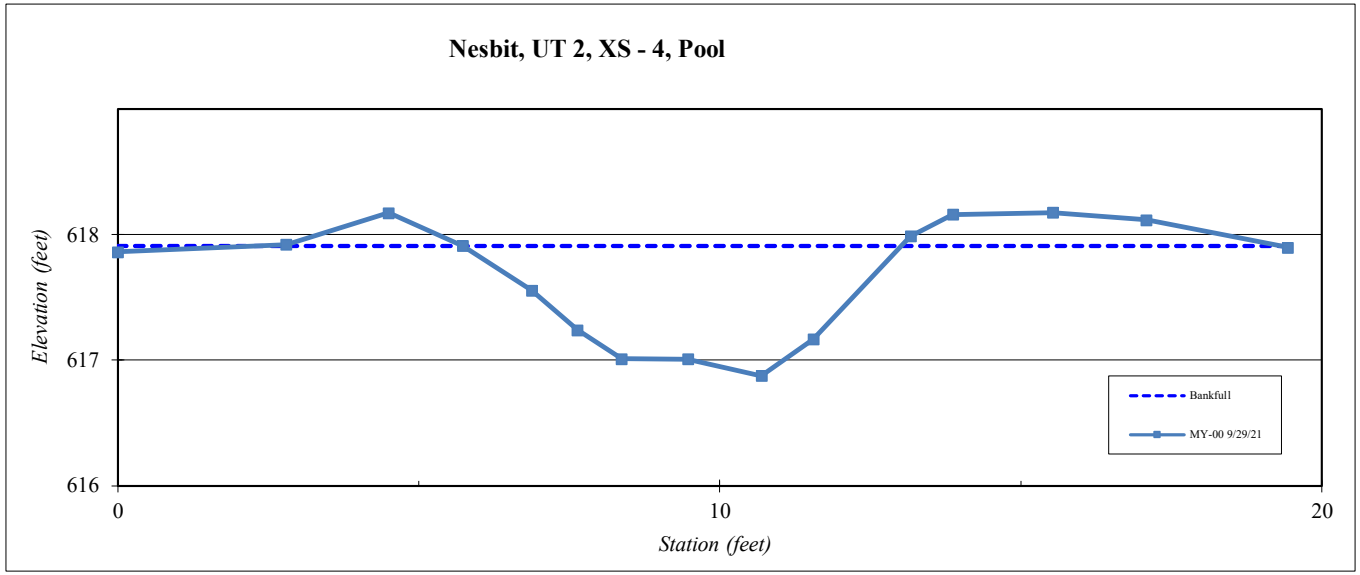


Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	UT 2, XS - 4, Pool
Feature	Pool
Date:	2/8/2022
Field Crew:	Perkinson

Station	Elevation
0.0	618.3
2.8	618.3
4.5	618.6
5.7	618.3
6.9	617.9
7.6	617.6
8.4	617.3
9.5	617.3
10.7	617.2
11.6	617.5
13.2	618.4
13.9	618.6
15.5	618.6
17.1	618.6
19.4	618.3

SUMMARY DATA	
Bankfull Elevation:	618.33
Bank Hieght Ratio:	1.00
Thalweg Elevation:	617.17
LTOB Elevation:	618.33
LTOB Max Depth:	1.17
LTOB Cross Sectional Area:	5.3

Stream Type	E/C 5

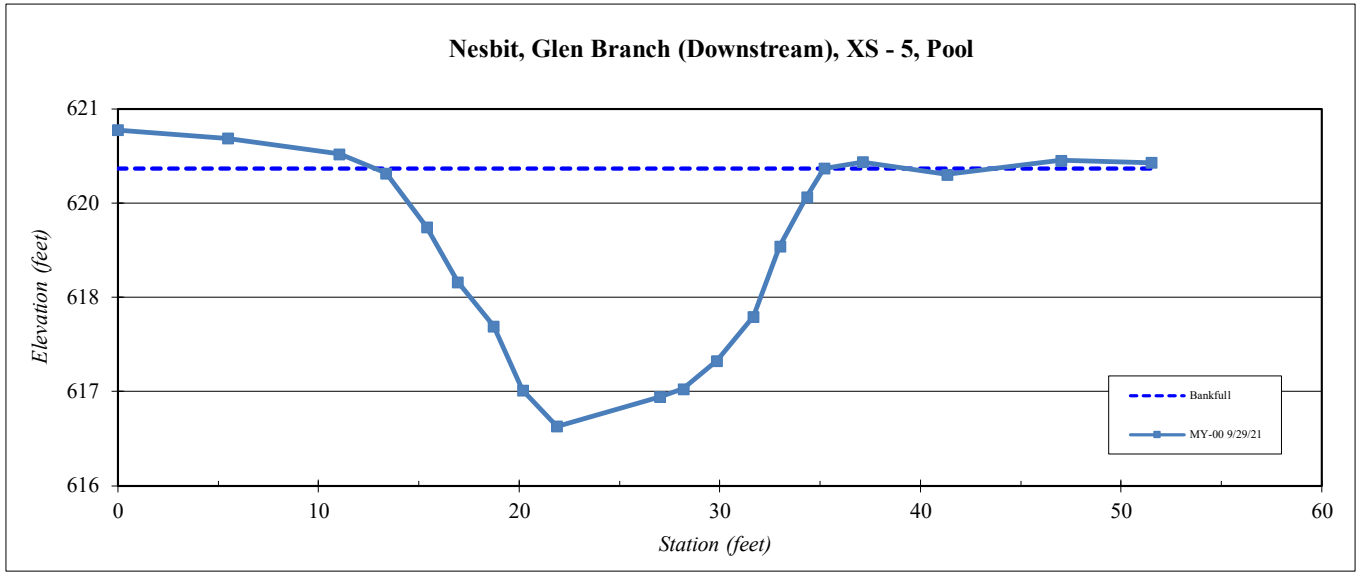


Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	Glen Br (Downstream), XS - 5, Pool
Feature	Pool
Date:	2/8/2022
Field Crew:	Perkinson

Station	Elevation
0.0	620.4
5.5	620.3
11.0	620.2
13.4	619.9
15.4	619.3
16.9	618.6
18.7	618.1
20.2	617.3
21.9	616.9
27.0	617.2
28.2	617.3
29.9	617.7
31.7	618.2
33.0	619.1
34.3	619.6
35.2	620.0
37.1	620.1
41.3	619.9
47.0	620.1
51.5	620.1

SUMMARY DATA	
Bankfull Elevation:	619.98
Bank Hieght Ratio:	1.00
Thalweg Elevation:	616.89
LTOB Elevation:	619.98
LTOB Max Depth:	3.09
LTOB Cross Sectional Area:	42.3

Stream Type	E/C 5

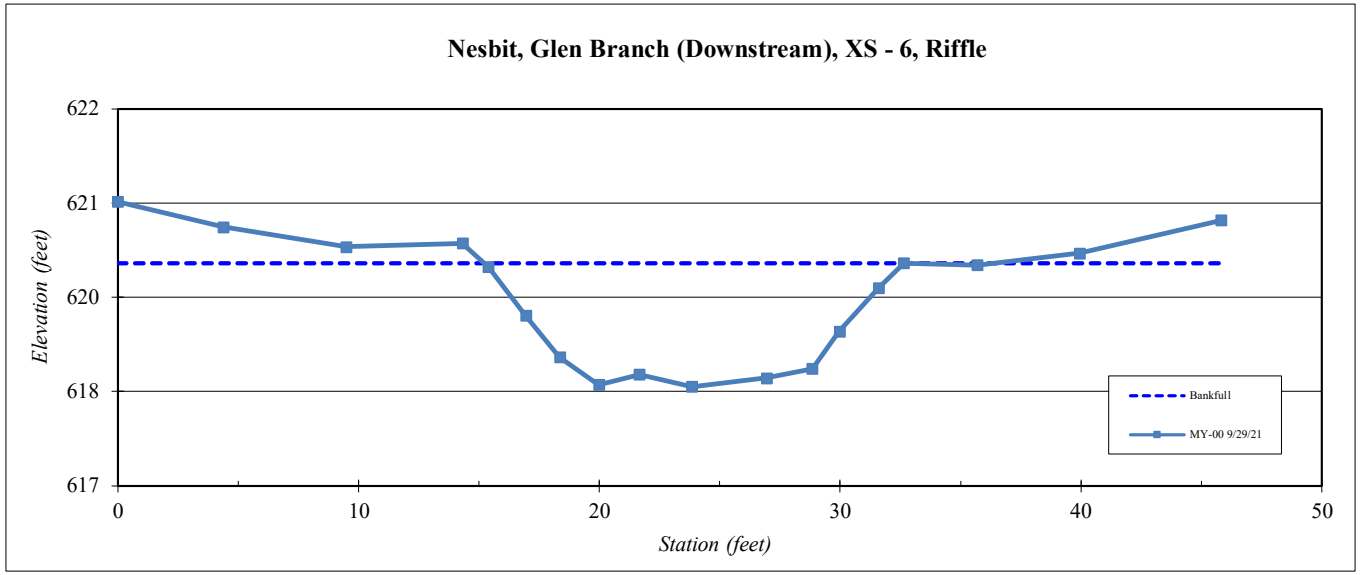


Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	Glen Br (Downstream), XS - 6, Riffle
Feature	Riffle
Date:	2/8/2022
Field Crew:	Perkinson

Station	Elevation
0.0	620.7
4.4	620.4
9.5	620.2
14.3	620.2
15.4	619.9
17.0	619.3
18.4	618.8
20.0	618.5
21.7	618.6
23.8	618.5
26.9	618.6
28.8	618.7
30.0	619.2
31.6	619.7
32.6	620.0
35.7	620.0
40.0	620.1
45.8	620.5

SUMMARY DATA	
Bankfull Elevation:	619.97
Bank Hieght Ratio:	1.00
Thalweg Elevation:	618.49
LTOB Elevation:	619.97
LTOB Max Depth:	1.48
LTOB Cross Sectional Area:	18.5

Stream Type	E/C 5

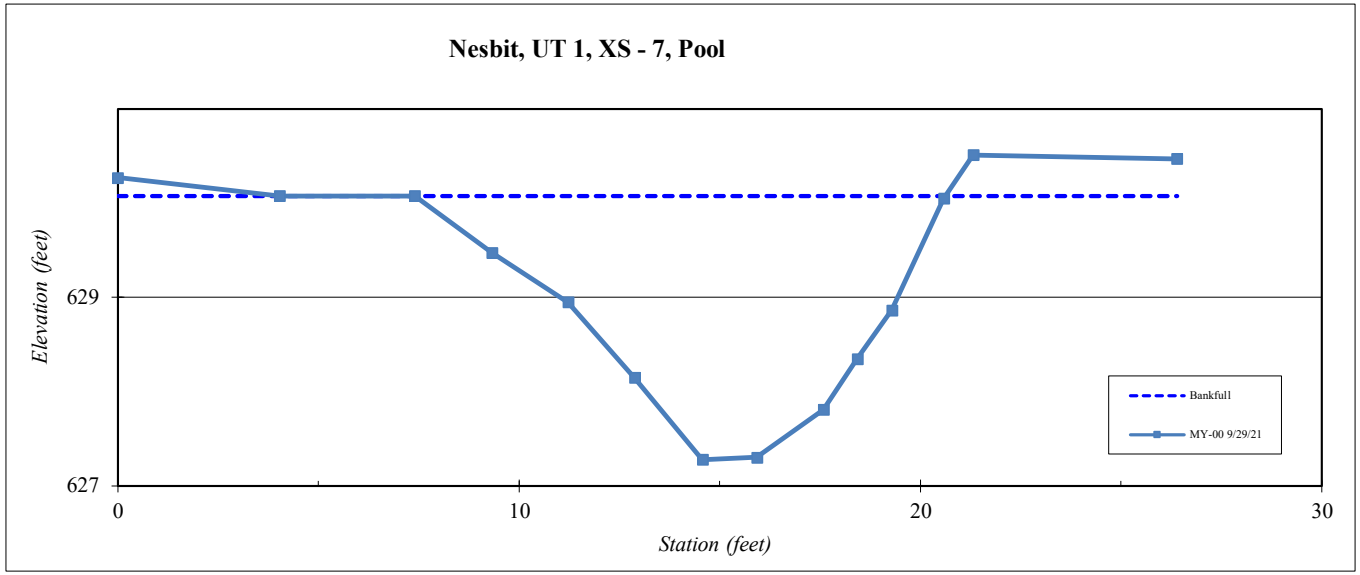


Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	UT 1, XS - 7, Pool
Feature	Pool
Date:	2/8/2022
Field Crew:	Perkinson

Station	Elevation
0.0	629.3
4.0	629.2
7.4	629.2
9.3	628.9
11.2	628.6
12.9	628.1
14.6	627.6
15.9	627.7
17.6	627.9
18.4	628.2
19.3	628.5
20.6	629.2
21.3	629.5
26.4	629.4

SUMMARY DATA	
Bankfull Elevation:	629.22
Bank Hieght Ratio:	1.00
Thalweg Elevation:	627.64
LTOB Elevation:	629.22
LTOB Max Depth:	1.58
LTOB Cross Sectional Area:	11.6

Stream Type	E/C 5

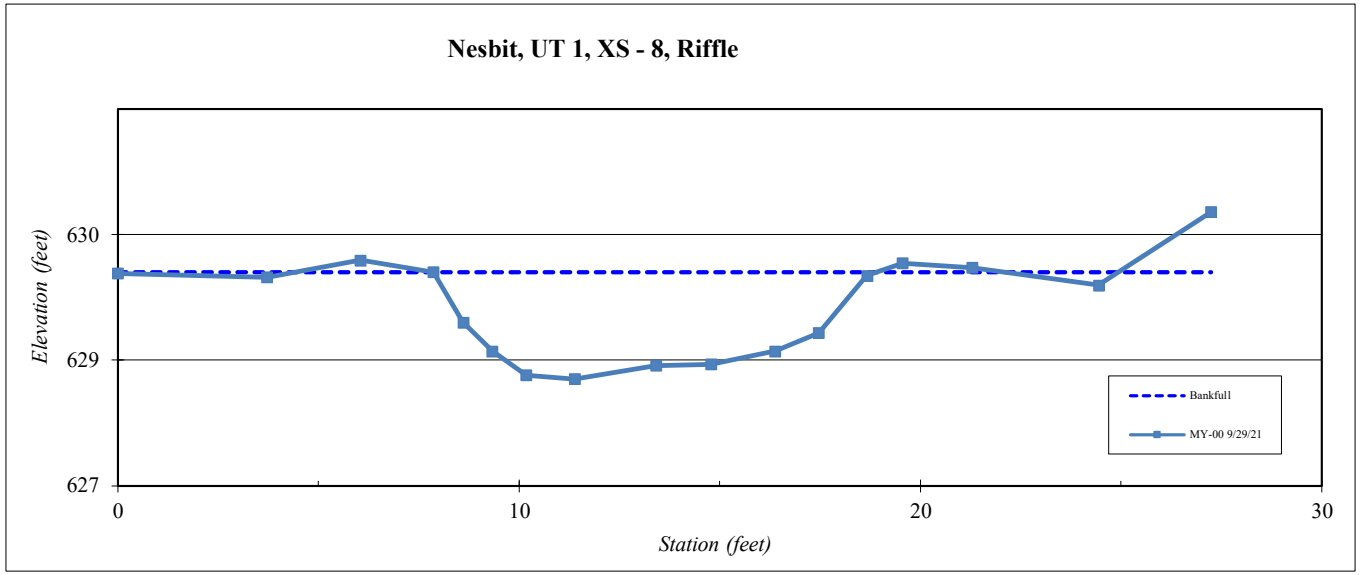


Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	UT 1, XS - 8, Riffle
Feature	Riffle
Date:	2/8/2022
Field Crew:	Perkinson

Station	Elevation
0.0	629.4
3.7	629.4
6.0	629.5
7.9	629.4
8.6	629.0
9.3	628.7
10.2	628.5
11.4	628.4
13.4	628.6
14.8	628.6
16.4	628.7
17.5	628.9
18.7	629.4
19.6	629.5
21.3	629.4
24.4	629.3
27.2	629.9

SUMMARY DATA	
Bankfull Elevation:	629.40
Bank Hieght Ratio:	1.00
Thalweg Elevation:	628.44
LTOB Elevation:	629.40
LTOB Max Depth:	0.96
LTOB Cross Sectional Area:	7.7

Stream Type	E/C 5

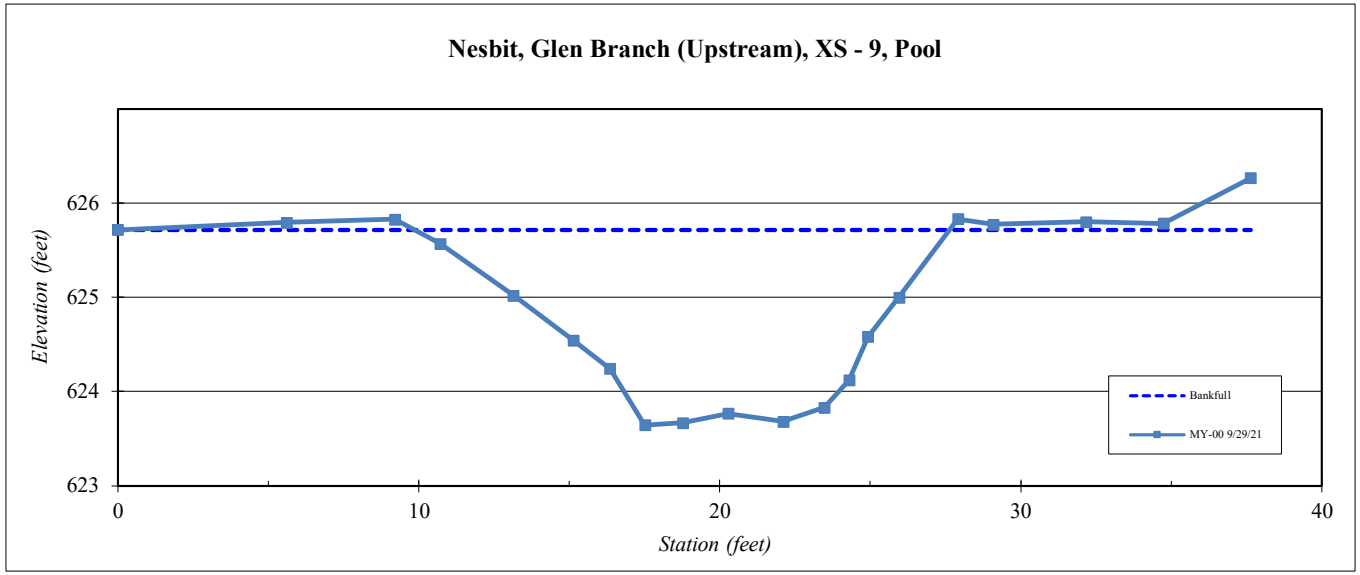


Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	Glen Br (Upstream), XS - 9, Pool
Feature	Pool
Date:	2/8/2022
Field Crew:	Perkinson

Station	Elevation
0.0	626.0
5.6	626.1
9.2	626.2
10.7	625.9
13.1	625.2
15.1	624.7
16.3	624.4
17.5	623.7
18.8	623.7
20.3	623.8
22.1	623.7
23.5	623.9
24.3	624.2
24.9	624.7
26.0	625.2
27.9	626.2
29.1	626.1
32.2	626.1
34.7	626.1
37.6	626.7

SUMMARY DATA	
Bankfull Elevation:	626.03
Bank Hieght Ratio:	1.03
Thalweg Elevation:	623.71
LTOB Elevation:	626.09
LTOB Max Depth:	2.38
LTOB Cross Sectional Area:	26.0

Stream Type	E/C 5

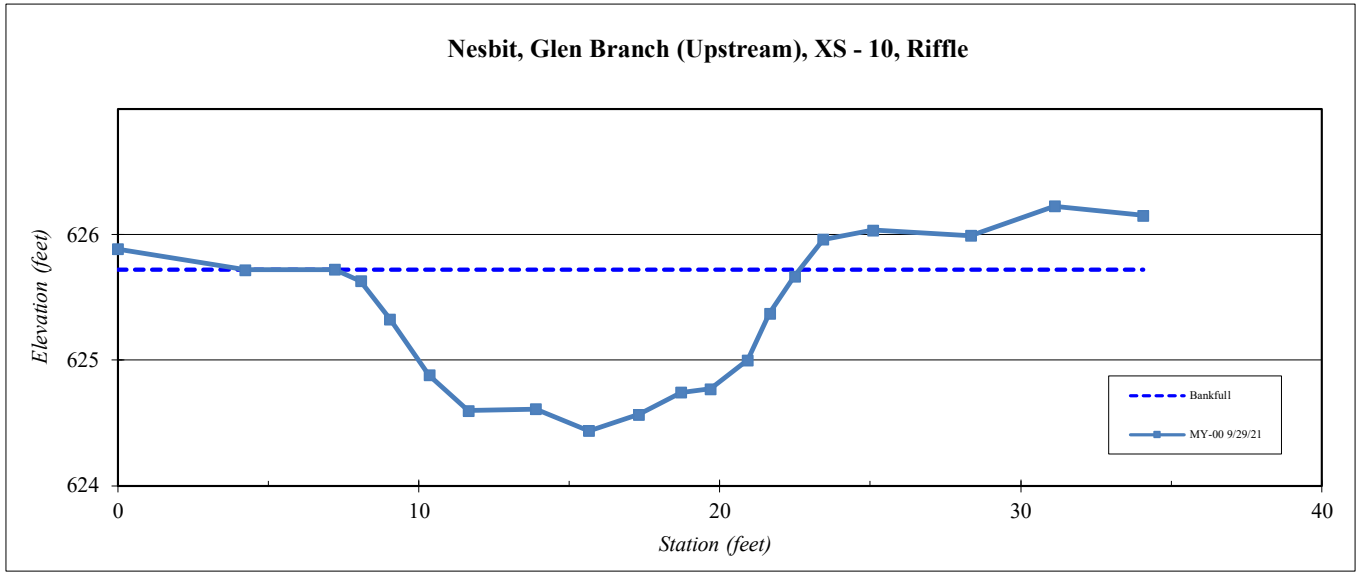


Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	Glen Br (Upstream), XS - 10, Riffle
Feature	Riffle
Date:	2/8/2022
Field Crew:	Perkinson

Station	Elevation
0.0	626.2
4.2	626.0
7.2	626.0
8.1	625.9
9.0	625.6
10.3	625.1
11.6	624.8
13.9	624.8
15.6	624.6
17.3	624.7
18.7	624.9
19.7	625.0
20.9	625.2
21.7	625.6
22.5	626.0
23.4	626.3
25.1	626.4
28.3	626.3
31.1	626.6
34.1	626.5

SUMMARY DATA	
Bankfull Elevation:	626.04
Bank Hieght Ratio:	1.00
Thalweg Elevation:	624.59
LTOB Elevation:	626.04
LTOB Max Depth:	1.45
LTOB Cross Sectional Area:	14.7

Stream Type	E/C 5

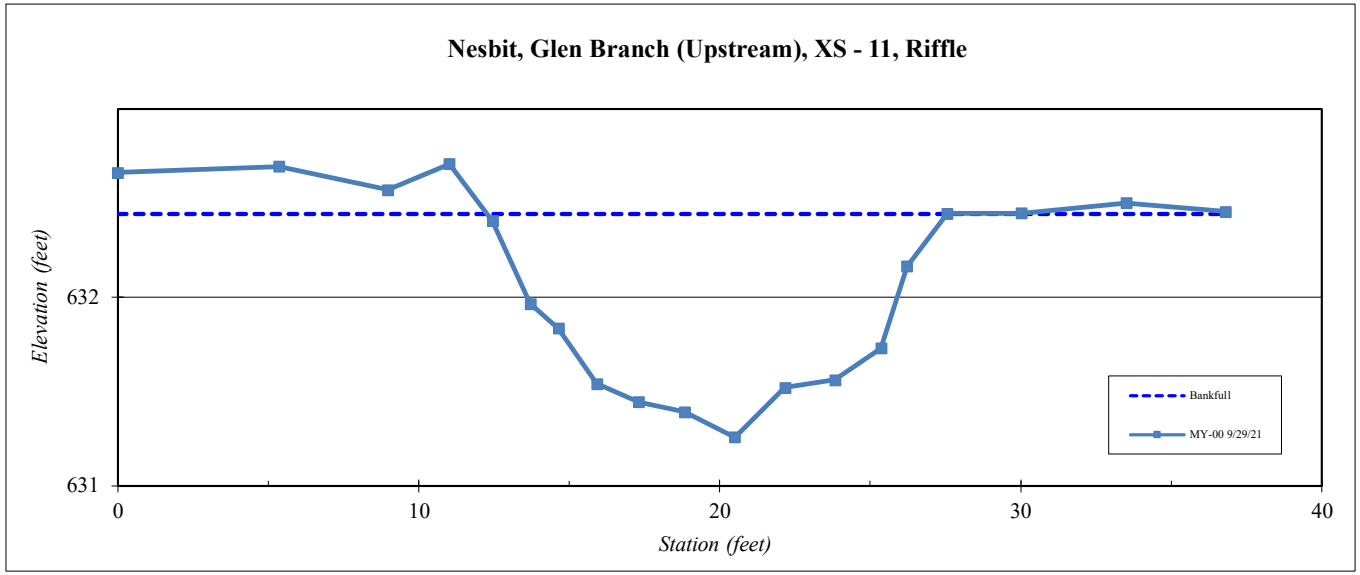


Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	Glen Br (Upstream), XS - 11, Riffle
Feature	Riffle
Date:	2/8/2022
Field Crew:	Perkinson

Station	Elevation
0.0	632.8
5.4	632.8
9.0	632.6
11.0	632.8
12.5	632.5
13.7	632.0
14.6	631.8
15.9	631.5
17.3	631.4
18.8	631.3
20.5	631.2
22.2	631.5
23.8	631.5
25.4	631.7
26.2	632.2
27.6	632.5
30.0	632.5
33.5	632.6
36.8	632.5

SUMMARY DATA	
Bankfull Elevation:	632.51
Bank Hieght Ratio:	1.00
Thalweg Elevation:	631.16
LTOB Elevation:	632.51
LTOB Max Depth:	1.34
LTOB Cross Sectional Area:	13.2

Stream Type	E/C 5

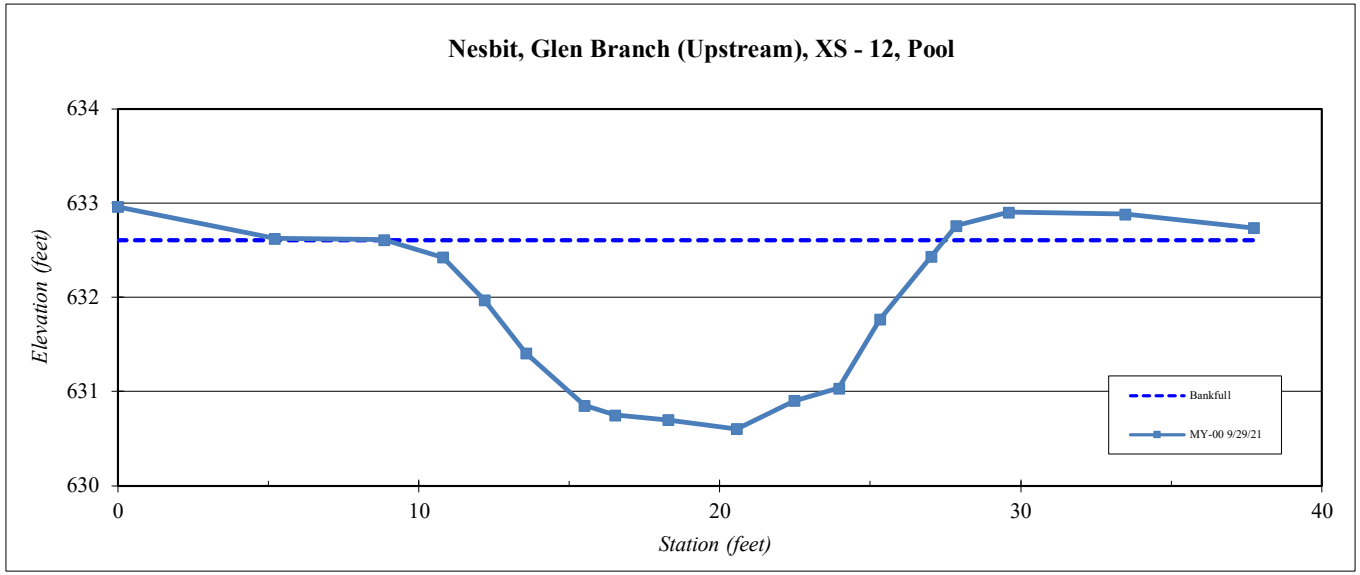


Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	Glen Br (Upstream), XS - 12, Pool
Feature	Pool
Date:	2/8/2022
Field Crew:	Perkinson

Station	Elevation
0.0	633.1
5.2	632.7
8.8	632.7
10.8	632.5
12.2	632.0
13.6	631.3
15.5	630.7
16.5	630.6
18.3	630.5
20.6	630.4
22.5	630.8
24.0	630.9
25.3	631.7
27.0	632.5
27.9	632.9
29.6	633.0
33.5	633.0
37.7	632.8

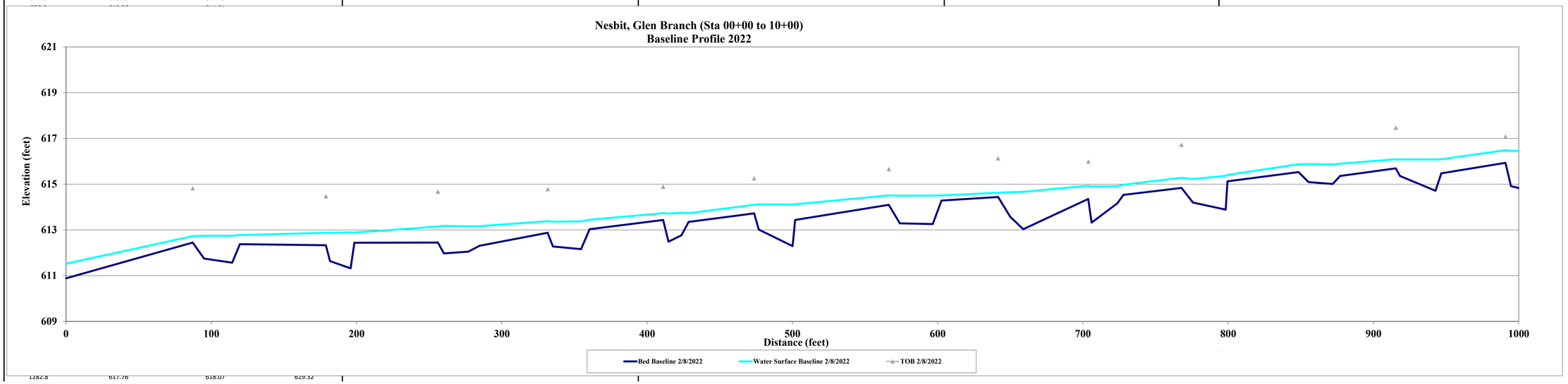
SUMMARY DATA	
Bankfull Elevation:	632.69
Bank Hieght Ratio:	1.00
Thalweg Elevation:	630.43
LTOB Elevation:	632.69
LTOB Max Depth:	2.27
LTOB Cross Sectional Area:	26.1

Stream Type	E/C 5



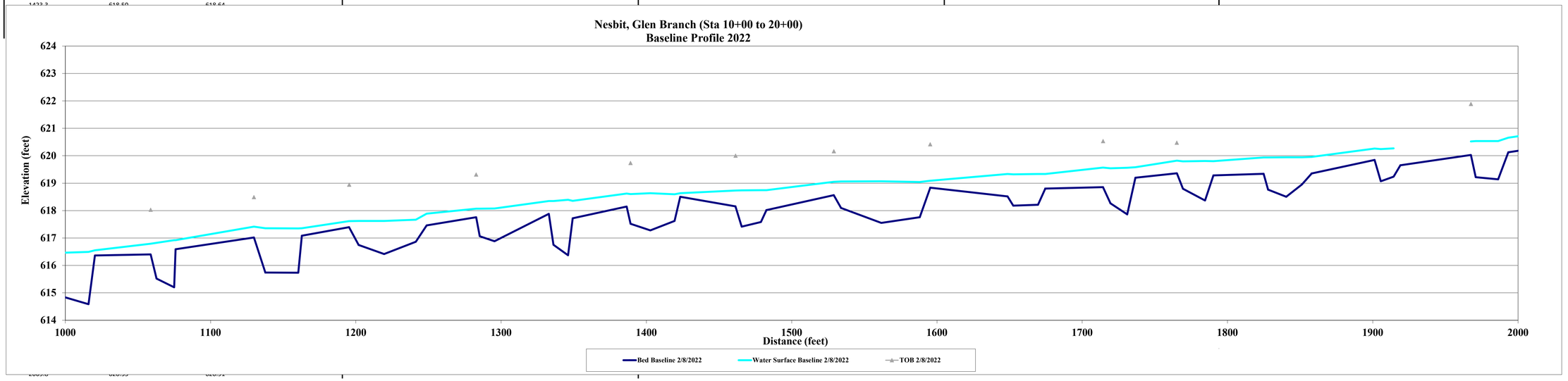
Project Name	Nesbit - Baseline (2022) Profile
Reach	Glen Branch (Sta 00+00 to 10+00)
Feature	Profile
Date	2/8/22
Crew	Perkinson

2022 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	610.89	611.52													
87.2	612.45	612.73	614.82												
95.0	611.75	612.75													
114.4	611.57	612.75													
119.6	612.38	612.78													
178.8	612.33	612.88	614.47												
181.7	611.64	612.87													
195.9	611.32	612.90													
198.5	612.44	612.88													
256.0	612.45	613.15	614.67												
260.2	611.97	613.18													
276.9	612.05	613.16													
284.7	612.31	613.17													
331.5	612.88	613.38	614.78												
335.1	612.28	613.36													
354.6	612.16	613.38													
360.4	613.03	613.45													
411.0	613.44	613.73	614.89												
414.7	612.49	613.72													
423.7	612.77	613.75													
428.5	613.35	613.73													
473.6	613.73	614.10	615.26												
476.9	613.02	614.12													
500.1	612.29	614.12													
501.9	613.43	614.12													
566.4	614.10	614.51	615.66												
574.0	613.29	614.49													
1282.8	617.76	618.07	619.32												



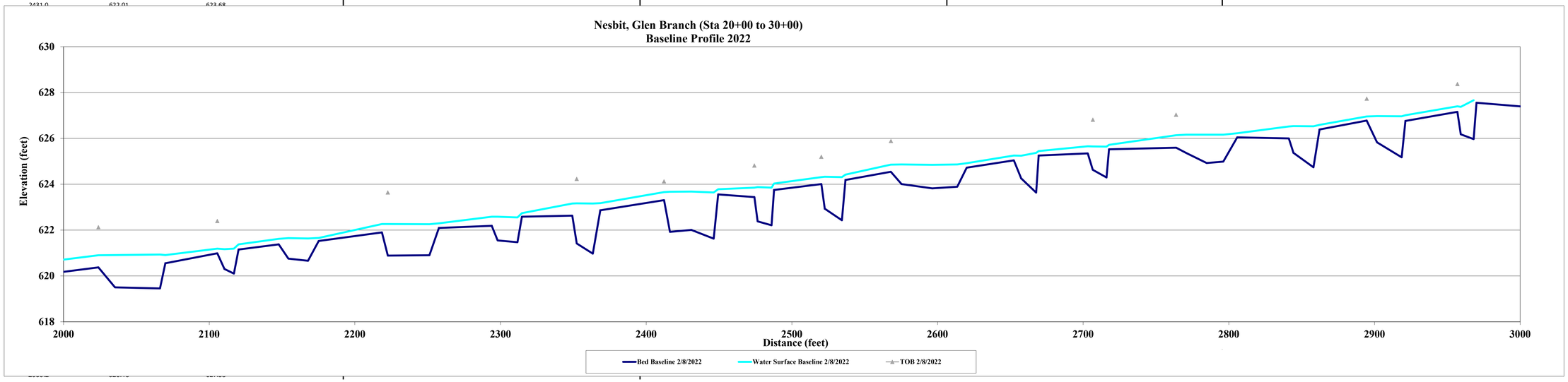
Project Name	Nesbit - Baseline (2022) Profile
Reach	Glen Branch (Sta 10+00 to 20+00)
Feature	Profile
Date	2/8/22
Crew	Perkinson

2022 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**
994.7	614.92	616.46													
1015.9	614.59	616.49													
1020.4	616.36	616.55													
1058.7	616.40	616.79	618.03												
1062.8	615.52	616.82													
1074.9	615.20	616.92													
1075.9	616.59	616.92													
1129.8	617.02	617.42	618.49												
1137.7	615.74	617.36													
1160.4	615.73	617.35													
1162.8	617.08	617.36													
1195.3	617.40	617.62	618.95												
1201.9	616.74	617.62													
1219.5	616.41	617.62													
1241.3	616.87	617.67													
1248.7	617.46	617.89													
1282.8	617.76	618.07	619.32												
1285.3	617.07	618.07													
1295.5	616.88	618.07													
1332.8	617.88	618.35													
1336.1	616.75	618.35													
1346.0	616.37	618.39													
1349.3	617.72	618.36													
1386.4	618.15	618.62													
1389.1	617.52	618.60	619.74												
1402.7	617.28	618.64													
1419.3	617.62	618.60													
1433.3	618.59	618.64													



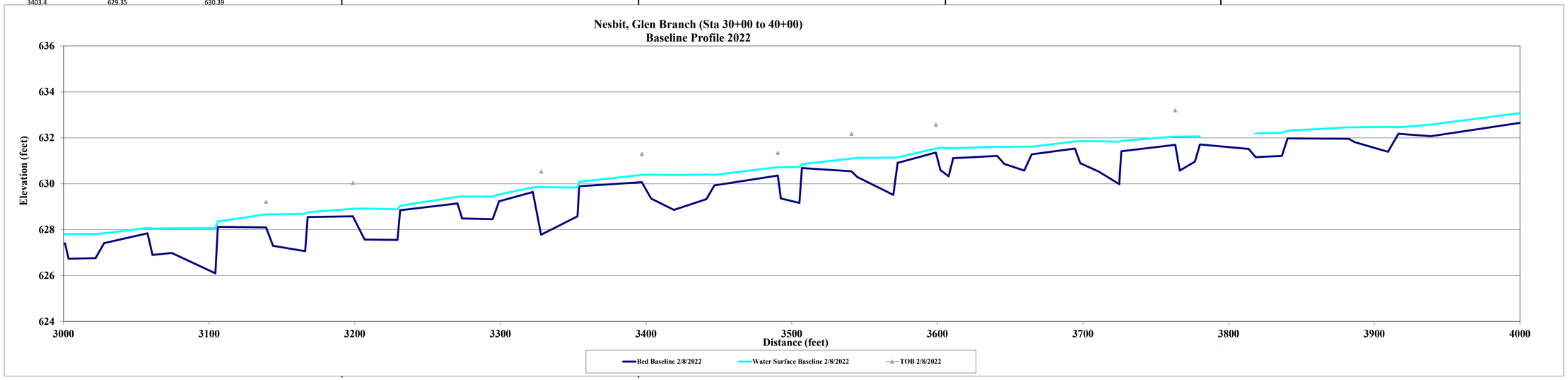
Project Name	Nesbit - Baseline (2022) Profile
Reach	Glen Branch (Sta 20+00 to 30+00)
Feature	Profile
Date	2/8/22
Crew	Perkinson

2022 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**
1993.3	620.13	620.66													
2023.9	620.37	620.90	622.13												
2035.3	619.50	620.91													
2066.2	619.46	620.94													
2069.8	620.55	620.91													
2105.5	620.99	621.19	622.40												
2110.5	620.30	621.17													
2117.0	620.10	621.19													
2120.1	621.15	621.38													
2147.7	621.38	621.62													
2154.4	620.75	621.65													
2167.9	620.66	621.63													
2175.2	621.52	621.66													
2218.6	621.90	622.26													
2222.6	620.88	622.26	623.65												
2251.2	620.90	622.26													
2257.7	622.10	622.30													
2294.0	622.19	622.58													
2298.1	621.55	622.58													
2311.6	621.47	622.55													
2314.7	622.58	622.74													
2349.2	622.63	623.16													
2352.3	621.42	623.17	624.24												
2363.4	620.97	623.16													
2368.5	622.87	623.18													
2412.2	623.31	623.66	624.12												
2416.4	621.93	623.67													
2431.0	623.01	623.68													



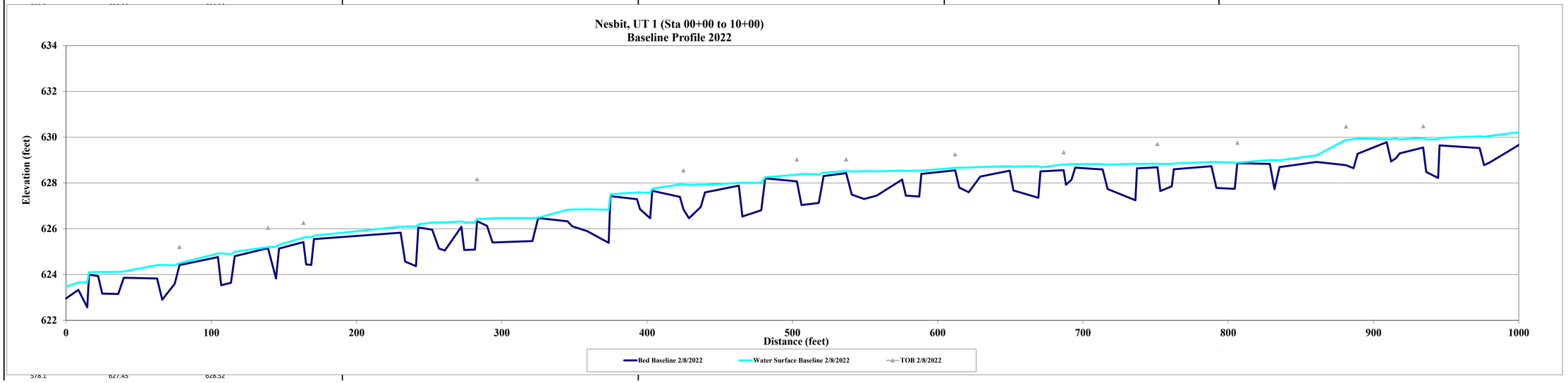
Project Name	Nesbit - Baseline (2022) Profile
Reach	Glen Branch (Sta 30+00 to 40+00)
Feature	Profile
Date	2/8/22
Crew	Perkinson

2022 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**
2970.0	627.56														
3000.9	627.39	627.80													
3003.5	626.74	627.81													
3022.0	626.76	627.81													
3027.9	627.41	627.84													
3057.6	627.84	628.07													
3061.0	626.90	628.05													
3074.3	626.98	628.06													
3104.3	626.10	628.07													
3106.0	628.12	628.35													
3139.1	628.10	628.66	629.22												
3143.8	627.29	628.66													
3165.9	627.06	628.69													
3167.6	628.55	628.76													
3198.6	628.58	628.90	630.05												
3206.8	627.57	628.92													
3229.3	627.55	628.88													
3231.1	628.84	629.04													
3270.4	629.14	629.43													
3273.7	628.48	629.44													
3294.6	628.46	629.44													
3299.1	629.23	629.53													
3322.2	629.64	629.84													
3327.9	627.78	629.85	630.54												
3352.9	628.58	629.83													
3354.1	629.89	630.08													
3397.0	630.07	630.39	631.30												
3403.4	629.35	630.39													



Project Name	Nesbit - Baseline (2022) Profile
Reach	UT 1 (Sta 00+00 to 10+00)
Feature	Profile
Date	2/8/22
Crew	Perkinson

2022 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	622.96	623.47													
8.5	623.33	623.65													
14.6	622.57	623.67													
15.9	624.00	624.10													
22.1	623.93	624.12													
24.9	623.17	624.11													
36.0	623.16	624.12													
39.7	623.86	624.13													
62.7	623.83	624.42													
66.2	622.90	624.42													
74.8	623.60	624.40													
78.1	624.41	624.50	625.21												
104.6	624.76	624.92													
106.7	623.54	624.92													
113.6	623.64	624.89													
116.1	624.80	625.00													
139.0	625.16	625.20	626.05												
144.6	623.83	625.21													
146.6	625.14	625.30													
163.4	625.42	625.61	626.26												
165.3	624.45	625.64													
168.8	624.42	625.62													
170.6	625.55	625.70													
230.3	625.83	626.10													
233.4	624.57	626.09													
240.9	624.36	626.10													
242.5	626.06	626.20													
578.1	627.45	628.32													



Project Name	Nesbit - Baseline (2022) Profile
Reach	UT 2 (Sta 00+00 to 02+00)
Feature	Profile
Date	2/8/22
Crew	Perkinson

2022 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	616.01	616.45													
21.7	616.39	616.53													
23.9	615.65	616.51													
31.6	615.20	616.50													
32.6	616.74	616.79													
47.4	616.83	616.93													
49.9	616.21	616.92													
53.7	616.35	616.90													
54.5	617.07	617.11													
72.4	616.99	617.31	617.83												
74.6	616.01	617.33													
82.0	616.27	617.29													
82.8	617.53	617.58													
98.5	617.69	617.76													
100.3	616.78	617.75													
107.5	616.74	617.74													
108.6	617.81	618.00													
120.7	617.90	618.11	618.32												
122.4	617.58	618.13													
125.6	617.45	618.09													
127.3	618.01	618.11	618.45												
137.6	618.09	618.10													
138.7	617.21	618.10													
142.9	617.28	618.11													
145.2	617.73	618.11													
157.4	618.09	618.24													
188.4	617.98	618.27													

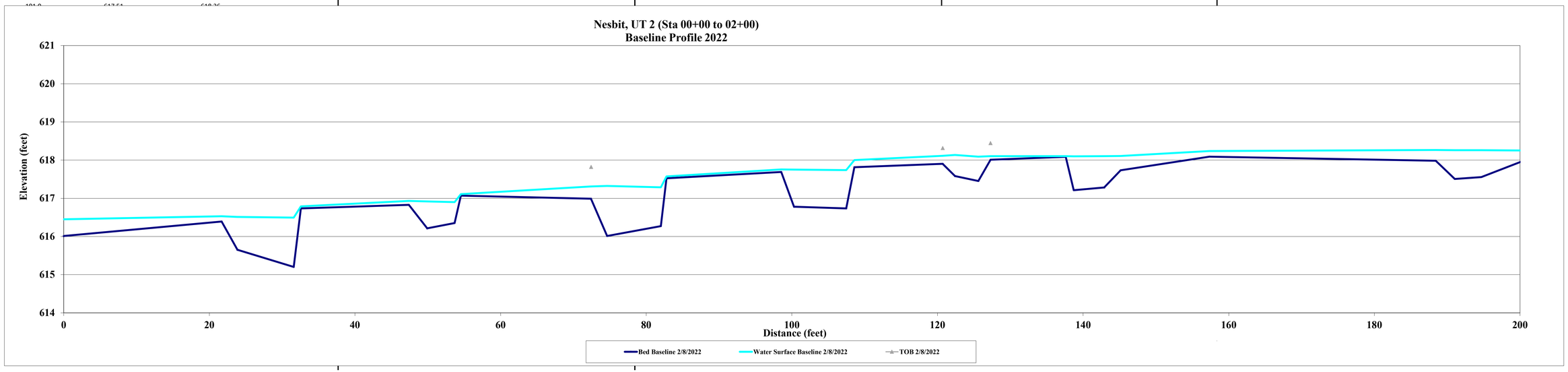


Table 9A. Baseline Stream Data Summary Nesbit - Glen Branch (Upstream)										
Parameter	**Pre-Existing Condition (applicaple)**					**Design**		**Monitoring Baseline (MY0)**		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	11.0		15.1	26	7	14.2	16.3	15.2	15.4	2
Floodprone Width (ft)	16		50	100	7	50	100	75	75	2
Bankfull Mean Depth (ft)	0.6		1.1	1.5	7	1	1.2	0.9	1.0	2
Bankfull Max Depth (ft)	1.3		2	2.2	7	1.3	1.8	1.3	1.4	2
Bankfull Cross Sectional Area (ft^2)	16.7		16.7	16.7	7	16.7	16.7	13.1	14.7	2
Width/Depth Ratio	7.3		13.7	43.3	7	12	16	16.2	17.8	2
Entrenchment Ratio	1.4		2.8	6.5	7	3.5	6.1	4.9	4.9	2
Bank Height Ratio	**1**		**1.8**	**2.2**	**7**	**1**	**1.3**	1	1	**2**
Max part size (mm) mobilized at bankfull										
Rosgen Classification	Cg 4					Ce 3/4		Ce 3/4		
Bankfull Discharge (cfs)	68.7					68.7		68.7		
Sinuosity (ft)	1.03					1.15		1.15		
Water Surface Slope (Channel) (ft/ft)	0..75					0.0067		0.006		
Other										

Table 9B. Baseline Stream Data Summary Nesbit - Glen Branch (Downstream)										
Parameter	**Pre-Existing Condition (applicaple)**					**Design**		**Monitoring Baseline (MY0)**		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	11.2		15.7	18.2	7	16.7	19.3	17.4	18.0	2
Floodprone Width (ft)	25		100	100	7	50	150	100	100	2
Bankfull Mean Depth (ft)	1.3		1.5	2.1	7	1.4	1.4	1.1	1.3	2
Bankfull Max Depth (ft)	1.6		2.4	2.8	7	1.5	2.1	1.5	1.9	2
Bankfull Cross Sectional Area (ft^2)	23.2		23.2	23.2	7	23.2	23.2	18.4	22.8	2
Width/Depth Ratio	5.3		10.5	14	7	12	16	14.1	16.4	2
Entrenchment Ratio	1.4		5.9	8.9	7	3	7.8	5.6	5.8	2
Bank Height Ratio	**1.3**		**1.7**	**2.1**	**7**	**1**	**1.3**	1	1	**2**
Max part size (mm) mobilized at bankfull										
Rosgen Classification	Eg 4					Ce 3/4		Ce 3/4		
Bankfull Discharge (cfs)	97.3					97.3		97.3		
Sinuosity (ft)	1.03					1.15		1.15		
Water Surface Slope (Channel) (ft/ft)	0.0047					0.0042		0.0046		
Other										

Table 9C. Baseline Stream Data Summary Nesbit - UT 1										
Parameter	**Pre-Existing Condition (applicaple)**					**Design**		**Monitoring Baseline (MY0)**		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	7.1		8.7	9.5	5	10	11.6	11.0	11.0	1
Floodprone Width (ft)	20		29	50	5	50	100	75.0	75.0	1
Bankfull Mean Depth (ft)	0.9		1	1.2	5	0.7	0.8	0.7	0.7	1
Bankfull Max Depth (ft)	0.9		1	1.3	5	0.9	1.3	1.0	1.0	1
Bankfull Cross Sectional Area (ft^2)	8.4		8.4	8.4	5	8.4	8.4	7.6	7.6	1
Width/Depth Ratio	5.9		8.7	10.6	5	12	16	15.9	15.9	1
Entrenchment Ratio	2.5		3.2	7	5	5	8.6	6.8	6.8	1
Bank Height Ratio	**1.4**		**1.7**	**1.8**	**5**	**1**	**1.3**	1.0	1.0	**1**
Max part size (mm) mobilized at bankfull										
Rosgen Classification	Eg 4					Ce 3/4		Ce 3/4		
Bankfull Discharge (cfs)	32.9					32.9		32.9		
Sinuosity (ft)	1.06					1.15		1.15		
Water Surface Slope (Channel) (ft/ft)	0.0081					0.0075		0.0069		
Other										

Table 9D. Baseline Stream Data Summary Nesbit - 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)	3.4		4.7	7.9	3	6.2	7.2	5.6	5.6	1
Floodprone Width (ft)	7		30	50	3	25	75	100.0	100.0	1
Bankfull Mean Depth (ft)	0.4		0.7	0.9	3	0.4	0.5	0.4	0.4	1
Bankfull Max Depth (ft)	0.6		1.1	1.5	3	0.6	0.8	0.6	0.6	1
Bankfull Cross Sectional Area (ft^2)	3.2		3.2	3.2	3	3.2	3.2	2.4	2.4	1
Width/Depth Ratio	3.8		6.7	19.8	3	12	16	13.1	13.1	1
Entrenchment Ratio	1.5		3.8	14.7	3	4	10.5	17.8	17.8	1
Bank Height Ratio	**1.6**		**2.5**	**8.7**	**3**	**1**	**1.3**	1.0	1.0	**1**
Max part size (mm) mobilized at bankfull										
Rosgen Classification	Eg 6					Ce 3/4		Ce 3/4		
Bankfull Discharge (cfs)	11.8					11.8		11.8		
Sinuosity (ft)	1.03					1.15		1.15		
Water Surface Slope (Channel) (ft/ft)	0.0143					0.0128		0.0089		
Other										

Table 10A. Monitoring Data - Cross Section Morphology Monitoring Summary

(Nesbit/ DMS:100121) Glen Branch Upstream

	Glen Br (Upstream) - Cross Section 1 (Riffle)							Glen Br (Upstream) - Cross Section 2 (Pool)							Glen Br (Upstream) - Cross Section 5 (Pool)							Glen Br (Upstream) - Cross Section 6 (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+								
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	614.79							615.07							619.98							619.97														
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00							1.00							1.00							1.00														
Thalweg Elevation	612.90							612.46							616.89							618.49														
LTOB[2] Elevation	614.79							615.07							619.98							619.97														
LTOB[2] Max Depth (ft)	1.88							2.61							3.09							1.48														
LTOB[2] Cross Sectional Area (ft^2)	22.9							33.2							42.3							18.5														
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area																																				
Bank Height Ratio_Based on AB Bankfull[1] Area																																				
Thalweg Elevation																																				
LTOB[2] Elevation																																				
LTOB[2] Max Depth (ft)																																				
LTOB[2] Cross Sectional Area (ft^2)																																				
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area																																				
Bank Height Ratio_Based on AB Bankfull[1] Area																																				
Thalweg Elevation																																				
LTOB[2] Elevation																																				
LTOB[2] Max Depth (ft)																																				
LTOB[2] Cross Sectional Area (ft^2)																																				

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 bankful 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

(Nesbit/ DMS:100121) Glen Branch Downstream

	Glen Br (Downstream) - Cross Section 9 (Pool)							Glen Br (Downstream) - Cross Section 10 (Riffle)							Glen Br (Downstream) - Cross Section 11 (Riffle)							Glen Br (Downstream) - Cross Section 12 (Pool)														
	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	626.03							626.04							632.51							632.69														
Bank Height Ratio_Based on AB Bankfull[1] Area	1.03							1.00							1.00							1.00														
Thalweg Elevation	623.71							624.59							631.16							630.43														
LTOB[2] Elevation	626.09							626.04				`			632.51							632.69														
LTOB[2] Max Depth (ft)	2.38							1.45							1.34							2.27														
LTOB[2] Cross Sectional Area (ft^2)	26.0							14.7							13.2							26.11														
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area																																				
Bank Height Ratio_Based on AB Bankfull[1] Area																																				
Thalweg Elevation																																				
LTOB[2] Elevation																																				
LTOB[2] Max Depth (ft)																																				
LTOB[2] Cross Sectional Area (ft^2)																																				
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area																																				
Bank Height Ratio_Based on AB Bankfull[1] Area																																				
Thalweg Elevation																																				
LTOB[2] Elevation																																				
LTOB[2] Max Depth (ft)																																				
LTOB[2] Cross Sectional Area (ft^2)																																				

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 bankful 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 10C. Monitoring Data - Cross Section Morphology Monitoring Summary

(Nesbit/ DMS:100121) UT 1 and UT 2

	UT 1 - Cross Section 7 (Pool)							UT 1 - Cross Section 8 (Riffle)							UT 2 - Cross Section 3 (Riffle)							UT 2 - Cross Section 4 (Pool)						
	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	629.22							629.40							618.41							618.33						
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00							1.00							1.00							1.00						
Thalweg Elevation	627.64							628.44							617.78							617.17						
LTOB[2] Elevation	629.22							629.40				`			618.41							618.33						
LTOB[2] Max Depth (ft)	1.58							0.96							0.64							1.17						
LTOB[2] Cross Sectional Area (ft^2)	11.6							7.7							2.4							5.3						
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area																													
Bank Height Ratio_Based on AB Bankfull[1] Area																													
Thalweg Elevation																													
LTOB[2] Elevation																													
LTOB[2] Max Depth (ft)																													
LTOB[2] Cross Sectional Area (ft^2)																													
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area																													
Bank Height Ratio_Based on AB Bankfull[1] Area																													
Thalweg Elevation																													
LTOB[2] Elevation																													
LTOB[2] Max Depth (ft)																													
LTOB[2] Cross Sectional Area (ft^2)																													

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:

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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

Axiom Environmental, Inc.

SOIL BORING LOG

Date: 2/8/2022

Project/Site: Nesbit

County, State: Union County, NC

Sampling Point/
Coordinates: **Soil Profile - Groundwater Gauge 1 (34.890737, -80.657679)**

Investigator: W. Grant Lewis

Soil Series: Wehadkee varient (mapped as Secrest Cid Complex)

Notes:

	Matrix		Mottling				
Depth (inches)	**Color**	**%**	**Color**	**%**	**Type**	**Location**	**Texture**
0-4	10 YR 5/2	100					silty clay
4-16	10 YR 7/1	75	10 YR 6/6	20	C	M	sandy clay
			10 YR 5/8	5	C	M	
16-20	10 YR 6/1	85	10 YR 6/6	10	C	M	clay
			10 YR 4/6	5	C	PL	
20+	Gley 6/1	80	10 YR 5/6	10	C	M	clay
			10 YR 6/4	10	C	M	

Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. Locaction: PL=Pore Lining, M=Matrix.

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

Axiom Environmental, Inc.

SOIL BORING LOG

Date: 2/8/2022

Project/Site: Nesbit

County, State: Union County, NC

Sampling Point/
Coordinates: **Soil Profile - Groundwater Gauge 2 (34.891545, -80.656266)**

Investigator: W. Grant Lewis

Soil Series: Wehadkee varient (mapped as Secrest Cid Complex)

Notes:

	Matrix		Mottling				
Depth (inches)	**Color**	**%**	**Color**	**%**	**Type**	**Location**	**Texture**
0-3	10 YR 5/2	95	10 YR 5/6	5	C	M	silty clay
3-12	10 YR 6/2	85	10 YR 5/6	10	C	M	clay
			10 YR 5/8	5	C	M	
12-18	10 YR 6/1	95	10 YR 5/6	5	C	PL	clay
18-22	10 YR 6/2	90	10 YR 7/6	10	C	M	clay
22+	10 YR 6/1	80	10 YR 6/6	20	C	M	clay

Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. Locaction: PL=Pore Lining, M=Matrix.

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

Axiom Environmental, Inc.

SOIL BORING LOG

Date: 2/8/2022

Project/Site: Nesbit

County, State: Union County, NC

Sampling Point/
Coordinates: **Soil Profile - Groundwater Gauge 3 (34.891814, -80.656475)**

Investigator: W. Grant Lewis

Soil Series: Wehadkee varient (mapped as Secrest Cid Complex)

Notes:

	Matrix		Mottling				
Depth (inches)	**Color**	**%**	**Color**	**%**	**Type**	**Location**	**Texture**
0-4	10 YR 4/2	100					silty clay
4-8	10 YR 5/2	95	10 YR 5/6	5	C	M	silty clay
8-12	10 YR 6/1	90	10 YR 5/6	10	C	M	clay
12-20	10 YR 6/1	70	10 YR 5/6	20	C	M	clay
			10 YR 6/4	10	C	M	
20+	10 YR 6/2	70	10 YR 5/6	30	C	M	sandy clay

Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. Locaction: PL=Pore Lining, M=Matrix.

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

Axiom Environmental, Inc.

SOIL BORING LOG

Date: 2/8/2022

Project/Site: Nesbit

County, State: Union County, NC

Sampling Point/
Coordinates: **Soil Profile - Groundwater Gauge 4 (34.892395, -80.654796)**

Investigator: W. Grant Lewis

Soil Series: Wehadkee varient (mapped as Secrest Cid Complex)

Notes:

	Matrix		Mottling				
Depth (inches)	**Color**	**%**	**Color**	**%**	**Type**	**Location**	**Texture**
0-5	10 YR 4/3	100					clay loam
5-11	10 YR 6/2	80	10 YR 5/6	20	C	M	clay loam
11-20	10 YR 6/2	80	10 YR 5/6	15	C	M	clay
			10 YR 5/8	5	C	M	
20+	10 YR 5/1	80	10 YR 4/3	20	C	M	clay

Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. Locaction: PL=Pore Lining, M=Matrix.

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

Axiom Environmental, Inc.

SOIL BORING LOG

Date: 2/8/2022

Project/Site: Nesbit

County, State: Union County, NC

Sampling Point/
Coordinates: **Soil Profile - Groundwater Gauge 5 (34.893161, -80.654477)**

Investigator: W. Grant Lewis

Soil Series: Wehadkee varient (mapped as Secrest Cid Complex)

Notes:

	Matrix		Mottling				
Depth (inches)	**Color**	**%**	**Color**	**%**	**Type**	**Location**	**Texture**
0-10	10 YR 6/2	70	10 YR 6/4	20	C	M	silty clay
			10 YR 4/4	10	C	PL	
10-20	10 YR 6/1	80	10 YR 4/3	15	C	M	clay
			10 YR 4/6	5	C	M	
20+	10 YR 7/1	90	10 YR 7/4	10	C	M	sandy clay

Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. Locaction: PL=Pore Lining, M=Matrix.

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Number: 1233

Signature: W Grant Lewis

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Axiom Environmental, Inc.

SOIL BORING LOG

Date: 2/8/2022

Project/Site: Nesbit

County, State: Union County, NC

Sampling Point/
Coordinates: **Soil Profile - Groundwater Gauge 6 (34.894454, -80.653669)**

Investigator: W. Grant Lewis

Soil Series: Wehadkee varient (mapped as Secrest Cid Complex)

Notes:

	Matrix		Mottling				
Depth (inches)	**Color**	**%**	**Color**	**%**	**Type**	**Location**	**Texture**
0-1	10 YR 6/4	100					silty clay
1-8	10 YR 6/2	95	10 YR 5/6	5	C	PL	silty clay
8-12	10 YR 6/3	80	10 YR 6/6	20	C	M	clay
12+	10 YR 6/2	90	10 YR 5/6	10	C	PL	clay

Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. Locaction: PL=Pore Lining, M=Matrix.

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

Axiom Environmental, Inc.

SOIL BORING LOG

Date: 2/8/2022

Project/Site: Nesbit

County, State: Union County, NC

Sampling Point/
Coordinates: **Soil Profile - Groundwater Gauge 7 (34.895188, -80.653881)**

Investigator: W. Grant Lewis

Soil Series: Wehadkee varient (mapped as Secrest Cid Complex)

Notes:

	Matrix		Mottling				
Depth (inches)	**Color**	**%**	**Color**	**%**	**Type**	**Location**	**Texture**
0-7	10 YR 5/3	90	10 YR 4/4	10	C	M	silty clay
7-15	10 YR 6/2	85	10 YR 6/4	10	C	M	clay
			10 YR 3/6	5	C	M	
15+	10 YR 7/1	90	10 YR 5/8	10	C	M	clay

Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. Locaction: PL=Pore Lining, M=Matrix.

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Number: 1233

Signature: W Grant Lewis

Name/Print: W. Grant Lewis

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Raleigh, North Carolina 27603
919-215-1693

Axiom Environmental, Inc.

SOIL BORING LOG

Date: 2/8/2022

Project/Site: Nesbit

County, State: Union County, NC

Sampling Point/
Coordinates: **Soil Profile - Groundwater Gauge 8 (34.896665, -80.653192)**

Investigator: W. Grant Lewis

Soil Series: Wehadkee varient (mapped as Secrest Cid Complex)

Notes:

	Matrix		Mottling				
Depth (inches)	**Color**	**%**	**Color**	**%**	**Type**	**Location**	**Texture**
0-5	10 YR 4/3	100					clay loam
5-9	10 YR 7/2	90	10 YR 6/6	10	C	M	silty clay
9-20	10 YR 6/1	70	10 YR 5/8	20	C	M	clay
			10 YR 4/2	10	D	M	
20-26	10 YR 6/1	70	10 YR 5/6	20	C	M	clay
			10 YR 5/8	10	D	M	
26+	10 YR 7/1	70	10 YR 6/6	10	C	M	clay
			10 YR 5/3	20	C	M	

Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. Locaction: PL=Pore Lining, M=Matrix.

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

Axiom Environmental, Inc.

SOIL BORING LOG

Date: 2/8/2022

Project/Site: Nesbit

County, State: Union County, NC

Sampling Point/
Coordinates: **Soil Profile - Groundwater Gauge 9 (34.897034, -80.652611)**

Investigator: W. Grant Lewis

Soil Series: Wehadkee varient (mapped as Secrest Cid Complex)

Notes:

	Matrix		Mottling				
Depth (inches)	**Color**	**%**	**Color**	**%**	**Type**	**Location**	**Texture**
0-5	10 YR 5/3	100					silty clay loam
5-9	10 YR 5/2	90	10 YR 5/8	10	C	M	silty clay loam
9-15	10 YR 6/2	85	10 YR 5/8	15	C	PL	silty clay
15-20	10 YR 6/2	80	10 YR 5/6	20	C	M	silty clay
20+	10 YR 7/1	80	10 YR 7/8	10	C	M	clay
			10 YR 4/6	10	PL	M	

Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. Locaction: PL=Pore Lining, M=Matrix.

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	NA	Apr-19
Mitigation Plan Approved	Jun-20	May-21
Construction (Grading) Completed	NA	07-Dec-21
Planting Completed	NA	Febuary 3, 2022
As-built Survey Completed	NA	Jun-22
MY-0 Baseline Report	Feb-22	Sep-22
MY1+ Monitoring Reports		

Table 12. Project Contacts

Swamp Grape Stream and Wetland Mitigation Site/100115	
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
Photo Log

PAI ID NO			53933	53934	53935
STATION			UT-1	GB-US	GB-LOW
DATE			6/2/2020	6/2/2020	6/2/2020
SPECIES	Tolerance Values	Functional Feeding Group			
PLATYHELMINTHES					
Tricladida		**P**			
Planariidae		**O**			
Girardia (Dugesia) tigrina	7.1	**P**		1	
MOLLUSCA					
Bivalvia					
Veneroida					
Sphaeriidae		**FC**			
Pisidium sp.	6.6	**FC**	2	2	
Sphaerium sp.	7.2	**FC**			3
Gastropoda					
Basommatophora					
Physidae					
Physella sp.	8.7	**CG**	3	7	5
ANNELIDA					
Clitellata					
Oligochaeta		**CG**			
Tubificida					
Naididae		**CG**			
Naidinae		**CG**			
Stylaria lacustris	8.4	**CG**	1	2	2
Tubificinae w.h.c.		**CG**			1
Tubificinae w.o.h.c.		**CG**			4
Pristininae					
Pristina sp.	7.7	**CG**			1
Lumbriculida					
Lumbriculidae		**CG**	1		
Lumbriculus sp.		**CG**		2	
ARTHROPODA					
Crustacea					
Amphipoda		**CG**			
Crangonyctidae					
Crangonyx sp.	7.2	**CG**	4		
Insecta					
Odonata					
Coenagrionidae		**P**			
Ischnura sp.	9.5				2
Libellulidae		**P**			
Erythemis simplicicollis		**P**			1
Corduliidae					
Neurocordulia sp.	5.3				1

PAI ID NO			53933	53934	53935
STATION			UT-1	GB-US	GB-LOW
DATE			6/2/2020	6/2/2020	6/2/2020
SPECIES	Tolerance Values	Functional Feeding Group			
Plecoptera					
Perlidae		**P**			
Perlesta sp.	2.9	**P**	6		1
Hemiptera					
Belostomatidae					
Belostoma sp.	9.5	**P**			1
Corixidae		**PI**			6
Trichoptera					
Hydropsychidae		**FC**			
Cheumatopsyche sp.	6.6	**FC**		1	
Coleoptera					
Dytiscidae		**P**			
Neoporus sp.	5		1		
Elmidae		**CG**			
Stenelmis sp.	*5.6*	**SC**		8	2
Haliplidae					
Peltodytes sexmaculatus				2	
Hydrophilidae		**P**			
Hydrochus sp.		**SH**	1		
Diptera					
Chironomidae					
Conchapelopia sp.	8.4	**P**	3	2	2
Cricotopus bicinctus	*8.7*	**CG**		2	
Cricotopus sp.		**CG**	7	1	
Cryptochironomus sp.	*6.4*	**P**	2		
Eukiefferiella claripennis gp.	*6.2*	**CG**		1	
Parametriocnemus sp.	*3.9*	**CG**	2	1	
Polypedilum illinoense gp.	*8.7*	**SH**	1	1	
Thienemanniella xena	*8*	**CG**			2
Zavrelimyia sp.	*8.6*	**P**	1	2	1
Sciomyzidae			1		
Simuliidae		**FC**			
Simulium decorum				1	
Simulium sp.	*4.9*	**FC**		1	
Simulium tuberosum complex	*4.9*	**FC**		13	15
Simulium venustum complex	*7.3*		1		
Simulium vittatum	*9.1*				10
Tipulidae		**SH**			
Tipula sp.	*7.5*	**SH**		1	
TOTAL NO. OF ORGANISMS			**37**	**51**	**60**
TOTAL NO. OF TAXA			**16**	**19**	**18**
EPT TAXA			**1**	**1**	**1**
BIOTIC INDEX ASSIGNED VALUES			**6.83**	**6.34**	**7.27**

Weight Glen Branch DS Lower GB_DS

3/06 Revision 6

Project # 20_007

Habitat Assessment Field Data Sheet
Mountain/ Piedmont Streams

Biological Assessment Unit, DWQ

TOTAL SCORE 66

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 Glen Branch DS **Location/road:** Weight **(Road Name**) **County** Union

Date 6-2-2020 **CC#** 03050103 **Basin** Catawba **Subbasin** 03-08-34

Observer(s) A.K. Type of Study: ☐ Fish ☑ Benthos ☐ Basinwide ☐ Special Study (Describe) ____

Latitude 34.891075 Longitude -80.651440 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 ____%Active Pasture 100 % Active Crops
____%Fallow Fields ____% Commercial ____%Industrial ____%Other - Describe: ____

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

Width: (meters) Stream 2 Channel (at top of bank) 5 **Stream Depth:** (m) Avg .2 Max /
☐ Width variable ☐ Large river >25m wide

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

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** lots of hydrology

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: Clear/ Normal **Photos:** ☐N ☑Y ☐ Digital ☐35mm

Remarks: Recent heavy rain, clear, cool for last five days

Preliminary assessment prior to restoration

GB-05

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 2

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.

C **Rocks** ____**Macrophytes** R **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.

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 6

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 6

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

Remarks lots of loose gravel + some embedded cobble

Page Total 28

GB-05

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	2
5. little or no bank vegetation, mass erosion and bank failure evident.....	0	0
		Total 12

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 Dominant vegetation: ☑Trees ☑Shrubs ☑Grasses ☐ Weeds/old field ☐Exotics (kudzu, etc)	Lft. Bank Score	Rt. Bank Score
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 4

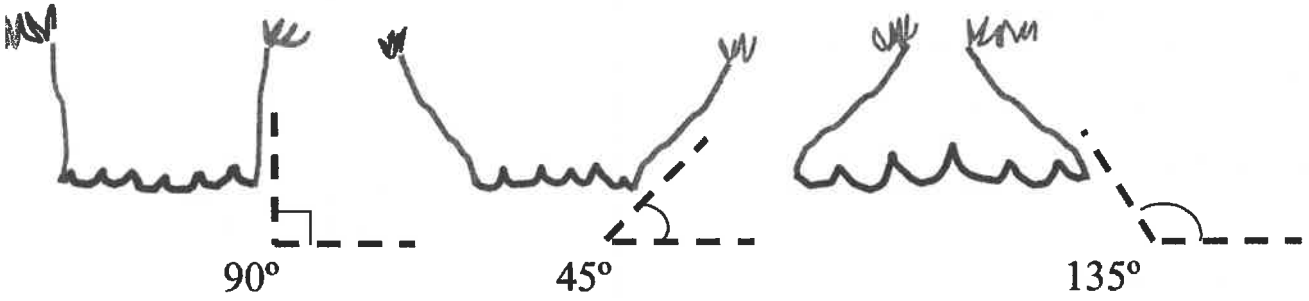
Remarks_____

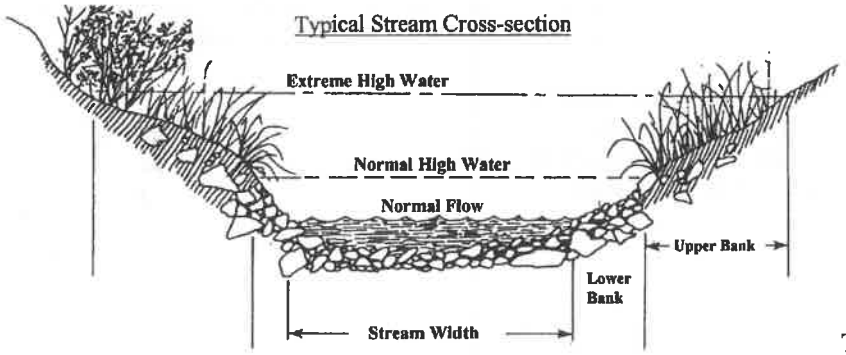
Page Total 38

☐ Disclaimer-form filled out, but score doesn't match subjective opinion-atypical stream. **TOTAL SCORE** 66

Supplement for Habitat Assessment Field Data Sheet

Diagram to determine bank angle:





This side is 45° bank angle.

Site Sketch:

Other comments: _____

_____

_____

_____

_____

Weshot Glen Branch 45 up stream

GB_45

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 Glen Branch 45 Location/road: Nesbit (Road Name) County Union

Date 6-2-2020 **CC#** 03050103 Basin Catawba Subbasin 03-08-34

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

Latitude 34.898345 Longitude -80.652247 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: 20 %Forest %Residential %Active Pasture 80 % Active Crops
%Fallow Fields % Commercial %Industrial %Other - Describe:

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

Width: (meters) Stream 4-5 Channel (at top of bank) 4 **Stream Depth:** (m) Avg 2 Max 6
☐ Width variable ☐ Large river >25m wide

Bank Height (from deepest part of riffle to top of bank-first flat surface you stand on): (m) 3

Bank Angle: 45 ° 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: Sunny 75° **Photos:** ☐N ☐Y ☐ Digital ☐35mm

Remarks: 2 aquatic Salamanders found
Stream exiting woods - Cobble Covered in
algae & worm castings - Sample area
is one long riffle - little undercut banks

GD.45

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 3

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.

A **Rocks** R **Macrophytes** ___ **Sticks and leafpacks** ___ **Snags and logs** R **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 17

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 15

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.

	Score
A. Pools present	
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 4

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

Remarks _____

Page Total 39

GB-45

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 16

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 2

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_____

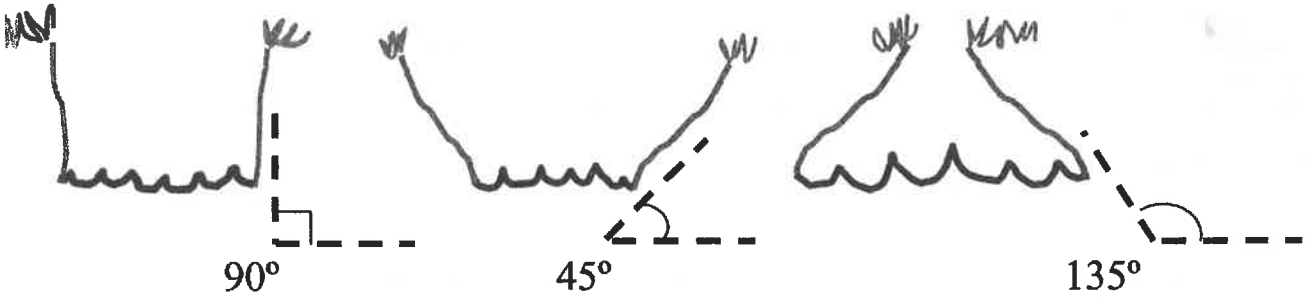
Page Total 42

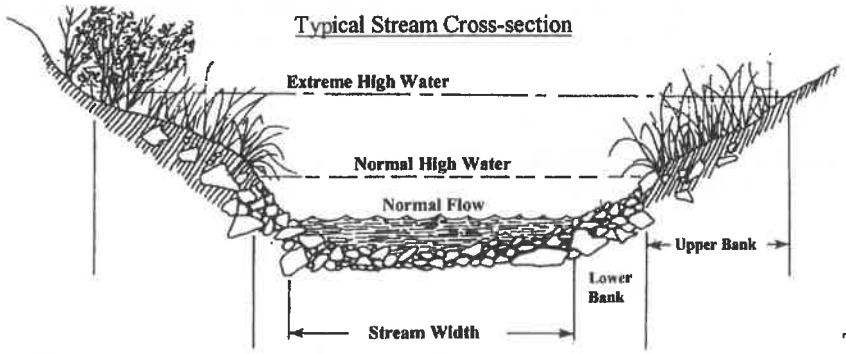
☐ Disclaimer-form filled out, but score doesn't match subjective opinion-atypical stream. **TOTAL SCORE** 81

39
+ 42
81

Supplement for Habitat Assessment Field Data Sheet

Diagram to determine bank angle:





This side is 45° bank angle.

Site Sketch:

Other comments: _____

Canopy	Liriodendron, Carya ovata, Acer rubrum, carpinus-
Saplings/ Shrubs	Carpinus, Acer, liquidambar. cercis, ligustrum
Herbs	polystichum, carex sp42
Vines	parthenocissus, muscadine, lonicera

WESBIT_UT-1 WESBIT UT1

3/06 Revision 6

Habitat Assessment Field Data Sheet
Mountain/ Piedmont Streams

Biological Assessment Unit, DWQ **TOTAL SCORE** 60

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 Wesbit UT-1 Location/road: Wesbit Rd (Road Name) County Union

Date 6-2-2020 **CC#** 03050103 Basin Catawba Subbasin 03-08-34

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

Latitude 34.845006 Longitude -80.652493 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: 5 %Forest %Residential %Active Pasture 95 % Active Crops Wheat
%Fallow Fields % Commercial %Industrial %Other - Describe:

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

Width: (meters) Stream 2 Channel (at top of bank) 3 **Stream Depth:** (m) Avg 2 Max 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) 3

Bank Angle: 45 ° 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: Sunny 75' **Photos:** ☐N ☐Y ☐ Digital ☐35mm

Remarks:

Benthic Sample below agricultural field crossing — filled with concrete rip-rap washed down from crossing — no shading/shrubs in this section —

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 2

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** ____ **Macrophytes** ☒ **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%	(8)
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 Riffle made of cobble & concrete Rip-Rap Subtotal 10

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.

	Score
A. Pools present	
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 4

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

Remarks _____

Page Total 26

MEASURE 1

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 10

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 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 Dominant vegetation: ☐ Trees ☐ Shrubs ☐ Grasses ☐ Weeds/old field ☐Exotics (kudzu, etc)	Lft. Bank Score	Rt. Bank Score
A. Riparian zone **intact** (no breaks)		
1. width > 18 meters.....	(3)	(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		
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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

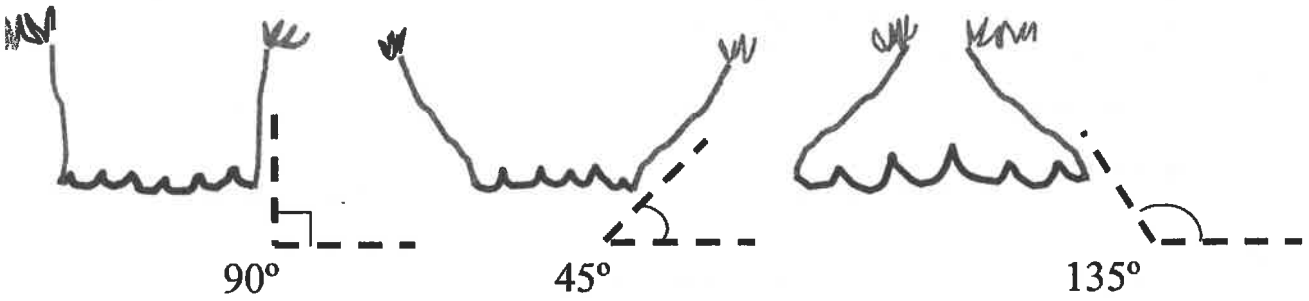
Remarks _____

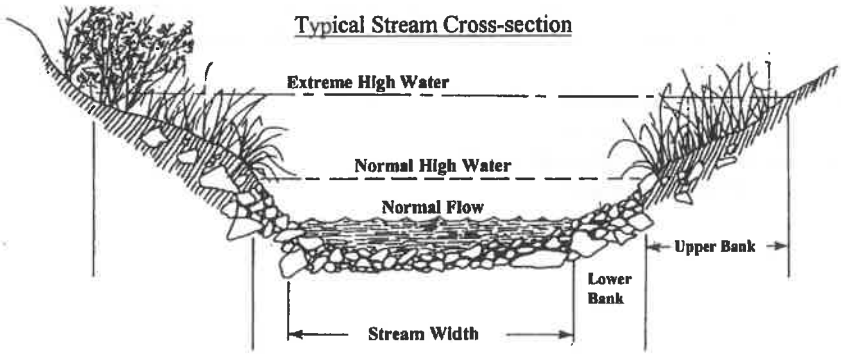
Page Total 34

☐ Disclaimer-form filled out, but score doesn't match subjective opinion-atypical stream. **TOTAL SCORE** 60

Supplement for Habitat Assessment Field Data Sheet

Diagram to determine bank angle:





This side is 45° bank angle.

Site Sketch:

Other comments:_____

_____

_____

_____

_____

Nesbit Mitigation Site: Task 5 – Planting & Monitoring Devices
DMS Contract #: 7868; DMS Project ID: 100121; RFP # 16-007704

Bare-root planting - 02/02/2022

Bare-root planting - 02/02/2022

Bare-root planting - 02/02/2022

Bare-root planting - 02/02/2022

Live Stakes - 02/08/2022

UT-2 Cross Sections - 02/08/2022

Glen Branch Cross Section - 02/08/2022

Glen Branch Cross Section - 02/08/2022

Ground Water Gauge Install - 02/02/2022

Ground Water Gauge Install - 02/02/2022

Glen Branch, upper extent, ford crossing - 01/15/2022

Glen Branch, upper extent, looking south - 01/15/2022

UT1 & UT1A - 01/15/2022

Glen Branch & UT1 confluence, looking south - 01/15/2022

Glen Branch & UT2 confluence, looking south - 01/15/2022

Glen Branch / Site outfall - 01/15/2022

Cross sections 1, Glen Branch - 02/08/2022

Cross sections 3 and 4, UT 2 - 02/08/2022

Cross sections 5, Glen Branch - 02/08/2022

Cross sections 7 and 8, UT 1 - 02/08/2022

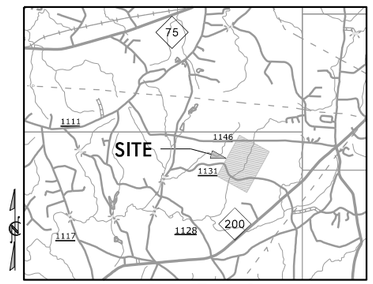
Cross sections 9, Glen Branch - 02/08/2022

Cross sections 11, Glen Branch - 02/08/2022

Appendix G: Record Drawing Plan Sheets

NC DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
AS–BUILT PLANS
NESBIT SITE

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	NESBIT SITE	1	

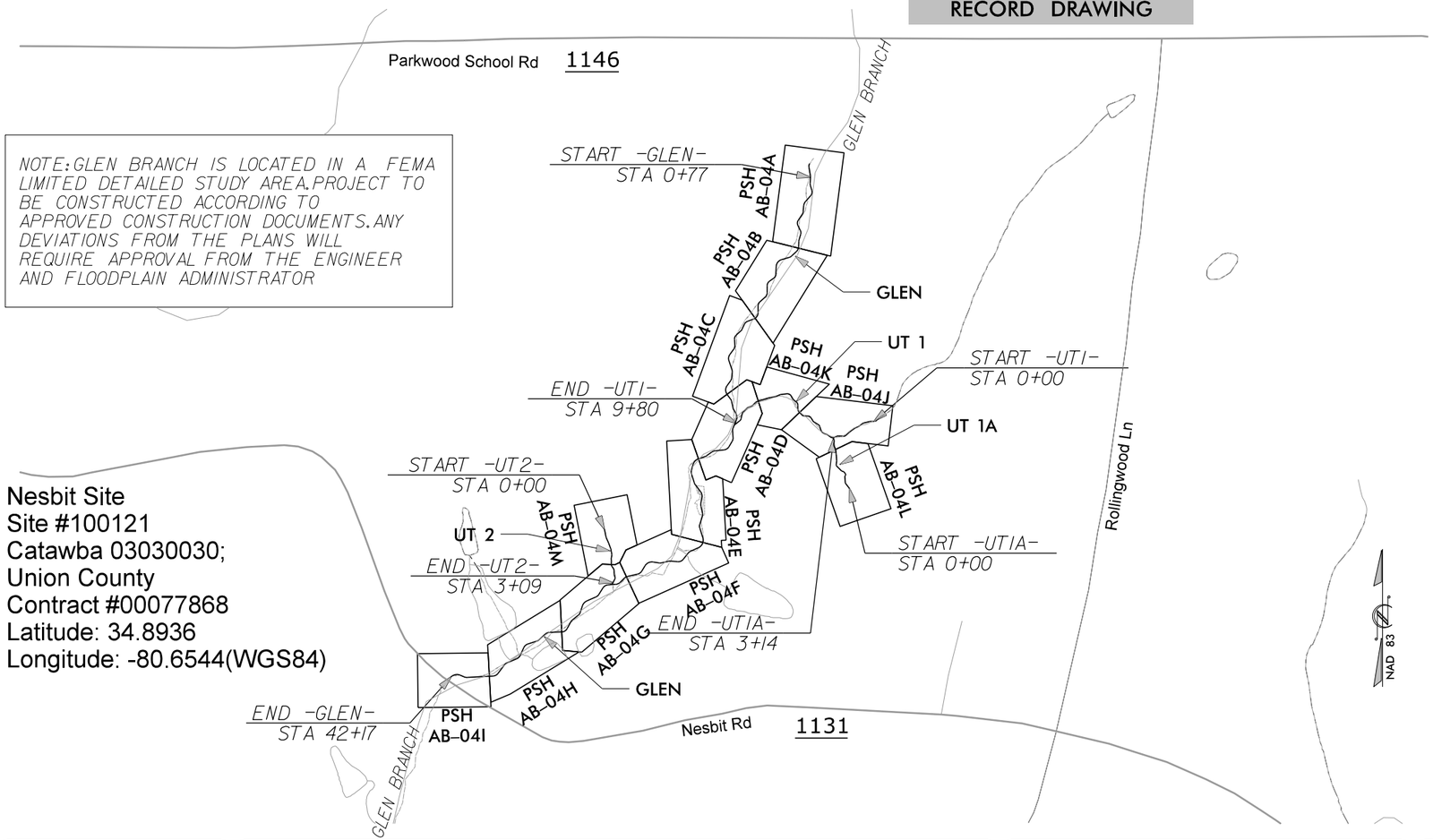


VICINITY MAP
Not to Scale

LOCATION: UNION COUNTY, NORTH CAROLINA

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

RECORD DRAWING



NOTE: GLEN BRANCH 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

Nesbit Site
Site #100121
Catawba 03030030;
Union County
Contract #00077868
Latitude: 34.8936
Longitude: -80.6544(WGS84)

INDEX OF SHEETS

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: May and June 2022
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 29th day of June , 2022.

SEAL OR STAMP

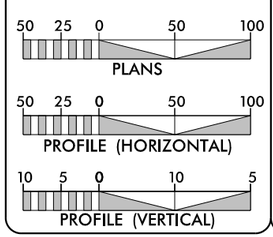
DocuSigned by:
1BB30246D54EC...
NORTH CAROLINA PROFESSIONAL SEAL L-4194 LAND SURVEYOR JOHN ASHLEY RUDOLPH

9/1/2022

Professional Land Surveyor — License Number L-4194

CONTRACT: NESBIT SITE

GRAPHIC SCALES



PROPOSED LENGTH OF -GLEN- = 4140		PROPOSED LENGTH OF -UT 1A- = 314	
PROPOSED LENGTH OF -UT 1- = 980		PROPOSED LENGTH OF -UT 2- = 309	
TOTAL STREAM LENGTHS (LF) = 5743			
RESTORATION LEVEL	STREAM (linear footage)	RIPARIAN WETLAND (acreage)	NONRIPARIAN WETLAND (acreage)
RESTORATION	4801	5.338 (Reestabilishment)	0.000
ENHANCEMENT I	316	1.789 (Rehabilitation)	0.000
ENHANCEMENT II	541	0.000	0.000
PRESERVATION	0	0.000	0.000
TOTALS	5658	7.127	0.000
MITIGATION UNITS	5199.756 SMUs	6.531 RIPARIAN WMUs	NONRIPARIAN WMUs

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

RESTORATION SYSTEMS | LLC
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
1088AD8C14994C3...
NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

9/1/2022
DATE:

9/1/2022
Nesbit_Rdy_PSH_AB-01.dgn
jharvey

CONVENTIONAL PLAN SHEET SYMBOLS

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

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 (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.)
- Existing Contour Major
- Existing Contour Minor
- Contour Interval = 1 ft
- 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

SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL: 919.851.1415
ENG FIRM LICENSE NO. C-890

Axiom Environmental, Inc.

NESBIT
UNION COUNTY, NC

SYMBOLOGY

PROJECT # :
DRAWING NAME:
DATE: 2022
DRAWN BY: JRH
REVIEWED BY: JGD
REVISIONS:

SHEET NO.
AB-02

9/1/2022
Nesbit_Rdy_PSH_AB-02.dgn
Harvey

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

—CE———CE— CONSERVATION EASEMENT

Parkwood School Rd
1146

GLEN BRANCH

200′ 100′ 0 200′ 400′
SCALE: 1″ = 400′

HORIZONTAL DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 1988

NAD 83

GLEN

UT 1

UT 1A

CROSSING

UT 2

GLEN

GLEN BRANCH

Nesbit Rd
1131

Rollingwood Ln

60′ WIDE NON–EXCLUSIVE ACCESS EASEMENT

9/1/2022
Nesbit_Rdy_PSH_AB-03.dgn
Harvey

SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
PH: (919) 859-0005
ENG FIRM LICENSE NO. C-890

Axiom Environmental, Inc.

NESBIT
UNION COUNTY, NC

EASEMENT

PROJECT # :
DRAWING NAME:
DATE: 2022
DRAWN BY: JRH
REVIEWED BY: JGD
REVISIONS:

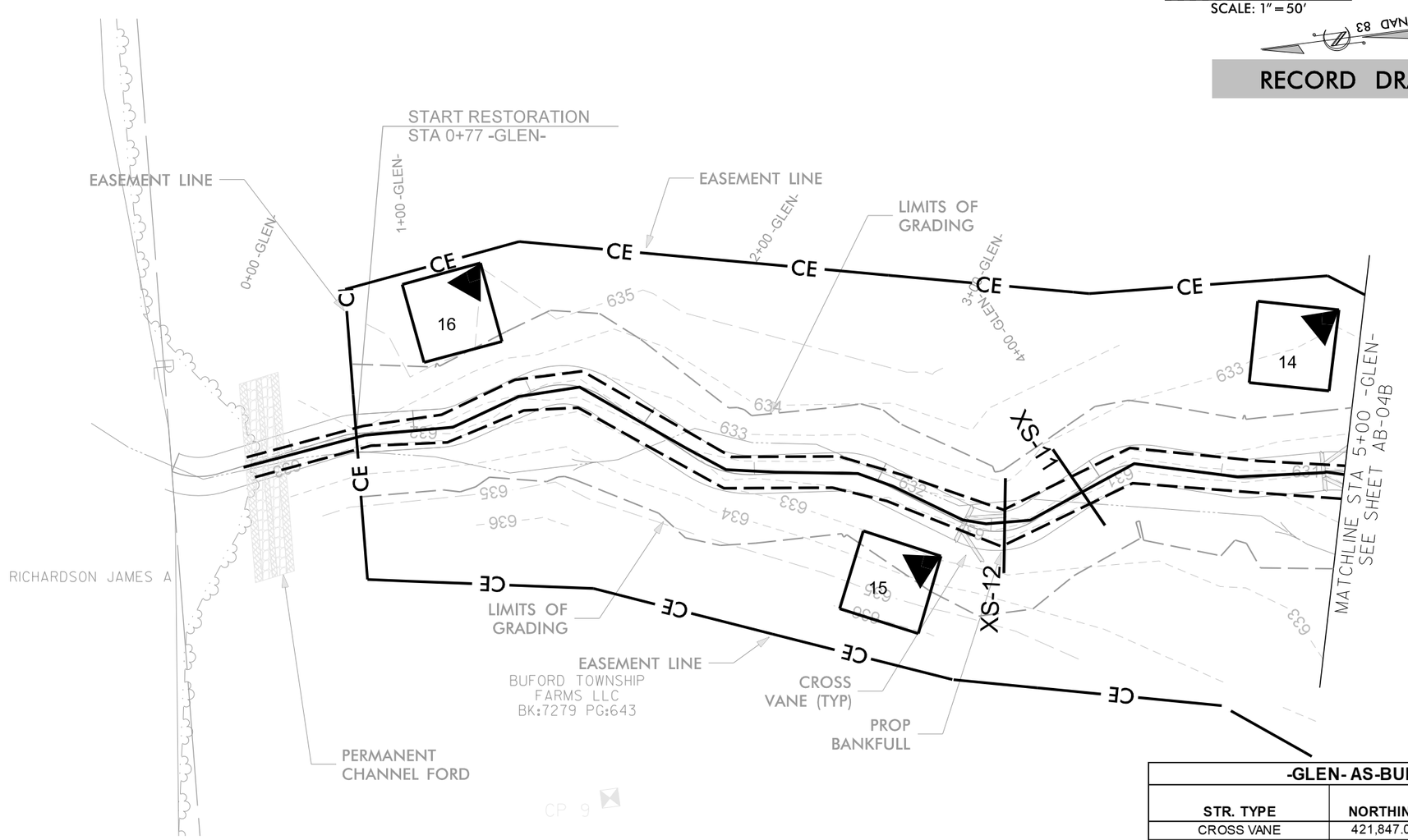
SHEET NO.
AB–03

25' 12.5' 0 25' 50'

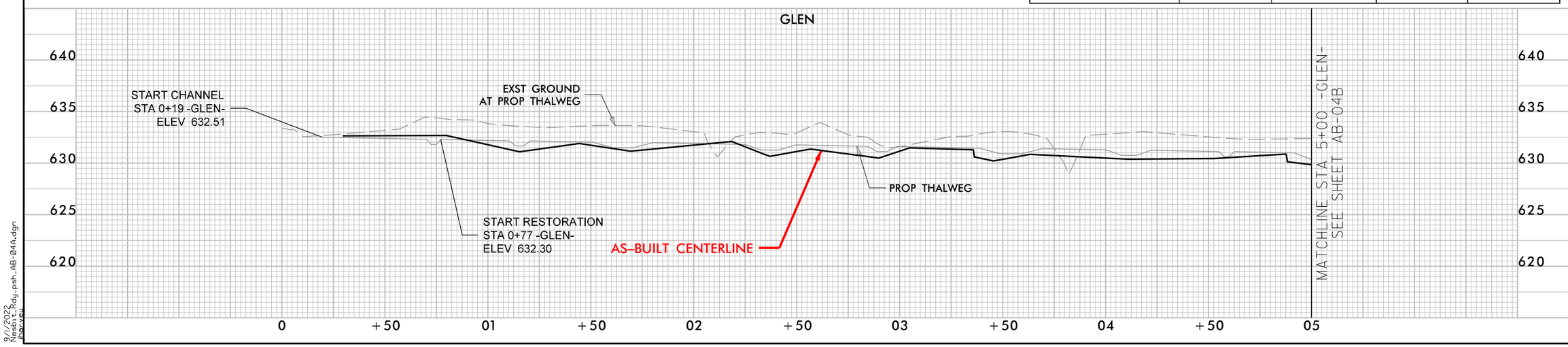
SCALE: 1" = 50'

NAD 83

RECORD DRAWING



-GLEN- AS-BUILT STRUCTURE LOCATIONS				
STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	421,847.05	1,504,567.15	631.45	631.30
CROSS VANE	421,701.08	1,504,569.32	631.00	630.88



DocuSigned by: Josh Dalton 1080AD8C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

9/1/2022

DATE:

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HORIZONTAL DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 1988

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905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL: 919.859.0013
ENG FIRM LICENSE NO. C-890

Axiom Environmental, Inc.

NESBIT
UNION COUNTY, NC

AS-BUILT STRUCTURES

PROJECT # :
DRAWING NAME:
DATE: 2022
DRAWN BY: JRH
REVIEWED BY: JGD
REVISIONS:

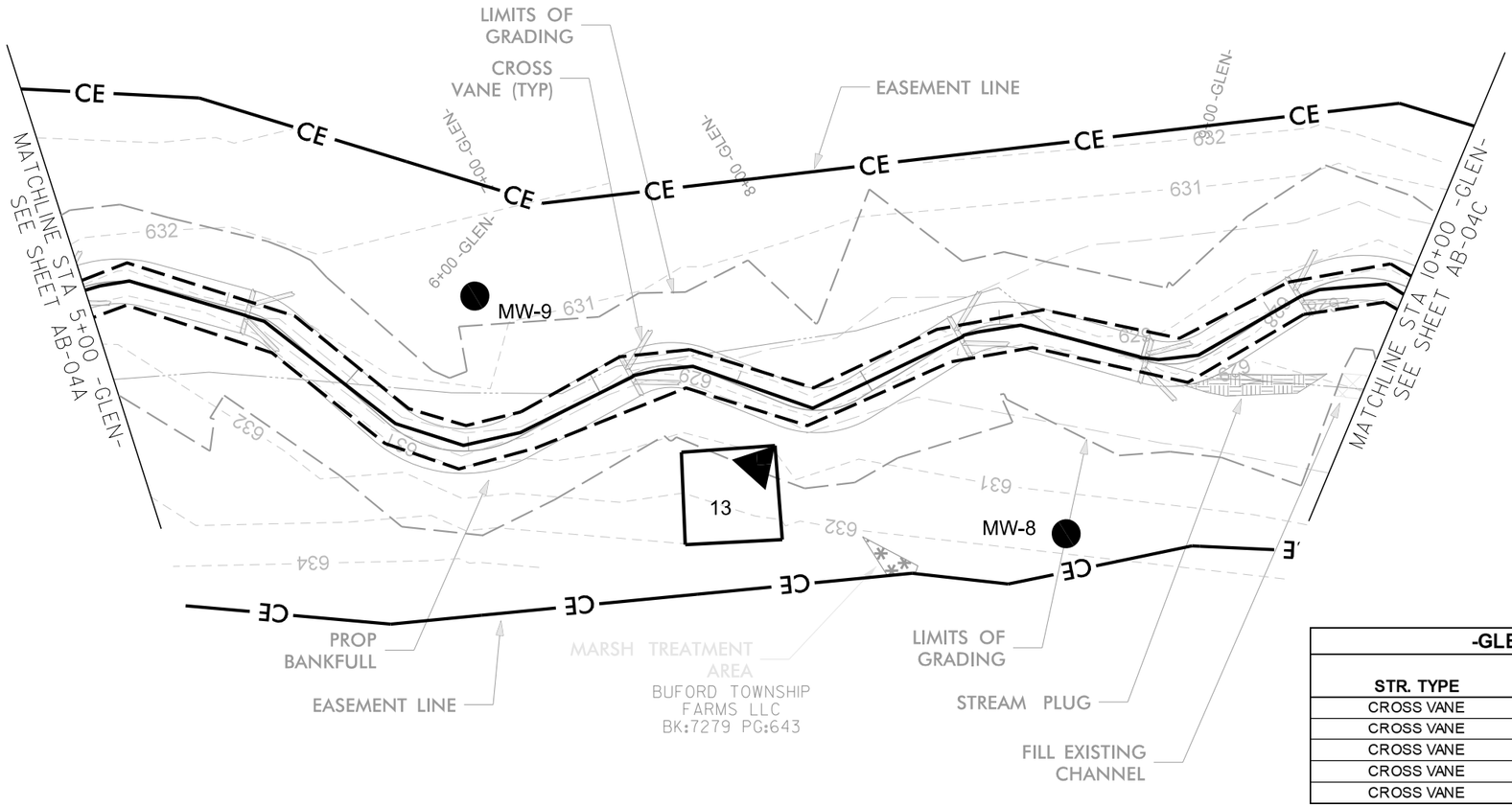
SHEET NO.
AB–04A

9/1/2022
Nesbit_Rdy_psh_AB-04A.dgn
harvey

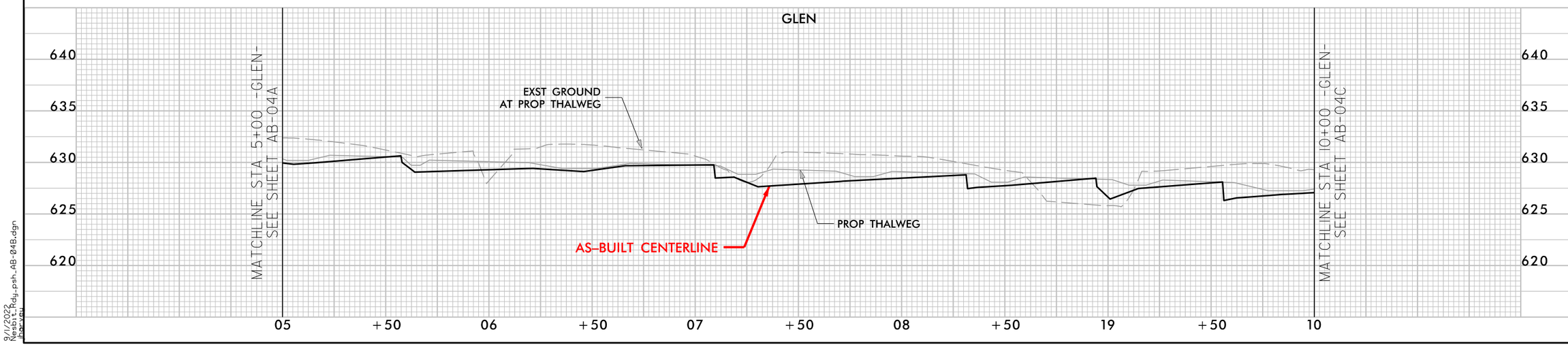
25' 12.5' 0 25' 50'
SCALE: 1" = 50'

NAD 83

RECORD DRAWING



-GLEN- AS-BUILT STRUCTURE LOCATIONS				
STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	421,649.30	1,504,531.06	630.52	630.64
CROSS VANE	421,548.54	1,504,443.25	629.65	629.77
CROSS VANE	421,445.17	1,504,395.08	628.88	628.80
CROSS VANE	421,395.15	1,504,354.34	628.33	628.47
CROSS VANE	421,338.52	1,504,345.58	628.05	628.10



HORIZONTAL DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 1988

DocuSigned by:
Josh Dalton
1089AD8C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

9/1/2022

DATE:

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905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL: 919.859.1353
ENG FIRM LICENSE NO. C-890

Axiom Environmental, Inc.

NESBIT
UNION COUNTY, NC

AS-BUILT STRUCTURES

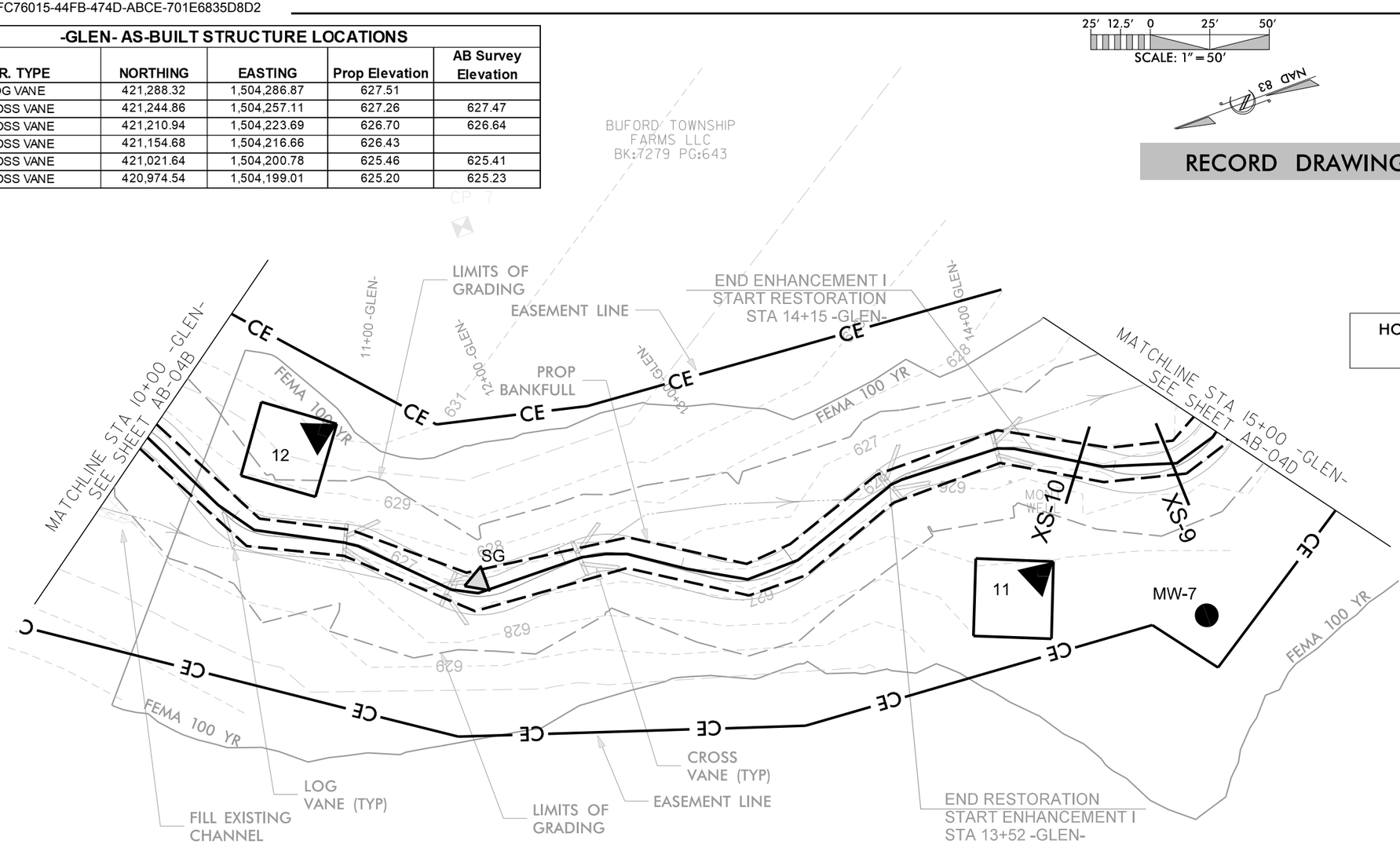
PROJECT # :
DRAWING NAME:
DATE: 2022
DRAWN BY: JRH
REVIEWED BY: JGD
REVISIONS:

SHEET NO.
AB-04B

9/1/2022
Nesbit_Rdy_psh_AB-04B.dgn
Jarvis

-GLEN- AS-BUILT STRUCTURE LOCATIONS

STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
LOG VANE	421,288.32	1,504,286.87	627.51	
CROSS VANE	421,244.86	1,504,257.11	627.26	627.47
CROSS VANE	421,210.94	1,504,223.69	626.70	626.64
CROSS VANE	421,154.68	1,504,216.66	626.43	
CROSS VANE	421,021.64	1,504,200.78	625.46	625.41
CROSS VANE	420,974.54	1,504,199.01	625.20	625.23



RECORD DRAWING

DocuSigned by: Josh Dalton 1089AD8C14994C3...

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9/1/2022

DATE:

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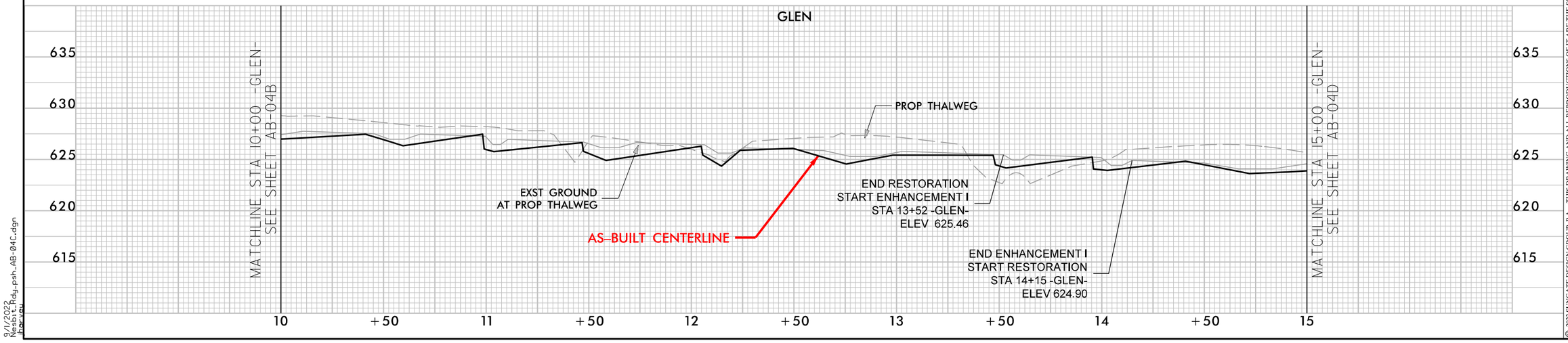
HORIZONTAL DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 1988



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RALEIGH, NORTH CAROLINA 27606
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Axiom Environmental, Inc.

NESBIT
UNION COUNTY, NC

AS-BUILT STRUCTURES

PROJECT # :
DRAWING NAME:
DATE: 2022
DRAWN BY: JRH
REVIEWED BY: JGD
REVISIONS:

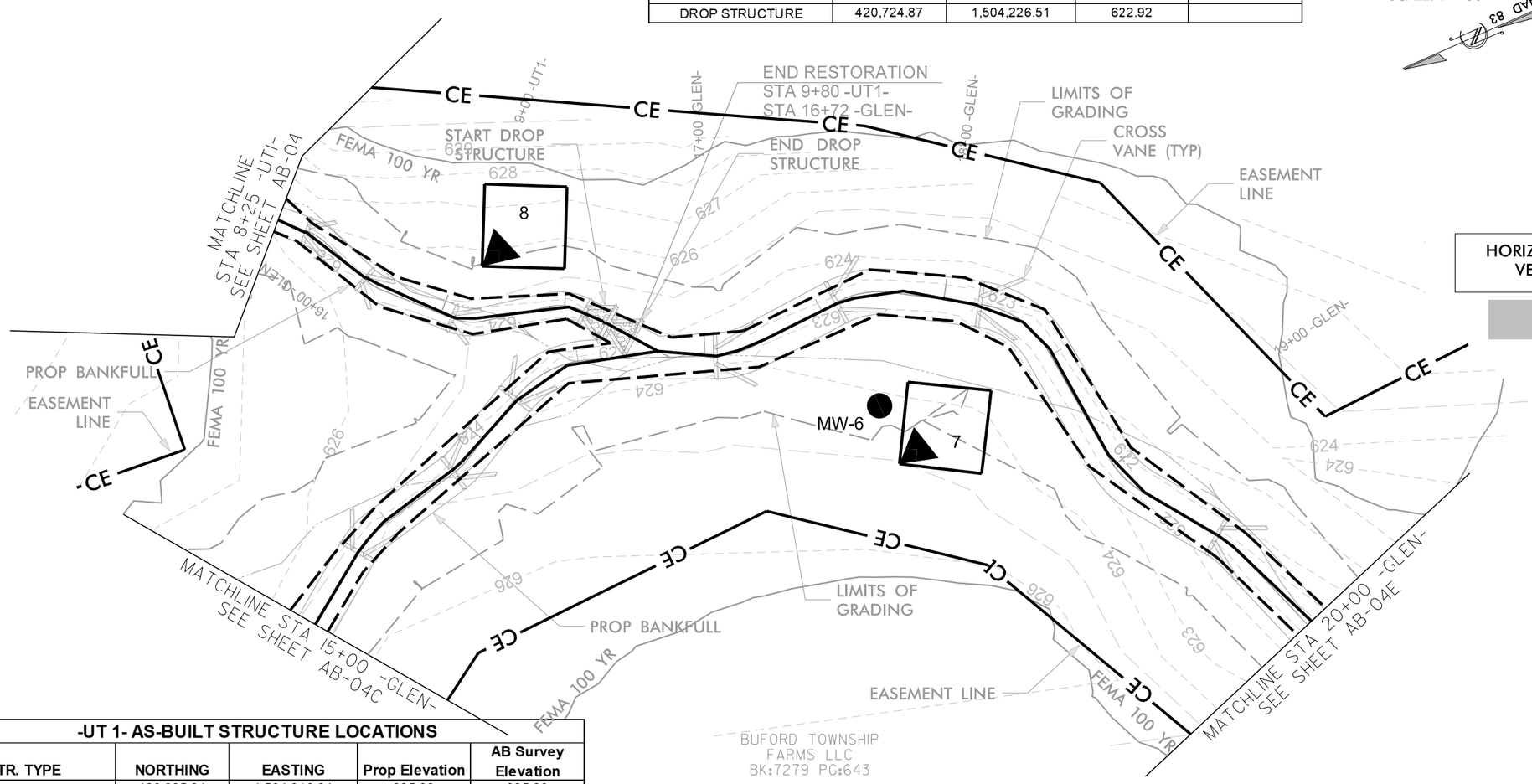
SHEET NO.
AB-04C

9/1/2022
Nesbit_Rdy_psh_AB-04C.dgn
jarvey

-UT 1- AS-BUILT STRUCTURE LOCATIONS

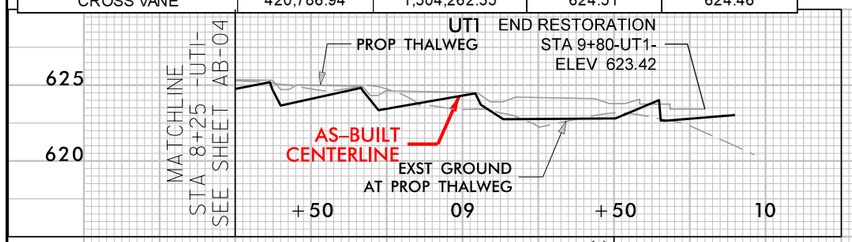
STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
DROP STRUCTURE	420,738.10	1,504,243.50	624.08	624.02.
DROP STRUCTURE	420,724.87	1,504,226.51	622.92	

25′ 12.5′ 0 25′ 50′
SCALE: 1″ = 50′
NAD 83



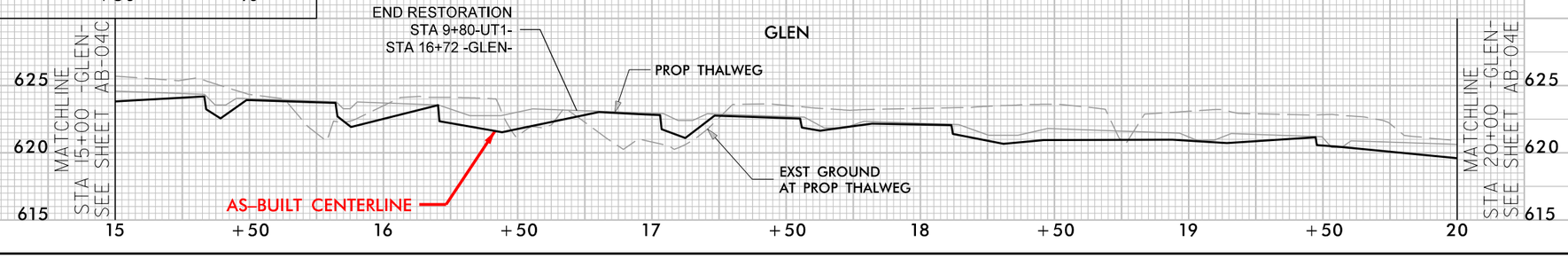
-UT 1- AS-BUILT STRUCTURE LOCATIONS

STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	420,825.34	1,504,316.94	625.32	625.20
CROSS VANE	420,812.27	1,504,290.44	624.93	624.83
CROSS VANE	420,786.94	1,504,262.35	624.51	624.46



-GLEN- AS-BUILT STRUCTURE LOCATIONS

STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	420,858.18	1,504,193.38	624.35	614.19
CROSS VANE	420,811.13	1,504,206.43	623.79	623.71
CROSS VANE	420,777.11	1,504,223.41	623.56	623.54
CROSS VANE	420,698.11	1,504,206.85	622.92	622.80
CROSS VANE	420,646.00	1,504,206.84	622.65	622.54
CROSS VANE	420,594.61	1,504,183.26	622.10	622.06
CROSS VANE	420,545.73	1,504,062.30	621.19	621.15



DocuSigned by: Josh Dalton 1089AD8C4994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

9/1/2022
DATE:

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HORIZONTAL DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 1988

RECORD DRAWING

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RALEIGH, NORTH CAROLINA 27606
TEL: 919.852.1003
ENG FIRM LICENSE NO. C-890

Axiom Environmental, Inc.

NESBIT
UNION COUNTY, NC

AS-BUILT STRUCTURES

PROJECT # :
DRAWING NAME:
DATE: 2022
DRAWN BY: JRH
REVIEWED BY: JGD
REVISIONS:

SHEET NO.
AB–04D

9/1/2022
Nesbit_Rdy_psh_AB-04D.dgn
Darren

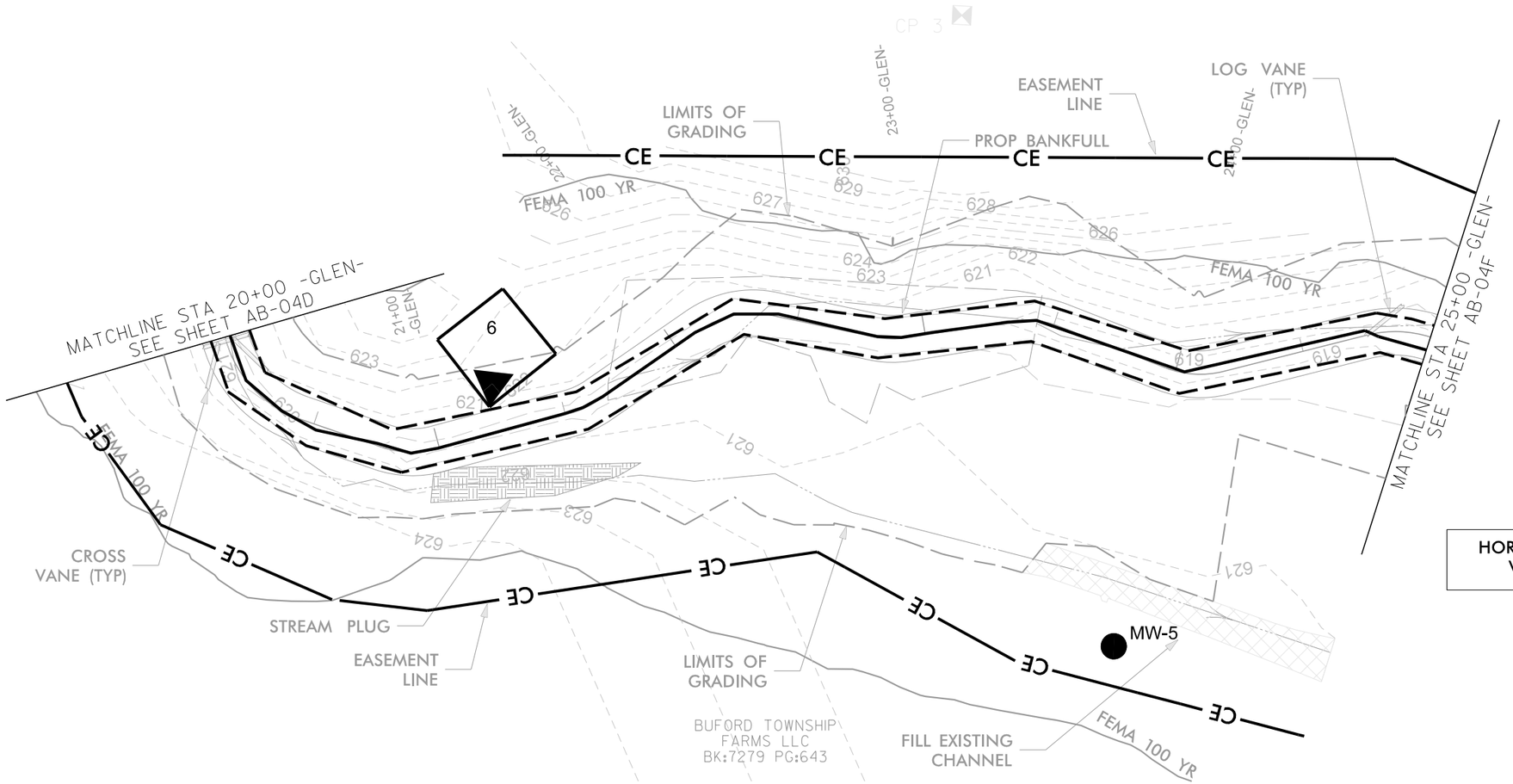
-GLEN- AS-BUILT STRUCTURE LOCATIONS				
STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	420,527.20	1,504,014.02	620.61	
LOG VANE	420,090.67	1,504,039.62	618.74	618.48

25' 12.5' 0 25' 50'

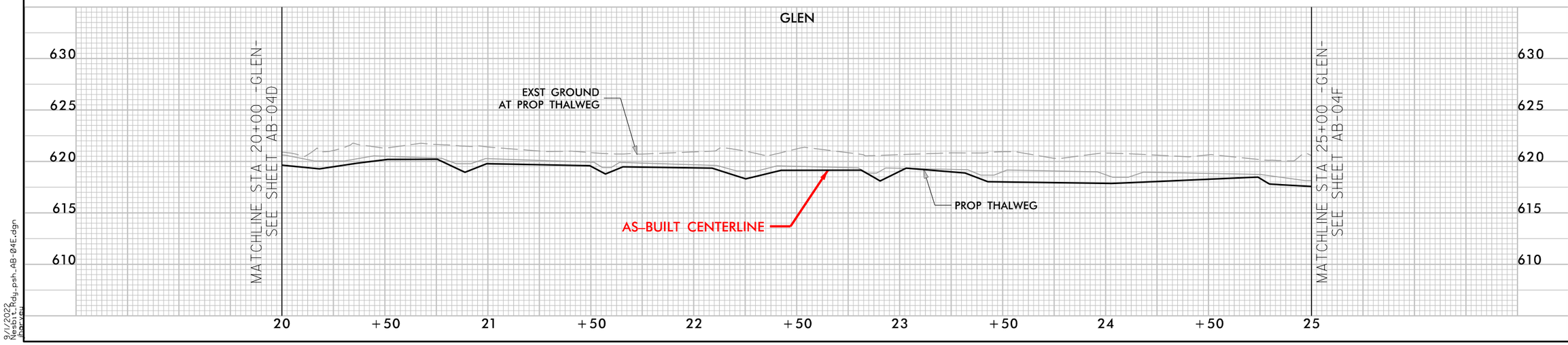
SCALE: 1" = 50'

NAD 83

RECORD DRAWING



HORIZONTAL DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 1988



DocuSigned by: Josh Dalton 1089AD8C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

9/1/2022

DATE:

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SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
PH: 919.859.2243
ENG FIRM LICENSE NO. C-890

Axiom Environmental, Inc.

NESBIT
UNION COUNTY, NC

AS-BUILT STRUCTURES

PROJECT # :
DRAWING NAME:
DATE: 2022
DRAWN BY: JRH
REVIEWED BY: JGD
REVISIONS:

SHEET NO.
AB-04E

9/1/2022
Nesbit_Rdy_psh_AB-04E.dgn
Jarvis

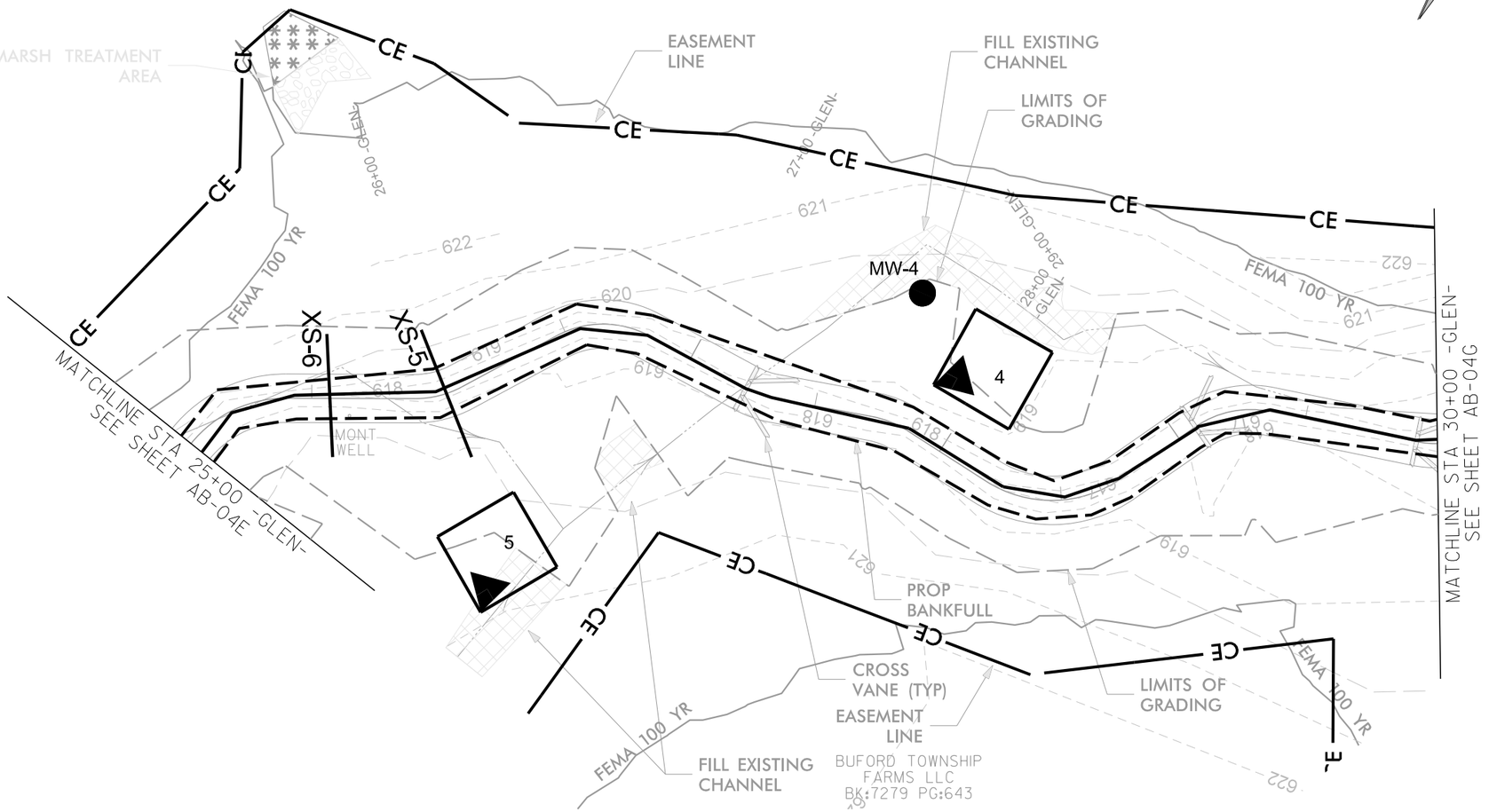
-GLEN- AS-BUILT STRUCTURE LOCATIONS

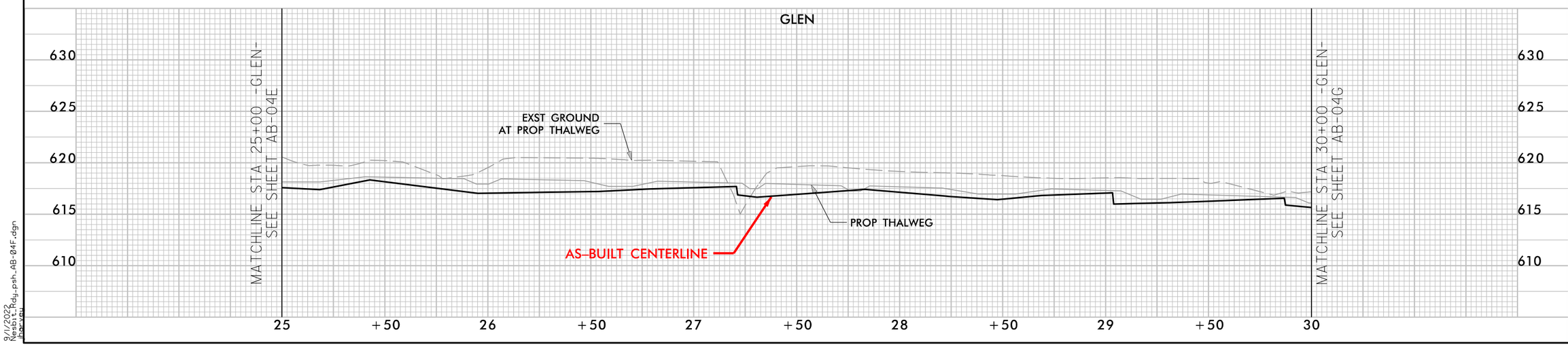
STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	419,962.76	1,503,860.41	618.01	617.69
CROSS VANE	419,907.35	1,503,702.20	617.26	617.08
CROSS VANE	419,878.66	1,503,624.97	616.63	616.55

25′ 12.5′ 0 25′ 50′
SCALE: 1″ = 50′

NAD 83

RECORD DRAWING





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NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

9/1/2022

DATE:

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HORIZONTAL DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 1988

SUNGATE DESIGN GROUP, P.A.
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RALEIGH, NORTH CAROLINA 27606
PH: (919) 859-0515
ENG FIRM LICENSE NO. C-890

Axiom Environmental, Inc.

NESBIT
UNION COUNTY, NC

AS-BUILT STRUCTURES

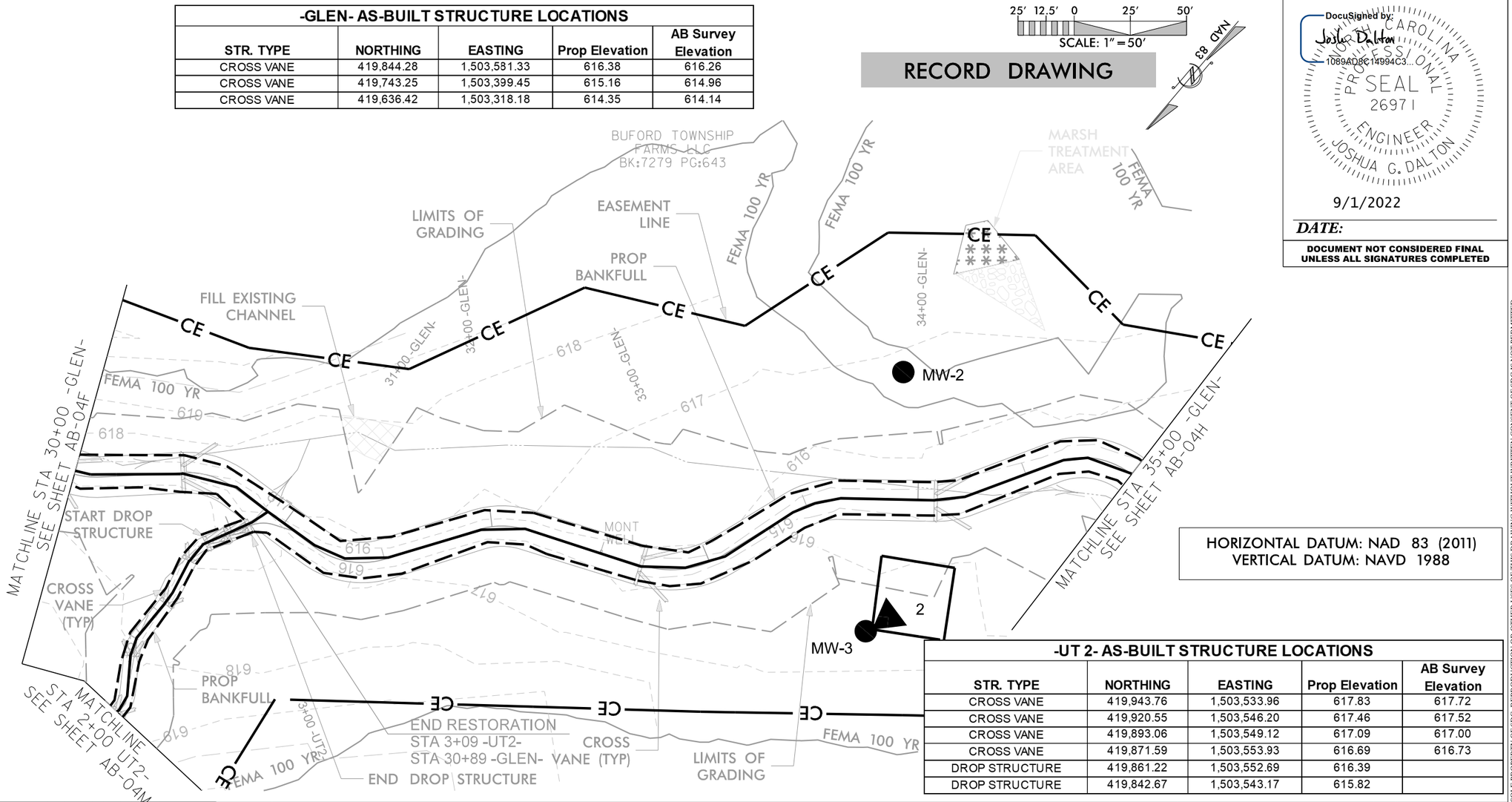
PROJECT # :
DRAWING NAME:
DATE: 2022
DRAWN BY: JRH
REVIEWED BY: JGD
REVISIONS:

SHEET NO.
AB–04F

9/1/2022
Nesbit_Rdy_psh_AB-04F.dgn
harvey

-GLEN- AS-BUILT STRUCTURE LOCATIONS

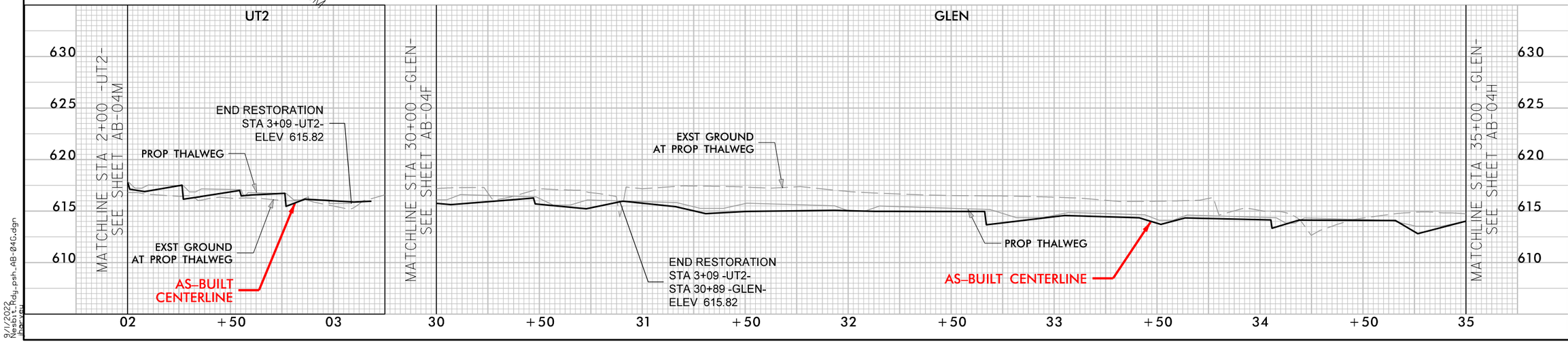
STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	419,844.28	1,503,581.33	616.38	616.26
CROSS VANE	419,743.25	1,503,399.45	615.16	614.96
CROSS VANE	419,636.42	1,503,318.18	614.35	614.14



HORIZONTAL DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 1988

-UT 2- AS-BUILT STRUCTURE LOCATIONS

STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	419,943.76	1,503,533.96	617.83	617.72
CROSS VANE	419,920.55	1,503,546.20	617.46	617.52
CROSS VANE	419,893.06	1,503,549.12	617.09	617.00
CROSS VANE	419,871.59	1,503,553.93	616.69	616.73
DROP STRUCTURE	419,861.22	1,503,552.69	616.39	
DROP STRUCTURE	419,842.67	1,503,543.17	615.82	



DocuSigned by: Joshua Dalton 1089AD8C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

9/1/2022

DATE:

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SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL: 919.851.9986
ENG FIRM LICENSE NO. C-890

Axiom Environmental, Inc.

NESBIT
UNION COUNTY, NC

AS-BUILT STRCUTURES

PROJECT # :
DRAWING NAME:
DATE: 2022
DRAWN BY: JRH
REVIEWED BY: JGD
REVISIONS:

SHEET NO.
AB–04G

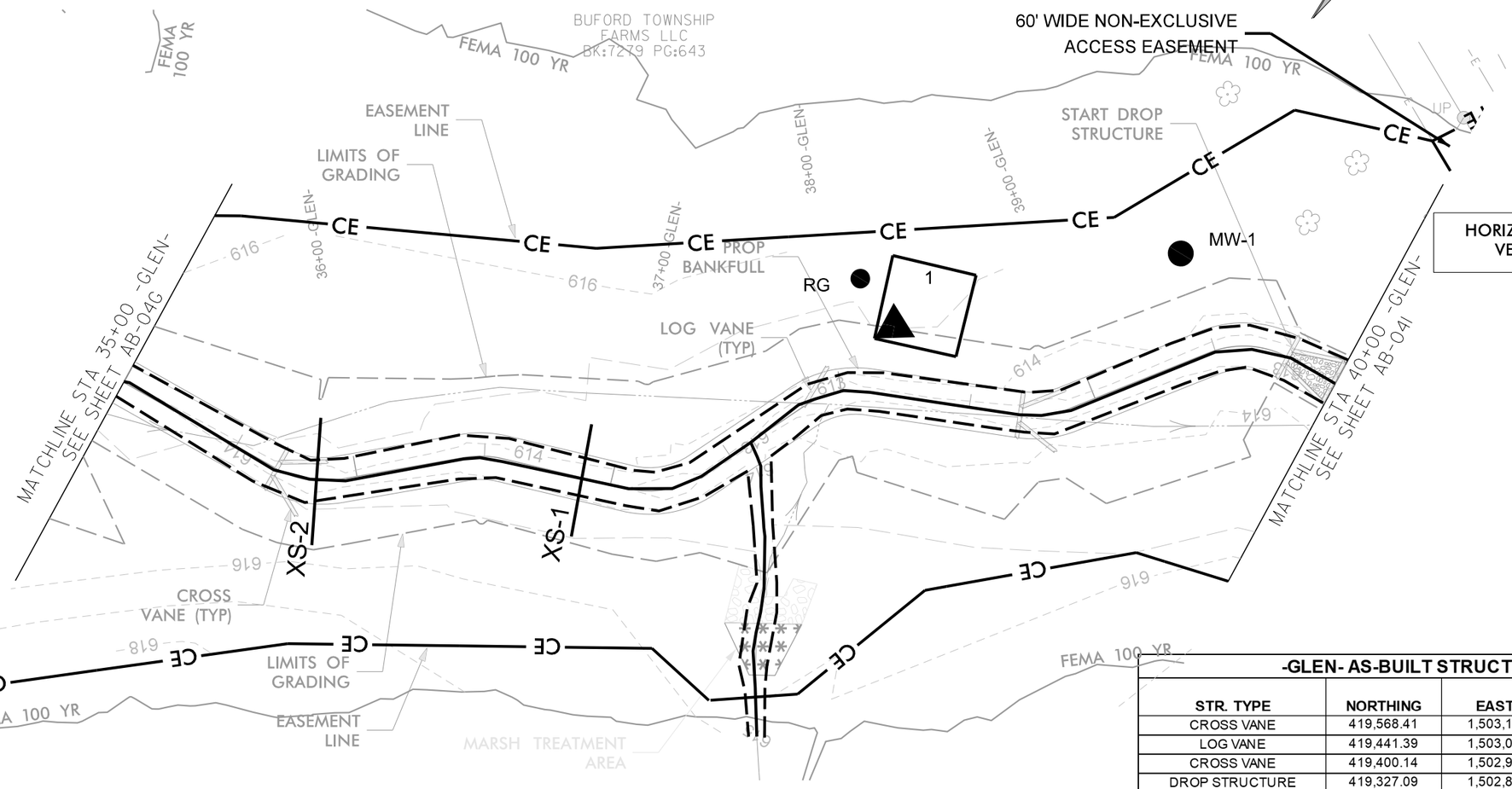
9/1/2022
Nesbit_Rdy_psh_AB-04G.dgn
Harden

25' 12.5' 0 25' 50'

SCALE: 1" = 50'

NAD 83

RECORD DRAWING



DocuSigned by: Joshua Dalton 1089AD8C14994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

9/1/2022

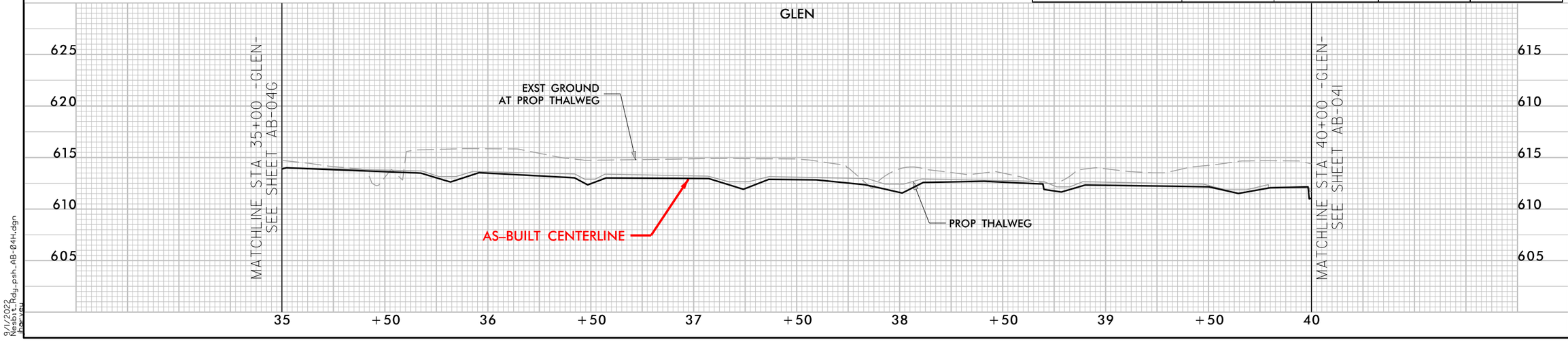
DATE:

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

HORIZONTAL DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 1988

-GLEN- AS-BUILT STRUCTURE LOCATIONS

STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	419,568.41	1,503,191.67	613.69	613.49
LOG VANE	419,441.39	1,503,030.54	612.96	612.36
CROSS VANE	419,400.14	1,502,957.46	612.68	612.43
DROP STRUCTURE	419,327.09	1,502,880.74	612.37	612.16



SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
PH: 919.852.1003
ENG FIRM LICENSE NO. C-890

Axiom Environmental, Inc.

NESBIT
UNION COUNTY, NC

AS-BUILT STRUCTURES

PROJECT # :
DRAWING NAME:
DATE: 2022
DRAWN BY: JRH
REVIEWED BY: JGD
REVISIONS:

SHEET NO.
AB-04H

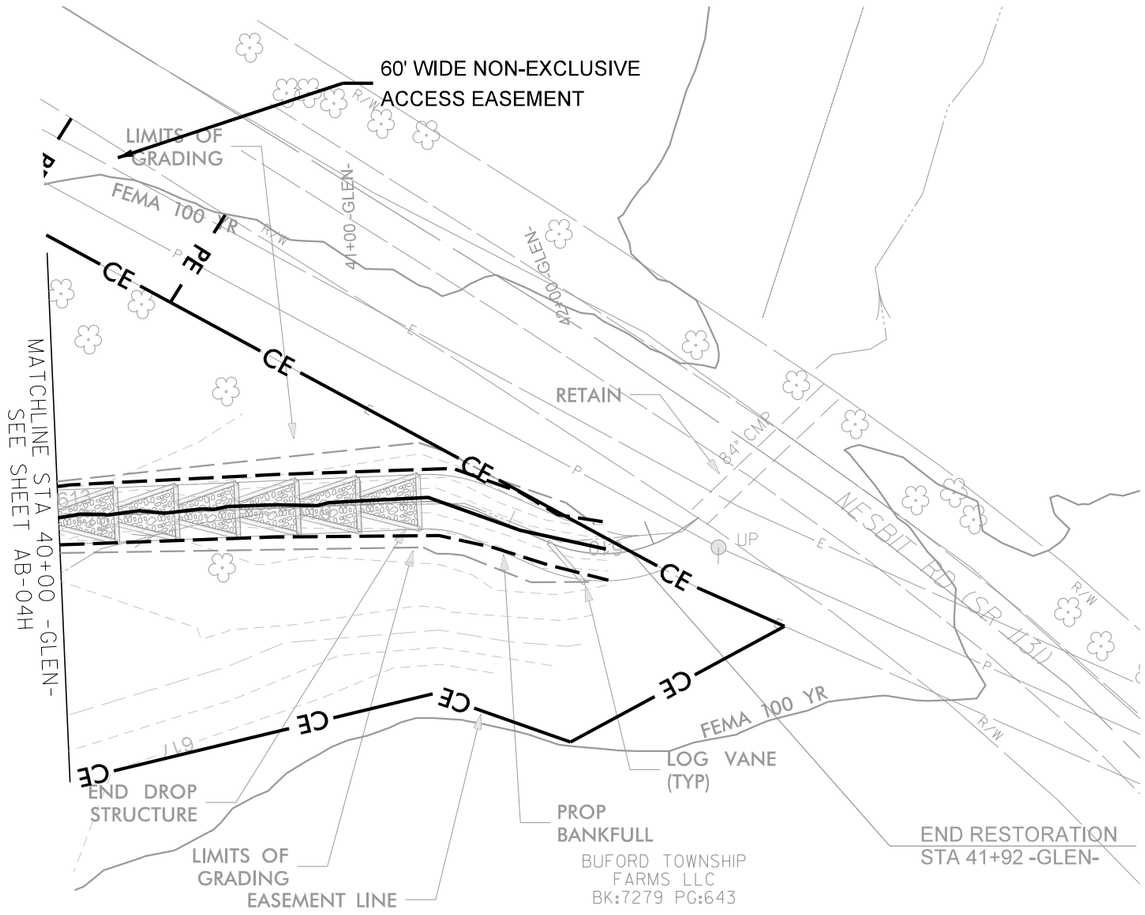
9/1/2022
Nesbit_Rdy_psh_AB-04H.dgn
Jgreen

25' 12.5' 0 25' 50'

SCALE: 1" = 50'

NAD 83

RECORD DRAWING



DocuSigned by:
Joshua Dalton
1089AD8C14994C3...

NORTH CAROLINA
PROFESSIONAL
SEAL
26971
ENGINEER
JOSHUA G. DALTON

9/1/2022

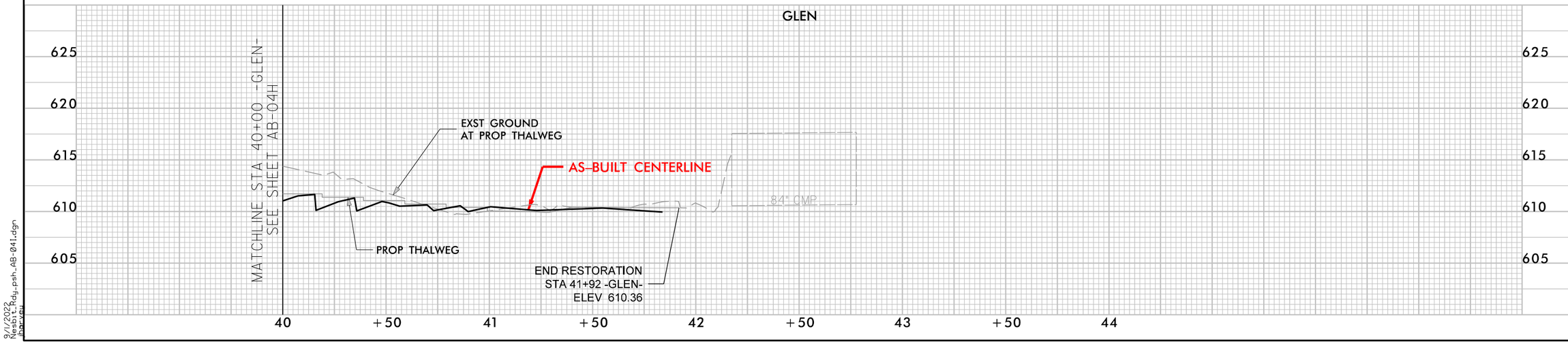
DATE:

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

HORIZONTAL DATUM: NAD 83 (2011)
VERTICAL DATUM: NAVD 1988

-GLEN- AS-BUILT STRUCTURE LOCATIONS

STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
DROP STRUCTURE	419,319.49	1,502,740.15	609.99	610.56
LOG VANE	419,332.39	1,502,698.02	610.37	



SUNGATE DESIGN GROUP, P.A.
905 JONES FRANKLIN ROAD
RALEIGH, NORTH CAROLINA 27606
TEL 919.859.0013
ENG FIRM LICENSE NO. C-890

Axiom Environmental, Inc.

NESBIT
UNION COUNTY, NC

AS-BUILT STRUCTURES

PROJECT # :
DRAWING NAME:
DATE: 2022
DRAWN BY: JRH
REVIEWED BY: JGD
REVISIONS:

SHEET NO.
AB–04I

9/1/2022
Nesbit_Rdy_psh_AB-04I.dgn
Parker

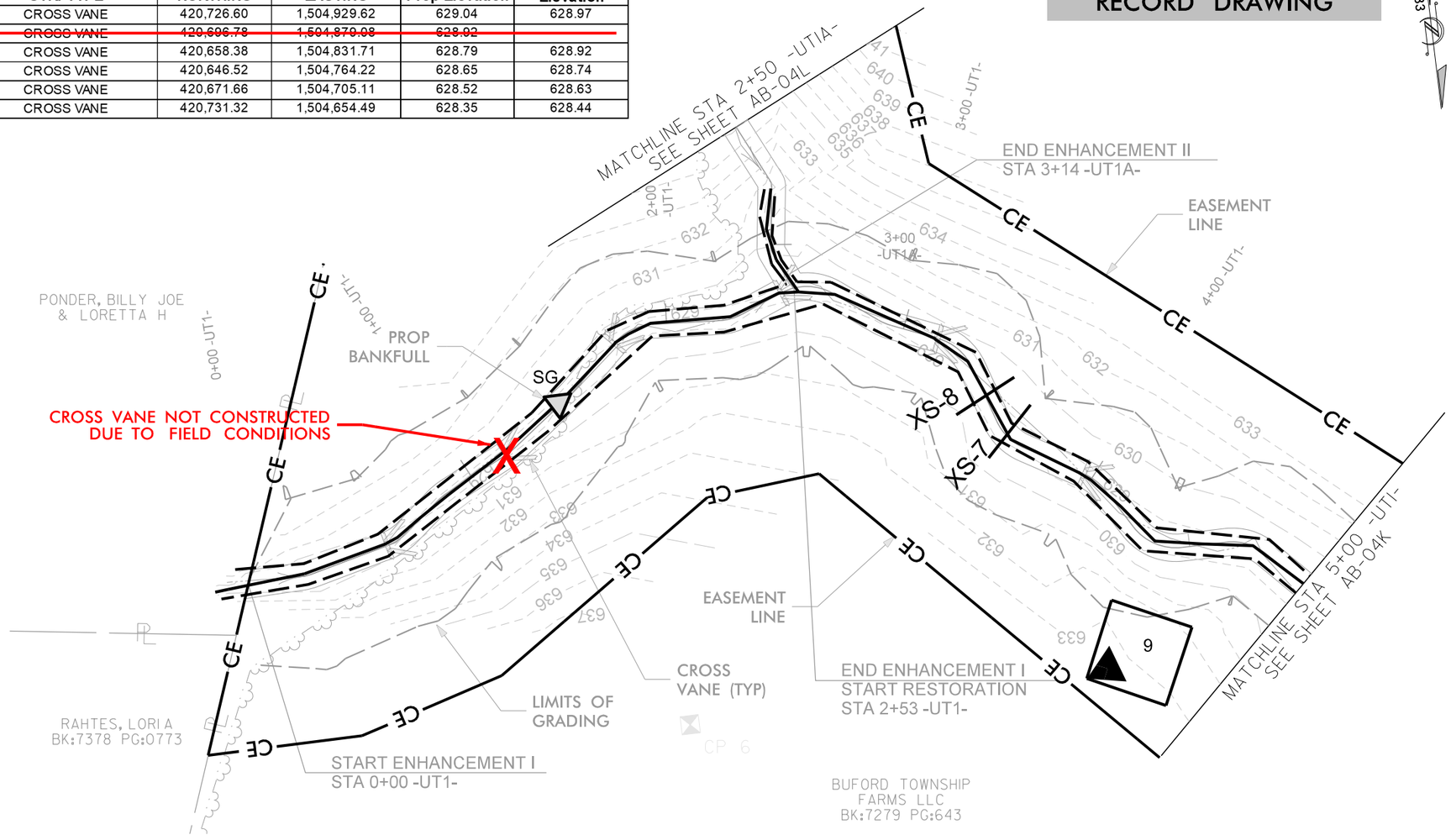
-UT 1- AS-BUILT STRUCTURE LOCATIONS

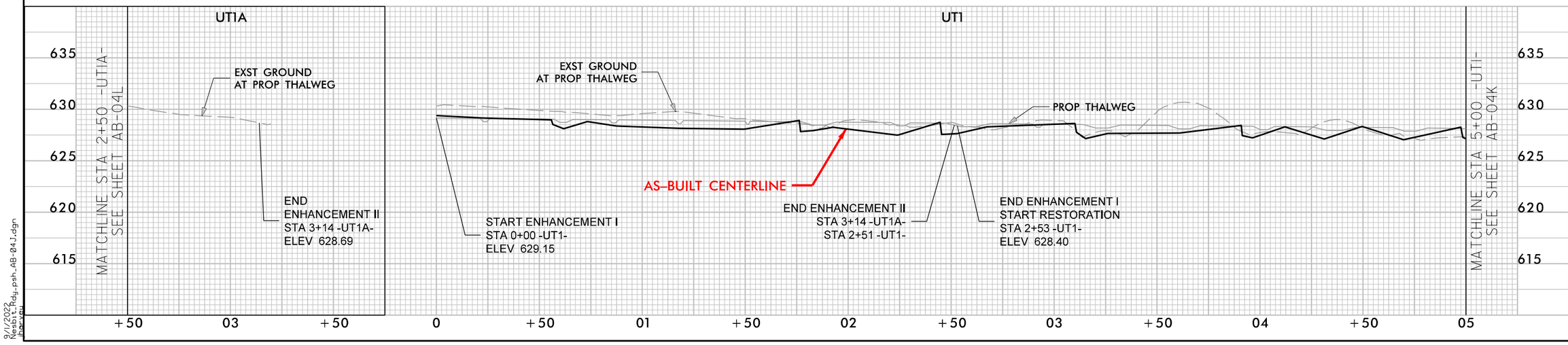
STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	420,726.60	1,504,929.62	629.04	628.97
~~CROSS VANE~~	~~420,696.78~~	~~1,504,879.08~~	~~628.82~~	
CROSS VANE	420,658.38	1,504,831.71	628.79	628.92
CROSS VANE	420,646.52	1,504,764.22	628.65	628.74
CROSS VANE	420,671.66	1,504,705.11	628.52	628.63
CROSS VANE	420,731.32	1,504,654.49	628.35	628.44

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

RECORD DRAWING

NAD 83





DocuSigned by: Josh Dalton 1088AD86C4994C3...

NORTH CAROLINA PROFESSIONAL SEAL 26971 ENGINEER JOSHUA G. DALTON

9/1/2022

DATE:

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HORIZONTAL DATUM: NAD 83 (2011)
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ENG FIRM LICENSE NO. C-890

Axiom Environmental, Inc.

NESBIT
UNION COUNTY, NC

AS-BUILT STRUCTURES

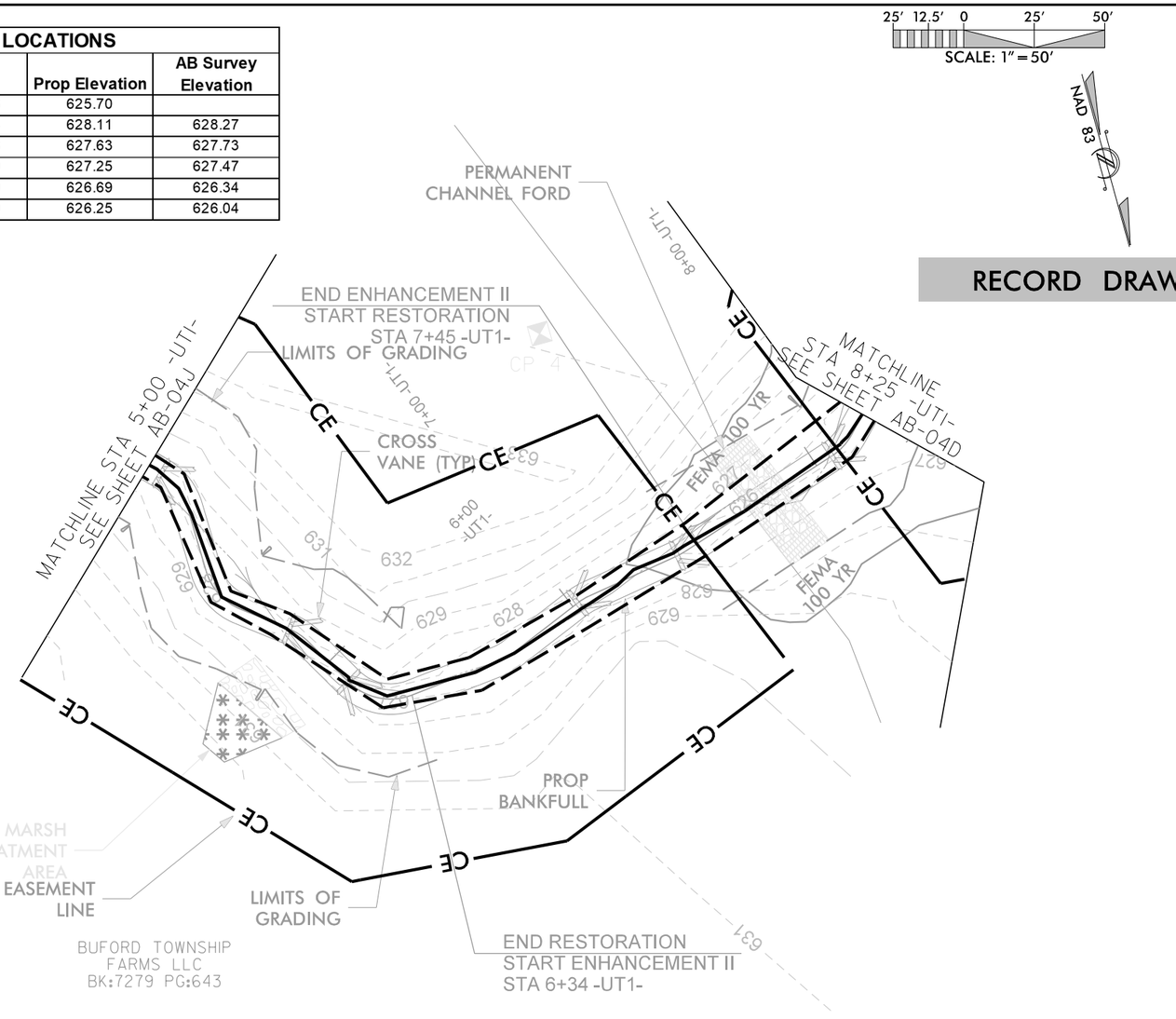
PROJECT # :
DRAWING NAME:
DATE: 2022
DRAWN BY: JRH
REVIEWED BY: JGD
REVISIONS:

SHEET NO.
AB–04J

9/1/2022
Nesbit_Rdy_psh_AB-04J.dgn
jarvey

-UT 1- AS-BUILT STRUCTURE LOCATIONS

STR. TYPE	NORTHING	EASTING	Prop Elevation	AB Survey Elevation
CROSS VANE	420,845.31	1,504,339.96	625.70	
CROSS VANE	420,788.20	1,504,570.84	628.11	628.27
CROSS VANE	420,853.55	1,504,541.68	627.63	627.73
CROSS VANE	420,877.08	1,504,526.39	627.25	627.47
CROSS VANE	420,871.67	1,504,440.70	626.69	626.34
CROSS VANE	420,864.90	1,504,402.19	626.25	626.04



RECORD DRAWING

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9/1/2022

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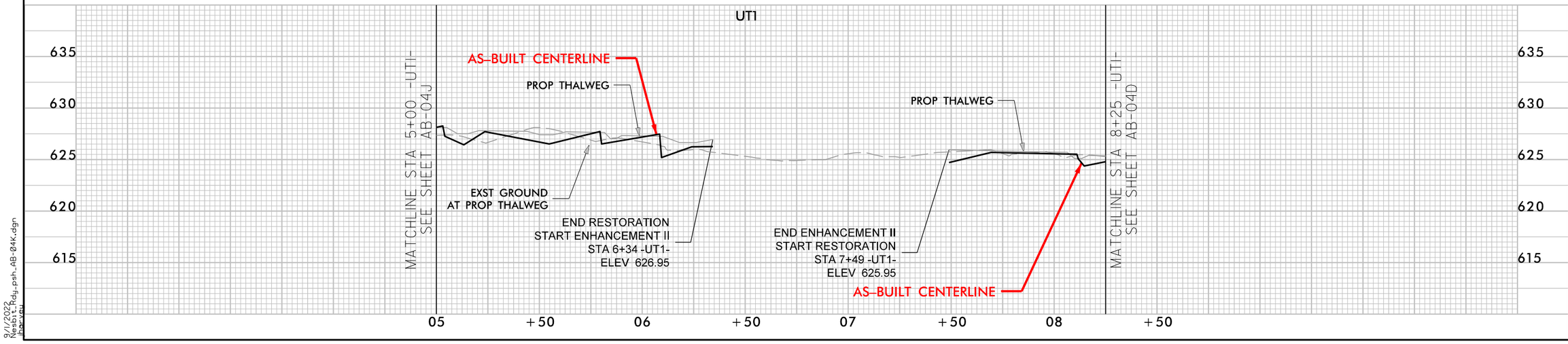

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AS-BUILT STRUCTURES

PROJECT # :
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REVIEWED BY: JGD
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AB-04K

9/1/2022
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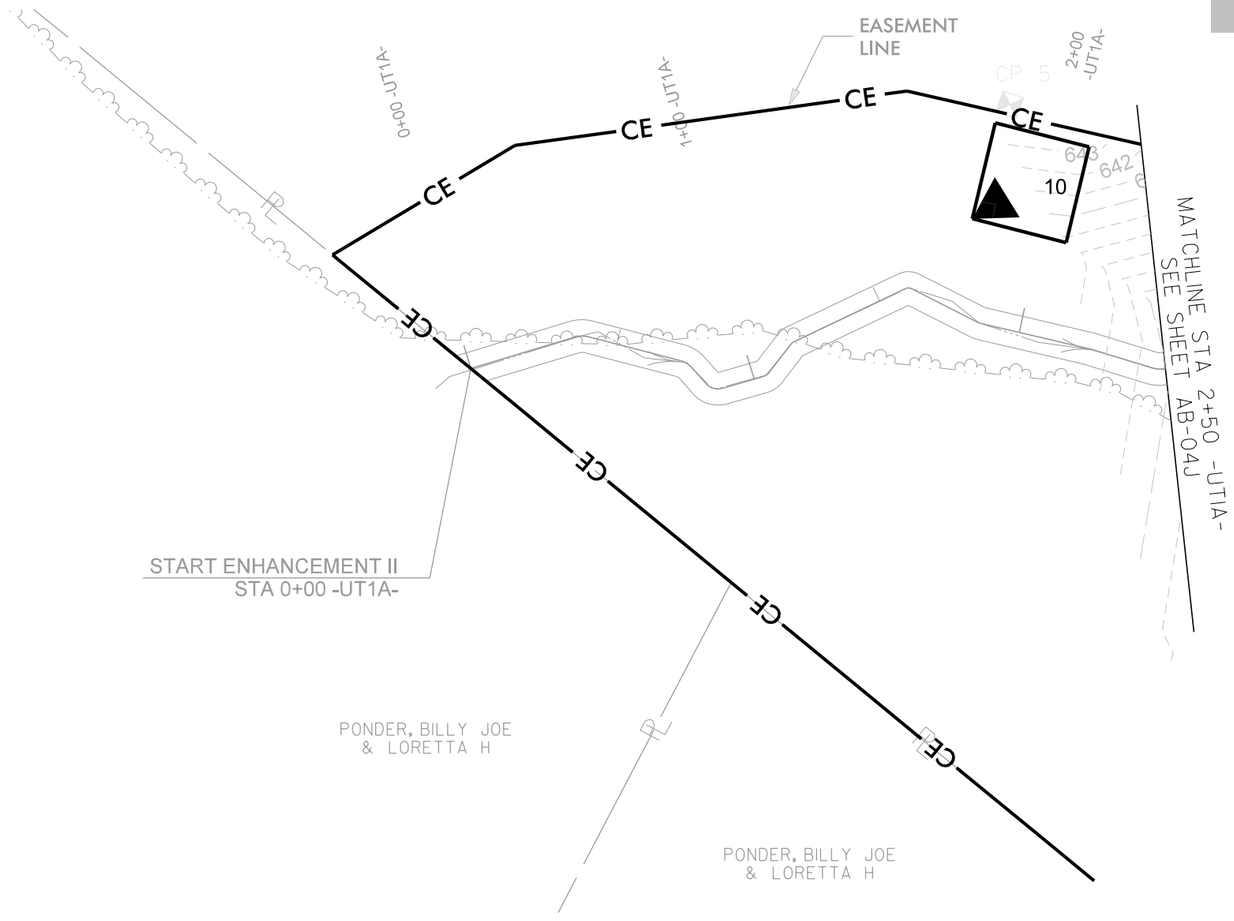
jharvey

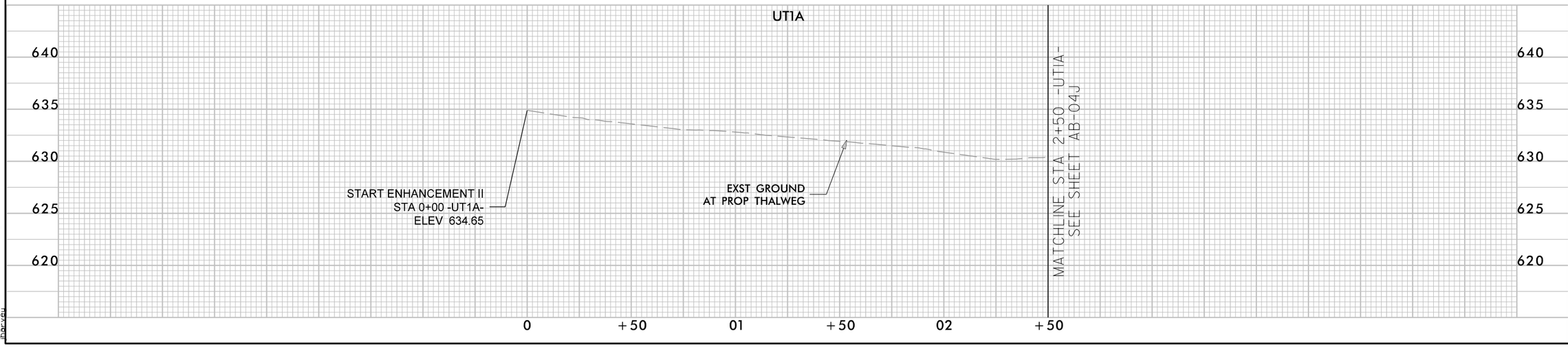
25' 12.5' 0 25' 50'

SCALE: 1" = 50'

NAD 83

RECORD DRAWING





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AS-BUILT STRUCTURES

PROJECT # :
DRAWING NAME:
DATE: 2022
DRAWN BY: JRH
REVIEWED BY: JGD
REVISIONS:

SHEET NO.
AB–04L

9/1/2022
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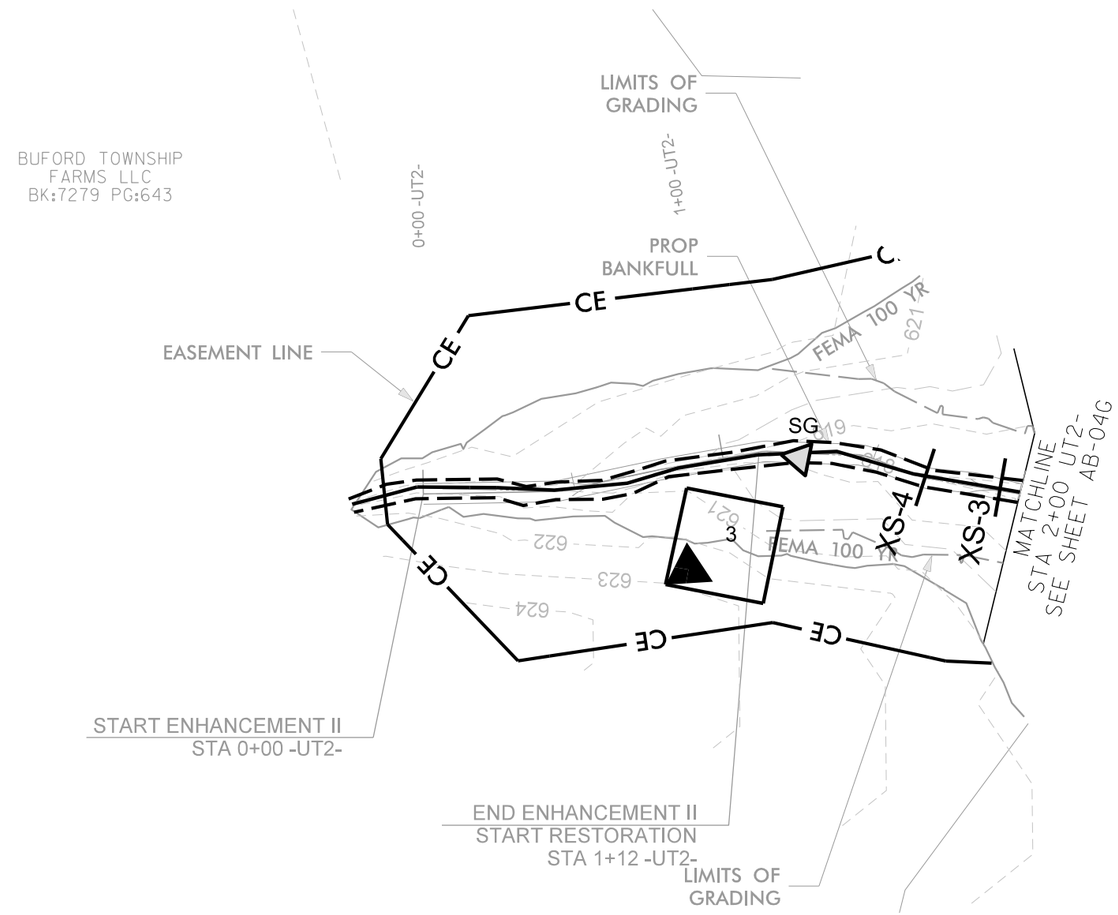
Parker

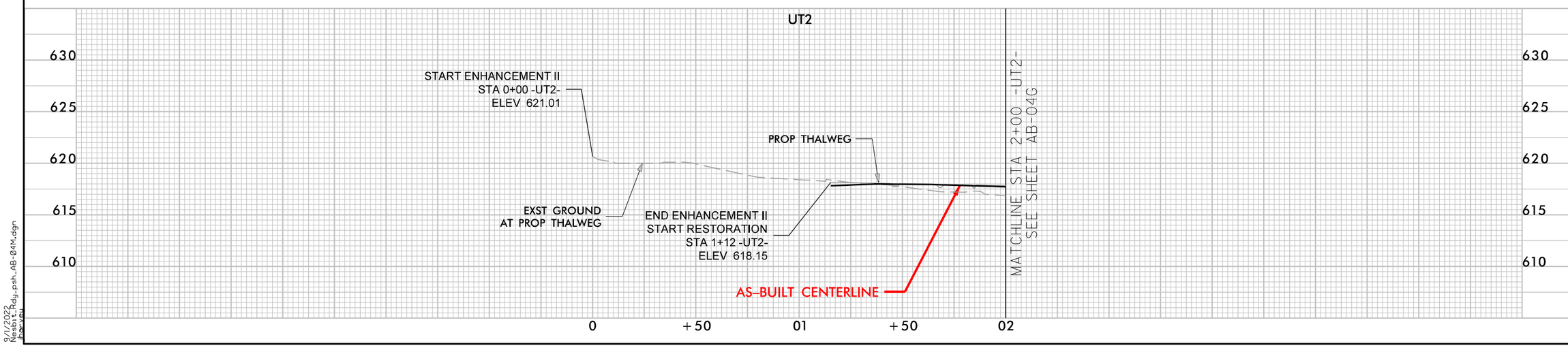
25' 12.5' 0 25' 50'

SCALE: 1" = 50'

NAD 83

RECORD DRAWING





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9/1/2022

DATE:

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AS-BUILT STRUCTURES

PROJECT # :
DRAWING NAME:
DATE: 2022
DRAWN BY: JRH
REVIEWED BY: JGD
REVISIONS:

SHEET NO.
AB–04M

9/1/2022
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Harvey

RECORD DRAWING

DESIGN PLANTING TABLE

Vegetation Association	Piedmont/Mountain Bottomland Forest*		Dry-Mesic Oak-Hickory Forest*		Stream-side Assemblage**		TOTAL
Area (acres)	7.2		5		3.8		16
Species	# planted*	% of total	# planted*	% of total	# planted**	% of total	# planted
River birch (*Betula nigra*)	245	5	--	--	1550	15	1795
Bitternut hickory (*Carya cordiformis*)	490	10	--	--	--	--	490
American elm (*Ulmus americana*)	245	5	170	5	--	--	415
Red bud (*Cercis canadensis*)	--	--	510	15	--	--	510
Silky dogwood (*Cornus amomum*)	245	5	--	--	2067	20	2312
Persimmon (*Diospyros virginiana*)	--	--	510	15	--	--	510
Hackberry (*Celtis occidentalis*)	490	10	--	--	517	5	1006
Green ash (*Fraxinus pennsylvanica*)	245	5	--	--	517	5	762
Tulip poplar (*Liriodendron tulipifera*)	245	5	170	5	517	5	932
Sycamore (*Platanus occidentalis*)	245	5	170	5	1550	15	1965
Red mulberry (*Morus rubra*)	--	--	170	5	517	5	687
Water oak (*Quercus nigra*)	734	15	680	20	--	--	1414
White oak (*Quercus alba*))	490	10	680	20	1034	10	2203
Red oak (*Quercus rubra*)	--	--	340	10	--	--	340
Black gum (*Nyssa sylvatica*)	490	10	--	--	1034	10	1523
Willow oak (*Quercus phellos*)	245	5	--	--	1034	10	1278
Shumard oak (*Quercus shumardii*)	490	10	--	--	--	--	490
TOTAL	**4896**	**100**	**3400**	**100**	**10336**	**100**	**18632**

* Planted at a density of 680 stems/acre.

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

AS–BUILT PLANTING TABLE

Vegetation Association	Piedmont/Mountain Bottomland Forest*		Dry-Mesic Oak-Hickory Forest*		Stream-side Assemblage**		TOTAL
Area (acres)	7.2		5.0		3.8		16.0
Species	# planted*	% of total	# planted*	% of total	# planted**	% of total	# planted
River birch (*Betula nigra*)	250	5	--	--	1750	17	2000
Shagbark hickory (*Carya cordiformis*)	500	10	--	--	--	--	500
Hackberry (*Celtis occidentalis*)	400	8	--	--	600	6	1000
Red bud (*Cercis canadensis*)	--	--	600	18	--	--	600
Silky dogwood (*Cornus amomum*)	350	7	--	--	2150	21	2500
Persimmon (*Diospyros virginiana*)	--	--	500	15	--	--	500
Green ash (*Fraxinus pennsylvanica*)	200	4.5	--	--	700	7	900
Tulip poplar (*Liriodendron tulipifera*)	200	4.5	150	4	650	6.5	1000
Red mulberry (*Morus rubra*)	--	--	150	4	350	3	500
Black gum (*Nyssa sylvatica*)	300	6	--	--	950	9	1250
Sycamore (*Platanus occidentalis*)	400	8	150	4	1700	16.5	2250
White oak (*Quercus alba*)	200	4.5	150	4	650	6	1000
Water oak (*Quercus nigra*)	1000	20	1000	30	--	--	2000
Willow oak (*Quercus phellos*)	200	4.5	--	--	800	8	1000
Red oak (*Quercus rubra*)	--	--	500	15	--	--	500
Shumard oak (*Quercus shumardii*)	600	12	--	--	--	--	600
American elm (*Ulmus americana*)	300	6	200	6	--	--	500
TOTAL	**4900**	**100**	**3400**	**100**	**10300**	**100**	**18600**

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AS-BUILT PLANTING LIST

PROJECT # :

DRAWING NAME:

DATE: 2022

DRAWN BY: JRH

REVIEWED BY: JGD

REVISIONS:

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AB–04N

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